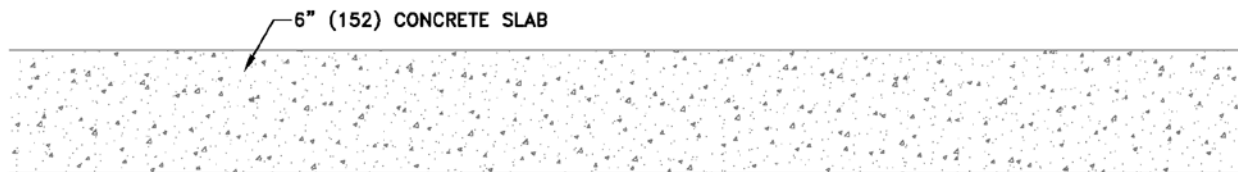


KINETICS NOISE CONTROL TEST REPORT #AT001110

- **KINETICS NOISE CONTROL PRODUCTS:**
 - NONE
- **ACOUSTICAL RATINGS:**
 - STC 53
 - IIC 29
- **TESTING AGENCY & REPORT NUMBER:**
 - NRC-CANADA
 - REPORT NO. A1-010601.1
 - DATED: JULY 25, 2017



KINETICS DRAWING NUMBER: AT001110



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NRC-CMRC

CONSTRUCTION

Acoustic Testing of the Base Concrete Floor Assembly

Kinetics Noise Control Inc.

Report No. A1-010601.1

25 July 2017



National Research
Council Canada

Conseil national de
recherches Canada

Canada

Acoustic Testing of the Base Concrete Floor Assembly

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Contract No: A1-010601
Agreement date: 2 December 2016
Program: Building Regulations for Market Access

7 pages

Copy no. 1 of 4

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Client Kinetics Noise Control Inc.
6300 Irelan Place
Dublin OH 43107

Specimen 150 mm (6 in) precast concrete slab

Specimen ID A1-010601-01F

Construction Date: March 6, 2017 to March 7, 2017

Specimen Description

Precast Concrete Slab: The precast concrete reference floor slab of size 150 mm x 4920 mm x 4010 mm (6 in x 193.7 in x 157.8 in) was installed in the test frame. The upper gap between the specimen and the test frame was filled with fibrous insulation and sealed with cloth tape. The lower gap between the specimen and the test frame was filled with putty.



Cross-section of A1-010601-01F

Specimen Properties

Element	Actual thickness (mm)	Mass (kg)	Mass/length, area or volume
150 mm (6 in) precast concrete slab	150	7 460	378.0 kg/m ²
Total	150	7 460	378.0 kg/m²

Test Specimen Installation

- The exposed area of the floor specimen used for the calculations of the airborne sound transmission loss was 17.85 m² (4.71 m x 3.79 m).
- The total area of the floor assembly resting on top of the lip was 19.32 m² (4.88 m x 3.96 m).
- The mass per area of the elements above the lip was calculated using the total area (19.32 m²).

