



2013-093
May 29, 2013

Mr. Doug Spear
ENVY Modular Wall Systems, Inc.
2900 Rodd St. #2847
Midland, MI 48641



Subject: Sound Transmission Loss Results of Five Test Samples
ENVY Modular Wall Systems, Inc. Initial tests Pre-paid
Kolano and Saha Engineers, Inc. Project No. 2013-093

Dear Mr. Spear:

At your request, Kolano and Saha Engineers, Inc. (K&SE) conducted sound transmission loss (STL) measurements of five different modular wall arrangements.

This report includes the following:

- Letter
- Tables 1 and 2
- Figure 1
- Exhibits 1 through 6

Test Samples

Descriptions of the test conditions are provided in **Table 1**.

Measurement

Test procedures followed for the STL tests conform to that specified by SAE Recommended Practice for the “*Laboratory Measurement of Airborne Sound Barrier Performance of Automotive Materials and Assemblies*” – SAE J1400 August, 2010. A schematic drawing of the test configuration used for these measurements is shown in **Figure 1**. Kolano and Saha Engineers, Inc. is accredited by Laboratory Accreditation Bureau (L-A-B) to perform this test per the ISO/IEC 17025 standard.

The K&SE standard test fixture is 0.61 m by 0.61 m (24 inch by 24 inch) in size and has an opening of 0.51 m by 0.51 m (20 inch by 20 inch) between the source room and the receiving room. For this set of tests a depth of more than the normal two inches was needed so an extra extension was used and required the samples to be 0.58 m by 0.58 m (23 inch by 23 inch) overall. The lowest usable frequency band of measurement for this size opening between the source and receiving rooms is 125 Hz $1/3^{\text{rd}}$ octave band frequency per **Table 1** in SAE J1400.

One 0.61m by 0.61m in size thin homogenous reference panel of 4.88 kg/m² surface density was used to compute the appropriate correlation factor as referenced in SAE J1400. Measurements were made at six microphone locations in the source room and at one location 102mm (four inches) away from the sample, repeated six times in the receiving room. A complete description and calibration record of the instruments used are on file with K&SE.

Results

The STL results are presented in one-third octave band frequencies from 125 Hz to 4000 Hz in **Exhibits 1** through **5**. Exhibits 1 through 5 also compare the measured STL data to the appropriate Sound Transmission Class (STC) contour that meets the STC rating determined in accordance with ASTM E-413 for each STL measurement result. **Exhibit 6** is provided for reference and shows published STL data for a nominal 2x4 wood stud wall with single layers of 5/8" gypsum wallboard (GWB) direct attached to each side of the studs, and without insulation in the stud cavities. This is shown compared to its respective STC 34 rating contour. **Table 2** provides tabular data of the measurement results.

Mr. Spear, we appreciate this opportunity to be of service to ENVY Modular Wall Systems, Inc. Please contact us should you have any questions. We appreciate your coming to us for this testing and look forward to working together again.

