PKA ACOUSTIC CONSULTING

Predicted Performance of Lorient Integrity Door Seals Applied to a 40mm MDF Faced Door

Project 202 145

September 2002

File : *202 145 R02 Predicted performance of 40mm door seals*

Prepared For:
Giles Newcombe
Lorient Australia Pty Ltd
8 Powells Road
Brookvale, N.S.W., 2100

Facsimile: 9907 3855

Prepared By
Peter Knowland
Peter R Knowland & Associates Pty Ltd
t/a PKA Acoustic Consulting
Suite 16, 401 Pacific Highway
ARTARMON, NSW, 2064
Telephone: (02) 9460 6824, Facsimile: (02) 9460 6823

ABN 73 001 594 583, ACN 001 594 583

Document Information

File: *202 145 R02 Predicted performance of 40mm door seals*

Author: Peter Knowland

Checked:

Revision: **Final**

Distribution:

Date	Copies	Version	To:	By:
8 August 2002	1	1.0	Giles Newcombe	9907 3855
25 September 2002	1	2.0	Giles Newcombe	9907 3855
2 October 2002	1	3.0	Giles Newcombe	9907 3855
23 October 2002	3	Final	Giles Newcombe	Hand

Contents

1 Introduction

Lorient Australia organized an extensive testing program of door panels and door seals at the Acoustic Facilities of RMIT University Melbourne. The testing was carried out in accordance with Australian Standard AS 1191-1985 and ISO140-3-1995. The test program carried out in November 2001 included test of three single door panels and a set of double doors. The tests included each of the door panels caulked in place and in the case of the 45mm steel door and the 40mm MDF faced particleboard door with various combinations of Lorient door seals. All the tests are covered by RMIT test reports 1211/01-093PD and 094PD.

The commission is to predict the acoustic performance of some of the 40mm MDF faced or ply faced solid timber core doors fitted with various Lorient Integrity sealing systems. The predictions are based on the interpolation of acoustic test results previously measured on a variety high performance doors assemblis.

The overall test program provided a wealth of information that allowed not only the required prediction to be made but also indicated that predictions on other door panels would be possible. The required predictions are given in this Report.

2 Methodology

There have been attempts by Lorient in their various testing programs carried out both at Sound Research Laboratories in the United Kingdom and RMIT in Australia to establish the performance of individual door seals. As well there has been research carried out at Rosenheim to evaluate the performance of individual door seals. Whilst this is important with product development, it is the door seal combination that is essential. The performance of a single door seal does not reveal the effect of gaps that may be formed when the entire system is put together.

The test results on the 40mm door panel fully caulked in the test aperture, and then non-caulked panels fitted with various door seal combination in the same aperture showed very little deterioration of acoustic performance. However careful examination of the higher performing steel door revealed that the door seal performance was now having a significant control on the acoustic performance of that door system. From these tests it seemed possible that the actual acoustic performance of the door seal combination could be mathematically determined using composite transmission loss calculations and using an edging technique to clarify door seal performance. A database was established and used to predict the performance of the door seal applied to the 40mm solid core doors. These results are attached overleaf.

3 Steel Frame/Timber Frame

The original series of door tests were carried out using steel frames. Acoustic laboratory measurements carried out by this firm has revealed that providing the timber frame material is at least 600 kg/m^3 and is properly sealed within the door opening that the performance of the infill door is capable of at least Rw 40. As the results contained in the attached tables are in the order of Rw 32 then timber frames can be considered to have the same performance as a steel frame.

4 Sound Lock Doors

The combination of a double door system to provide a sound lock achieves very high acoustic insulation. The addition of acoustic absorbent linings to the sound locks can also further enhance the sound insulation achieved. Experience has shown that a sound lock arrangement is a preferable way to achieve and maintain high acoustic performance with good traffic ability compared to that of a very high performance acoustic door.

The distance between the two sets of doors influences the performance of a sound lock. Some predictions are attached overleaf for a number of door configurations. The assumption is based on the doors being approximately 1metre apart and that there is no acoustic absorption between the doors. The addition of acoustic absorbency in the form of carpet and acoustic wall linings can increase the values shown overleaf by 6 to 8 dB.

Sometimes a double set of single doors is used to provide increase in acoustic performance. These are typically used between hotel apartments. Our experience indicates that when the doors are on a common timber frame there is only limited gain in acoustic performance. It appears that the doors should be on separate frames that are not connected across the cavity wall and that the doors are at least 200mm apart. The performance of these doors is very difficult to predict.

