440 Park Avenue South
7th Floor
New York, NY 10016
tel: 212 696-0670
fax: 212 213-3191
www.akrf.com

May 24, 2013

William Baker
Michael Halebian & Co., Inc.
557 Washington Avenue
Carlstadt, NJ 07072

Re: 2050 Central Road (Fort Lee, New Jersey)
Field Mock-Up Impact Insulation Class Testing

Dear Mr. Baker:

As requested, we have completed the field mock-up impact insulation class testing for two flooring mock-ups. The reason for the field test was to evaluate the impact sound acoustical performance of two installation options—underlayment adhesive/glued to the concrete and underlayment "floating" (i.e., no adhesive/glue) on the concrete. The test methodology, a description of the floor-ceiling assembly and mock-ups, field mock-up test results and our comments are presented below.

ASTM International Methodology

Impact noise isolation for floor-ceiling assemblies is rated in terms of the Impact Insulation Class (IIC) and is defined by ASTM E989-06, "*Standard Classification for Determination of Impact Insulation Class*." The IIC rating increases with rising impact isolation performance of a floor/ceiling assembly (i.e., the greater the IIC rating, the greater the impact noise isolation). ASTM E492-09, "*Standard Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine*" is used to measure the impact sound transmission performance of an isolated floor-ceiling assembly in a controlled laboratory environment. ASTM E1007-11, "*Standard Test Method for Field Measurement of Tapping Machine Impact Sound Transmission Through Floor-Ceiling Assemblies and Associated Support Structures*" is used to deal with field measurement of impact sound transmission through floor-ceiling assemblies. ASTM E1007-11 is specifically oriented to performing field measurements to determine AIIC[1] (Apparent Impact Insulation Class), versus performing measurements in a laboratory (i.e., ASTM E492-09) to determine IIC, and therefore addresses many of the issues that arise when performing field IIC testing in rooms that are irregularly shaped, small, or contain furniture. While ASTM E1007-11 specifies the techniques and procedures for the field testing of impact noise isolation, it also provides some latitude in the field testing procedures to address non-ideal conditions. Field measurements outlined in ASTM E1007-11 are accomplished by placing a standardized device called a tapping machine in the upper apartment unit (i.e., source room) and making a series of sound

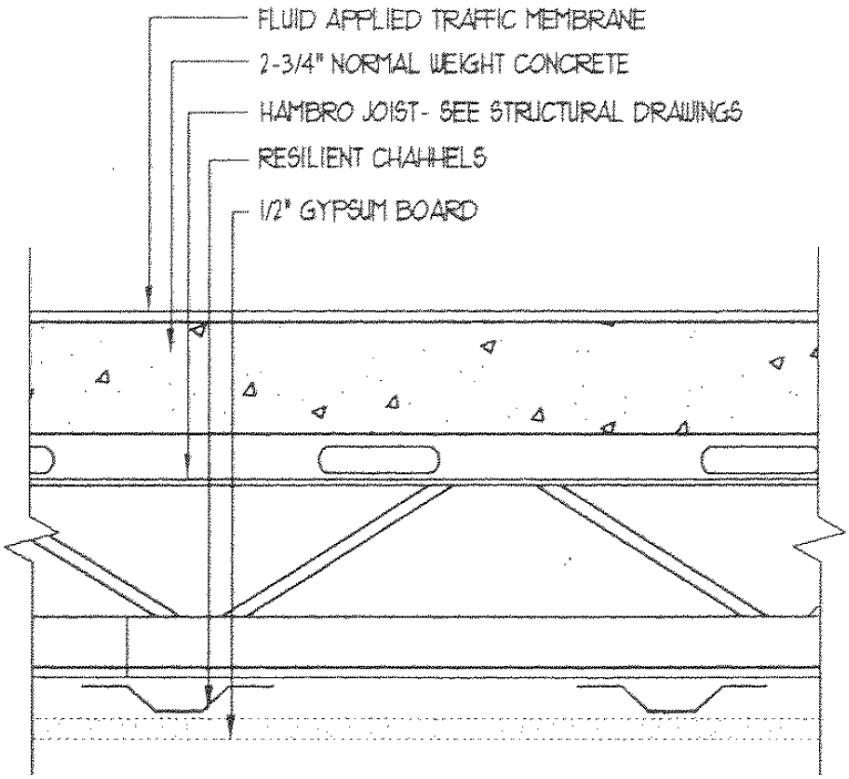
[1] Note: In 2011, ASTM International revised their terminology in E1007 by replacing the Field Impact Insulation Class nomenclature, or FIIC, with the nomenclature "AIIC" to harmonize terminology with ASTM E336. While the AIIC nomenclature is the current industry standard, AIIC and FIIC values are interchangeable and represent the same principle: a field determined impact insulation class.

