



TEST REPORT

ON

Laboratory measurement of airborne sound transmission loss of

Fire Rate Door

OF

SAMHOON Co., Ltd.



FIRE INSURERS LABORATORIES OF KOREA

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FORWARD

This report was prepared under a contract between SAMHOON Co., Ltd. and Fire Insurers Laboratories of Korea(FILK).

This test was intended to determine the airborne sound transmission loss of the specimen, supplied by SAMHOON Co., Ltd.

The test result is applied only to the test specimen submitted by SAMHOON Co., Ltd. and this should not be used in a commercial advertisement, a suit and other legal requirements.

April 9, 2012

Approved by :

A handwritten signature in black ink, appearing to read 'Seo', is written over a horizontal line. The signature is stylized and cursive.

Seo, Jang-duck

Executive Director of FILK

※ The laboratory is accredited for the above tests by Korea Laboratory Accreditation Scheme(KOLAS), which is a signatory to the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement(MRA).



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1. SUMMARY

- 1.1 Name of test : Laboratory measurement of airborne sound transmission loss in accordance with ASTM E 90 : 2009.
- 1.2 Applicant : Mi Young Kim, the president of SAMHOON Co., Ltd.
577-1, Songnae-dong, Sosa-gu, Bucheon-si, Gyeonggi-do, Korea
- 1.3 Manufacturer : SAMHOON Co., Ltd
- 1.4 Test specimen : Fire Rate Door
- 1.5 Spec. Drawing : Refer to Appendix 1.
- 1.6 Test Standard : ASTM E 90 : 2009(Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements)
- 1.7 Test Result : The airborne sound transmission loss of the test specimen are shown in **table 3**.

2. PURPOSE OF THE TEST

The purpose of the test was to determine the airborne sound transmission loss(TL) of the specimen through the acoustic test in condition of its type, materials, thickness, etc. as described in this report.

3. OUTLINE OF THE TEST

- 3.1 The test was conducted in laboratory space which simulated a pair of horizontally adjoined reverberation rooms with the test specimen as a partition.
- 3.2 The measurements were repeated 30 times at 5 positions with rotating microphone boom in each room and the reported values(TL) were calculated in accordance with ASTM E 90 : 2009.

Date tested : March 14, 2012

Report issued : April 9, 2012

3.3 The single-number rating(STC) for airborne sound transmission loss of the specimen was determined with values above(TL) in accordance with ASTM E 413 : 2007.

4. CONSTRUCTION OF THE TEST SPECIMEN

4.1 The test specimen consisted of Fire Rate Door supplied and constructed by SAMHOON Co., Ltd. as shown in **Table 1**.(See Appendix 1, 2.)

〈Table 1〉 Material components of the Test specimen

Test Specimen	Material components
Fire Rate Door	Fire Rate Door 49 mm
Filler Wall	RC Concrete 200 mm(25-8-240)

4.2 The details of the specimen was shown in appendix 1.

5. TEST PROCEDURE

5.1 INSTALLATION OF THE TEST SPECIMEN

The specimen was installed in the opening of the restraint frame in accordance with the recommended practice of the standard installation manual submitted by SAMHOON Co., Ltd. as shown in Appendix 1, 2. The available test opening was 11.2 m².(Width 4.0 m × Height 2.8 m)

5.2 SOUND SOURCE AND MICROPHONE POSITION

The sound source(speaker) was placed facing one corner of each room and the sound fields in each room were sampled with microphone at five random positions.

The microphones were located in each room with distance not less than 2 m from the sound source, between each microphone positions and not less than 1 m from the specimen as well as the wall of room.

5.3 MEASUREMENT OF THE AVERAGE SOUND PRESSURE LEVEL

The average sound pressure level was obtained at five different measuring positions through a rotating microphone and repeated 30 times as P below.

$$L = 10 \text{ Log}_{10} \frac{P_1^2 + P_2^2 + \dots + P_n^2}{nP_0^2} \quad \text{-----} (1)$$

where L : the average sound pressure level in the room
 P_n : the R.M.S sound pressures at different positions in the room
 P_0 : the reference sound pressure(20 μPa)
 n : times of measurement(30 times)

5.4 MEASUREMENT OF ABSORPTION IN RECEIVING ROOM

The equivalent absorption area of receiving room was evaluated from reverberation time in accordance with ASTM C 423 : 2009.

$$A = \frac{55.3}{c} \times V \times \frac{1}{T} \quad \text{-----} (2)$$

where A : the equivalent absorption area(m^2)
 V : the receiving room volume (m^3)
 T : the reverberation time of the receiving room(s)
 c : speed of sound in air(m/s)
 $c = 331.5 + 0.61t$ (t : temperature of air, $^{\circ}\text{C}$)

5.5 DETERMINATION OF AIRBORNE SOUND TRANSMISSION LOSS

The airborne sound transmission loss is the sound pressure level difference corresponding to a equivalent absorption area of the receiving room.

