

September 8, 2026

Klem Acoustic Consulting LLC
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[Client Info Redacted]

Re: Apparent Impact Insulation Class (AIIIC) of a floor-ceiling assembly in a residential dwelling

Dear [Client Info Redacted],

The test report for the Impact sound pressure level in accordance with ASTM-E1007 Field measurements of impact sound insulation of floors using the tapping machine is below.

Problem and Background

Klem Acoustic Consulting (KAC) was asked to conduct an acoustic test to help determine if new flooring was installed correctly in a residential space. The chief concern was to measure the 'foot-fall' / apparent impact insulation class (AIIC) (see Acoustic Terminology below) of the floor-ceiling assembly, in contemplation of converting the basement space into a habitable suite for a parent of one of homeowners. These measurements will demonstrate the actual floor-ceiling assembly's performance and better identify what measures are required to reach the homeowner's desired AIIC of 50.

Acoustic Terminology

All terminology is defined by the Acoustical Society of America's Standards Terminology Index.¹

ANISPL

Absorption normalized impact sound pressure level - into a receiving room of at least 40 m³ in a specified frequency band, the impact sound pressure level (ISPL) normalized to a reference absorption of 10 m² in the receiving room, the equivalent of 108 Sabins.

AIIC

Apparent impact insulation class – a single-number rating derived from values of ANISPL in accordance with ASTM E989. AIIC provides an estimate of the apparent sound insulating properties of a floor-ceiling assembly under tapping machine excitation where sound power from associated support structures is attributed to the floor-ceiling assembly.

IIC

Impact Insulation Class – a single-number rating of impact sound insulation derived by fitting a reference rating curve to the normalized impact sound pressure level values measured for the 16 contiguous one-third octave frequency bands with nominal midband frequencies of 100 Hz to 3150 Hz, inclusive, by a standard method described in ASTM E989.

ISPL

Impact sound pressure level, (dB), in a specified frequency band, the average sound pressure level produced by the operation of the standard tapping machine on a floor-ceiling assembly as measured in a room below or near the room or space containing the tapping machine, averaged over each of the specified tapping machine positions.

ISR

Impact sound rating - a single number rating derived from values of the ISPL in accordance with Classification E989. ISR provides a measure of the isolation of the receiving room from the impact sound produced by the operation of the tapping machine in the source room given the existing conditions (that is, sound absorption, reverberation time) in the receiving room at the time of the test.

NISI

Normalized impact sound rating (index) – a single-number rating of impact sound insulation derived by fitting a reference rating curve to the normalized impact sound pressure level values measured for the 16 contiguous one-third octave frequency bands with nominal midband frequencies of 100 Hz to 3150 Hz, inclusive, by a standard method described in ISO 717-2.

¹ <https://asastandards.org/working-groups-home/working-groups-portal/asa-standard-term-database/>

Applicable Building Codes

Single-family homes are exempt from specific impact insulation class (IIC) values. However, the homeowners wish to approximate the standards found in multi-dwelling areas. International Building Code (IBC) 1206.3 mandates that floor-ceiling assemblies between a sleeping area and another dwelling unit (such as two condominiums or apartments above/below one another) have a normalized impact sound rating (NISR) of at least 45 when field tested per ASTM E1007-16.²

Receiving Room

The receiving room in this test is a residential bedroom with the following wall-to-wall dimensions: east to west: 157 1/2"; north to south: 196 1/2"; height 93". Flooring consists of loop pile carpet and pad (unknown thicknesses) over 4" thick concrete slab over undisturbed earth per building plans. Walls are framed with 2x4s and floating bottom plates due to soil expansion and contraction. Walls and ceiling have a facing of 1/2" GWB (textured). East and South walls abut the exterior, while North and West walls abut other interior spaces. Ceiling contains two HVAC supply registers and two recessed light fixtures. A king size bed and typical bedroom furniture (bedside tables, clothing dresser) were present. A sliding glass door behind curtains opens to the outside on the east wall, and double doors (two doors that open from the center) were on the west wall. For testing, all doors were closed and curtains drawn; no coupled spaces were present. Room volume is 1665.64 cubic feet. See Figures 1 and 3.

Source Room

The source room in this test is a living room with floor dimensions noted in Figure 2. The receiving and source rooms are vertically aligned with one another in their east and south walls, both of which abut the exterior space. Therefore, all locations for the tapping machine as well as microphone were determined measuring from the common east and south walls. See Figures 2 and 4.

