afs logicwall®

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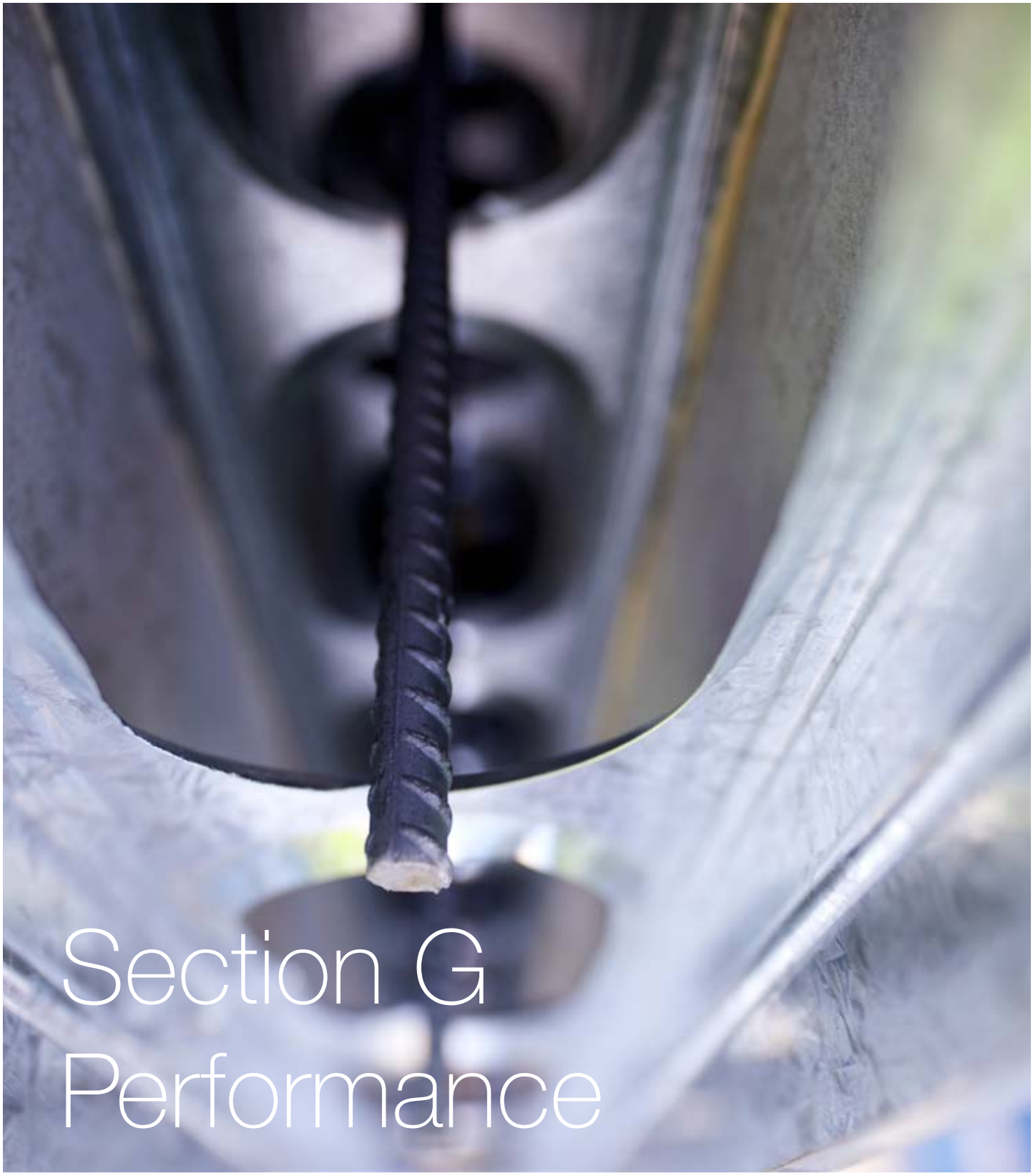

Section G Performance

Logicwall® CodeMark Certification, Fire Resistance, Acoustics, Thermal Insulation, Thermal System Options, Structural Durability Compliance, Weatherproofing, Non-Combustibility

CSR

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Internal Design Considerations

Disclaimer: This section of the AFS Logicwall® Design Guide is intended only by AFS to represent good building practice in achieving suitable internal design of AFS Logicwall®. This section is not intended in any way by AFS to represent all relevant information required on a project. It is the responsibility of those using AFS Logicwall®, including but not limited to builders, designers, consultants and engineers, to ensure that AFS Logicwall® is suitable for use on a project in relation to internal design. All diagram, plans and illustrations used in this section including any reinforcement shown are included for indicative and diagrammatic purposes only. It remains the responsibility of those using AFS Logicwall® to ensure that reference is made to the structural engineer's details for all diagrammatic and reinforcement requirements.

