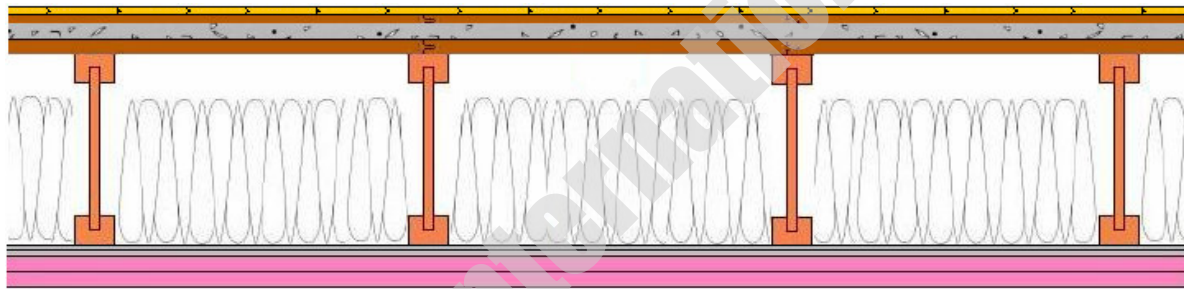


RC CHANNEL ACOUSTIC ASSEMBLY

**FLOOR/CEILING ASSEMBLY
DIRECT FIX TO TJI**



DSA TJI rc channel FSTC 53 FIIC 44



CONSTRUCTION

- * Hardwood Flooring
- * 1/2" Plywood
- * 1-1/2" Light Weight Gypsum Concrete
- * 3/4" Plywood
- * 16" TJI joist
- * 13.5" Fiberglass Batt Insulation
- * Rc Channel
- * 2 layers 5/8" Gypsum Direct Attached

Test report: DSA 720041-IIC2-NNR2



**FIELD SOUND
TRANSMISSION
CLASS**

FSTC 53



**Fire resistance ratings
ANS/UL
L518, L542**

**FIELD IMPACT
ISOLATION
CLASS**

FIIC 44

DSA Test No:
720041-IIC2

Conducted:
Mar 22, 2004

Prepared for:
Mike Gernhart
PAC International
PO Box 5369
Aloha, OR 97006



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Report on:

Field Impact Insulation Class (FIIC) Test

Subject:

**Waverly Landing Condominiums
Floor-Ceiling System between Units 24 and 17**

Summary

This report describes a test conducted to determine the Field Impact Insulation Class (FIIC) rating of the Floor-Ceiling System between Units 24 and 17 at Waverly Landing Condominiums according to standard test procedures outlined in ASTM Designation E1007-97. The floor-ceiling system tested consisted of the following elements:

- 16" TJI™ joists with (1-2) layers of $\frac{3}{4}$ " plywood, a 1- $\frac{1}{2}$ " layer of lightweight concrete topping and finished with vinyl tile
- Two layers of 5/8" gypsum wallboard fastened to the underside of the joists with Resilient Channel
- One layer of R-30 fiberglass and one layer of R-11 fiberglass in the joist cavity

The test met all the requirements of ASTM E1007-97. The assembly tested achieved an FIIC rating of 44.

Tested by:



EXPIRES: 12/31/2005

Joseph C. Begin
Sr. Engineer



Field Impact Insulation Class (FIIC) Test Report

DSA Test No: 720041-IIC2
Conducted on: Mar 22, 2004

For: PAC International
On: Waverly Landing Condominiums
Floor-Ceiling System between Units 24 and 17

Conformance to Standards

A Field Impact Insulation Class (FIIC) test was conducted at the request of the PAC International to determine FIIC rating of the floor-ceiling system located between the great room (living room / dining room / kitchen) of Unit 24 and the great room of Unit 17 at the Waverly Landing Condominiums located at 525 SE Marion St in Portland, OR. The test was conducted in conformance to the test methods and procedures outlined in industry standard ASTM E1007-97¹.