Sincerely,

**KOLANO AND SAHA ENGINEERS,
INC.**



Richard A. Kolano, P.E.
INCE - Board Certified
Principal Consultant

FIGURE 1
SOUND TRANSMISSION LOSS
TEST CONFIGURATION
Per SAE J1400

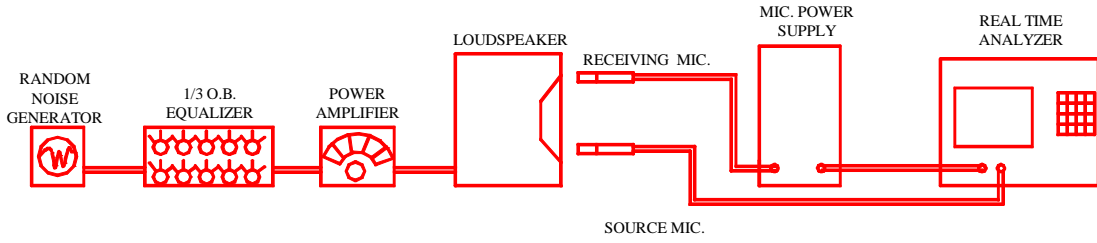
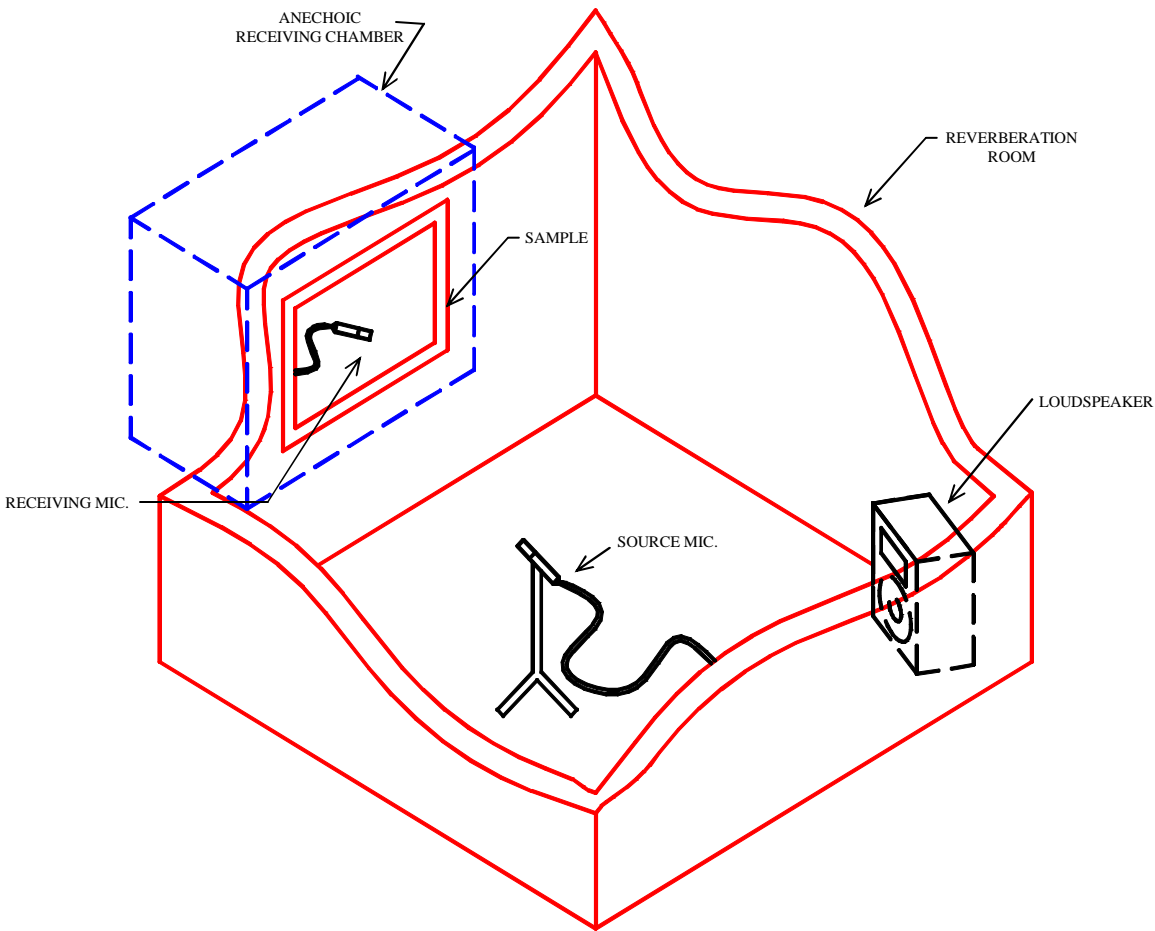


TABLE 1

LIST OF TEST SAMPLE DISCRIPTIONS

Measurements Conducted for: **ENVY Modular Wall Systems, Inc.**

Descriptions of the test samples are provided below.

| Test No. | Test Description | Measured Data ¹ | |
|----------|---|----------------------------|------------------------------------|
| | | Thickness (mm) | Surf. Density (kg/m ²) |
| T1 | Single wall panel only ² | 29 | 5.3 |
| T2 | One wall panel, 2" air gap, second wall panel | 108.8 | 10.6 |
| T3 | One wall panel, 4" air gap, second wall panel | 159.6 | 10.6 |
| T4 | One wall panel w/o inside skin, 4" air gap, other wall panel w/o inside skin ³ | 155.6 | 7.3 |
| T5 | Double skin wall panel w/o inside skin, 4" air gap, other double skin wall panel w/o inside skin ⁴ | 159.6 | 10.6 |
| T6 | 5/8" GWB, 2X4, 5/8" GWB ⁵ | 123.8 | 25.9 |

¹ The measured data is for "information purposes only"

² One wall panel consists of a glass fiber reinforced plastic skin (1.67 kg/m²), a layer of scrim, a 27 mm plastic honeycomb (7 mm Hex), a second layer of scrim, and a second GFRP skin

³ The GFRP skins on the air space side of both panels was removed

⁴ The GRFP skins removed for test T4 were added and adhesively attached to the outer sides of both panels, to effectively double the thickness and surface mass of the outside face of each panel

