

MEISTERWERKE SCHULTE GMBH

ACOUSTICAL PERFORMANCE TEST REPORT

SCOPE OF WORK

ASTM E90 AND ASTM E492 TESTING ON LINDURA ENGINEERED HARDWOOD

SPECIMEN TYPE

Concrete Slab - 203 mm (8")

REPORT NUMBER

I9165.02-113-11-R1

TEST DATE

09/26/18

ISSUE DATE

10/05/18

REVISED DATE

10/17/18

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PAGES

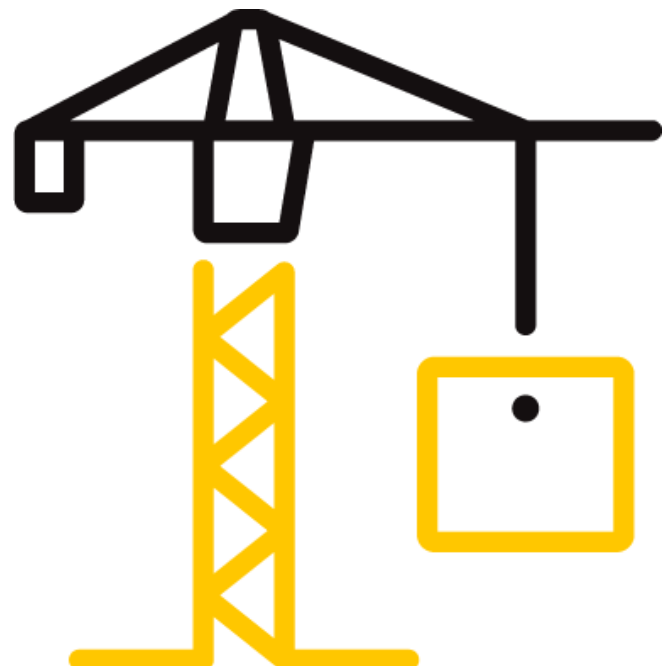
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TEST REPORT FOR MEISTERWERKE SCHULTE GMBH

Report No.: I9165.02-113-11-R1

Date: 10/17/18

REPORT ISSUED TO

MEISTERWERKE SCHULTE GMBH

Johannes Schulte Allee 5

59602 Ruthen-Meiste, GERMANY

SECTION 1

SCOPE

Intertek Building & Construction (B&C) was contracted by Meisterwerke Schulte GmbH to perform testing in accordance with ASTM E90 AND ASTM E492 on Lindura Engineered Hardwood. Results obtained are tested values and were secured by using the designated test method(s). Testing was conducted in the VT test chambers at Intertek B&C located in York, Pennsylvania.

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

SECTION 2

SUMMARY OF TEST RESULTS

| | |
|----------------------|-----------------------------|
| DATA FILE NO. | I9165.02 |
| SERIES/MODEL: | Lindura Engineered Hardwood |
| STC | 55 |
| IIC | 52 |

| | |
|----------------------|-----------------------------------|
| COMPLETED BY: | Cody R. Snyder |
| TITLE: | Technician I - Acoustical Testing |
| SIGNATURE: | |
| DATE: | 10/17/18 |

| | |
|----------------------|--------------------------------------|
| COMPLETED BY: | Jordan Strybos |
| TITLE: | Project Manager - Acoustical Testing |
| SIGNATURE: | |
| DATE: | 10/17/18 |

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SECTION 3**TEST METHODS**

The specimen was evaluated in accordance with the following:

ASTM E90-09 (2016), *Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions*

ASTM E413-16, *Classification for Rating Sound Insulation*

ASTM E492-09(2016)e1, *Standard Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine*

ASTM E989-06 (2012), *Classification for Determination of Impact Insulation Class (IIC)*

ASTM E2235-04 (2012), *Standard Test Method for Determination of Decay Rates for Use in Sound Insulation Test Methods*

SECTION 4**MATERIAL SOURCE/INSTALLATION**

The full test specimen was assembled on the day of testing by B&C. All materials provided by the client were installed on an existing B&C assembly (Concrete Slab - 203 mm (8")) utilizing B&C-supplied materials. The assembly was installed in a steel test frame which was installed into the opening between the source and receive rooms in the test chamber. The test frame was isolated from the structure with dense neoprene gasket.