Description of Test Environment

The subject of this test was the floor-ceiling system between the great room of Unit 24 and the great room of Unit 17 at the Waverly Landing Condominiums. The impacted floor area was the vinyl tile covered floor located approximately in the center of the kitchen of Unit 24. The sound receiving space for the test was the great room of Unit 17. The receiving space had an open floor plan with carpeting in the living and dining area, and vinyl tile in the kitchen. Unit 17 contained no furniture or other absorptive materials (besides the carpet) at the time of the test. The dimensions of the great room floor under test were approximately 23'-9" by 25'-4". The total volume of the receiving space was calculated to be approximately 4,950 cubic feet.

Description of Test Specimen

The test specimen was the floor-ceiling system between the great rooms of Unit 24 and Unit 17. The floor construction consisted of 16" TJI™ engineered joists with one to two layers of 3/4" plywood², a 1 1/2" layer of lightweight concrete over the plywood and hardwood flooring. The ceiling consisted of two layers of gypsum wallboard fastened to the underside of the joists via Resilient Channel. The joist cavity was filled with one layer of R-30 fiberglass, and one layer of R-11 fiberglass insulation.

Description of Test Procedure

The test was conducted in accordance with the procedures outlined in ASTM Designation E1007-97. All measurements were made with a Larson Davis Model 800B sound level meter, which meets the requirements of standard ANSI S1.4 for Type 1 meters³, and a Dactron Photon™ real-time analyzer. As specified in Sections 10.1, 10.3 and 10.6 of ASTM E1007-97, a single microphone was moved continuously along a defined traverse in order to obtain the necessary space-average levels. Absorption in the receiving room was calculated from the reverberation time measurement results as prescribed in the test procedure.

Test Results

Table 1 presents the calculated normalized Sound Pressure Level (SPL) values at each of sixteen standard 1/3-octave band test frequencies. Deficiencies in the data relative to an assigned Impact Insulation Class (IIC) curve are presented and used to establish an IIC rating per ASTM Designation E989-89. Table 1 also lists the receiving room absorption values in each frequency band.

¹ American Society for Testing and Materials Designation E1007-97, *Standard Test Method for Field Measurement of Tapping Machine Impact Sound Transmission Through Floor-Ceiling Assemblies and Associated Support Structures*

² According to the homeowner, a second layer of plywood was added to the kitchen floor at some time prior to the test, to repair water damage. The exact location of the second layer of plywood was not specified.

³ American National Standards Institute, S1.4-1983, *Specification for Sound Level Meters*



Field Impact Insulation Class (FIIC) Test Report

DSA Test No: 720041-IIC2
 Conducted on: Mar 22, 2004

For: PAC International
 On: Waverly Landing Condominiums
 Floor-Ceiling System between Units 24 and 17

**Table 1 – Normalize Impact Sound Pressure Levels
 Waverly Landing Condominiums Floor-Ceiling System, Units 24 and 17**

1/3 Octave Center Frequency (Hz)	Normalized Impact SPL (dB)	Deficiency (dB)	Receiving Room Absorption (Sabins)	Notes	1/3 Octave Center Frequency (Hz)	Normalized Impact SPL (dB)	Deficiency (dB)	Receiving Room Absorption (Sabins)	Notes
100	69	1	449	3	630	64	0	385	3
125	69	1	406		800	64	0	365	3
160	69	1	388	3	1000	62	0	357	3
200	64	0	401	3	1250	60	0	371	3
250	63	0	440	3	1600	59	2	370	3
315	62	0	440	3	2000	62	8	381	3
400	62	0	477	3	2500	59	8	376	3
500	63	0	412	3	3150	52	4	355	3
Total Deficiencies = 25					FIIC = 44				

- Notes:
1. Receiving room volume was less than the ideal value specified in ASTM E1007-97 (6.4) for testing in this frequency band.
 2. Impact noise level in this band was less than 5 dB above ambient. Therefore level indicates only an upper bound of the impact noise level ASTM E1007-97 (10.7)
 3. Room absorption at this frequency was higher than preferred, as specified by ASTM E1007 (11.6)

Field Impact Insulation Class (FIIC)

The rating of the floor-ceiling system tested is FIIC-44. The deficiencies between the normalized impact sound pressure levels and the assigned IIC curve total 25 dB, with no deficiency exceeding 8 dB in any 1/3-octave frequency band.