level measurements of one-third octave spectra in the apartment (i.e., receiving room) below. The measured sound levels are then averaged, adjusted for the room characteristics of the receiving room and then curve-fitted to provide a single number rating of field determined impact noise isolation performance (i.e., AIIC).

Description of Floor-Ceiling Assembly and Mock-Ups Tested

Both mock-ups were tested on the floor-ceiling assembly described (from top down) and shown below:

- Kahrs Avanti Wood Flooring (13 mm thick)
- Healthier Choice Sound Solution (2.16 mm thick)
- 2-3/4" Normal Weight Concrete
- Hambro Joist (16" Deep, 4'-1.25" O.C.)
- One (1) Layer of 1/2" Gypsum Board Attached Via Resilient Channels



The only difference between the two tests was that Mock-up #1 had the underlayment adhesive/glued to the concrete while Mock-up #2 had the underlayment "floating" (i.e., no adhesive/glue) on the concrete.

This is our understanding of the floor-ceiling assembly and mock-up details provided to AKRF and observed during our survey. Please notify us of any omissions or necessary corrections.

ASTM E1007-11 Test Results

The testing was performed between the bedroom of Apartment 211 (source room with tapping machine) and the bedroom of Apartment 111 (receiving room) as well as the bedroom of Apartment 208 (source room with tapping machine) and the bedroom of Apartment 108 (receiving room) at 2050 Central Road in

Fort Lee, New Jersey. Apartment 211 had the underlayment adhesive/glued to the concrete white Apartment 208 had the underlayment "floating" (i.e., not glued) on the concrete. These two floors stack; consequently the floor plans of the tested units are identical. The receiving rooms met both the volume and absorption requirements of ASTM E1007-11 Section 5.4.1.

Measurements were performed using a Brüel & Kjær Sound Level Meter (SLM) Type 2270 (S/N 2706757), a Brüel & Kjær Sound Level Calibrator Type 4231 (S/N 2412436), a Brüel & Kjær ½-inch microphone Type 4189 (S/N 2695523), a JBL EON 515XT amplified loudspeaker, and a Brüel & Kjær Type 3207 Tapping Machine (S/N 2724868). The SLM was last factory calibrated on February 15, 2013, which is valid through February of 2014. The SLM's calibration was field-checked before and after readings using the Brüel & Kjær Type 4231 sound level calibrator with the appropriate adaptors. The data were digitally recorded by the sound level meter. All measurement procedures were based on the guidelines outlined in ASTM Standard E1007-11.

Based on the ASTM E1007-11 procedure outlined above, the two mock-ups were tested and the results are summarized below in **Table 1**. More detailed test results for both mock-ups are included as an attachment to this report.

Table 1
Mock-Up IIC Test Results Summary

Flooring Mock-Up	AIIC Rating
Mock-Up #1 (underlayment adhesive/glued)	53
Mock-Up #2 (underlayment floating)	56

Notes: 1) See Section, "*Description of Floor-Ceiling Assembly and Mock-Ups Tested*" above for details.
2) More detailed test results are included as an attachment to this report.

Discussion of Results

Mock-Up #1 (glued to the concrete) tested at AIIC 53 and Mock-Up #2 (floating on top of the concrete) tested at AIIC 56. In a separate letter dated March 7, 2012, AKRF performed ASTM E1007-11 tests for another Millennium Home project located at 753 Northfield Avenue in West Orange, NJ. In this 2012 test, a mock-up similar (the only difference was the Kahrs flooring model) to Mock-Up #2 above — which achieved an AIIC 56 rating — was tested and achieved an AIIC 54 rating. Based on our experience, an AIIC 56 vs. 54 rating is within: 1) the expected variation of a flooring manufacturer's similar product line for comparable flooring thicknesses, 2) the ability to replicate construction conditions from building-to-building/room-to-room, and 3) the repeatability of the ASTM E1007 standard.