ASTM E90 Test Results – Airborne Sound Transmission Loss

Client: Kinetics Noise Control Inc.
Specimen ID: A1-010601-01F

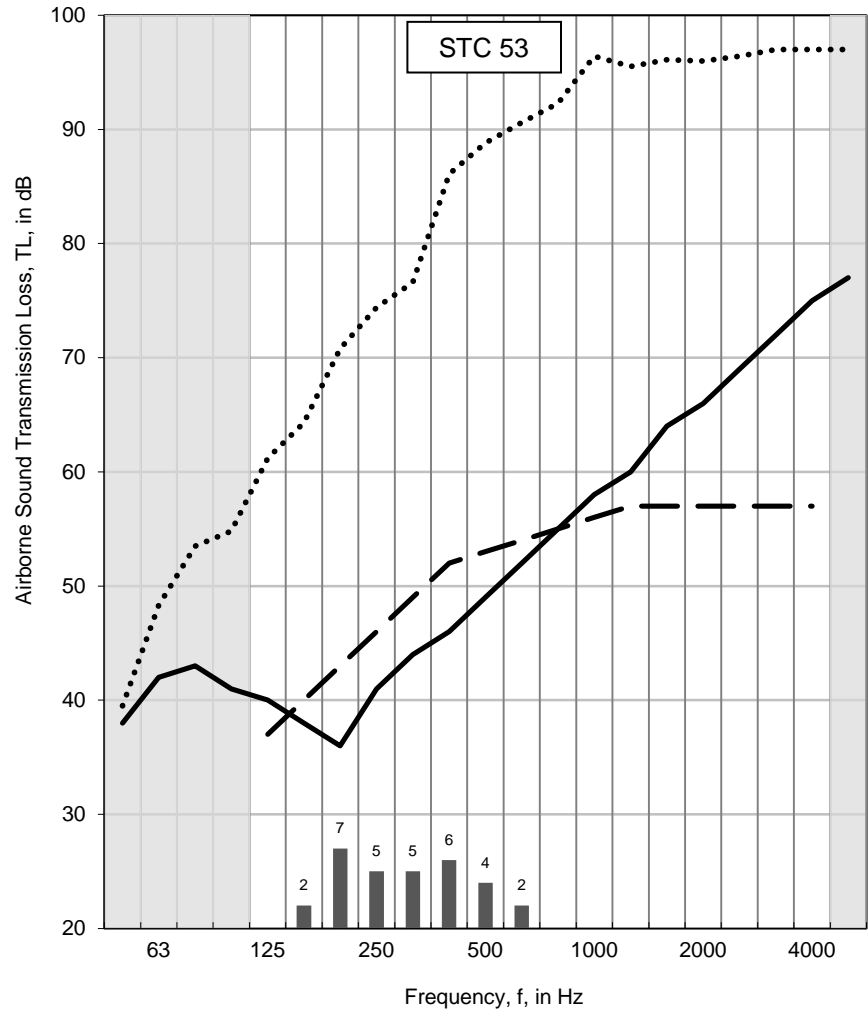
Test ID: TLF-17-025
Date of Test: April 4, 2017

Room	Volume (m ³)	Air Temperature (°C)	Humidity (%)
Upper	176.4	23.3 to 23.4	37.7 to 39.2
Lower	177.1	20.2 to 21.0	39.7 to 40.2

Area S of test specimen:	17.85 m ²
Mass per unit area:	378.0 kg/m ²

f (Hz)	Airborne TL (dB)
50	38
63	42
80	43
100	41
125	40
160	38
200	36
250	41
315	44
400	46
500	49
630	52
800	55
1000	58
1250	60
1600	64
2000	66
2500	69
3150	72
4000	75
5000	77
Sound Transmission Class (STC)	53

Sum of Deficiencies (dB)
31
Max. Deficiency (dB)
7 dB at 200 Hz



For a description of the test specimen and mounting conditions see text pages before. The results in this report apply only to the specific sample submitted for measurement. No responsibility is assumed for performance of any other specimen. **Airborne sound transmission loss measurements were conducted in accordance with the requirements of ASTM E90-09, “Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements”.**

In the graph:

The solid line is the measured sound transmission loss for this specimen. The dashed line is the STC contour fitted to the measured values according to ASTM E413-16. The dotted line (may be above the displayed range) is the flanking limit established for this facility. For any frequency band where the measured transmission loss is less than 10 dB lower than the dotted line, the reported value is potentially limited by flanking transmission via laboratory surfaces, and the true value may be higher than that measured. Bars at the bottom of the graph show deficiencies where the measured data are less than the reference contour as described in the fitting procedure for the STC, defined in ASTM E413-16. The shaded cells in the table and areas in the graph are outside the STC contour range.

In the table:

Values marked “c” indicate that the measured background level was between 5 dB and 10 dB below the combined receiving room level and background level. The reported values have been corrected according to the procedure outlined in ASTM E90-09. Values marked “**” indicate that the measured background level was less than 5 dB below the combined receiving room level and background level, in which case, the corrected values provide an estimate of the lower limit of airborne sound transmission loss.