The total weight of the floor/ceiling assembly was 5920 kg / 13051.5 lbs. B&C will store samples of the test specimen for four years. Photographs of the test specimen are included in the report. A drawing of the test specimen is included in the report.

B&C will service this report for the entire test record retention period. Test records, such as detailed drawings, datasheets, representative samples of test specimens, or other pertinent project documentation, will be retained by B&C for the entire test record retention period.

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**SECTION 5
EQUIPMENT**

| INSTRUMENT | MANUFACTURER | MODEL | DESCRIPTION | ASSET # | CAL DATE |
|--------------------------------------|----------------------|----------|--------------------------------------|----------|----------|
| Data Acquisition Unit | National Instruments | PXI-4462 | Data Acquisition Card | INT00977 | 08/18 * |
| Data Acquisition Unit | National Instruments | PXI-4462 | Data Acquisition Card | 65124 | 05/18 * |
| Data Acquisition Unit | National Instruments | PXI-4462 | Data Acquisition Card | 63763-1 | 06/18 * |
| Microphone Calibrator | Norsonic | Nor1251 | Acoustical Calibrator | 65105 | 06/18 |
| Receive Room Microphone | PCB Piezotronics | 378C20 | Microphone and Preamplifier | 65617 | 06/18 |
| Receive Room Microphone | PCB Piezotronics | 378B20 | Microphone and Preamplifier | 63744 | 06/18 |
| Receive Room Microphone | PCB Piezotronics | 378B20 | Microphone and Preamplifier | 63745 | 06/18 |
| Receive Room Microphone | PCB Piezotronics | 378B20 | Microphone and Preamplifier | 63746 | 12/17 |
| Receive Room Microphone | PCB Piezotronics | 378B20 | Microphone and Preamplifier | 63747 | 07/18 |
| Receive Room Environmental Indicator | Comet | T7510 | Temperature and Humidity Transmitter | 63810 | 10/17 |
| | | | | 63811 | 10/17 |
| Source Room Microphone | PCB Piezotronics | 378C20 | Microphone and Preamplifier | INT01009 | 02/18 |
| Source Room Microphone | PCB Piezotronics | 378C20 | Microphone and Preamplifier | 63739 | 04/18 |
| Source Room Microphone | PCB Piezotronics | 378C20 | Microphone and Preamplifier | 63740 | 04/18 |
| Source Room Microphone | PCB Piezotronics | 378C20 | Microphone and Preamplifier | 63742 | 03/18 |
| Source Room Microphone | PCB Electronics | 378C20 | Microphone and Preamplifier | 63741 | 04/18 |
| Source Room Environmental Indicator | Comet | T7510 | Temperature and Humidity Transmitter | INT00603 | 03/18 |
| Tapping Machine | Norsonic | Nor277 | Tapping Machine | INT00936 | 12/17 |

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

| | |
|-------------------------------|--|
| VT RECEIVE ROOM VOLUME | 158.34 m ³ (5591.89 ft ³) |
| VT SOURCE ROOM VOLUME | 190 m ³ (6709.79 ft ³) |

**SECTION 6
LIST OF OFFICIAL OBSERVERS**

| NAME | COMPANY |
|----------------|--------------|
| Cody R. Snyder | Intertek B&C |
| Jordan Strybos | Intertek B&C |

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SECTION 7**TEST PROCEDURE**

The microphones were calibrated before conducting the tests. The air temperature and relative humidity conditions were monitored and recorded during all measurements. The average temperature and humidity of both the source and received rooms are listed in Sections 10 and 11. The maximum and minimum temperatures and humidities of the receive room from the duration of the test are listed in Sections 12 and 13.

The airborne transmission loss test was conducted in accordance with the ASTM E90 test method using the single direction method. Two background noise sound pressure level and five sound absorption measurements were conducted at each of five microphone positions. Two sound pressure level measurements were made simultaneously in both rooms, at each of five microphone positions.

The impact sound transmission test was conducted in accordance with the ASTM E492 test method. Two background noise sound pressure level, two sound pressure level measurements with the tapping machine operating at each position specified by ASTM E492, and five sound absorption measurements were conducted at each of five microphone positions.

Detailed test procedures, data for flanking limit tests, repeatability measurements, and reference specimen tests are available upon request.

SECTION 8**TEST CALCULATIONS**

The STC (Sound Transmission Class) and IIC (Impact Insulation Class) ratings were calculated in accordance with ASTM E413 and ASTM E989, respectively.

