Airborne Sound Transmission Loss Measurement Performed on One Wall Assembly with the Product WFR2-200-100-02 for EMSEAL, LLC

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Client: EMSEAL LLC

Specimen: Wall assembly with the product WFR2-200-100-02

Specimen ID: B3478-7W

Construction Dates: **Start date:** August 21, 2009 **End date:** August 21, 2009

Test Specimen:

Expansion joint: An opening 51 mm (2") wide by 2.4 m (8') high was created in a filler wall assembly to accept the client's expansion joint. This opening was located 1.1 m (45") away from the edge of the wall. For this full wall test the 51 mm (2") wide x 102 mm (4") deep x 2438 mm (96") long expansion joint identified by the client as WFR2-200-100-02 (Wall, Fire-Rated 2 hours) was installed by the client in the 51 mm (2") wall opening. The expansion joint, as identified by the client comprised precompressed fire-retardant-impregnated foam that was factory pre-coated on both inside and outside sides with an intumescent fire proofing material, then each side was coated with a silicone coating. Two pieces of material were installed one above the other to create the full 2.4 m (8') high expansion joint. The bottom piece measured 51 mm (2") wide x 102 mm (4") deep x 2032 mm (80") long and the top piece measured 51 mm (2") wide x 51 mm (2") deep x 406 mm (16") long. The two pieces had a total mass of 9.3 kg (20.5 lbs). The Dow Corning 790 Silicone Building Sealant was applied to seal the expansion joint to the filler wall and at the joint between the two pieces of material. This was done on both sides of the wall.

Filler Wall:

Wall panels (small chamber side- face layer): The layer consisted of a single layer of CGC SHEETROCK (R) FIRECODE CORE Type X gypsum panels with nominal dimensions of 1.22 m wide and 16 mm thick. Panels were oriented with the long axis parallel to the steel studs with staggered joints of 610 mm on center. The gypsum board panels were fastened to the base layer of gypsum board panels using Type S drywall screws 51 mm long and spaced 305 mm on center, both at the perimeter and in the field. Exposed joints between the gypsum board panels were caulked and covered with metal tape.

Wall panels (small chamber side - base layer): The layer consisted of a single layer of CGC SHEETROCK (R) FIRECODE CORE Type X gypsum panels with nominal dimensions of 1.22 m wide and 16 mm thick. Panels were oriented with the long axis parallel to the steel studs. The gypsum board panels were fastened to the steel studs using Type S drywall screws 41 mm long and spaced 610 mm on center on the edges and 305 mm on center in the field.

Framing: Single row of 38 x 92 mm light weight non-load-bearing (25 Ga. nominal) steel studs were installed with a spacing of 610 mm on center. The actual thickness of the steel was 0.46 mm.

Insulation: One layer of glass fiber insulation batts (Owens Corning R-12) having nominal dimensions of 92 x 610 x 1219 mm was installed in the steel stud cavities.

Wall panels (large chamber side - base layer): The layer consisted of a single layer of CGC SHEETROCK (R) FIRECODE CORE Type X gypsum panels with nominal dimensions of 1.22 m wide and 16 mm thick. Panels were oriented with the long axis parallel to the steel studs with staggered joints of 610 mm on center. The gypsum board panels were fastened using Type S drywall screws 41 mm long and spaced 610 mm on center on the edges and 305 mm on center in the field.

Wall panels (large chamber side - face layer): The layer consisted of a single layer of CGC SHEETROCK (R) FIRECODE CORE Type X gypsum panels with nominal dimensions of 1.22 m wide and 16 mm thick. Panels were oriented with the long axis parallel to the steel studs with staggered joints of 610 mm on center. The gypsum board panels were fastened using Type S drywall screws 51 mm long and spaced 305 mm on center both at the perimeter and in the field. Exposed joints between the gypsum panels were caulked and covered with metal tape.

The results in this report apply only to the specific sample submitted for measurement. No responsibility is assumed for performance of any other specimen.

Specimen Properties

Element		Actual Thickness (mm)	Mass (Kg)	Mass/length,area or volume	
Gypsum Board	FireCode Core Type X 16 mm	15.8	96.7	11.11	kg/m²
Gypsum Board	FireCode Core Type X 16 mm	15.8	96.5	11.07	kg/m²
Steel Studs	Generic 38 x 92 mm	92	10.4	0.53	kg/m
Glass Fibre Batts	R12 92 mm	92 *	7.8	9.29	kg/m³
Emseal	WFR2-200-100-02 102 mm	102 **	9.3	3.81	kg/m
Gypsum Board	FireCode Core Type X 16 mm	15.8	96.6	11.06	kg/m²
Gypsum Board	FireCode Core Type X 16 mm	15.8	97.2	11.15	kg/m²
Total		**155**	**414.5**		

Note:
* The thickness of the Glass Fibre Batts is not included in the total thickness of the specimen because it is inside the cavity.
** The thickness of the Emseal COS-150-65-02 is not included in the total thickness of the specimen because it is inside the cavity.

Test Specimen Installation:

During the measurements, the test specimen was mounted in the IRC acoustical wall test opening which measures approximately 3.66 m x 2.44 m.

The perimeter of the filler wall was sealed on both sides with caulking and then covered with a metal tape.

The area used for the calculation of the airborne sound transmission loss was 8.92 m².

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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".