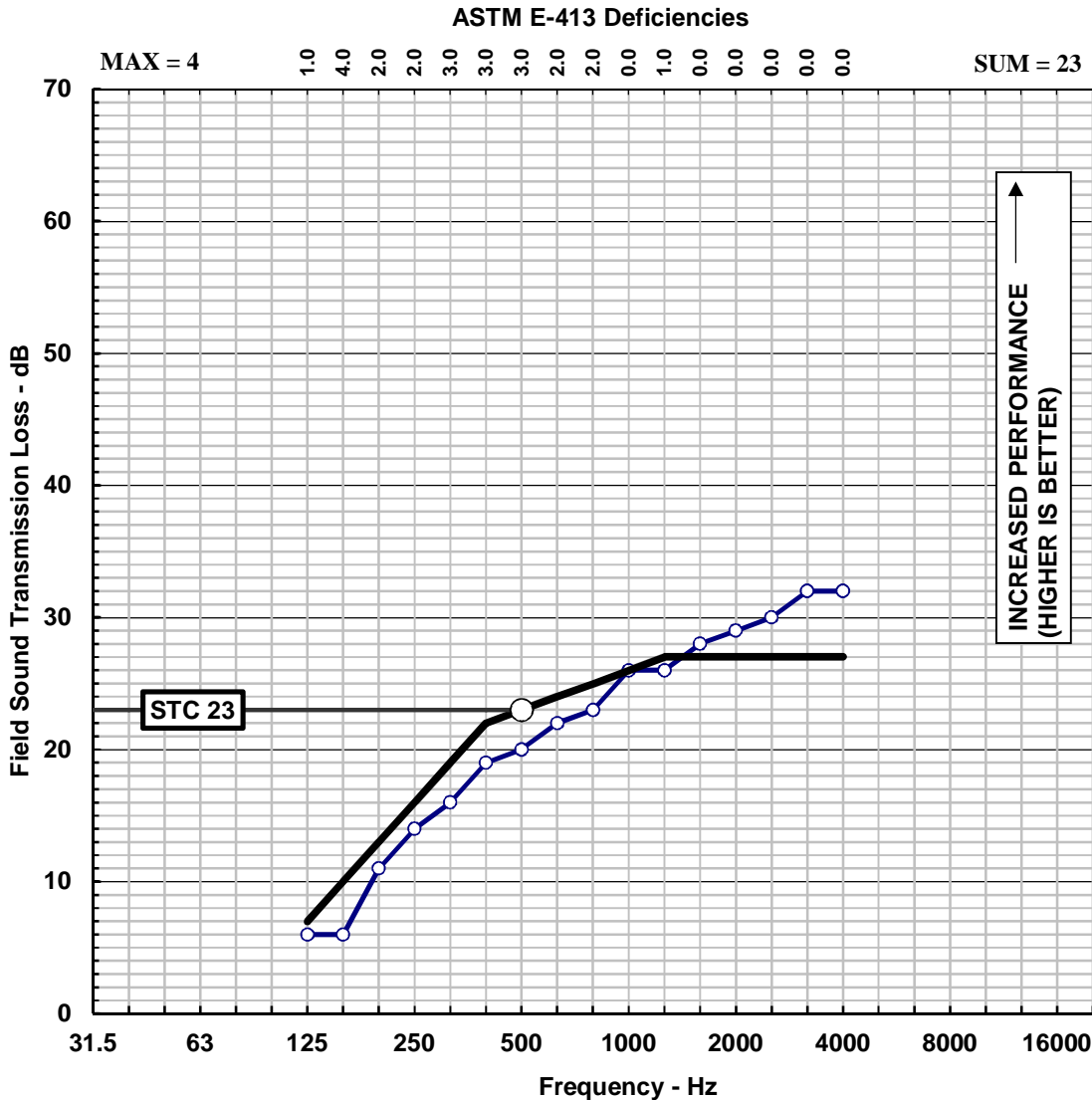
⁵ Tested by the National Research Council of Canada and published in NRC Test Report No. 66/68

