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Client Report

October 6, 2010

Measurement of Airborne Sound Transmission Loss in Accordance with ASTM E90, Performed on a Skyfold Classic Operable Partition (in Testing Configuration "4E")

B3484.3

SKYFOLD
ALL NRC MODELS

National Research Council Canada
Conseil national de recherches Canada

Canada

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

Measurement of Airborne Sound Transmission Loss in Accordance with ASTM E90, Performed on a Skyfold Classic Operable Partition (in Testing Configuration "4E")

SKYFOLD
ALL NRC MODELS

for

Railtech Ltd.,
Skyfold Division of Railtech
325, Lee Avenue
Baie d'Urfé
Montréal, QC
H9X 3S3

6 October 2010

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Report No: B3484.3
Report Date: October 6, 2010
Contract No: B3484
Reference: Agreement dated June 3, 2010
Program: Indoor Environment

5 pages
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Client:	Skyfold Custom Powerlift Partitions, Railtech Ltd.
Specimen:	Skyfold Classic "4E"
Specimen ID:	B3484-32W
Construction Dates:	August 19, 2010 to August 20, 2010

Specimen Description:
The specimen B3484-32W was identified by the client as a Skyfold Classic operable partition, with panels, seals, and clearances in configuration "4E".

The Skyfold Classic operable partition was installed by the client and consisted of 8 panels, mounted to a lifting mechanism that was supported from the top. Four panels were installed on each side of the mechanism. The overall dimensions of the partition, including seals, were 3508 mm wide by 2172 mm high. The overall thickness of the partition was 299 mm.

The client reported that each panel consisted of an honeycomb cellulose core between a fabric covered perforated steel plate on the outer face, and a backer plate of sheet steel on the inner face. The steel-core-steel part of each panel was 19 mm thick, 3457 mm wide and 510 mm high. The inside surface of each panel had a layer of 38 mm fiberglass duct liner.

Each panel had lined rubber "end" seals on the vertical edges that retracted and extended for operation. The width of these vertical end seals when fully extended was nominally 25 mm. All panels sealed to each other with horizontal "lip" seals that compressed a strip of foam when the partition was closed. The top panel sealed to the header with a lined extruded rubber "bulb" seal 57 mm high. The bottom panel sealed to the floor with a lined extruded rubber "bulb" seal 57 mm high.

The total mass of all 8 panels including seals was 229.9 kg. The total mass of the specimen was 342.7 kg. Proprietary details of the specimen are withheld from this report at the request of the client.

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. 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. The supports had a finished measurement of 76 mm deep x 380 mm wide and 2362 mm high. 2 strips of a single layer of CGC Type X gypsum board each measuring 16 mm x 189 mm x 3581 mm were placed on the bottom portion of the test frame. Exposed joints between pieces of gypsum board were caulked and covered with metal foil tape.

Specimen Properties:

Element		Actual thickness (mm)	Mass (kg)	Mass/length, area or volume
Operable Partition	Classic 299 mm	299	342.7	44.7 kg/m²
Total		299	342.7	

Test Specimen Installation:
The test specimen was installed in the NRC-IRC Wall Sound Transmission Facility. The facility test opening measures 2.44 m by 3. 66 m. The area was reduced by constructing filler elements, as described above. 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 by 2172 mm high. The area used for calculation of airborne sound transmission loss was 7.66 m².

The specimen was opened and closed five times after installation was completed and was tested without further adjustments.

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: B3484-32W SKYFOLD ALL NRC MODELS

Test ID: TLA-10-059

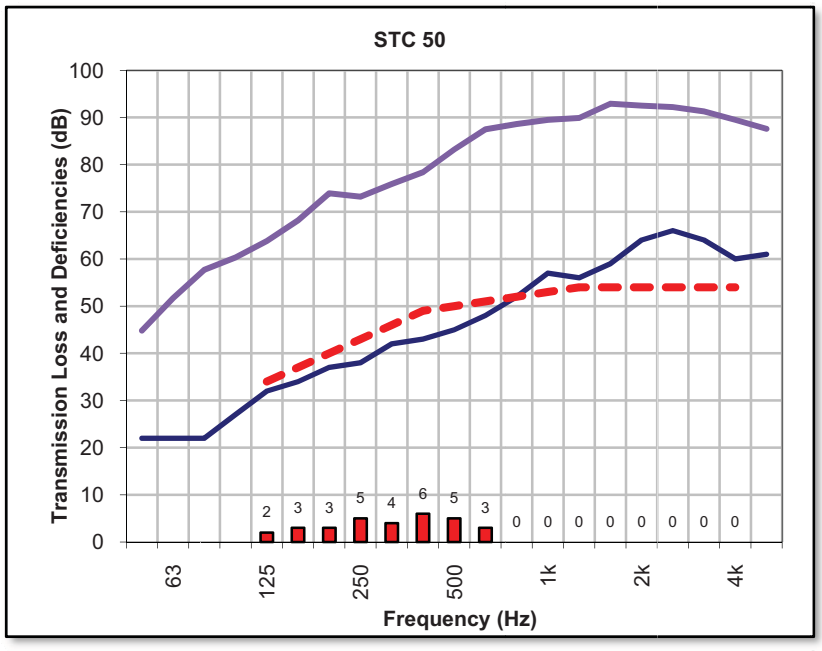
Date Tested: August 20, 2010

Large Chamber Volume: 254.9 m³

Small Chamber Volume: 139.9 m³

Measured Temperature and Relative Humidity During Testing

	Temperature, °C		Humidity %	
Room	Min	Max	Min	Max
Large	**22.1**	**22.1**	**45.8**	**46.1**
Small	**22.2**	**22.3**	**47.7**	**48.3**



Frequency (Hz)	Airborne Sound Transmission Loss (dB)	95% Confidence Limits (dB)
50	22	± 6.2
63	22	± 4.2
80	22	± 4.2
100	27	± 3.7
125	32	± 2.2
160	34	± 1.9
200	37	± 1.2
250	38	± 1.3
315	42	± 0.8
400	43	± 0.8
500	45	± 0.7
630	48	± 0.7
800	52	± 0.5
1000	57	± 0.5
1250	56	± 0.6
1600	59	± 0.5
2000	64	± 0.5
2500	66	± 0.4
3150	64	± 0.6
4000	60	± 0.8
5000	61	± 0.7
Sound Transmission Class (STC) =		**50**

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. '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.

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 E90-04.

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.

Values marked with "clc" indicate a correction applied for transmission that occurs through the filler wall.

Values marked "min" indicate transmission through the filler wall was within 6 dB of the result for specimen plus filler. Reported value give an estimate of the lower limit of airborne sound transmission loss.

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
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 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.