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SECTION 9

TEST SPECIMEN DESCRIPTION

| MATERIAL | Dimensions (mm/inch) | Thickness (mm/inch) | MANUFACTURER AND SERIES | QUANTITY | AVERAGE WEIGHT |
|---------------------|---|---------------------|-------------------------------|--|---|
| Engineered Hardwood | 2200 by 205 86.6 by 8.1 | 11 / 0.43 | Lindura | 10.98 m ² 118.19 ft ² | 10.54 kg/m ² 2.16 lb/ft ² |
| | Note: Adhered to the underlayment with Bostik's BEST Wood Flooring Urethane Adhesive using a 6.35 mm by 6.35 mm by 6.35 mm (0.25" by 0.25" by 0.25") square notch trowel. Adhesive was allowed to cure per manufacturer's specifications. | | | | |
| Rubber Underlayment | 3023 by 1219 119 by 48 | 5 / 0.2 | ECORE International QT4005 | 10.98 m ² 118.19 ft ² | 3.92 kg/m ² 0.8 lb/ft ² |
| | Note: A sheet of 2 mil polyethylene plastic was adhered to the floor slab with Sprayway Fast Tack 85 spray adhesive. The underlayment was adhered to the sheeting with Ecore E-Grip III adhesive, which was spread using a 1.59 mm by 1.59 mm by 1.59 mm (0.06" by 0.06" by 0.06") square notch trowel. Adhesive was allowed to cure per manufacturer's specifications. | | | | |
| Concrete Slab | 3023 by 3632 119 by 143 | 203.2 / 8 | 5000 PSI | 10.98 m ² 118.19 ft ² | 524.71 kg/m ² 107.47 lb/ft ² |
| | Note: Installed in a test frame flush to the source room. Mats of #5 reinforcing bars were placed 25.4 mm (1") from both the top and bottom of the slab, with bars spaced on 305 mm (12") centers in both directions. No noticeable shrinkage or cracking was visible on the specimen. | | | | |

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SECTION 10

TEST RESULTS - AIRBORNE SOUND TRANSMISSION LOSS



| | | | | | |
|----------------------|---|-------------------------|---------------|------------------------|---------------|
| TEST DATE | 9/26/2018 | | | | |
| DATA FILE NO. | I9165.02 | | | | |
| CLIENT | Meisterwerke Schulte GmbH | | | | |
| DESCRIPTION | 11 mm (0.43") Lindura Engineered Hardwood, 5 mm (0.2") ECOPE International QT4005 Rubber Underlayment, 203.2 mm (8") 5000 PSI Concrete Slab | | | | |
| SPECIMEN AREA | 10.98 m ² | Receive Temp. | 21°C (69.8°F) | Source Temp. | 21°C (69.8°F) |
| TECHNICIAN | CRS | Receive Humidity | 73% | Source Humidity | 73% |

| FREQ (Hz) | BACKGROUND SPL (dB) | ABSORPTION m ² | SOURCE SPL (dB) | RECEIVE SPL (dB) | SPECIMEN TL (dB) | 95% CONFIDENCE LIMIT | NUMBER OF DEFICIENCIES |
|-------------------|---------------------------|-----------------------------------|-----------------------|------------------------|----------------------------|----------------------------|------------------------------|
| 50 | 38.8 | 34.4 | 99 | 63 | 31 | 4.5 | - |
| 63 | 39.2 | 27.7 | 101 | 65 | 32 | 5.3 | - |
| 80 | 34.0 | 15.3 | 109 | 66 | 42 | 2.5 | - |
| 100 | 29.5 | 12.7 | 107 | 66 | 40 | 2.5 | - |
| 125 | 29.0 | 8.7 | 104 | 66 | 40 | 2.0 | 0 |
| 160 | 26.6 | 9.1 | 105 | 69 | 37 | 0.8 | 5 |
| 200 | 23.3 | 10.0 | 102 | 60 | 42 | 1.5 | 3 |
| 250 | 29.3 | 9.9 | 101 | 58 | 43 | 1.0 | 5 |
| 315 | 22.2 | 9.5 | 104 | 59 | 46 | 0.8 | 5 |
| 400 | 19.0 | 8.1 | 102 | 54 | 49 | 0.8 | 5 |
| 500 | 21.6 | 7.6 | 103 | 54 | 51 | 0.5 | 4 |
| 630 | 19.8 | 7.4 | 103 | 50 | 54 | 0.6 | 2 |
| 800 | 18.9 | 7.3 | 103 | 49 | 55 | 0.7 | 2 |
| 1000 | 21.6 | 7.4 | 103 | 45 | 60 | 0.5 | 0 |
| 1250 | 20.2 | 7.4 | 103 | 43 | 62 | 1.0 | 0 |
| 1600 | 16.1 | 7.5 | 103 | 39 | 65 | 0.4 | 0 |
| 2000 | 16.3 | 8.1 | 103 | 39 | 66 | 0.5 | 0 |
| 2500 | 13.8 | 9.0 | 100 | 36 | 65 | 0.4 | 0 |
| 3150 | 12.7 | 9.9 | 102 | 33 | 70 | 0.5 | 0 |
| 4000 | 10.9 | 11.0 | 103 | 31 | 72 | 0.4 | 0 |
| 5000 | 8.6 | 12.5 | 103 | 28 | 74 | 0.6 | - |
| 6300 | 7.3 | 15.4 | 97 | 20 | 76 | 1.1 | - |
| 8000 | 7.2 | 19.9 | 97 | 14 | 80 | 0.7 | - |
| 10000 | 6.7 | 24.3 | 92 | 8 | 81 | 0.7 | - |
| STC Rating | 55 | <i>(Sound Transmission Class)</i> | | | Sum of Deficiencies | 31 | |