This completes our comments at this time. Please do not hesitate to contact me at cthompson@akrf.com or 646-388-9511 if you should have any questions.

Sincerely,

Christian Thompson
Acoustical Consultant

Benjamin H. Sachwald
Vice President – Acoustics, Noise & Vibration

cc: Caitlin Ormsbee / AKRF

ATTACHMENT

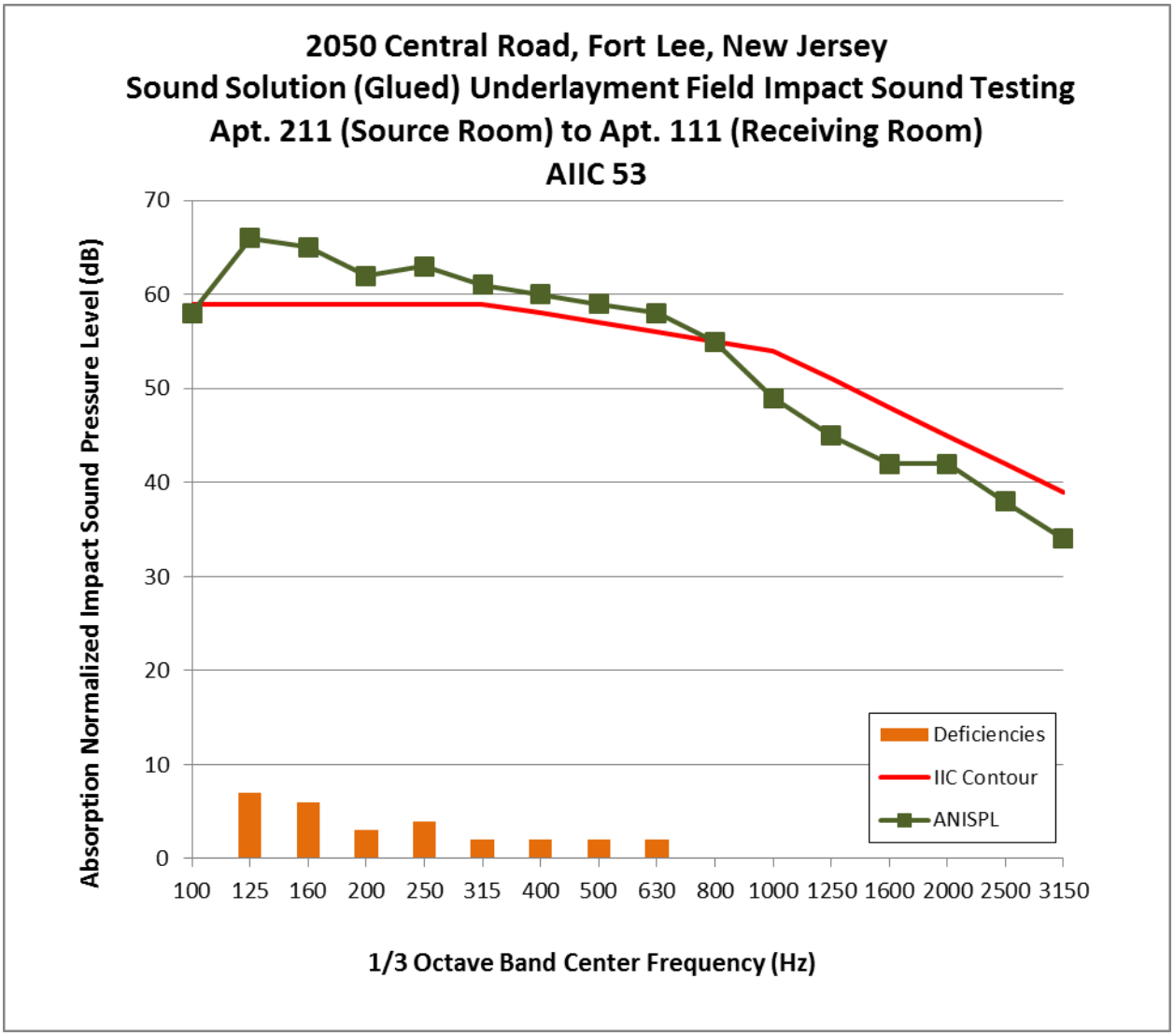


Figure 1 – Mock-Up #1 Detailed Test Results

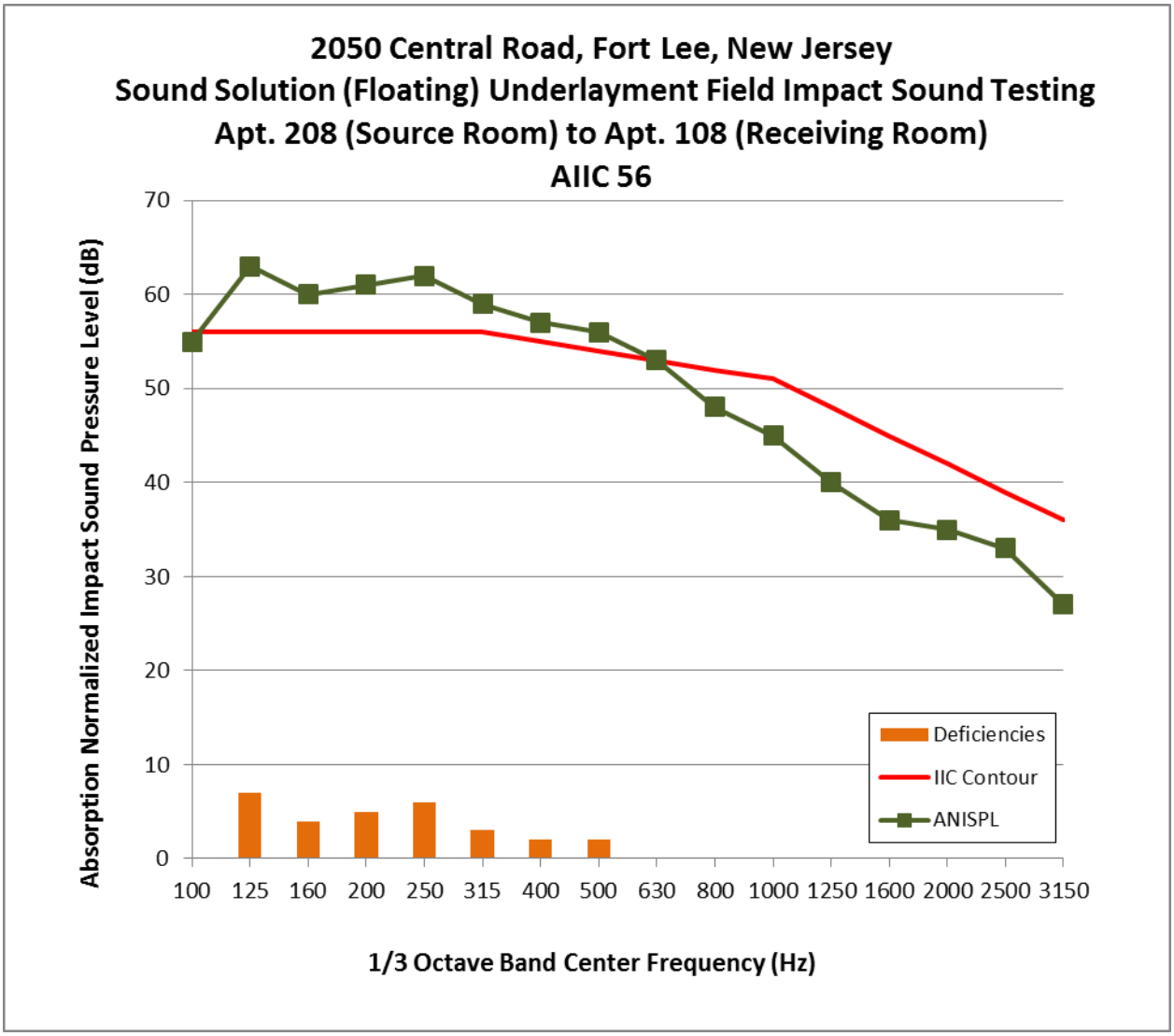


Figure 2 – Mock-Up #2 Detailed Test Results