This quantity was denoted as TL and expressed in decibels.

$$TL = L_1 - L_2 + 10 \log \left(\frac{S}{A} \right) \quad \text{-----} (3)$$

- where
- TL : the airborne sound transmission loss(dB)
 - L_1 : average sound pressure level of the sound source room(dB)
 - L_2 : average sound pressure level of the sound receiving room(dB)
 - S : the available area of specimen(m^2)
 - A : the equivalent absorption area in receiving room(m^3)

5.6 CALCULATION OF SOUND TRANSMISSION CLASS(STC)

The STC was calculated on the basis of measured curve TL in accordance with ASTM E 413 : 2007.

5.7 FREQUENCY RANGE OF MEASUREMENTS

From 100 Hz to 5 000 Hz(defined as one-third octave band).

6. TEST FACILITY

6.1 TEST ROOM

6.1.1 The test room was consisted of two adjacent reverberation rooms called source room and receiving room respectively.

6.1.2 The features of test room are specified in **table 2**.

<Table 2> The feature of test rooms

	Source room	Receiving room	Remark
Volume(m^3)	269.0	200.0	◦ Main structure : Reinforced concrete 300 mmThk.

6.2 TEST INSTRUMENT

6.2.1 SOUND SOURCE

- Broad band noise with amplifier and loudspeaker.
- Instrument model : B&K 4296 made in Denmark.

6.2.2 MICROPHONE

- Omni-directional microphone.
- Instrument model : B&K 4942 made in Denmark.



6.2.3 SOUND LEVEL ANALYSER

- Real-time frequency analyser.
- Instrument model : B&K PULSE made in Denmark.

7. TEST RESULTS

7.1 The test was carried out for the specimen in accordance with the test method specified in ASTM E 90 : 2009.

7.2 As the results of the test, the airborne sound transmission loss(TL) were determined as shown in **table 3**.

<Table 3> TEST RESULTS

Test method	ASTM E 90		Date tested	March 14, 2012
Test specimen	Fire Rate Door		Conditions	Temperature : (11 ± 1) °C Humidity : (50 ± 5) %RH
Frequency(Hz)	R_S(dB)	R' _T (dB)	<p>※ MEASURED GRAPH</p>	
100	34.0	34.8		
125	37.9	38.2		
160	35.6	34.2		
200	39.2	37.6		
250	38.6	36.7		
315	42.7	41.4		
400	45.2	44.6		
500	46.9	46.3		
630	48.6	47.4		
800	48.8	47.3		
1000	51.9	51.2		
1250	54.7	54.2		
1600	59.7	60.3		
2000	61.5	62.1		
2500	60.7	62.6		
3150	59.0	62.7		
4000	59.6	58.7		
5000	58.0	57.2		
STC	50	-		

Tested and Reported by :

Jeong Jeongho
Research Engineer
Construction materials &
Environmental Lab.