- Notes:**
- 1) Receive Room levels less than 5 dB above the Background levels are highlighted in yellow.
 - 2) Specimen TL levels listed in red are potentially limited by the laboratory flanking limit.
 - 3) Specimen TL levels listed in blue indicate the lower limit of the transmission loss.
 - 4) Specimen TL levels listed in green indicate that there has been a filler wall correction applied

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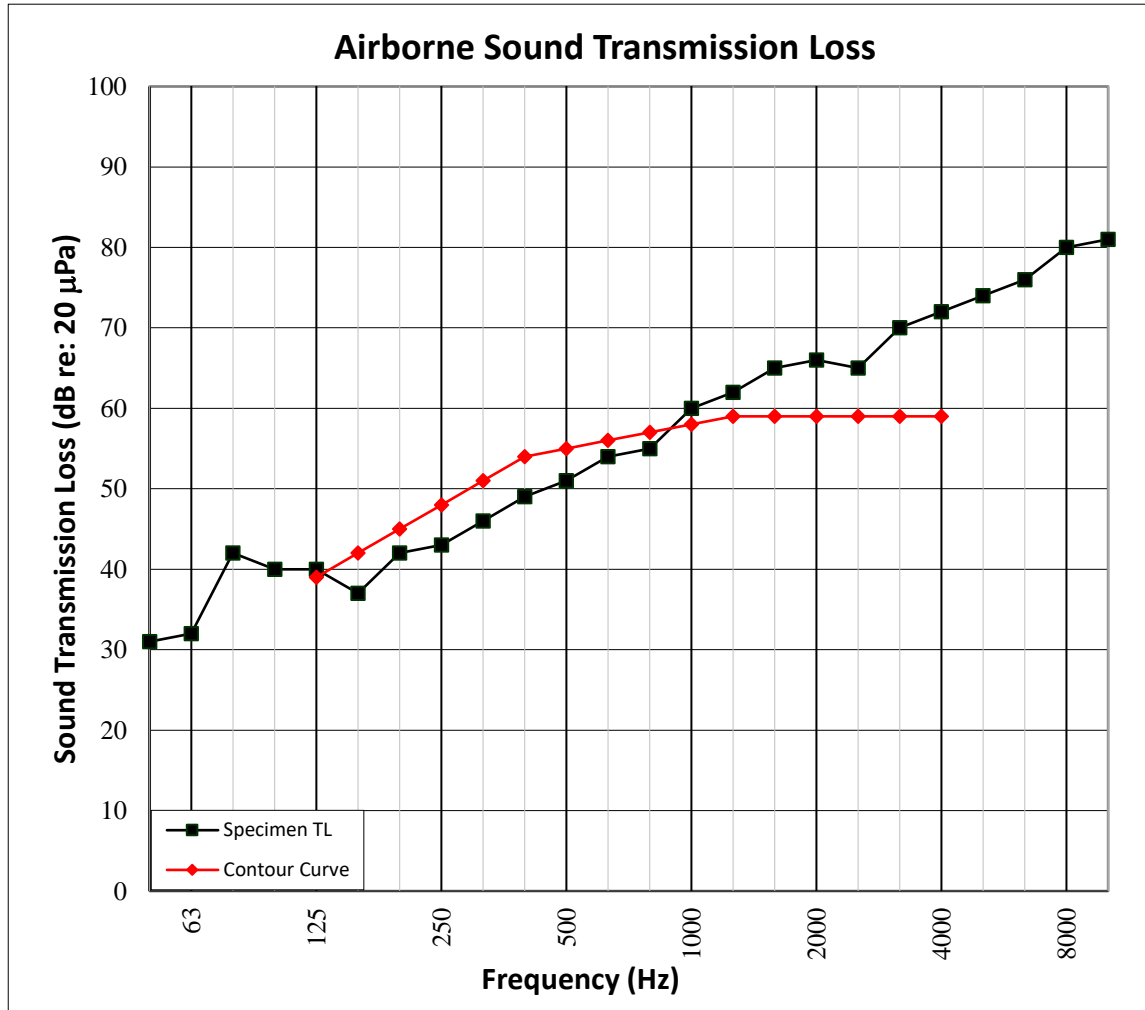
Date: 10/17/18