Introduction

AFS Logicwall® is a CodeMark certified permanent formwork for reinforced concrete. Its material properties when concrete core filled deliver excellent performance characteristics. AFS Logicwall® walls comply with the NCC requirements for acoustics in certain applications without requiring additional treatment. For thermal insulation AFS Logicwall® walls, in most cases, require the additional treatment of foam, foil board or wool insulation products to satisfy the NCC requirements.

CodeMark Certification

The AFS Logicwall® system has CodeMark Certification to confirm that it can be designed, detailed and installed to satisfy the relevant performance requirements of NCC 2019. These include the following:

Section B. Structure

- BP1.1 Structural reliability
- BP1.2 Structural resistance

Section C. Fire Resistance:

- CP1 Structure stability
- CP2 Avoid spread of fire
- CP3 Protect from spread of fire and smoke in patient care and aged care buildings
- CP4 Material and assembly
- CP8 Protect spread of fire to openings and penetrations

Section F. Health and Amenity

- FP1.4 Weatherproofing
- FP5.2 Sound transmission and insulation – Walls
- FP5.5 Sound transmission in insulation – Walls in age care buildings

Section G. Ancillary Provisions

- GP.5.1 Construction in bush fire prone areas

Sections J. Energy efficiency

- JP1 Energy efficiency

Fire Resistance

Fire Resistance Levels (FRLs)

Fire rating requirements of the NCC are specified in terms of Fire Resistance Levels(FRL). The FRL specifies the performance, in minutes, of fire tested specimens for each of the following three design criteria when fire tested to the requirements of the Australian Standard AS1530 'Methods for Fire Tests on Building Materials, Components and Structures' part 4 'Fire-Resistance Tests of Elements of Building Construction':

Structural Adequacy

Integrity

Insulation

A wall system under fire test that carries its load for 240 minutes and maintains its integrity and insulation for 240 minutes is given a FRL of 240/240/240, i.e. 240 minutes structural adequacy, 240 minutes integrity and 240 minutes insulation.

Systems constructed to the standard required for a particular FRL may be used to satisfy the requirements of lesser FRL.

CSIRO FRL Test

In March 2004 and again in November 2011, AFS Logicwall® wall panels were subjected to a Fire Resistance Test by the CSIRO in Sydney.

In 2004 an LW150 wall (150mm AFS Logicwall®). and in 2011 and LW120 (120mm AFS Logicwall®) were constructed replicating on-site conditions, i.e subjected to typical load, reinfored horizontally and vertically, electrical services installed in the wall and core filled with a concrete mix and method the same as would be adopted on site.

2004 Test Result (LW150)

The following results were achieved (refer to report No.FSV1038 by CSIRO):

Fire Resistance (continued)

Structural adequacy	No Failure at 240 minutes
Integrity	No Failure at 240 minutes
Insulation	236 minutes

The following notes were also made by CSIRO:

Fire Resistance Level (FRL):

For the purpose of building regulations in Australia, the FRL of the test specimen was 240/240/180.

The fire resistance level of the specimen is applicable when the system is exposed to fire from either side, as the specimen was symmetrical.

For the purposes of AS1530.4 the results of these fire tests may be used to directly assess fire hazard, but it should be noted that a single test method will not provide a full assessment of fire hazard under all fire conditions.

2011 Test Result (LW120)

Performance

Performance observed in respect to the following AS1530.4 criteria:

Structural adequacy	No Failure at 241 minutes
Integrity	No Failure at 241 minutes
Insulation	190 minutes

The following notes were made by CSIRO:

Fire Resistance Level (FRL):

For the purpose of building regulations in Australia, the FRL of the test specimen was 240/240/180.

The fire resistance level of the specimen is applicable when the system is exposed to fire from either direction.

