PKA ACOUSTIC CONSULTING

Acoustic Performance Assessment Of a Product or System

Company Description

AFS Systems Pty Ltd, 2/34-38 Anzac Ave, Smeaton Grange

Product

AFS Logic Wall covering range of AFS120 to AFS262D providing ISO or ASTM Evaluation of various configurations from the base walls or using plasterboard on one or both sides

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Assessment by: **Peter Knowland**

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PO Box 345, LANE COVE, NSW, 1595 / Suite 12, 401 Pacific Highway, Artarmon, 2064
Tel 612 9460 6824 Fax 612 9460 6823 Email admin@pka.com.au
ABN 73 001 594 583

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1 CLIENT

AFS Systems Pty Ltd, 2/34 Anzac Ave, Smeaton Grange, NSW 2567

2 PRODUCT FOR ASSESSMENT

AFS Logic Walls of either 120mm, 150mm, 162mm, 200mm or 262mm overall thickness. The wall sheeted one side or both sides with plasterboard to allow the installation of services, mainly electrical. Consideration is also given to a separate plasterboard wall on steel studs which can be provided to satisfy *discontinuous construction* as required in the BCA/NCC of Australia.

3 PRODUCT DESCRIPTION

The AFS Logic Wall consists of lightweight sandwich panels created by bonding hard wearing fibre cement sheets to galvanized steel stud frames. The panels are quickly and simply hand erected on site and then core filled with concrete. The joints between the panels are then set, leaving the wall ready for applied finishes. The Logic Wall system is an advancement on the previous AFS wall system. The improvements include:

- Reinforced Fibre Cement Board – stronger, lighter, more durable and water resistant
- Polyurethane Adhesive System – universally renowned for product reliability
- Large oval holes in the steel studs enabling excellent concrete flow & compaction
- Glueless Site Joiner System creating a faster and cleaner site installation process

The sandwich panel is shown below.

4 CLIENT REQUEST

To assess the compliance of the AFS Structural Wall system with the acoustic provisions contained in Part F of the BCA (National Construction Code of Australia). To also provide the sound insulation values as Sound Transmission Class (STC) to enable the Logic Wall to be considered for compliance with the New Zealand Building Code Section G6

The systems under consideration are as follows:

- AFS120
- AFS150
- AFS162
- AFS200
- AFS200D
- AFS262D

5 REQUIREMENTS OF BCA 2014

The acoustic provisions for all states and territories, except the Northern Territory, have been significantly upgraded.

The BCA provides basically four avenues of compliance for a wall or floor system.

1. By measurements carried out by an approved acoustic laboratory.
   Or
2. By reference to “deem to satisfy” systems contained within BCA 2014.
   or
3. By on site verification by actual acoustic testing of the completed installation.
   or
4. By expert judgement.

This assessment uses a combination of conditions 3 and 4 above and also makes reference to acoustic tests carried out by approved acoustic laboratories.

In respect to an isolated wall system, the Australian Building Codes Board has deemed that a clear separation must exist across the wall leaves and at this point in time a resilient mount system is not considered to comply. There is an exception where a double leaf masonry wall is used, the provision of resilient wall ties is considered as a “deemed-to-satisfy” construction.

6 REQUIREMENTS OF NEW ZEALAND BUILDING CODE CLAUSE G6

FUNCTION REQUIREMENT
G6.2 Building Elements which are common between occupancies, shall be constructed to prevent undue noise transmission from other occupancies or common spaces to the habitable spaces of household units.

PERFORMANCE
G6.3.1 The Sound Transmission Class of walls, floors and ceilings shall be no less than 55.

7 ASSESSMENT

AIRBORNE SOUND INSULATION

Table 1

AFS Panels – No Plasterboard to the Faces

Product Code	Overall Thickness	Rw	Ctr	Rw+Ctr	Complies	STC	Complies
AFS 120	120mm	50	-3	47	No	50	No
AFS 150	150mm	54	-4	50	Yes	54	No
AFS 162	162mm	55	-5	50	Yes	55	Yes
AFS 200	200mm	58	-5	53	Yes	58	Yes
AFS 200D	200mm	58	-5	53	Yes	58	Yes
AFS 262D	262mm	62	-5	57	Yes	62	Yes

Table 2

AFS Panels with 28mm Furring Channel one side 13mm standard plasterboard with Autex ASB2 or Martini MSB2 in the cavity