SECTION 11

TEST RESULTS - AIRBORNE SOUND TRANSMISSION LOSS GRAPH



| | | | | | |
|----------------------|---|-------------------------|---------------|------------------------|---------------|
| TEST DATE | 9/26/2018 | | | | |
| DATA FILE NO. | I9165.02 | | | | |
| CLIENT | Meisterwerke Schulte GmbH | | | | |
| DESCRIPTION | 11 mm (0.43") Lindura Engineered Hardwood, 5 mm (0.2") ECORE International QT4005 Rubber Underlayment, 203.2 mm (8") 5000 PSI Concrete Slab | | | | |
| SPECIMEN AREA | 10.98 m ² | Receive Temp. | 21°C (69.8°F) | Source Temp. | 21°C (69.8°F) |
| TECHNICIAN | CRS | Receive Humidity | 73% | Source Humidity | 73% |



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SECTION 12

TEST RESULTS - IMPACT SOUND TRANSMISSION



| | | | | | |
|----------------------|---|----------------------|---------------|----------------------|-----------------|
| TEST DATE | 9/26/2018 | | | | |
| DATA FILE NO. | I9165.02 | | | | |
| CLIENT | Meisterwerke Schulte GmbH | | | | |
| DESCRIPTION | 11 mm (0.43") Lindura Engineered Hardwood, 5 mm (0.2") ECOPE International QT4005 Rubber Underlayment, 203.2 mm (8") 5000 PSI Concrete Slab | | | | |
| SPECIMEN AREA | 10.98 m ² | Maximum Temp. | 21.1°C (70°F) | Minimum Temp. | 20.9°C (69.7°F) |
| TECHNICIAN | CRS | Max. Humidity | 74% | Min. Humidity | 72% |

| FREQ (Hz) | BACKGROUND SPL (dB) | ABSORPTION m ² | NORMALIZED IMPACT SPL (dB) | 95% CONFIDENCE LIMIT | NUMBER OF DEFICIENCIES |
|-------------------|---------------------------|----------------------------------|-------------------------------|----------------------------|------------------------------|
| 50 | 37.4 | 33.1 | 59 | 3.0 | - |
| 63 | 38.6 | 24.6 | 55 | 3.7 | - |
| 80 | 33.1 | 15.6 | 52 | 1.3 | - |
| 100 | 27.8 | 13.4 | 54 | 1.3 | 0 |
| 125 | 27.6 | 9.7 | 59 | 1.7 | 0 |
| 160 | 24.9 | 9.2 | 61 | 1.2 | 1 |
| 200 | 22.4 | 10.7 | 63 | 0.8 | 3 |
| 250 | 29.1 | 10.2 | 66 | 1.2 | 6 |
| 315 | 21.9 | 9.6 | 66 | 0.5 | 6 |
| 400 | 18.9 | 8.2 | 62 | 0.4 | 3 |
| 500 | 21.8 | 7.6 | 64 | 0.4 | 6 |
| 630 | 19.9 | 7.5 | 60 | 0.4 | 3 |
| 800 | 18.3 | 7.4 | 59 | 0.7 | 3 |
| 1000 | 19.3 | 7.4 | 53 | 0.5 | 0 |
| 1250 | 17.5 | 7.4 | 49 | 0.4 | 0 |
| 1600 | 14.6 | 7.4 | 45 | 0.4 | 0 |
| 2000 | 13.5 | 8.2 | 40 | 0.5 | 0 |
| 2500 | 11.2 | 9.1 | 34 | 0.6 | 0 |
| 3150 | 9.3 | 9.8 | 27 | 0.7 | 0 |
| 4000 | 8.0 | 11.0 | 22 | 1.0 | - |
| 5000 | 7.1 | 12.4 | 17 | 0.9 | - |
| 6300 | 6.5 | 15.4 | 10 | 0.7 | - |
| 8000 | 6.9 | 19.8 | 9 | 0.4 | - |
| 10000 | 6.5 | 24.3 | 9 | 0.6 | - |
| IIC Rating | 52 | <i>(Impact Insulation Class)</i> | | Sum of Deficiencies | 31 |