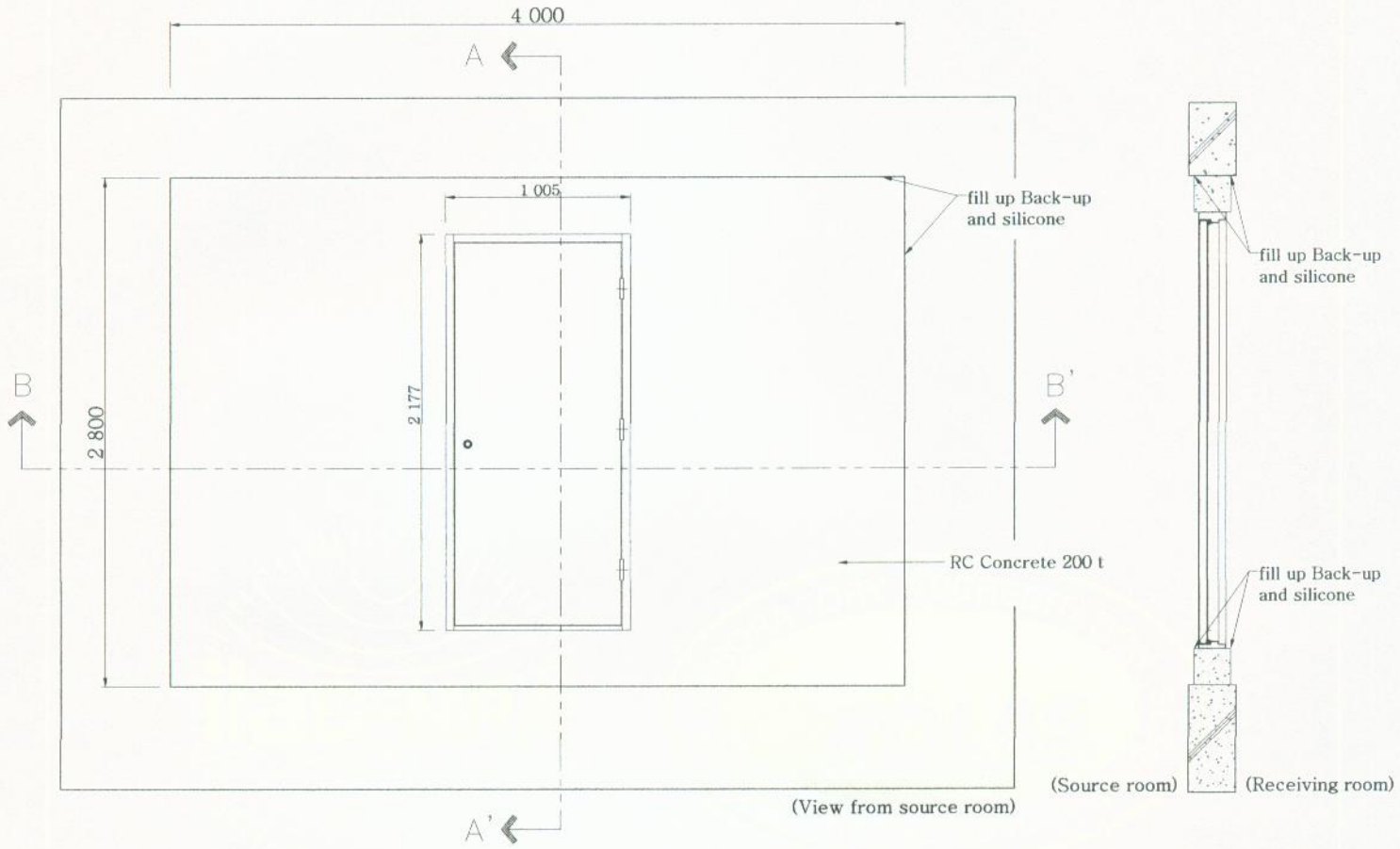
Reviewed by :

Jeong Jaegun
Team Leader
Construction materials &
Environmental Team

APPENDIX 1.

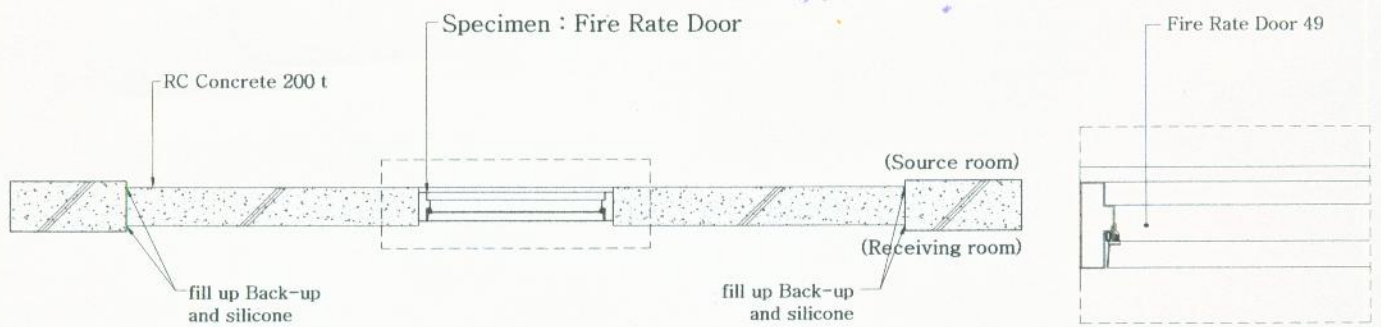
DRAWING OF THE TEST SPECIMEN

(Dimension : mm)