Product Code	Overall Thickness	Rw	Ctr	Rw+Ctr	Complies	STC	Complies
AFS 120	149mm	57	-8	49	No	58	Yes
AFS 150	177mm	60	-9	51	Yes	58	Yes
AFS 162	191mm	60	-9	51	Yes	58	Yes
AFS 200	231mm	63	-11	51	Yes	59	Yes
AFS 200D	231mm	63	-11	51	Yes	59	Yes
AFS 262D	291mm	67	-11	56	Yes	62	Yes

Table 3

AFS Panels – With 50mm Furring Channels both sides, furring channels sheeted with 13mm standard plasterboard, cavity filled with Autex ASB2 or Martini MSB2

Product Code	Overall Thickness	Rw	Ctr	Rw+Ctr	Complies	STC	Complies
AFS 120	234mm	63	-15	48	No *	66	Yes
AFS 150	262mm	65	-15	50	Yes	67	Yes
AFS 162	278mm	65	-15	50	Yes	68	Yes
AFS 200	314mm	66	-14	52	Yes	69	Yes
AFS 200D	314mm	66	-14	52	Yes	69	Yes
AFS 262D	376mm	68	-15	53	Yes	68	Yes

*Would comply for Class 9C Building

Table 4

AFS Panels - With 28mm Furring Channel both sides with 16mm fire-rated plasterboard(12.5kg per square metre) with Autex ASB2 or Martini MSB2 in the cavity

Product Code	Overall Thickness	Rw	Ctr	Rw+Ctr	Complies	STC	Complies
AFS 120	196mm	60	-15	45	No	62	No
AFS 150	224mm	62	-15	47	No	64	No
AFS 162	238mm	62	-14	48	No	64	No
AFS 200	276mm	63	-14	49	No	65	Yes
AFS 200D	276mm	63	-14	49	No	65	Yes
AFS 262D	338mm	65	-14	51	Yes	65	Yes

Plasterboard facings directly fixed to the AFS concrete panels

The inappropriate application of plasterboard facing, particularly 10mm plasterboard, has the opportunity to severely downgrade the acoustic performance of the AFS panel. The worst possible combination is to use 10mm plasterboard on dobs of wall board adhesive which results in creating typically a 5mm or more cavity between the plasterboard and the face of the AFS panel. AFS have laid down a procedure of using notch screeding and heavier grades of plasterboard to ensure that the plasterboard facing is firmly held to the concrete panel and there is no chance of panel resonance causing significant degradation of the acoustic performance of the AFS wall.

8 INFORMATION ON WHICH THE ASSESSMENT IS BASED

The determination of the existing performance is based on the following:
Tests carried out on an AFS 162 bare concrete wall at CSIRO Acoustic Laboratories, Highett, Victoria covered by report numbered TL463A. The same wall was also fitted with resilient mounts, 29mm furring channels sheeted with 10mm CSR Soundchek and the cavity filled with Tontine TSB 2 that is covered by Report TL63B. A third test was carried out using the bare wall, a separate 64mm steel stud separated 20mm from concrete wall panel sheeted with 10mm Gyprock Soundchek and the cavity filled with Autex ASB4 polyester insulation covered by Report TL63C.

Reference is also made to tests carried out at CSIRO North Ryde of 2 thinner concrete panels one 102 mm thick and the other equivalent to 95 mm thick which both had low frequency performance approaching or exceeding that of the heavier 150 mm concrete slab and the AFS 162 wall measured at CSIRO Acoustic Laboratories, Highett.

Field tests of AFS 162 structural walls carried out by PKA Acoustic Consulting on various projects. A field test carried out by Vipac Engineers & Scientists Document No 50B-04-5464-TRP-239671-0 which clearly showed superior low frequency performance of an AFS 162 wall to that measured by CSIRO at their Highett laboratories covered by Report No TL463A.

It was observed that the results of the test of the bare 162 AFS Logic Wall were lower than the theoretical performance. Many subsequent installations on site consistently provided a result better than would have been anticipated from the laboratory results. Reference to other tests of 150 concrete panels and walls also tested at CSIRO Highett showed a lower than theoretical result. The results were identical to that of the AFS 162 wall. An investigation has been carried out over some time which confirmed that the results measured at CSIRO Highett from 630 Hertz upwards appear to be of the highest accuracy when compared to equivalent laboratories elsewhere. The investigation clearly showed that the low frequency performance below 500 Hertz was significantly lower when measured at the CSIRO Highett Laboratories. This is not an unusual situation and has been the subject of several papers. An inter-laboratory test of sound insulation measurements on heavy walls, a paper listed in the references demonstrated that the same type of masonry wall of 440 kgs per square metre was tested in 12 different acoustic laboratories. The results varied from Rw55 to Rw62. Five acoustic laboratories were grouped for comparison the Sound Transmission Loss from 400 Hertz to 4000 Hertz was identical in all cases, whereas the variation between laboratories occurred below 400 Hertz. This situation is consistent with the results measured at CSIRO, Highett.