Notes: Receive Room levels less than 5 dB above the Background levels are highlighted in yellow.

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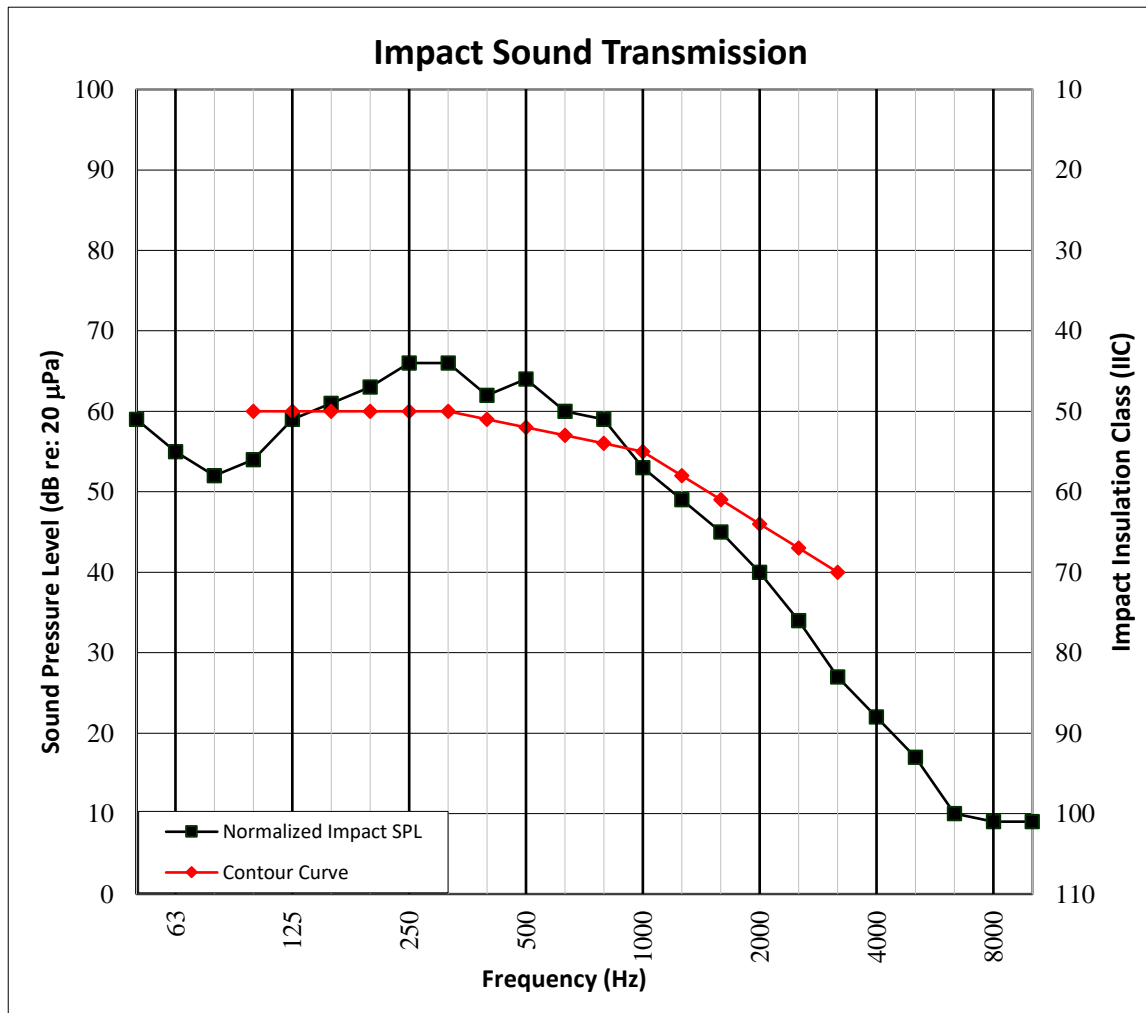
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SECTION 13