Floor-Ceiling Assembly

The floor-ceiling assembly was observed as follows, from upper floor to ceiling below:

- Hardwood (oak) flooring 5/8" thickness (per visual inspection at floor register)
- No underlayment (per visual inspection at floor registers)
- 3/4" OSB subfloor (per building plans)
- Joists 16" on center (O.C.) comprised of 2x8 dimensional lumber (actual 1.5" x 7.25")
- Fiberglass insulation, estimated to be R19 at 6.5" thickness (per visual inspection in unfinished space of basement)
- Gypsum Wall Board (GWB) 1/2" thickness screwed directly into joists, textured finish (per visual inspection at ceiling register)

Acoustic calculators estimate similar floor-ceiling assemblies to have an IIC of 24³ to 36⁴.

Test Procedure and Equipment

A Class 1 sound level measurement system (Table 1) was used for all measurements and was calibrated directly prior to and after the measurement (Table 2).

² https://codes.iccsafe.org/content/IBC2021P2/chapter-12-interior-environment#IBC2021P2_Ch12_Sec1206.3

³ <https://calcmator.com/calculators/construction-diy/iic-rating-calculator>

⁴ <https://commercial-acoustics.com/resources/iic-calculator/>

Table 1: Sound Measurement and Source Generator Equipment

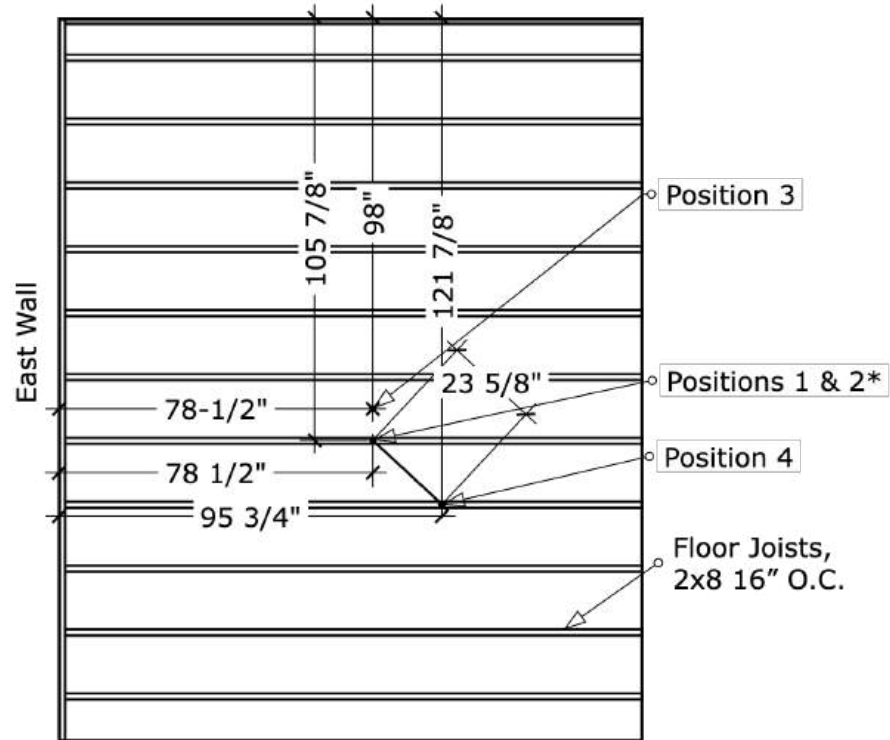
<i>Sound Measurement Equipment</i>	Serial Number
Sound Level Meter: NTi XL3, FW1.56, 'KAC_XL3'	A3A-02481-F0
Microphone: NTi Audio M2230 (MA220 preamplifier and MC230A 13mm microphone capsule)	16192; capsule S/N: A40361
MC230A microphone capsule	
NTi Class 1 microphone calibrator (Larson Davis CAL200)	24009
5m microphone cable (wired per NTi ASD cable specifications)	N/A
Four (4) Konig & Meyer (K&M) microphone stands, models 25600 & 25900	N/A
This Class 1 measurement system was successfully calibrated by NTI on June 12, 2026.	
<i>Sound Sources</i>	Serial Number
NTi Tapping Machine (Sources Line model TM EOS 2.0)	NGE05455
NTi Minirator MR-PRO Signal Generator	G2P-RAUEU-G4
RapcoHorizon NM1-25 Microphone Cable	N/A
QSC Audio K12.2 Loudspeaker	15CN2617104455

