NRC Construction

Client Report

March 11, 2013

SKYFOLD ZENITH® 48

Measurement of Airborne Sound Transmission Loss in Accordance with ASTM E90 of Skyfold Zenith 48 Partition

B3504.Phase2.1

National Research Council Canada
Conseil national de recherches Canada

Canada

Client Report
B3504.Phase2.1

Measurement of Airborne Sound Transmission Loss in Accordance with ASTM E90 of Skyfold Zenith 48 Partition

A Client Report based on the results of the NRC Research Project on:

Acoustic Measurements of Railtech Partitions

for

Skyfold Custom Powerlift Partitions, Railtech LTD.
Montréal, Québec
H9X 3S3

March 11, 2013

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Measurement of Airborne Sound Transmission Loss in Accordance with ASTM E90 of Skyfold Zenith 48 Partition

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Report No:	B3504.Phase2.1
Report Date:	March 11, 2013
Contract No:	B3504
Reference:	Agreement dated December 16, 2011
Program:	Building Envelope and Materials

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Client: Skyfold Custom Powerlift Partitions, Railtech LTD.
325 Lee Avenue, Montréal, Québec H9X 3S3

Specimen: Skyfold Zenith 48

Specimen ID: B3504-Zenith-A2-2-67W

Construction Date: January 17, 2013

SKYFOLD ZENITH® 48

Specimen Description and Installation:

Test Specimen

Description: Skyfold Zenith 48

Specimen name	Skyfold Zenith 48
The specimen was opened and closed after installation was completed without further adjustments	5 times

Description of Panels and Seals

Panels

Panels type	Skyfold Zenith 48 panels
Panels on each side	4
Thickness of panels	19 mm
Air gap between panels	197 mm
Overall width of partition	3508 mm
Overall height of partition	2172 mm
Overall thickness of partition	299 mm
Total mass of all 8 panels	182.4 kg

Seals

Vertical end seals extended by	25 mm
Top panel seal to header	extruded rubber "bulb" seal 57 mm high
bottom panel seal to footer	extruded rubber "bulb" seal 57 mm high
Other seals	none

Framing

The size of the 2.44 m by 3.66 m facility test opening was reduced to accommodate the specimen by constructing a filler element as follows:

- A header consisting of a steel beam (C12 x 20.7) measuring 77 mm x 305 mm x 3667 mm covered on both sides with 2 layers of plywood with dimensions of 19 mm x 305 mm x 3667 mm and 6 layers of CGC SHEETROCK gypsum panels with

dimensions of 16 mm x 305 mm x 3667 mm was constructed.

- The header housed the motor and other operable parts of the lifting mechanism. The header assembly was supported at each end by 39 mm x 89 mm wood studs 2439 mm long and spaced 89 mm apart and fastened to the test frame using Type S screws 51 mm long spaced every 200 mm on centre. Insulation was added in the motor bulkhead.
- The space between the studs, which measured 39 mm x 89 mm, was filled with fiberglass insulation and the supports were then enclosed with 2 layers of 16 mm CGC SHEETROCK gypsum board on the face and sides.
- Two strips of CGC Type X gypsum boards each measuring 16 mm x 189 mm x 3581 mm were placed on the bottom of the test frame.
- Two layers of Plexiglas each measuring 7.5 mm x 189 mm x 2174 mm were placed over each side of the end supports to provide a smooth surface for the seals. Two additional layers of 1.6 mm thick Plexiglas was added to the east side of the end support to align the finished surfaces.
- Foam strips measuring 3mm x 50 mm x 3557 mm strips were placed at the underside of the header surface area that the panel's top seals closed against.
- The supports had a finished measurement of 76 mm deep x 380 mm wide and 2362 mm high.
- Exposed joints between pieces of gypsum board were caulked and covered with metal foil tape.
- The perimeter of the filler elements was sealed on both sides to the facility test opening with latex caulk and covered with metal foil tape.
- The opening in the filler elements for the test specimen measured 3508 mm wide x 2172 mm high. The area used for calculation of airborne sound transmission loss was 7.62 m².

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: Skyfold Custom Powerlift Partitions, Railtech LTD.

Specimen ID: B3504-Zenith-A2-2-67W

Test ID: TLA-13-021

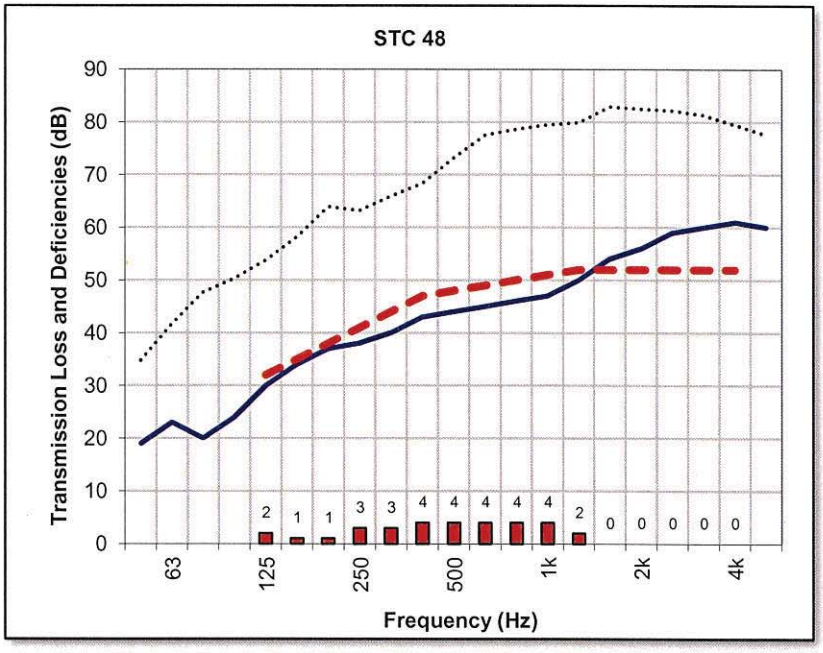
Date Tested: January 17, 2013

Large Chamber Volume: 254.8 m³

Small Chamber Volume: 140.0 m³

Measured Temperature and Relative Humidity During Testing

	Temperature, °C		Humidity %	
Room	Min	Max	Min	Max
Large	**19.8**	**20.2**	**39.8**	**48.4**
Small	**19.1**	**19.7**	**31.7**	**36.0**



Frequency (Hz)	Airborne Sound Transmission Loss (dB)	95% Confidence Limits (dB)
50	19	± 6.0
63	23	± 4.2
80	20	± 3.7
100	24	± 3.6
125	30	± 2.0
160	34	± 1.9
200	37	± 1.0
250	38	± 1.2
315	40	± 0.6
400	43	± 0.7
500	44	± 0.5
630	45	± 0.6
800	46	± 0.5
1000	47	± 0.5
1250	50	± 0.4
1600	54	± 0.3
2000	56	± 0.3
2500	59	± 0.4
3150	60	± 0.4
4000	61	± 0.5
5000	60	± 0.7
Sound Transmission Class (STC) =		**48**

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. 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 bottom of 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 E413-04.

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The results in this report apply only to the specimen that was tested. NRC does not represent that the results in this report apply to any other specimen.

APPENDIX:
Airborne Sound Transmission Wall Facility

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

Facility and Equipment: The acoustics 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 condenser microphone (type 4166 or 4165) with preamp is moved under computer control to nine positions, and measurements are made in both rooms using an 8-channel National Instrument NI4472 system installed in a desktop PC-type computer. Each room has four bi-amped loudspeakers driven by separate amplifiers and noise sources. To increase randomness of the sound field, there are 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.