EXHIBIT 1

DETERMINATION OF
SOUND TRANSMISSION CLASS RATING
ENVY Modular Wall Systems

T1⁶

Sound Transmission Loss Measured per SAE J1400



⁶ Refer to Table 1 for descriptions of the test samples

EXHIBIT 2

DETERMINATION OF
SOUND TRANSMISSION CLASS RATING
ENVY Modular Wall Systems

T2

Sound Transmission Loss Measured per SAE J1400

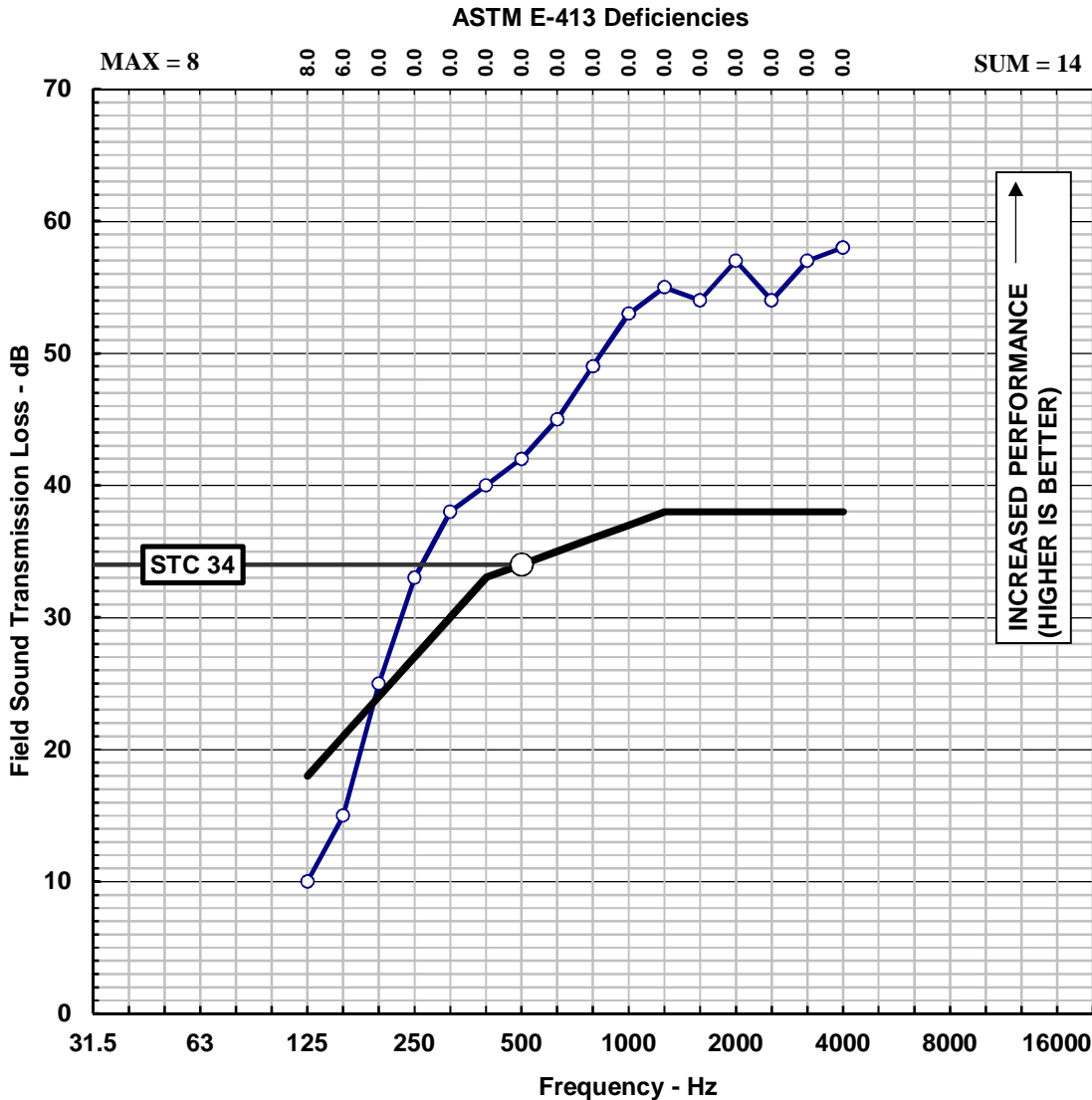


EXHIBIT 3

DETERMINATION OF
SOUND TRANSMISSION CLASS RATING
ENVY Modular Wall Systems

T3

Sound Transmission Loss Measured per SAE J1400

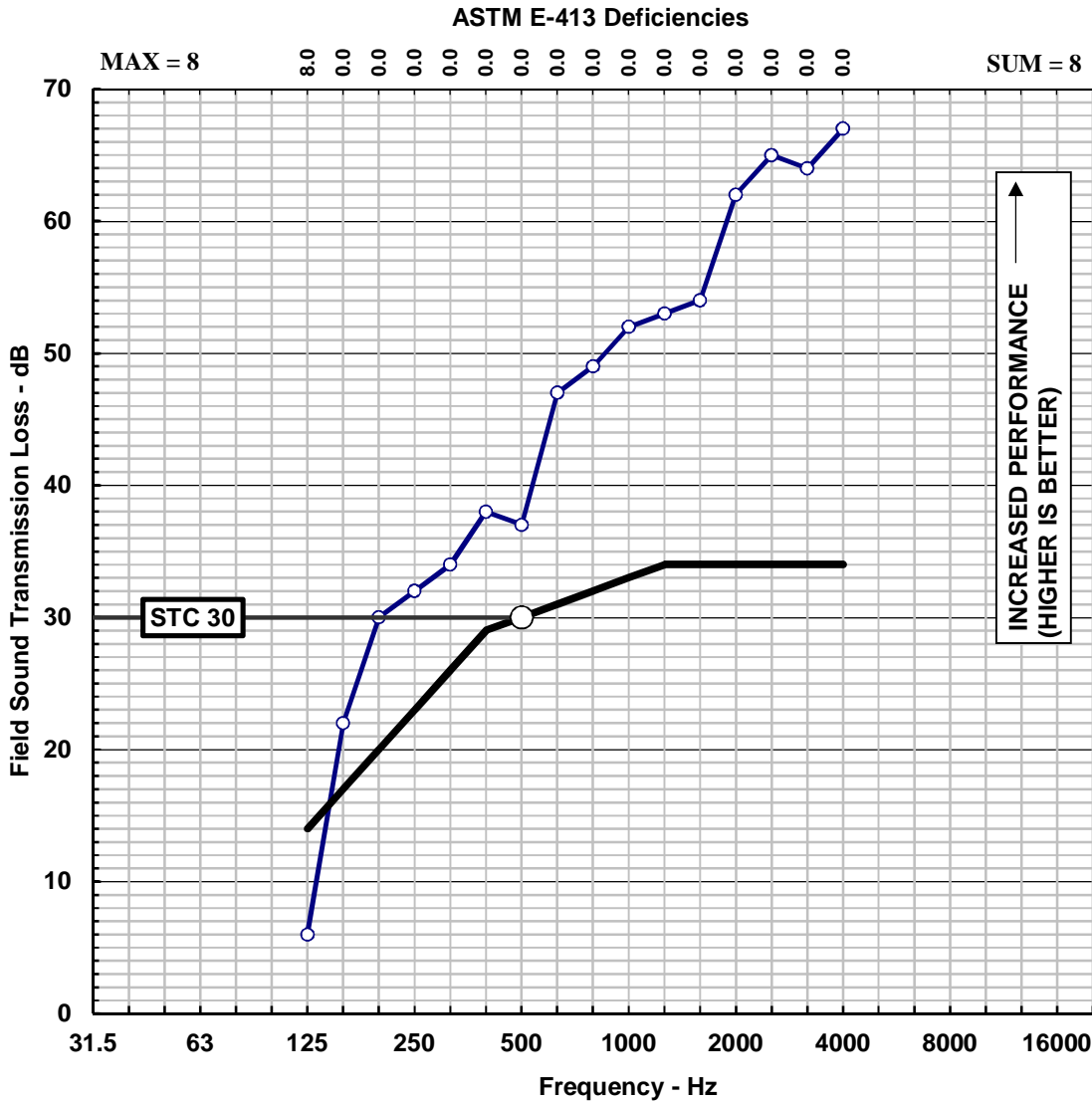