Single Door 40mm MDF or Ply Faced Particle Board

Predictions of acoustic performance based on tests carried out at RMIT University

Doorset description	Seal Combination		Fully caulked 40mm MDF faced particleboard door as tested at RMIT	STC	Rw	Ctr	Rw+Ctr	
				33	32	-2	30	
	Perimeter (head & uprights)	Door bottom	100 125 160 200 250 315 400 500 630 800 1K 1.25 1.6 2K 2.5 3.15 4K 5K	STC	R_w	$C_{t,r}$	$R_w+C_{t,r}$	
Medium Duty systems								
Single 40mm door	LE1212 Batwing	IS8011si face fixed	21 26 29 31 31 31 32 31 29 27 28 31 34 35 36 39 40 41	32	32	-2	30	Tested
Single 40mm door	IS7025	IS8011si face fixed	21 28 28 32 33 33 33 33 31 28 27 30 32 34 37 40 40 41	32	32	-2	30	Tested
Single 40mm door	IS7110	IS8011si face fixed	24 27 29 31 32 33 34 33 31 28 27 30 32 34 37 40 40 41	32	32	-2	30	Tested
Single 40mm door	IS7080	IS8011si face fixed	23 27 28 31 32 33 33 33 30 27 27 29 32 34 37 38 38 40	32	32	-2	30	Tested
Single 40mm door	LE1212 Batwing	IS8011si semi mortised	22 24 27 30 27 26 28 27 27 27 28 31.5 34 35 36 39 41 41	31	31	-2	29	Predicted
Single 40mm door	IS7025	IS8011si semi mortised	21 24 27 30 27 26 28 27 27 28 27 30 32 35 37 40 40 41	31	30	-2	28	Predicted
Single 40mm door	IS7110	IS8011si semi mortised	22 24 27 30 27 26 28 27 27 28 28 31 33 34 37 40 41 42	31	31	-2	29	Predicted
Single 40mm door	IS7080	IS8011si semi mortised	22 24 27 30 27 26 28 27 27 27 28 29 33 35 37 39 38 41	31	30	-2	28	Predicted
Single 40mm door	LE1212 Batwing	IS8010si fully mortised	22 24 27 30 27 26 28 27 27 27 28 31.5 34 35 36 39 41 41	31	31	-2	29	Predicted
Single 40mm door	IS7025	IS8010si fully mortised	21 24 27 30 27 26 28 27 27 28 27 30 32 35 37 40 40 41	31	30	-2	28	Predicted
Single 40mm door	IS7110	IS8010si fully mortised	22 24 27 30 27 26 28 27 27 28 28 31 33 34 37 40 41 42	31	31	-2	29	Predicted
Single 40mm door	IS7080	IS8010si fully mortised	22 24 27 30 27 26 28 27 27 27 28 29 33 35 37 39 38 41	31	30	-2	28	Predicted
Heavy Duty systems								
Single 40mm door	LE1515 Batwing	IS8090si face fixed	21 24 27 30 27 26 28 27 27 28 30 33 35 35 36 39 40 40	32	31	-2	29	Predicted
Single 40mm door	IS7090si	IS8090si face fixed	20 24 27 30 27 26 28 27 27 27 28 30 32 35 38 39 35 37	31	30	-2	28	Predicted
Single 40mm door	IS7190si	IS8090si face fixed	20 24 27 30 27 26 28 27 27 27 28 30 32 35 38 39 35 37	31	30	-2	28	Predicted
Single 40mm door	LE1515 Batwing	IS8090si semi mortised	21 24 27 30 27 26 28 27 27 28 30 33 35 35 36 39 40 40	32	31	-2	29	Predicted
Single 40mm door	IS7120	IS8090si face fixed	20 24 27 30 27 26 28 27 27 27 29 32 34 35 38 40 39 37	31	31	-2	29	Predicted
Single 40mm door	IS7090si	IS8090si semi mortised	20 24 27 30 27 26 28 27 27 27 28 30 32 35 38 39 35 37	31	30	-2	28	Predicted
Single 40mm door	IS7190si	IS8090si semi mortised	20 24 27 30 27 26 28 27 27 27 28 30 32 35 38 39 35 37	31	30	-2	28	Predicted
Single 40mm door	LE1515 Batwing	IS8091si face fixed	21 24 27 30 27 26 28 27 27 28 30 33 35 35 36 39 40 40	32	31	-2	29	Predicted
Single 40mm door	IS7090si	IS8091si face fixed	20 24 27 30 27 26 28 27 27 27 28 30 32 35 38 39 35 37	31	30	-2	28	Predicted
Single 40mm door	IS7190si	IS8091si face fixed	20 24 27 30 27 26 28 27 27 27 28 30 32 35 38 39 35 37	31	30	-2	28	Predicted
Single 40mm door	LE1515 Batwing	IS8100si fully mortised	20 24 27 30 27 26 28 27 27 28 30 33 34 35 36 39 39 40	32	32	-2	30	Predicted
Single 40mm door	IS7090si	IS8100si fully mortised	19 24 27 30 27 26 28 27 27 27 28 30 32 35 38 39 35 37	30	30	-2	28	Predicted
Single 40mm door	IS7190si	IS8100si fully mortised	19 24 27 30 27 26 28 27 27 27 28 30 32 35 38 39 35 37	30	30	-2	28	Predicted
Single 40mm door	LE1515 Batwing	IS8020si faced fixed	21 24 27 30 27 26 28 27 27 28 30 33 35 35 38 39 40 40	32	31	-2	29	Predicted
Single 40mm door	IS7090si	IS8020si faced fixed	20 24 27 30 27 26 28 27 27 27 28 30 32 35 38 39 35 37	31	30	-2	28	Predicted
Single 40mm door	IS7190si	IS8020si faced fixed	20 24 27 30 27 26 28 27 27 27 28 30 32 35 38 39 35 37	31	30	-2	28	Predicted