ASTM E492 Test Results – Normalized Impact Sound Pressure Levels

Client: Kinetics Noise Control Inc.
Specimen ID: A1-010601-01F

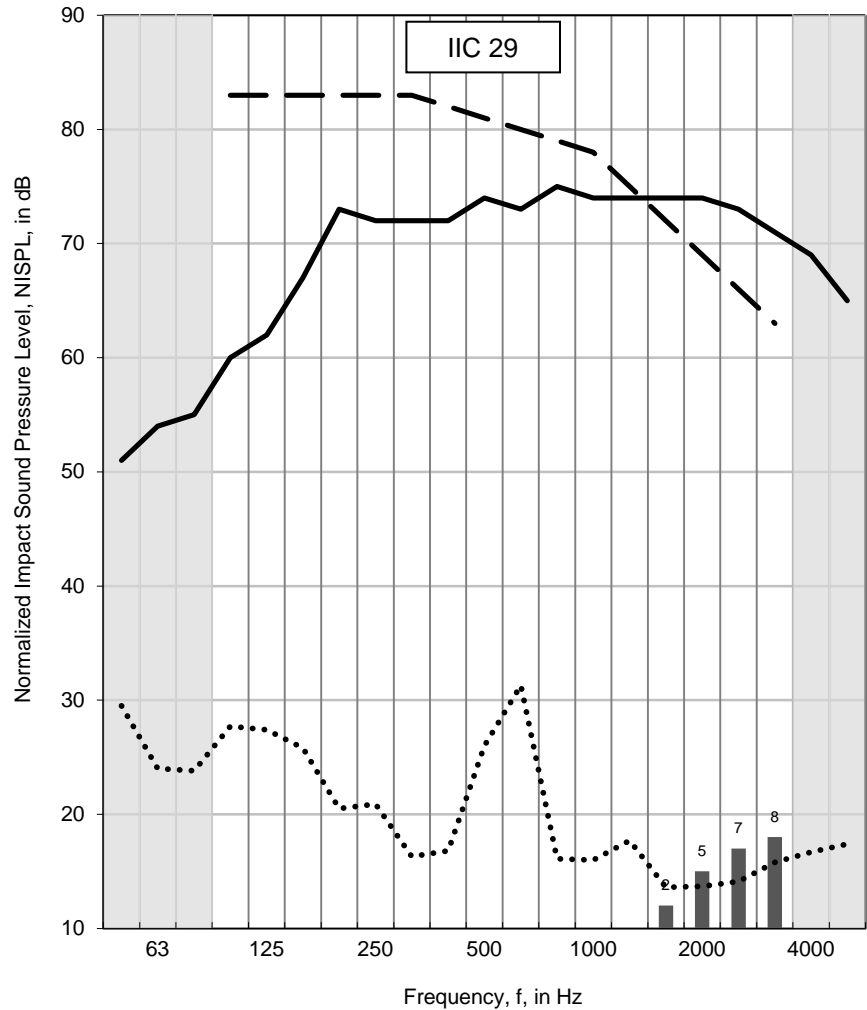
Test ID: IIF-17-013
Date of Test: March 6, 2017

Room	Volume (m ³)	Air Temperature (°C)	Humidity (%)
Upper	176.4	22.7 to 22.8	56.7 to 74.7
Lower	177.1	18.8 to 19.1	35.3 to 35.6

Area S of test specimen:	17.85 m ²
Mass per unit area:	378.0 kg/m ²

f (Hz)	NISPL (dB)
50	51
63	54
80	55
100	60
125	62
160	67
200	73
250	72
315	72
400	72
500	74
630	73
800	75
1000	74
1250	74
1600	74
2000	74
2500	73
3150	71
4000	69
5000	65
Impact Insulation Class (IIC)	29

Sum of Positive Differences (dB)	22
Max. Positive Difference (dB)	8 dB at 3150 Hz



For a description of the test specimen and mounting conditions see text pages before. The results in this report apply only to the specific sample submitted for measurement. No responsibility is assumed for performance of any other specimen. **Measurements of normalized impact sound pressure level (NISPL) were conducted in accordance with the requirements of ASTM E492-09, “Standard Laboratory Measurement of Impact Sound Transmission through Floor-Ceiling Assemblies Using the Tapping Machine”.**

In the graph:

The solid line is the measured normalized impact sound pressure level (NISPL) for this specimen. The dashed line is the IIC contour fitted to the measured values according to ASTM E989-06. The dotted line is the background sound level measured in the receiving room during this test (may be below the displayed range). For any frequency where the measured NISPL is less than 10 dB above the dotted line, the reported values were adjusted as noted below. Bars at the bottom of the graph show positive differences; where the measured data are greater than the reference contour as defined in ASTM E989-06. Shaded cells in the table and areas in the graph are outside the IIC contour range.

In the table:

Values marked “c” indicate that the measured background level was between 5 dB and 10 dB below the combined receiving room level and background level. Values marked “**” indicate that the measured background level was less than 5 dB below the combined receiving room level and background level and the reported values of NISPL provide an estimate of the upper limit of normalized impact sound pressure level, according to the procedure outlined in ASTM E492-09. The reported values of NISPL have been corrected according to the procedure outlined in ASTM E492-09.