Table 2: Calibration Log

Device Info: XL3, SNo. A3A-02481-F0, FW1.60, KAC_XL3

Date	Time	Model	Serial	Sensitivity	Deviation	Calibrator	Type
	UTC -06:00			[mV/Pa]	[dB]	[dB]	
2026-09-05	12:32	M2230	16192	45.43	-.--	94.00	Adjustment
2026-09-05	11:38	M2230	16192	45.32	-.--	94.00	Adjustment

Figure 1: Sending Room, Tapping Machine Middle Hammer Positions



* Position 2 is rotated 90 degrees relative to Position 1

Figure 2: Receiving Room, Microphone Positions

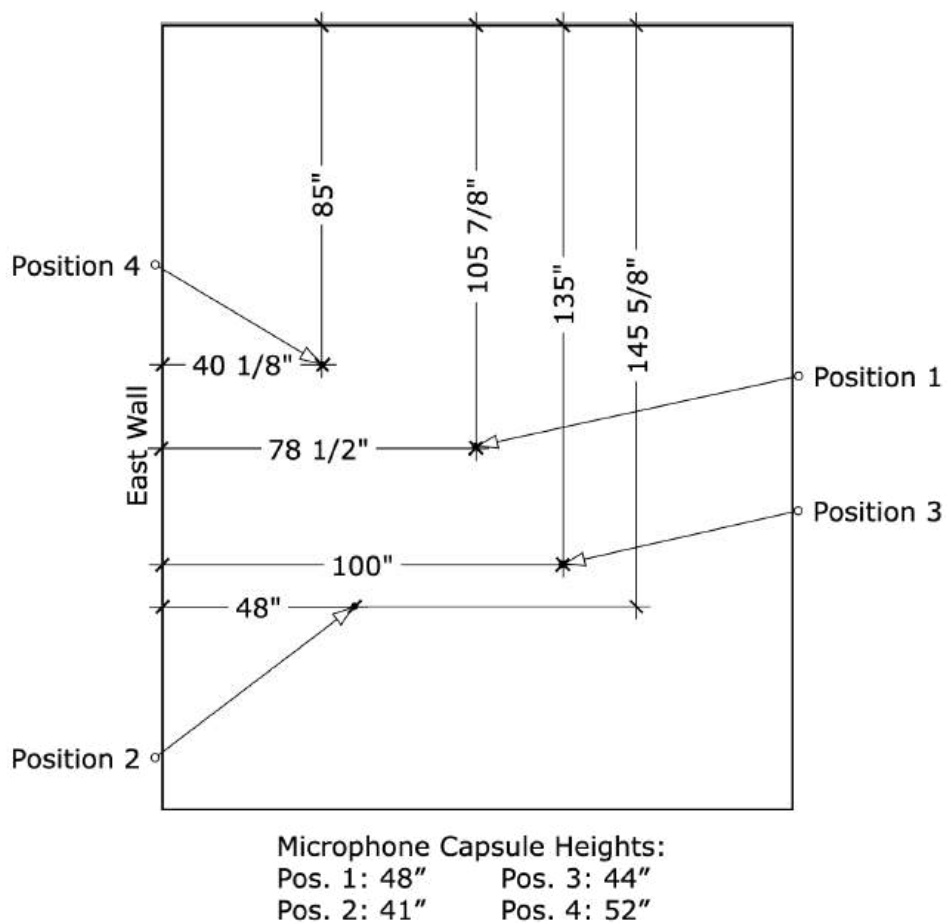


Figure 3: Sending Room

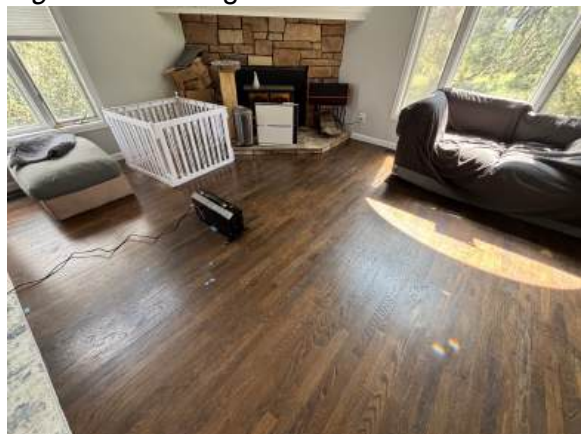
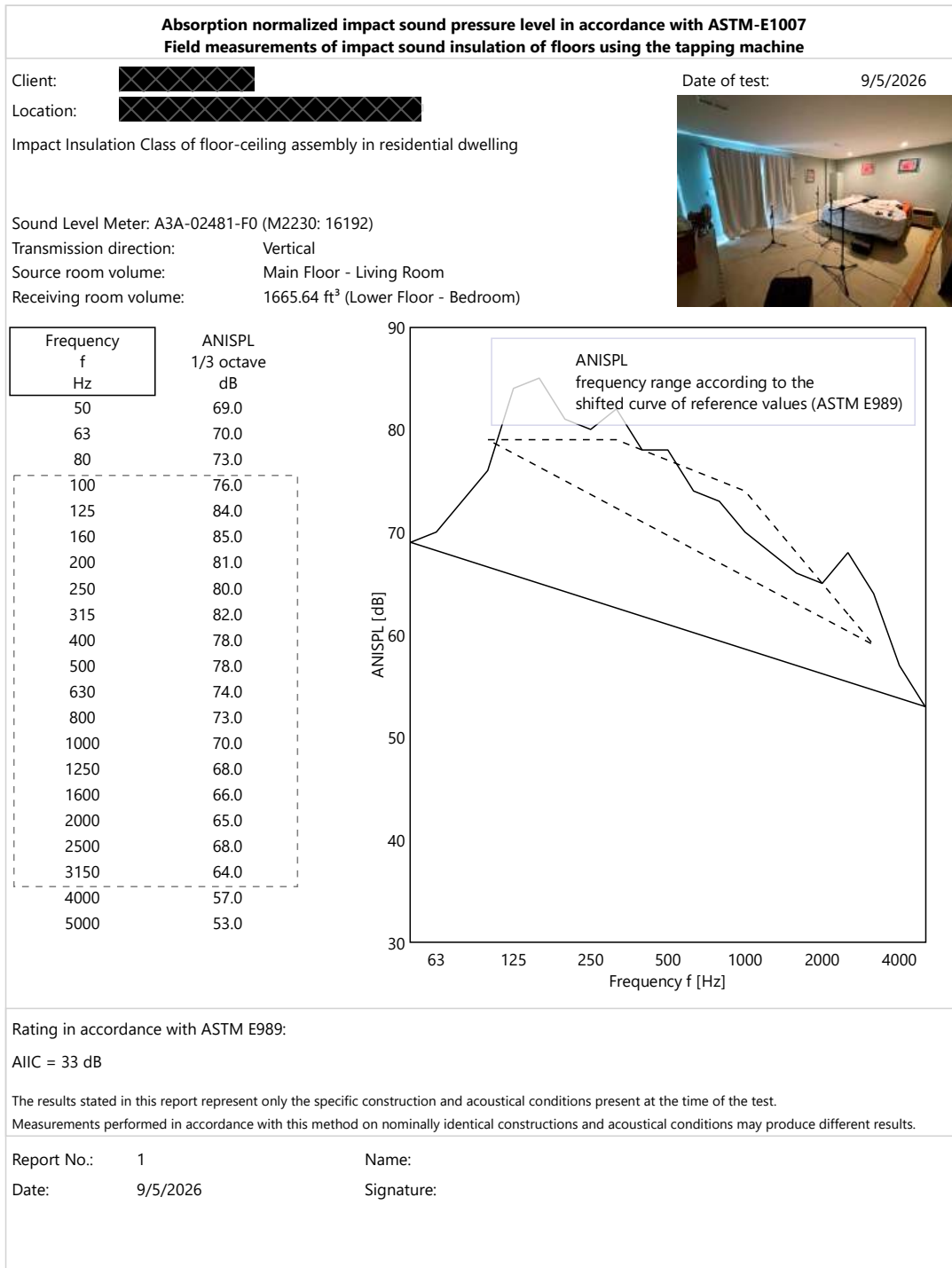


Figure 4: Receiving Room





NOTE: The testing described, the results calculated, and this report fully comply with the requirements of ASTM E1007-16. The results stated in this report represent only the specific construction and acoustical conditions present at the time of the test. Measurements performed in accordance with this standard on nominally identical constructions and acoustical conditions may produce different results.

Findings from Baseline Measurements:

The AIIIC is shown as 33. While this is a moderate to high AIIIC value for a single-family residence, it does not reach the level of insulation required in multi-dwelling constructions (50).

Summary of Potential Treatments

KAC discussed the following treatment types during the on-site visit to further decrease the foot-fall noise from entering the tested receiving area (bedroom).

- END OF REPORT EXCERPT -

Should you have any questions or want to further discuss this project, please feel free to contact me.

Sincerely,

Patrick Klem, MPH, CPH
Owner, Klem Acoustic Consulting LLC