EXHIBIT 4

DETERMINATION OF
SOUND TRANSMISSION CLASS RATING
ENVY Modular Wall Systems

T4

Sound Transmission Loss Measured per SAE J1400

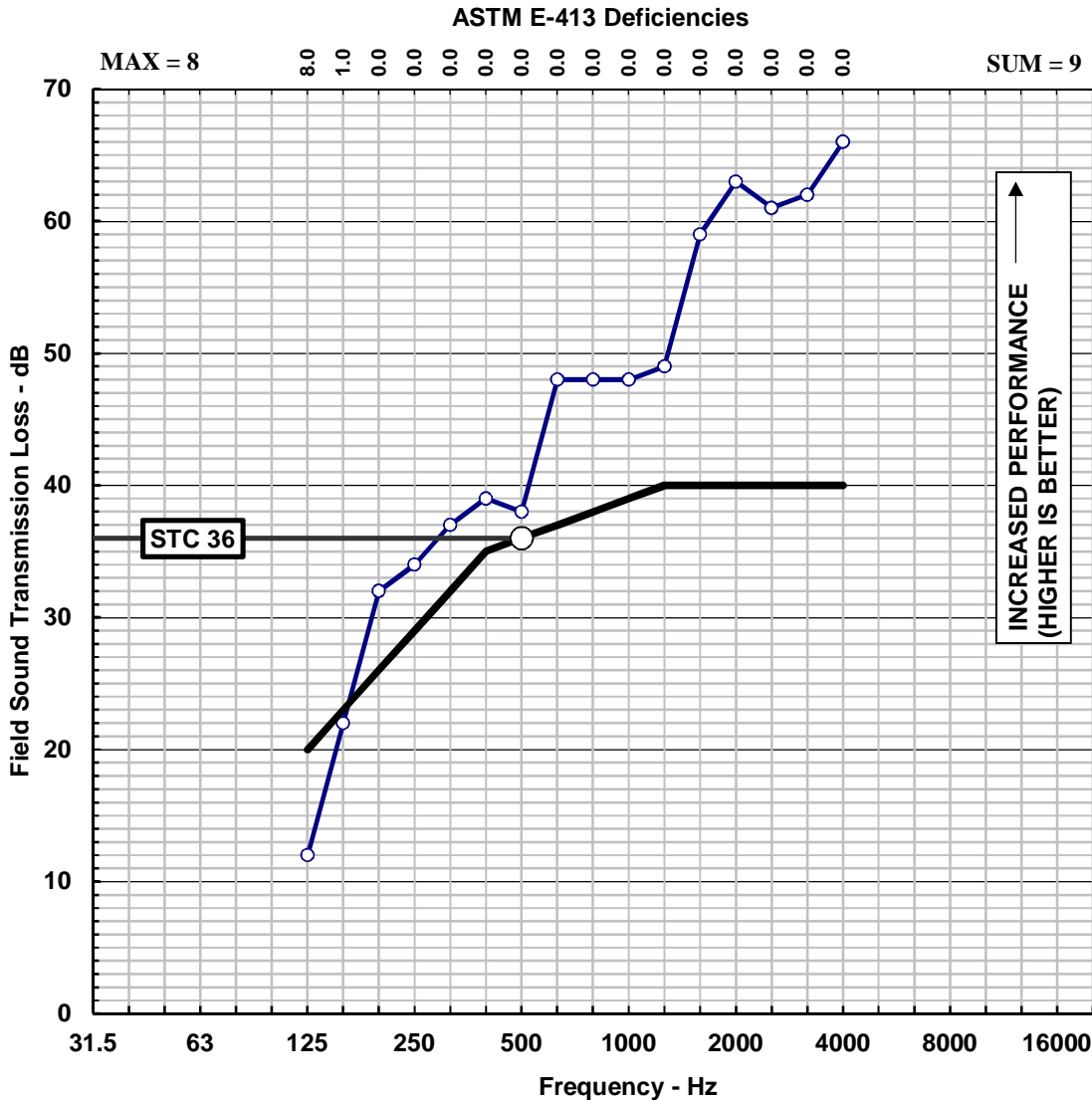


EXHIBIT 5

DETERMINATION OF
SOUND TRANSMISSION CLASS RATING
ENVY Modular Wall Systems

T5