The acoustic performance of the AFS 162 wall system in this Assessment is slightly modified for the frequency range of 100 Hertz to 400 Hertz to reflect consistency with the performance of 150mm thick concrete wall systems measured elsewhere. This has the effect of bringing the performance from Rw52 as tested by CSIRO Highett to Rw55 which is the median value of similar walls tested elsewhere.

In providing an assessment of the likely field performance, a range of performance is given. The results on site, even if best workmanship is carried out and the sound flanking paths have been well controlled, will vary. This is due in part to where the partition is located within the total apartment block and the nature and the mass of the terminating walls.

9 PLASTERBOARD EQUIVALENTS

The following table gives an approximate equivalent of different plasterboards

Table 1

Nominated Plasterboard	**Acoustic Equivalent**
10mm Standard Plasterboard	All standard 10mm plasterboard
13mm Standard Plasterboard	All standard 13mm plasterboard
13mm Fyrechek	13mm GIB Fyreline, 13mm Boral Firestop
16mm Fyrechek	16mm GIB Fyreline, 16mm Boral Firestop
10mm Sounchek	10mm GIB Noiseline 13mm Boral Soundstop
13mm Soundchek	13mm GIB Noiseline
10mm Aquachek	10mm GIB Aqualine
13mm Aquachek	13mm GIB Aqualine
Nominated Insulation	**Equivalent Insulation**
Martini MSB 2	Autex ASB 2, Tontine TSB 2
Martini MSB 3	Autex ASB 3, Tontine TSB 3

10 CONDITIONS

- The Assessment(s) above refer to the expected laboratory and field performances of the product or system(s), with each product or system only as described.
- The product or system must be constructed and installed according to the material manufacturer's instructions for acoustic-rated construction and be installed with good workmanship.
- No allowance is made for sound flanking that may occur in a field installation. With appropriate design, good workmanship and attention to detail, and ideal site conditions, Field Dn,tw performance can be broadly comparable to laboratory performance.
- This Assessment is only valid for a period of 5 Years from the date of issue.
- Any changes to the construction of the material(s) used in the product or the system(s) can invalidate this assessment. If changes are made then they should be checked for compliance.
- The Assessment is on the acoustic performance only, and that relevant authorities should be consulted in regards to the aspects of structural, fire, durability and all other areas of the products' or systems' performance.
- The use of plasterboard lining to the face of the AFS structural wall can result in degradation of acoustic performance. This will particularly occur with the use of 10mm plasterboard. If plasterboard lining is to be used it should be at least 13mm thick. It is essential that there are no air gaps between the plasterboard and the face of the concrete panel as can be created by large dobs of wallboard adhesive. It is recommended that the wallboard adhesive be a combed screed application so that the plasterboard lining can be firmly pressed against the AFS panel.

11 REFERENCES

An Intercomparison of Laboratory Measurements of Airborne Sound Insulation of Lightweight Plasterboard Walls

by Patrizio Fausti, Roberto Pompoli and R Sean Smith
Dept of Engineering, University of Ferrara, Via Saragat 1, Ferrara 44100, Italy
Dept of Acoustics, Istituto Elettrotecnico Nazionale, Galileo Ferraris, Strada Delle Cacce 91, Torino 10135, Italy

Inter-Laboratory Test of Sound Insulation Measurements on Heavy Walls:
Part 1 – Preliminary Test

by A Schmitz, A Meier and G Raabe
Physikalisch-Technische Bundesanstalt, Bundesallee 100, D-38116 Braunschweig, Germany

Part II – Results of Main Test

by A Schmitz, A Meier and G Raabe
Physikalisch-Technische Bundesanstalt, Bundesallee 100, D-38116 Braunschweig, Germany

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BUILDING ACOUSTICS INDUSTRIAL ACOUSTICS MECHANICAL ACOUSTICS

OCCUPATIONAL NOISE SURVEYS VIBRATION AUDIO VISUAL LEGAL ACOUSTICS

SUITE 16 401 PACIFIC HIGHWAY ARTARMON 2064 Tel 612 9460 6824 Fax 612 9460 6823
admin@pka.com.au