Figure 1 displays the normalized measured SPL values and the FIIC-44 contour.

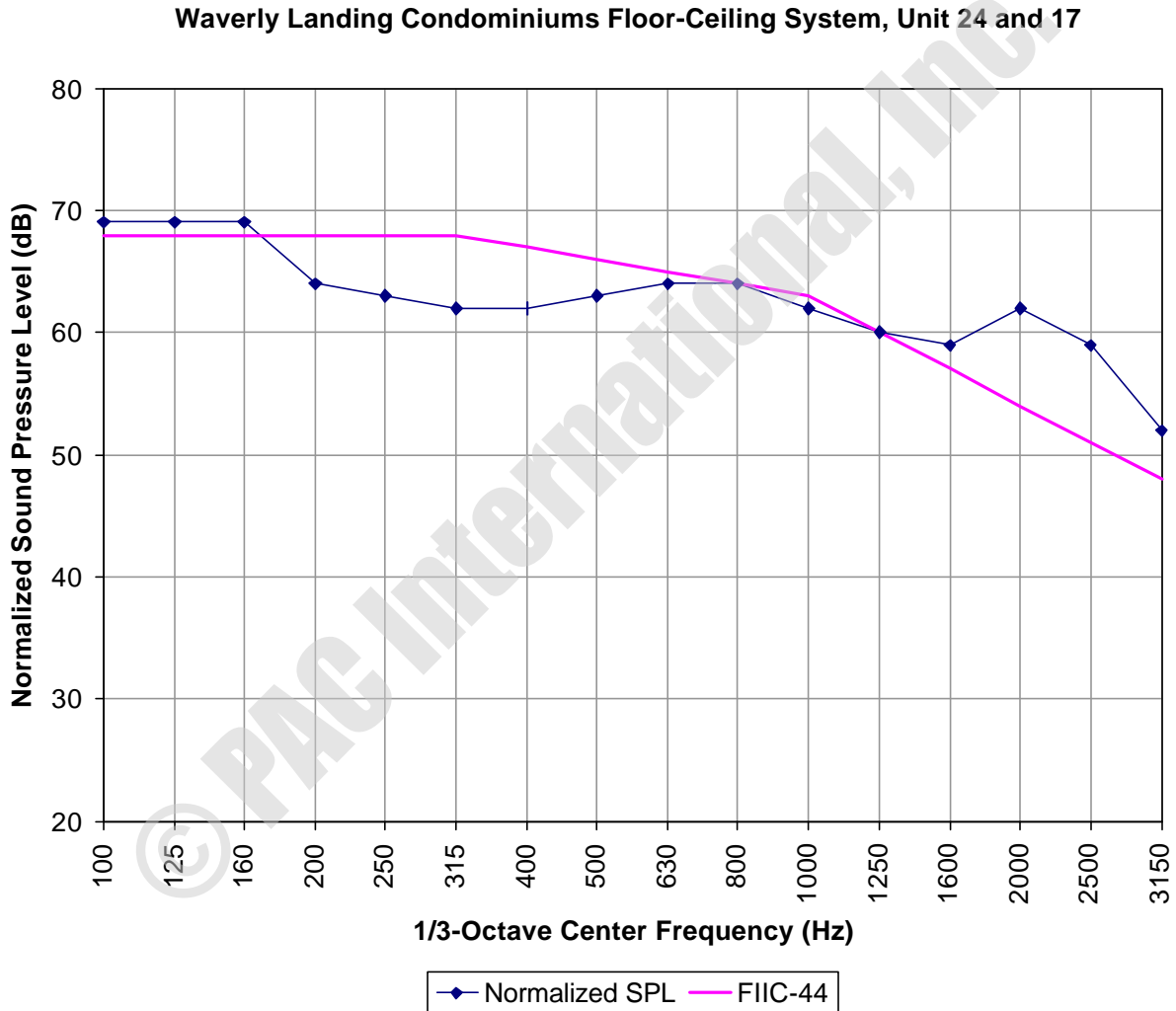


Field Impact Insulation Class (FIIC) Test Report

DSA Test No: 720041-IIC2
Conducted on: Mar 22, 2004

For: PAC International
On: Waverly Landing Condominiums
Floor-Ceiling System between Units 24 and 17

Figure 1



DSA Test No:
720041-NNR2

Conducted:
Mar 22, 2004

Prepared for:
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Report on:

Airborne Sound Insulation Test

Subject:

**Waverly Landing Condominiums
Floor-Ceiling System between Units 24 and 17**

Summary

This report describes a test conducted to determine the airborne sound insulation rating of a floor-ceiling system between the great rooms of Units 24 and 17 at the Waverly Landing Condominiums according to standard test procedures outlined in ASTM Designation E336-97. The floor-ceiling system tested consisted of the following elements:

- 16" TJI™ joists with 2 layers of 3/4" plywood, a 1-1/2" layer of light weight concrete topping and finished with hardwood flooring
- Two layers of 5/8" gypsum wallboard fastened to the underside of the joists with Resilient Channel
- One layer of R-30 fiberglass and one layer of R-11 fiberglass in the joist cavity

The test met all the requirements of ASTM E336-97. The floor-ceiling system tested achieved a NNR rating of 52.

The NNR rating is reported in lieu of the Field Sound Transmission Class (FSTC) rating because the receiving room absorption was higher than required by ASTM E-336. Although strict adherence to ASTM E-336 would prohibit assigning an FSTC rating in this case, the STC rating calculated from the test data may be of interest. The *STC equivalent* rating calculated from this test data was 53.

Tested by:



Joseph C. Begin
Sr. Engineer



Airborne Sound Insulation Test Report

DSA Test No: 720041-NNR2