Sound Transmission Loss Measured per SAE J1400

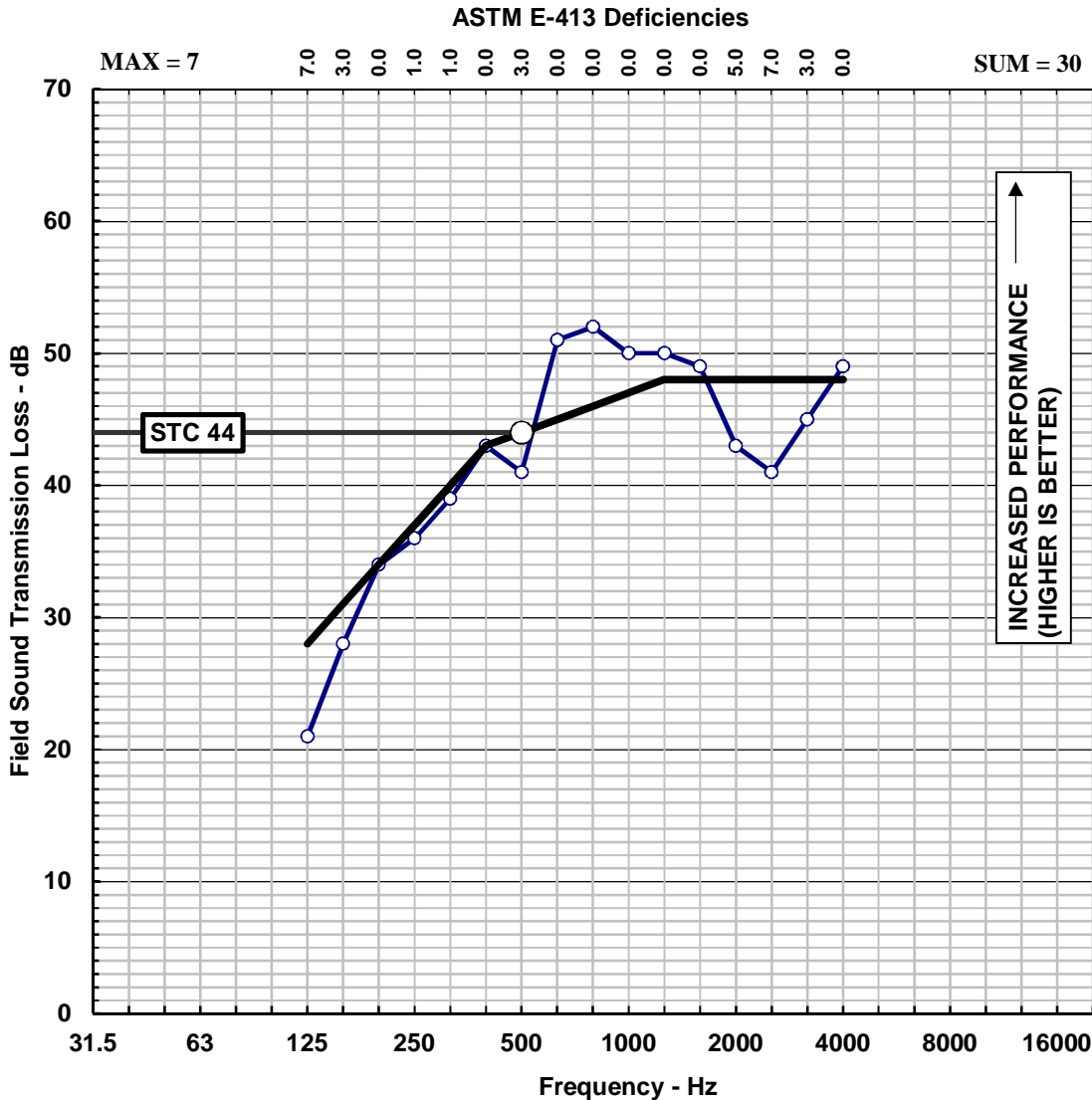


EXHIBIT 6

DETERMINATION OF
SOUND TRANSMISSION CLASS RATING
ENVY Modular Wall Systems

5/8"GW, 2x4 wood studs, 5/8"GW (STC 34, NRC Canada, Test No. NRC 66/68)
Measured Sound Transmission Loss per ASTM E-90