TEST RESULTS - IMPACT SOUND TRANSMISSION GRAPH



| | | | | | |
|----------------------|--|----------------------|---------------|----------------------|-----------------|
| TEST DATE | 9/26/2018 | | | | |
| DATA FILE NO. | I9165.02 | | | | |
| CLIENT | Meisterwerke Schulte GmbH | | | | |
| DESCRIPTION | 11 mm (0.43") Lindura Engineered Hardwood, 5 mm (0.2") E CORE International QT4005 Rubber Underlayment, 203.2 mm (8") 5000 PSI Concrete Slab | | | | |
| SPECIMEN AREA | 10.98 m ² | Maximum Temp. | 21.1°C (70°F) | Minimum Temp. | 20.9°C (69.7°F) |
| TECHNICIAN | CRS | Max. Humidity | 74% | Min. Humidity | 72% |



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SECTION 14

PHOTOGRAPHS

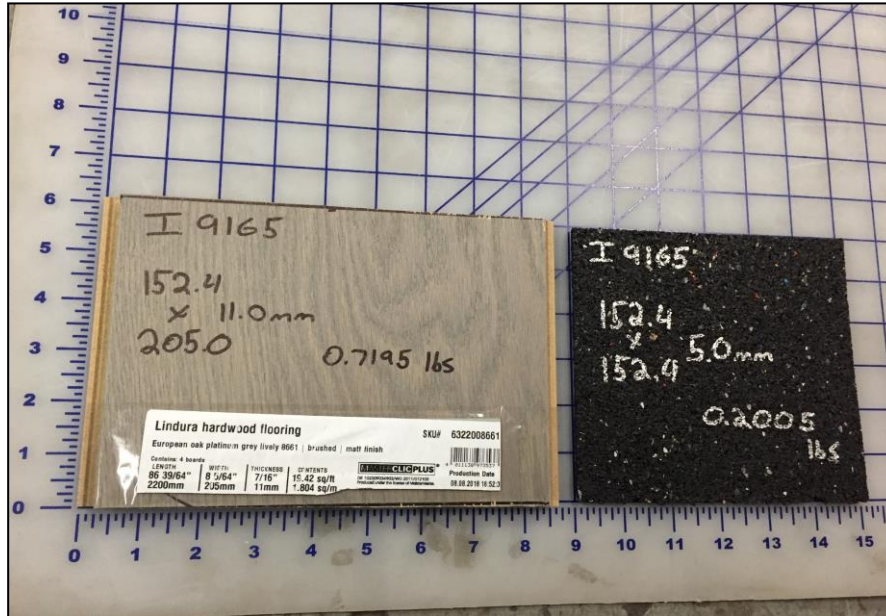


Photo No. 1
Close-Up of Test Specimen



Photo No. 2
Receive Room View of Test Specimen Installation

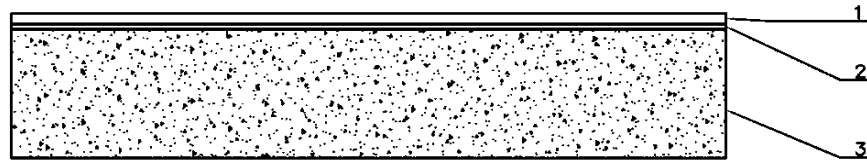
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SECTION 15

DRAWING



- 1-Floor Topping
- 2-Underlayment
- 3-Concrete Slab

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SECTION 16

REVISION LOG

| REVISION # | DATE | PAGES | DESCRIPTION |
|------------|----------|-----------|---|
| R0 | 10/05/18 | N/A | Original Report Issue |
| R1 | 10/17/18 | All pages | Company name changed per client's request |