Client: EMSEAL LLC

Specimen ID: B3478-7W

Test ID: TLA-09-033

Tested: 21-Aug-09

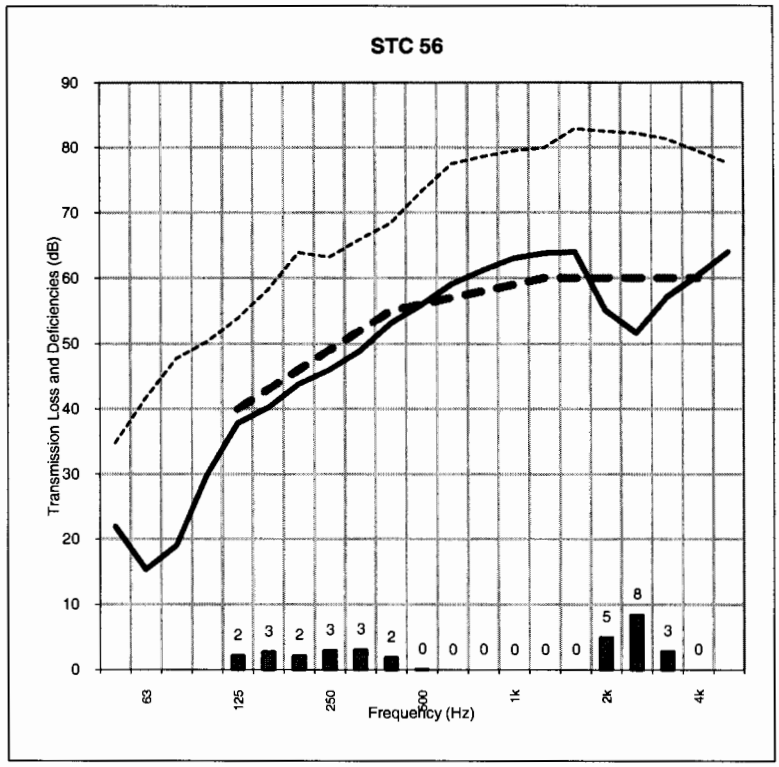
Small Room Volume: 141.1 m³

Large Room Volume: 255.8 m³

Measured Temperature and Relative Humidity During Testing

	Temperature, °C		Humidity %	
Room	Min	Max	Min	Max
Small Room	23.4	23.5	61.9	62.2
Large Room	24.4	24.4	58.9	58.9

Frequency (Hz)	Airborne Sound Transmission Loss (dB)	95% Confidence Limits (dB)
50	22 *	
63	15	
80	19	± 4.0
100	30	± 3.0
125	38	± 2.2
160	40	± 1.9
200	44	± 1.1
250	46	± 1.3
315	49	± 0.8
400	53	± 0.6
500	56	± 0.6
630	59	± 0.6
800	61	± 0.4
1000	63	± 0.3
1250	64	± 0.4
1600	64	± 0.4
2000	55	± 0.5
2500	52	± 0.4
3150	57	± 0.3
4000	60	± 0.4
5000	64	± 0.5
Sound Transmission Class (STC) = 56		
Outdoor Indoor Transmission Class (OITC) = 38		



In the graph:
Solid line is the measured sound transmission loss for this specimen. Dashed line is the STC contour fitted to the measured values according to ASTM E413-04. The dotted line is 10 dB below the flanking limit established for this facility. For any frequency where measured transmission loss is above the dotted line, the reported value is potentially limited by vibration transmission via laboratory surfaces, and the true value may be higher than that measured.

Bars at the bottom of the graph show deficiencies. At each frequency the difference between the shifted reference contour value and the measured data is calculated. Only deficiencies, that is, where the measured data are less than the reference contour, are counted in the fitting procedure for the STC, defined in ASTM E413.

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. The reported values provide an estimate of the lower limit of airborne sound transmission loss.

The results in this report apply only to the specific sample submitted for measurement. No responsibility is assumed for performance of any other specimen.

APPENDIX:

Airborne Sound Transmission Wall Facility

National Research Council Canada
Institute for Research in Construction Acoustics Laboratory
1200 Montreal Road, Ottawa, Ontario K1A 0R6
Tel: 613-993-2305 Fax: 613-954-1495

Facility and Equipment: The acoustic test facility comprises two reverberation rooms (referred to in this report as the small and large rooms) with a moveable test frame between the two rooms. In each room, a calibrated Bruel & Kjaer type 4166 condenser microphone with preamp is moved under computer control to nine positions, and measurements are made in both rooms using a real time analyzer controlled by a desktop PC-type computer. Each room has four loudspeakers driven by separate amplifiers and noise sources controlled by the computer. To increase the randomness of the sound field, there are also 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 large room) and reverse (receiving room is the small 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 times were averaged to get the average reverberation times for the room. A complete description of the test procedure, 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 1/3-octave bands in the frequency range 100 Hz to 5000 Hz. Within those ranges, reproducibility has been assessed by inter-laboratory round robin studies. 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 to 5000 Hz range has not been established, but is expected to depend on laboratory-specific factors.

Sound Transmission Class (STC): was determined in accordance with ASTM E413-04, "Classification for Rating Sound Insulation". The Sound Transmission Class (STC) is a single-figure 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.

Confidence Limits: Acoustical measurement in rooms is a sampling process and as such has associated with it a degree of uncertainty. By using enough microphone and loudspeaker positions, the uncertainty can be reduced and upper and lower limits assigned to the probable error in the measurement. These limits are called 95% confidence limits. They are calculated for each test according to the procedures in ASTM E90-09 and must be less than upper limits given in the standards. These confidence limits do not relate directly to the variation expected when a nominally identical specimen is built, installed and tested (repeatability). Nor do they relate directly to the differences expected when nominally identical specimens are tested in different laboratories (reproducibility).

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.

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