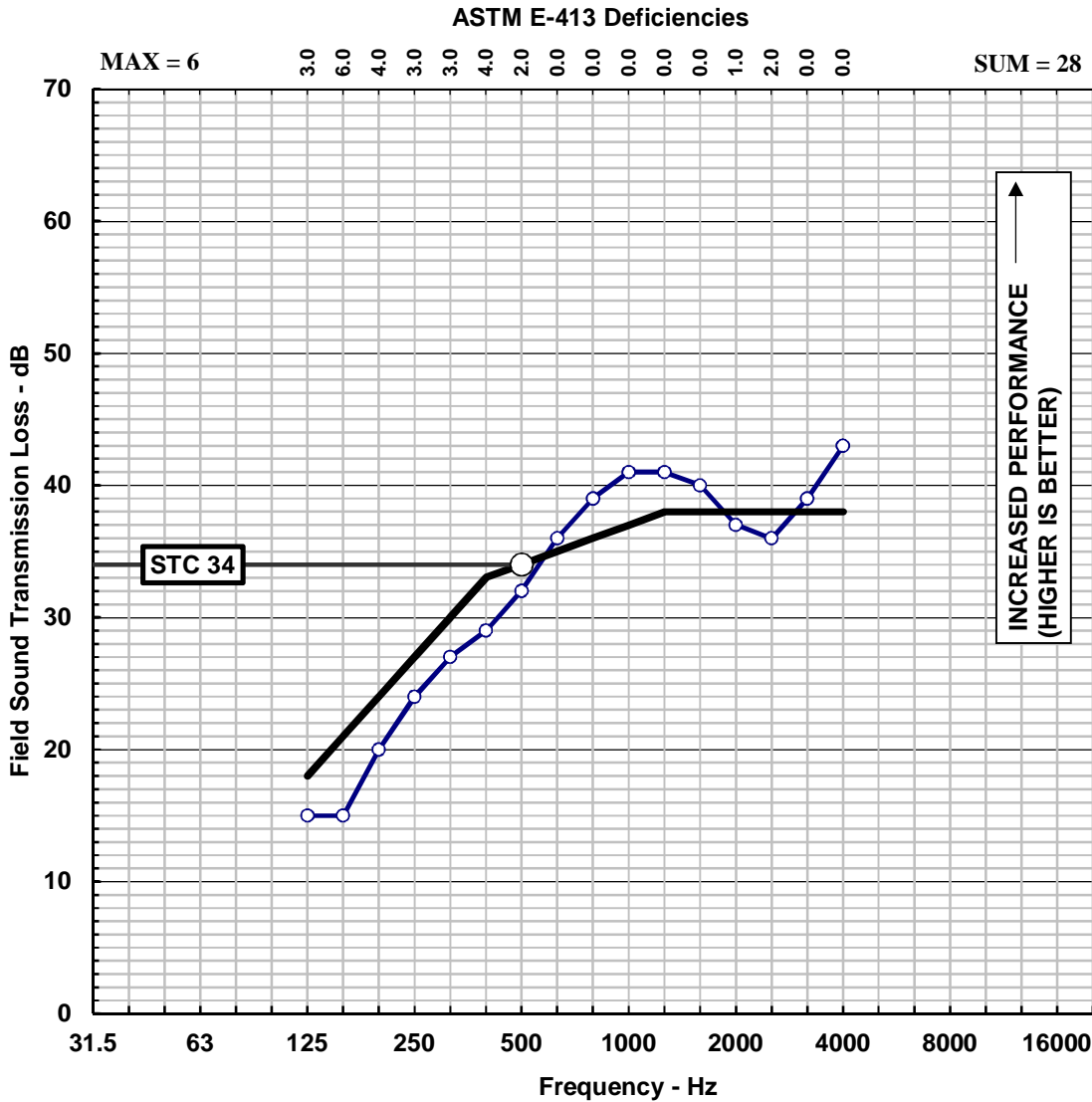


TABLE 2

SOUND TRANSMISSION LOSS VALUES

Study Conducted for: ENVY Modular Wall Systems, Inc.

Test No.:

| Freq. Hz | T1 | T2 | T3 | T4 | T5 | T6 |
|-----------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 125 | 9.6 | 9.0 | 8.3 | 7.6 | 10.1 | 9.4 |
| 160 | 14.7 | 13.3 | 12.8 | 13.9 | 12.7 | 13.0 |
| 200 | 17.6 | 15.3 | 15.2 | 16.5 | 13.9 | 15.1 |
| 250 | 18.1 | 16.8 | 16.5 | 17.1 | 15.3 | 17.2 |
| 315 | 19.9 | 18.3 | 18.2 | 19.1 | 13.6 | 19.2 |
| 400 | 22.8 | 21.0 | 21.1 | 21.7 | 14.9 | 21.2 |
| 500 | 24.1 | 22.7 | 23.0 | 23.4 | 24.3 | 23.1 |
| 630 | 26.4 | 24.9 | 25.1 | 25.2 | 33.1 | 26.6 |
| 800 | 28.3 | 27.2 | 27.1 | 26.8 | 39.9 | 31.0 |
| 1000 | 29.7 | 28.5 | 28.8 | 26.8 | 45.3 | 33.8 |
| 1250 | 30.8 | 30.7 | 31.0 | 25.3 | 53.3 | 38.4 |
| 1600 | 31.0 | 33.4 | 33.5 | 28.4 | 57.9 | 42.5 |
| 2000 | 28.2 | 35.4 | 34.7 | 31.6 | 61.3 | 47.7 |
| 2500 | 32.5 | 37.9 | 36.9 | 35.6 | 62.3 | 51.0 |
| 3150 | 37.9 | 40.1 | 38.1 | 38.7 | 65.9 | 55.1 |
| 4000 | 43.7 | 43.6 | 40.7 | 43.0 | 71.4 | 59.7 |
| 5000 | 47.6 | 47.6 | 42.9 | 45.7 | 74.7 | 63.8 |
| 6300 | 50.7 | 51.0 | 45.1 | 49.6 | 78.7 | 67.2 |
| 8000 | 53.1 | 54.5 | 46.5 | 53.5 | 81.0 | 70.9 |

Refer to Table 1 for descriptions of the test samples