Conducted on: Mar 22, 2004

For: PAC International, Inc.
On: Waverly Landing Condominiums
Floor-Ceiling system between Units 24 and 17

Conformance to Standards

An airborne sound insulation field test was conducted at the request of PAC International, Inc. to determine the airborne sound insulation rating of the floor-ceiling systems located between the great room (living room / dining room / kitchen) of Unit 24 and the great room of Unit 17 at the Waverly Landing Condominiums located at 525 SE Marion St in Portland, OR. The test was conducted in conformance to the test methods and procedures outlined in the industry standard ASTM E336-97¹.

Description of Test Environment

The subject of this test was the floor-ceiling system between the great room of Unit 24 and the great room of Unit 17 at Waverly Landing Condominiums. The source room for the test was the great room of Unit 17 and the sound receiving space for the test was the great room of Unit 24. The receiving space had an open floor plan with carpeting in the living and dining area, and vinyl tile in the kitchen. The living and dining area was furnished with couches, tables, and bookshelves typical of such rooms. The dimensions of the great room floor under test were approximately 23'9" by 25'4". The total volume of the receiving space was calculated to be approximately 8500 cubic feet.

Description of Test Specimen

The test specimen was the floor-ceiling system between the great rooms of Unit 24 and Unit 17. The floor construction consisted of 16" TJI™ engineered joists with one to two layers of ¾" plywood², a 1½" layer of lightweight concrete over the plywood and hardwood flooring. The ceiling consisted of two layers of gypsum wallboard fastened to the underside of the joists via Resilient Channel. The joist cavity was filled with one layer of R-30 fiberglass and one layer of R-11 fiberglass insulation.