Predictions of acoustic performance based on tests carried out at RMIT University

Double Doors

40 MDF or Ply Faced Particleboard

The following are double door systems utilising a pair of 40mm solid core doors with the following meeting stile and perimeter seal configurations :

	Meeting Style	Perimeter/Bottom	100	125	160	200	250	315	400	500	630	800	1K	1.25	1.6	2K	2.5	3.15	4K	5K	STC	R_w	$C_{t,r}$	$R_w+C_{t,r}$	
Double 40mm door	Single IS7061 (Batwing variant)	LE1515/IS8090si	22	24	26	29	27	26	28	27	27	28	30	34	35	35	37	38	39	39	32	31	-2	29	Predicted
Double 40mm door	Single IS7070si	LE1515/IS8090si	21	24	26	28	27	25	28	27	27	28	30	34	35	35	36	36	36	37	32	31	-2	29	Predicted
Double 40mm door	Single IS7060	LE1515/IS8090si	22	24	26	30	27	26	28	27	27	28	30	33	34	31	33	34	34	38	31	30	-1	29	Predicted
Double 40mm door	Single IS7061 (Batwing variant)	LE1212/IS8011si	21	24	24	27	26	24	27	27	27	28	30	34	35	36	35	34	34	35	31	31	-2	29	Predicted
Double 40mm door	Single IS7070si	LE1212/IS8011si	21	24	26	28	27	25	28	27	27	28	29	32	34	36	36	36	36	38	31	31	-2	29	Predicted
Double 40mm door	Single IS7060	LE1212/IS8011si	22	24	24	28	26	24	27	27	27	28	30	34	34	31	32	32	33	36	30	30	-1	29	Predicted
Double 40mm door	Single IS7061 (Batwing variant)	IS7025/IS8090si	22	24	26	29	27	25	28	27	27	28	29	33	34	36	38	39	39	39	31	31	-2	29	Predicted
Double 40mm door	Single IS7070si	IS7025/IS8090si	21	24	26	28	27	25	28	27	27	28	29	33	34	36	38	36	36	37	31	31	-2	29	Predicted
Double 40mm door	Single IS7060	IS7025/IS8090si	22	24	26	30	27	25	28	27	27	28	29	32	33	31	33	34	34	37	30	30	-1	29	Predicted

Sound Lock Doors

40 MDF or Ply Faced Particleboard

The following are Sound lock double door systems utilising a pair of 40mm solid core doors with the following meeting stile and perimeter seal configurations : The pairs of doors are 1000 apart

	Meeting Style	Perimeter/Bottom	100	125	160	200	250	315	400	500	630	800	1K	1.25	1.6	2K	2.5	3.15	4K	5K	STC	R_w	$C_{t,r}$	$R_w+C_{t,r}$	
Double 40mm door	Single IS7061 (Batwing variant)	LE1515/IS8090si	24	28	33	38	36	36	40	40	42	44	49	56	58	60	62	65	67	66	46	45	-5	40	Predicted
Double 40mm door	Single IS7070si	LE1515/IS8090si	23	28	33	37	36	36	40	40	42	45	49	56	58	60	62	61	61	63	46	45	-6	39	Predicted
Double 40mm door	Single IS7060	LE1515/IS8090si	24	28	33	39	37	36	40	40	42	45	49	56	56	52	56	57	57	64	46	46	-6	40	Predicted
Double 40mm door	Single IS7061 (Batwing variant)	LE1212/IS8011si	23	28	31	35	35	33	39	40	42	45	50	57	58	60	60	57	58	60	45	45	-6	39	Predicted
Double 40mm door	Single IS7070si	LE1212/IS8011si	23	28	33	37	36	35	40	40	42	44	48	54	57	60	62	61	62	64	45	45	-6	39	Predicted
Double 40mm door	Single IS7060	LE1212/IS8011si	24	28	30	36	35	33	40	40	42	45	50	56	56	53	55	55	56	60	45	45	-6	39	Predicted
Double 40mm door	Single IS7061 (Batwing variant)	IS7025/IS8090si	24	28	33	38	36	36	40	40	41	44	49	54	57	61	65	66	67	66	46	45	-5	40	Predicted
Double 40mm door	Single IS7070si	IS7025/IS8090si	23	28	33	37	36	36	40	40	41	44	49	54	57	61	64	61	61	63	46	45	-6	39	Predicted
Double 40mm door	Single IS7060	IS7025/IS8090si	24	28	33	39	37	36	40	40	41	44	49	54	55	53	57	58	57	64	46	45	-5	40	Predicted