APPENDIX: ASTM E90-09 – Airborne Sound Transmission – Floor Facility

Facility and Equipment: The NRC Construction Floor Sound Transmission Facility comprises two reverberation rooms (referred to in this report as the upper and lower rooms) with a moveable test frame between the rooms. Both rooms have an approximate volume of 175 m³. In each room, a calibrated Bruel & Kjaer condenser microphone (type 4166 or 4165) with preamp is moved under computer control to nine positions, and measurements are made in both rooms using an 8-channel National Instrument NI-4472 system installed in a computer. Each room has four bi-amped loudspeakers driven by separate amplifiers and noise sources. To increase randomness of the sound field, there are fixed diffusing panels in each room.

Test Procedure: Airborne sound transmission measurements were conducted in accordance with the requirements of ASTM E90-09, "Standard Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions". Airborne sound transmission loss tests were performed in the forward (receiving room is the lower room) and reverse (receiving room is the upper room) directions. Results presented in this report are the average of the tests in these two directions. In each case, sound transmission loss values were calculated from the average sound pressure levels of both the source and receiving rooms and the average reverberation times of the receiving room. One-third octave band sound pressure levels were measured for 32 seconds at nine microphone positions in each room and then averaged to get the average sound pressure level in each room. Five sound decays were averaged to get the reverberation time at each microphone position in the receiving room; these reverberation times were averaged to get the average reverberation times for each room. Information on the flanking limit of the facility and reference specimen test results are available on request.

Significance of Test Results: ASTM E90-09 requires measurements in one-third octave bands in the frequency range 100 Hz to 5000 Hz. 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 precision of results outside the 100 Hz to 5000 Hz range has not been established, but is expected to depend on laboratory-specific factors.

Sound Transmission Class (STC): The Sound Transmission Class (STC) was determined in accordance with ASTM E413-16, "Classification for Rating Sound Insulation". It is a single-number rating scheme intended to rate the acoustical performance of a partition element separating offices or dwellings. The higher the value of the rating, the better the performance. The rating is intended to correlate with subjective impressions of the sound insulation provided against the sounds of speech, radio, television, music, and similar sources of noise characteristic of offices and dwellings. The STC is of limited use in applications involving noise spectra that differ markedly from those referred to above (for example, heavy machinery, power transformers, aircraft noise, motor vehicle noise). Generally, in such applications it is preferable to consider the source levels and insulation requirements for each frequency band.

In Situ Performance: Ratings obtained by this standard method tend to represent an upper limit to what might be measured in a field test, due to structure-borne transmission ("flanking") and construction deficiencies in actual buildings.

APPENDIX: ASTM E492-09 – Light Impact Sound Transmission – Floor Facility

Facility and Equipment: The NRC Construction Floor Sound Transmission Facility comprises two reverberation rooms (referred to in this report as the upper and lower rooms) with a moveable test frame between the two rooms. Both rooms have an approximate volume of 175 m³. For impact sound transmission, only the lower room is used. A calibrated Bruel & Kjaer condenser microphone (type 4166 or 4165) with preamp is moved under computer control to nine positions, and measurements are made using an 8-channel National Instrument NI 4472 system installed in a computer. The room has 4 bi-amped loudspeakers driven by separate amplifiers and incoherent noise sources. To increase randomness of the sound field, there are fixed diffusing panels in the room.

Test Procedure: Impact sound transmission measurements were conducted in accordance with ASTM E492-09, “Standard Test Method for Laboratory Measurement of Impact Sound Transmission through Floor-Ceiling Assemblies Using the Tapping Machine”. This method uses a standard tapping machine placed at four prescribed positions on the floor. One-third octave band sound pressure levels were measured for 32 seconds at each microphone position in the receiving room and then averaged to get the average sound pressure level in the room. Five sound decays were averaged to get the reverberation time at each of the nine microphone positions in the receiving room; these nine reverberation times were averaged to get the spatial average reverberation times for the room. The spatial average sound pressure levels and reverberation times of the receiving room were used to calculate the Normalized Impact Sound Pressure Levels.

Significance of Test Results: ASTM E492-09 requires measurements in one-third octave bands in the frequency range 100 Hz to 3150 Hz. The standard recommends 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 precision of results outside the standard ranges has not been established, and is expected to depend on laboratory-specific factors such as room size and specimen dimensions.

Impact Insulation Class (IIC): The Impact Insulation Class (IIC) was determined in accordance with ASTM E989-06, “Standard Classification for Determination of Impact Insulation Class (IIC)”. It is a single-number rating scheme intended to rate the effectiveness of floor-ceiling assemblies at preventing the transmission of impact sound from the standard tapping machine. A higher IIC value indicates a better floor performance.

In Situ Performance: Ratings obtained by this standard method tend to represent an upper limit to what might be measured in a field test, due to structure-borne transmission (“flanking”) and construction deficiencies in actual buildings.