Description of Test Procedure

The test was conducted in accordance with the procedures outlined in ASTM Designation E336-97. All measurements were made with a Larson Davis Model 800B sound level meter, which meets the requirements of standard ANSI S1.4 for Type 1 meters³, and a Dactron Photon™ real-time analyzer. As specified in Sections 10 of ASTM E336-97, a single microphone was moved continuously along a defined traverse in order to obtain the necessary space-average levels. Absorption in the receiving room was calculated from the reverberation time measurement results as prescribed in the test procedure.

Test Results

Table 1 presents the calculated Normalized Noise Reduction (NNR) values at each of sixteen standard 1/3-octave band test frequencies. Deficiencies in the data relative to an assigned NNR curve are presented and used to establish an NNR rating per ASTM Designation E597. Table 1 also lists the receiving room absorption values in each frequency band.

¹ American Society for Testing and Materials Designation E336-97, *Standard Test Method for Measurement of Airborne Sound Insulation in Buildings*

² According to the homeowner, a second layer of plywood was added to the great room floor at some time prior to the test, to repair water damage. The exact location of the second layer of plywood was not specified.

³ American National Standards Institute, S1.4-1983, *Specification for Sound Level Meters*



Airborne Sound Insulation Test Report

DSA Test No: 720041-NNR2
 Conducted on: Mar 22, 2004

For: PAC International, Inc.
 On: Waverly Landing Condominiums
 Floor-Ceiling system between Units 24 and 17

Table 1 - Normalized Noise Reduction Values for the Floor-Ceiling System located between Units 24 and 17 of Waverly Landing Condominiums

1/3-Octave Center Frequency f (Hz)	Avg. SPL in Source Room L ₁ (dB)	Avg. SPL in Receiving Room L ₂ (dB)	Receiving Room Absorption A (sabins)	Normalized Noise Reduction (dB)	Deficiency (dB)	Notes		
125	82.8	55.6	465	25	8			3
160	82.0	46.2	465	28	2			3
200	81.1	40.0	448	37	0			3
250	82.2	36.2	448	42	0			3
315	83.2	35.1	448	46	0			3
400	82.3	30.9	418	48	0			3
500	84.5	32.6	418	51	0			3
630	88.4	30.4	418	52	0			3
800	92.5	30.2	367	59	0			3
1000	88.6	24.9	367	63	0			
1250	87.9	23.7	367	65	0			
1600	89.9	23.2	381	65	0			
2000	91.2	23.8	381	68	0			
2500	93.4	21.7	381	68	0			
3150	91.2	18.5	377	73	0			
4000	86.1	17.1	377	74	0		2	
NNR-52								
Total Deficiencies = 10								

- Notes: 1. Receiving room volume was less than the ideal value specified in ASTM E 336-97 (A1.3) for testing in this frequency band.
 2. Impact noise level in this band was less than 5 dB above ambient. Therefore level indicates only an upper bound of the impact noise level ASTM E 336-97 (10.5)
 3. Room absorption at this frequency was higher than preferred, as specified by ASTM E 336-97 (A1.5)

Normalized Noise Reduction (NNR)

The Normalized Noise Reduction rating of the floor-ceiling system tested is NNR-52. The deficiencies between the measured Normalized Noise Reduction values and the assigned NNR curve total 10 dB, with no deficiency exceeding 8 dB in any 1/3-octave frequency band.

The NNR rating is being reported in lieu of the Field Sound Transmission Class (FSTC) rating because the receiving room absorption was higher than required by ASTM E-336.⁴

Figure 1 displays the Normalized Noise Reduction values and the NNR-52 contour.

⁴ Although strict adherence to ASTM E-336 would prohibit assigning an FSTC rating to a partition tested under these conditions, the FSTC rating calculated from the test data may be of interest. The *FSTC equivalent* calculated from this data was 53.



Airborne Sound Insulation Test Report

DSA Test No: 720041-NNR2
Conducted on: Mar 22, 2004

For: PAC International, Inc.
On: Waverly Landing Condominiums
Floor-Ceiling system between Units 24 and 17

Figure 1

Normalized Noise Reduction Values