ELEVATION

A-A' SECTION

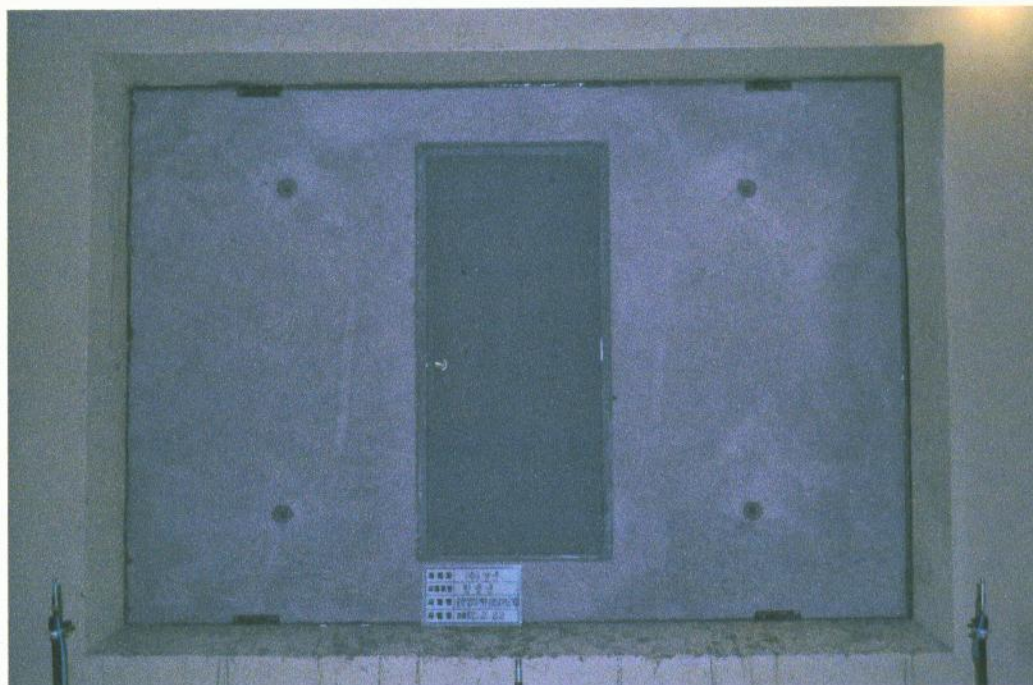


B-B' SECTION

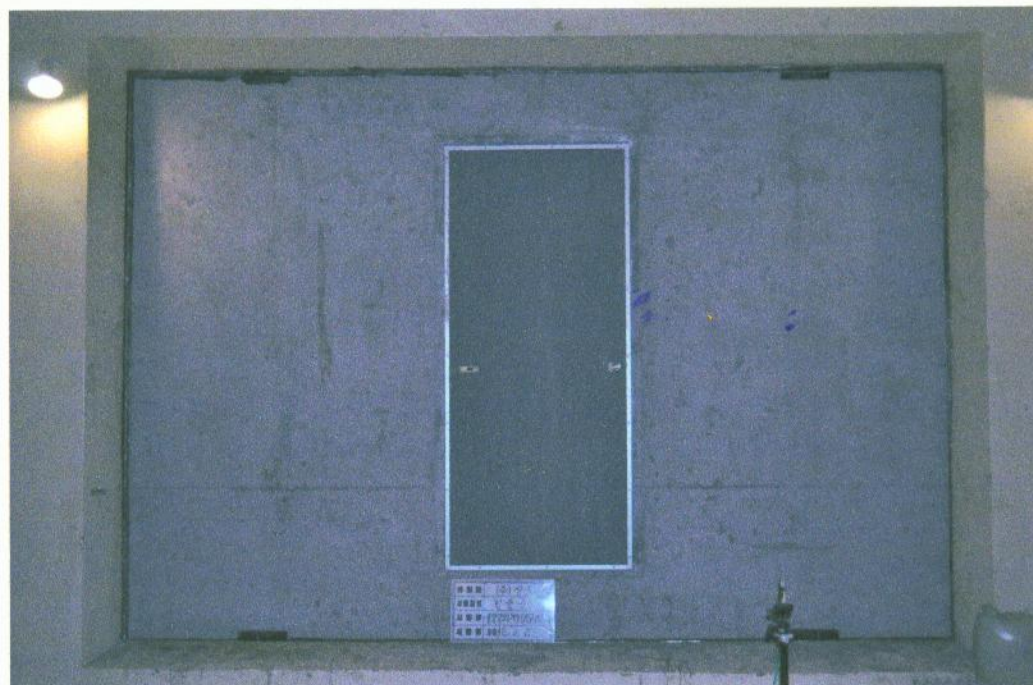
DETAIL

APPENDIX 2.

PHOTOGRAPHS

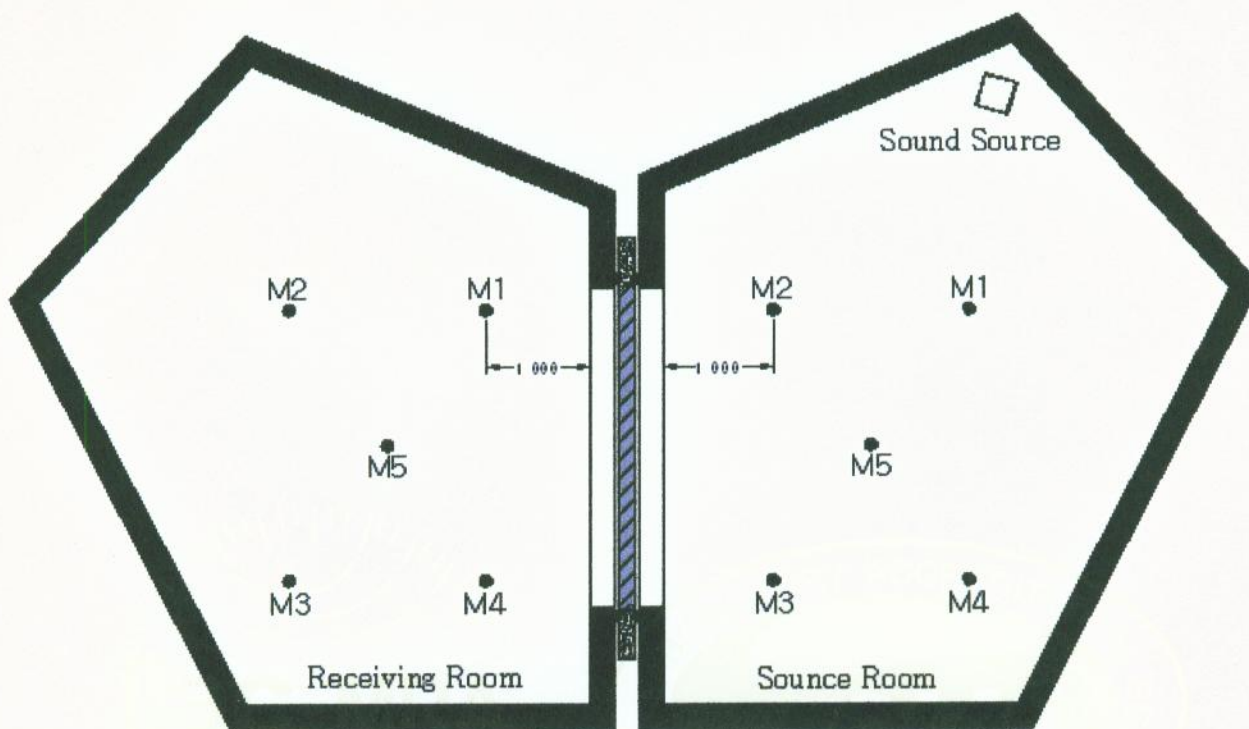


[PHOTO 1] Test specimen in view of source room



[PHOTO 2] Test specimen in view of receiving room

APPENDIX 3. LAYOUT OF THE TEST FACILITY



* M1, M2, M3, M4, M5 : Microphone position

* Height of each receiving point of microphone position is 1.5 m from the floor.