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Client Report

October 6, 2010

Measurement of Sound Absorption in Accordance with ASTM C423, Performed on a Skyfold Classic Operable Partition (in Testing Configuration "4E"

B3484.5

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 Sound Absorption in Accordance with ASTM C423, Performed on a Skyfold Classic Operable Partition (in Testing Configuration "4E")

for

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

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ALL NRC MODELS

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5 pages
Copy No. 1 of 4 copies

Client:	Skyfold Custom Powerlift Partitions, Railtech Ltd. 325 Lee Ave, Baie D'urfe Montreal, Quebec H9X 3S3
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.

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 sound absorption was 7.66 m^2.

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

Sound absorption measurements were conducted in accordance with the requirements of ASTM C423, "Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method"

Client: Skyfold Custom Powerlift Partitions, Railtech Ltd.

Specimen ID: B3484-32W SKYFOLD ALL NRC MODELS

Test ID: ABA-10-008

Date Tested: August 20, 2010

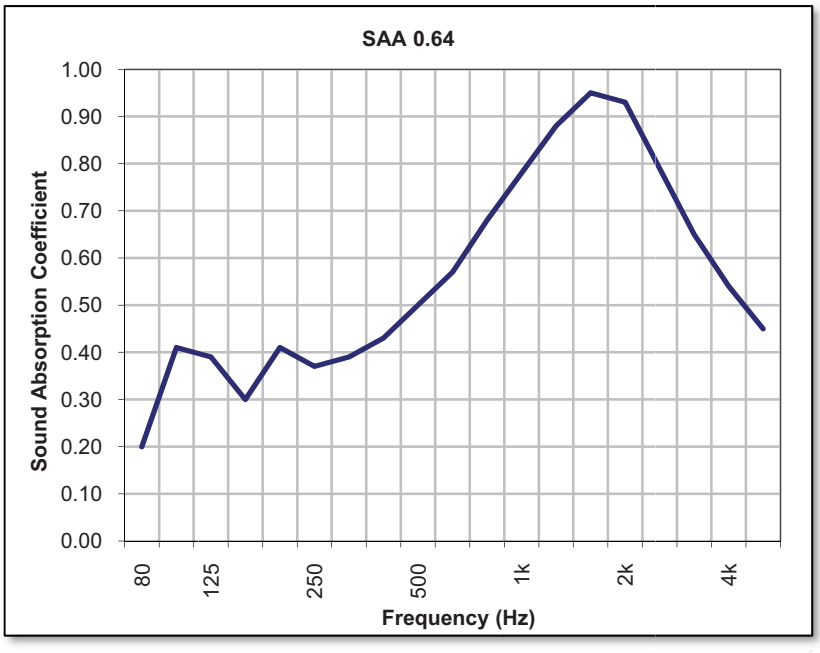
Large Chamber Volume 250.9 m^3

Specimen Surface Area 7.66 m^2

Measured Temperature and Relative Humidity During Testing

	Temperature, °C	Humidity %
Large	21.9	45.7

Frequency (Hz)	Sound Absorption Coefficient	95% Confidence Limits
80	0.20	± 0.20
100	0.41	± 0.09
125	0.39	± 0.05
160	0.30	± 0.03
200	0.41	± 0.03
250	0.37	± 0.02
315	0.39	± 0.02
400	0.43	± 0.02
500	0.50	± 0.01
630	0.57	± 0.01
800	0.68	± 0.01
1000	0.78	± 0.01
1250	0.88	± 0.01
1600	0.95	± 0.01
2000	0.93	± 0.01
2500	0.79	± 0.01
3150	0.65	± 0.01
4000	0.54	± 0.01
5000	0.45	± 0.01
Sound Absorption Average (SAA)		**0.64**
Noise Reduction Coefficient (NRC)		**0.65**



In the graph:
Solid line is the measured sound absorption coefficient calculated for this specimen according to ASTM C423.

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:
Sound Absorption
M-27 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 Procedure: The facility for absorption testing has a reverberation room with nominal volume of 250 m^3. The room has four loudspeakers driven by separate amplifiers and noise sources controlled by a computer. To increase the randomness of the sound field, there are fixed and moving diffusing panels in the room. In this room, a calibrated Bruel & Kjaer type 4166 microphone with preamp is moved under computer control to nine repeatable positions, and measurements of sound decays are made. Sound absorption measurements are conducted in accordance with the requirements of ASTM C423-02a, "Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method". Mean empty room reverberation times are obtained by averaging the measurements of ten decays at each of nine microphone positions. Similarly, mean reverberation times are obtained with the specimen in the chamber, at 9 microphone positions for each test specimen position; the latter depends on the specimen mounting (see below). The mean reverberation times are then used to calculate the absorption coefficient in each one-third-octave band.

Specimen Mounting: Standard mounting conditions for absorption testing conform to ASTM C423-02a and ASTM E795-00 "Standard Practices for Mounting Test Specimens During Sound Absorption Tests." Mountings normally used at this laboratory include:

- *A Mounting*—The test specimen is laid directly on the floor, with its perimeter edges covered by a wood frame that is sealed to the floor. Measurements are made for one standard position.
- *E400 Mounting*—The test specimen is installed in a standard frame (area 2.74 m x 2.44 m) that supports the specimen 400 mm above the chamber floor. Measurements are made for two standard positions, with the frame sealed to the floor.
- *Office screen*—This special case is referred to as "Type K Mounting" in ASTM E795-00. Measurements are made for three standard positions, with the test specimen standing on the floor.

Sound Absorption Coefficients: Sound absorption for a specimen is measured in square metres. "1 m^2 of absorption" may be thought of as one square metre of perfect absorber. Sound absorption coefficients are derived by dividing the sound absorption of the complete specimen (metric sabins) at each frequency by the total surface area of a specimen in square metres. Diffraction effects usually cause the effective area of a specimen to be greater than its geometrical area thereby increasing the measured absorption coefficient. When the coefficients are large, the measured values may exceed unity, but no adjustments to the measured coefficients are made.

Sound Absorption Average (SAA), and Noise Reduction Coefficient (NRC) are single number ratings calculated from measured sound absorption coefficients, as specified in ASTM C423-02a. SAA is the average of the sound absorption coefficients of a material for the one-third-octave bands from 200 through 2500 Hz, inclusive, rounded to the nearest multiple of 0.01. NRC is the average of the sound absorption coefficients of a material for 250, 500, 1000 and 2000 Hz rounded to the nearest multiple of 0.05. The higher the SAA or NRC value, the greater the average sound absorption.

Confidence Limits and Significance of Test Results: 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 C423-02a 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 to the differences expected when nominally identical specimens are tested in different laboratories (reproducibility). Standard test procedures require measurements in 1/3-octave bands over a specified frequency range (100 to 5000 Hz for ASTM C423-02a). Within this range, 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.