For the purpose of AS1530 the result of these fire tests may be used to directly asses fire hazard, but it should be recognised that a single test method will not provide a full assessment of all fire conditions

Likely Fire Performance of AFS Logicwall® Systems

The likely fire performance od AFS Logicwall® systems LW162, LW200(D), if tested in accordance with AS1530.4 – 2005, is reported in the CSIRO report FCO-3084B. Refer to Chapter L "Certification" to view the report.

Fire Resistance level of Logicwall® may be determined in accordance with current NCC requirements using the FRL given in the CSIRO Test Reports. For wall configurations outside the limits of the CSIRO fire tests , the FRL may be determined in accordance with AS3600-2018.

Penetrations, Recesses and Chases

Penetrations through AFS Logicwall® walls to accommodate services, such as pipework, electrical cabling or ducktwork must be protected, to prevent the spreadof fire through penetration, recess or chase.

This can be achieved with proprietary products, such as:

- Fire rated sealants
- Fire collars and Intumescent wraps
- Fire rated mortars
- Fire rated pillows
- Fire rated switch boxes

Alternatively, the effect of penetrations, recesses and chases may not be significant and can be ignored, as set out in AS3600 Section 5.7.4 'Recess for Services in Walls'.

Acoustics

Building Acoustics relates to the control of noise in buildings including the minimization of noise transmission from one space to another and the control of noise levels within a space.

The Acoustic terms used in this section are explained as follows:

R_w

An R_w value is a laboratory measurement to determine the effectiveness of a system as a noise insulator.

C_{tr}

A C_{tr} is an adjustment factor to account for low frequency noise.

C_{tr} was originally a correction factor for traffic noise, however it is also useful for representing noise sources such as home entertainment systems, home cinema, rock music, distant jet aircraft and low speed rail traffic. It reflects the perceived sound reduction through an element subjected to these typical urban noises.

C_{tr} is a negative number so $R_w + C_{tr}$ will be less than R_w. It is not a constant and can vary from system to system.

$D_nT,_w$

A $D_nT,_w$ is a field measurement that is more indicative of the actual sound insulation of a system. The laboratory rating and field rating differ as the field measurements usually have sound transmission paths other than the one through the wall itself (flanking) and may have different room absorption, wall areas and room volumes that are constant in a laboratory.

Laboratory and Field Performance

It is a requirement of the NCC for the majority of States and Territories of Australia that a wall separating sole occupancy units is required to have an $R_w + C_{tr}$ not less than 50 when measured in an acoustic laboratory.

There is however the verification clause that states that when the wall is installed in the actual dwelling that it shall achieve not less than a $D_nT,_w + C_{tr}$ of 45. In the end it is the field conditions that dominate as people do not live in acoustic laboratories. It is important that all the components in the chain of providing sound insulation have adequate performance and it is critically important to demonstrate in an acoustic laboratory that the chosen element has the potential performance.

TABLE G2: Standard AFS Logicwall®

Wall Type	R_W	$R_W + C_{TR}$	Composition
LW120	51	46	 Consisting of a stand alone AFS Logicwall®. 120mm,150mm, 162mm, 200mm or 262mm
LW150	54	50	
LW162	55	50	
LW200	58	53	
LW262	62	57	

TABLE G3: AFS Logicwall® with Separating Stud wall system providing impact isolation

Wall Type	R_W	$R_W + C_{TR}$	Composition
LW120	66	58	 Consisting of 64mm separate stud frame, separated by at least 20mm from the AFS Logicwall®. The stud is sheeted with 9mm fibre cement, 13mm standard plasterboard or 10mm soundchek. Included in the cavity is 50mm Bradford Glasswool Partition batt, Autex ASB4 polyester insulation.
LW150	70	62	
LW162	70	62	
LW200	73	65	
LW262	77	69	

NOTES

1. To achieve a discontinuous construction, a separate stud wall is required. To maintain the discontinuous construction the plumbing or other services must be run within the studs of the separate wall. There must be no direct connection between the plumbing services and the AFS Logicwall® wall other than at the perimeter.
2. The use of plasterboard lining to the face of the AFS Logicwall® walls can result in degradation of the 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 daubs 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 Logicwall®.

Thermal Insulation

A primary objective for a designer when planning a building is to design a building fabric – external elements such as ceilings, roofs and floors, which will deliver a cost effective, comfortable living or working environment for the inhabitants.

AFS Logicwall® walls being a monolithic concrete barrier possess inherent features which greatly assist the designer in achieving the objective of thermal mass and air tightness.

Energy Efficiency

The NCC contains thermal performance requirements in terms of minimum Total R for building fabric (the external ceilings, floors and walls) of new buildings in Australia.

The total R-Value is the total thermal resistance of a building surface, including indoor and outdoor air film resistance.

Thermal Insulation & Mass

The NCC recognizes the benefit o f thermal capacity o r mass, and so provides R concessions for heavyweight walls such as AFS Logicwall® walls.

Heavy mass delays the transfer of outdoor temperature variations, improving indoor comfort. The concrete construction of AFS Logicwall® walls provides a significant thermal mass barrier to the external elements. If necessary additional insulation materials can be installed with ASF Logicwall® walls to achieve the higher R-values specified by the NCC. This in turn not only enhances occupant confort, but also reduces heating/cooling costs and improves the acoustic performance of the wall against outside noise. Insulation materials should be installed with AFS Logicwall® walls so as to form a continuous thermal barrier.

Airtight this and condensation

Due to AFS Logicwall® walls being a uniform concrete monolithic mass, the air infiltration rate is practically zero eliminating the possibility of drafts and currents from outside. This contributes significantly to the thermal installation of the building.

Condensation is not uncommon in new buildings, apartments in particular. In fact, it is increased thermal installation requirements that exacerbate condensation risk, so careful thermal design, vapour barrier placement and construction practices are essential to minimise condensation.

Housing stock in Australia has historically been quite deficient in preventing air leakage. Poor sealing and high-level open wall vents meant water vapour from close dryers, showers and bath was carried from the building before condensing. With increased installation and better techniques for preventing heat loss, buildings can no longer accommodate sufficient evaporation inside. The water vapour does not exit the dwelling and there are no in gaps for the air to carry it away, so it condenses on the coolest surface, typicaly the window glass. Although it may look excessive, it is an 'operational' issue rather than a building fault

Activities such as failing to run fans while showering and while a room dries out, drying clothes inside without a dryer and exhaust fan operating and appliances such as food steamers, kettles urns and humidifiers will contribute to water vapour and therefore potentially to condensation. The formation of condensation typically illustrates that the building is well sealed against draught and well insulated.

Prevention of condensation can be achieved by the following common practices:-

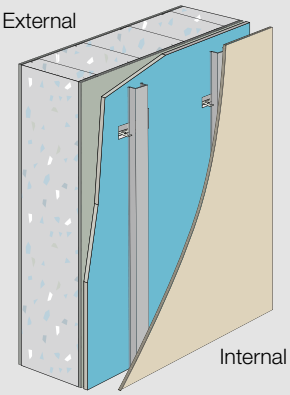
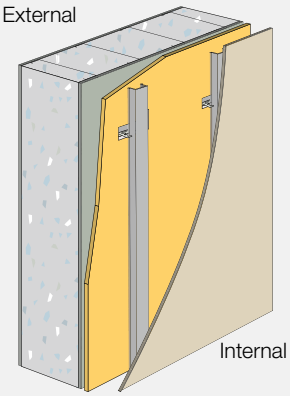
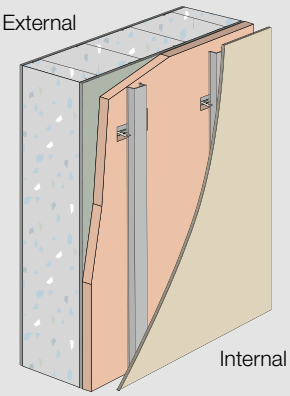
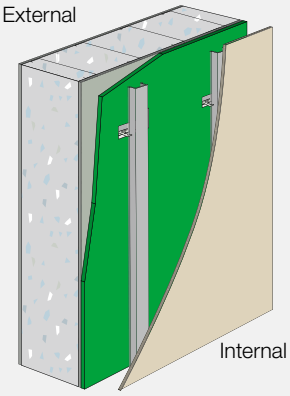
- Running bathroom fans while showering and leaving them on for a time afterwards.
- Dry clothes outside, in a dryer with the laundry fan running or on a rack in the bathroom with the bathroom fan running, or in a communal drying facility.
- Avoid using humidifiers and other appliances which create steam/water vapour.
- If using steamers, urns or boiling water, ensure the rangehood is operating. (Rangehoods should exhaust to outside and must not be recycling type.)
- Leave windows ajar some of the time, particularly in bathrooms.
- Consider opening the outside doors and windows for a few minutes each day to ‘flush out’ humid air.

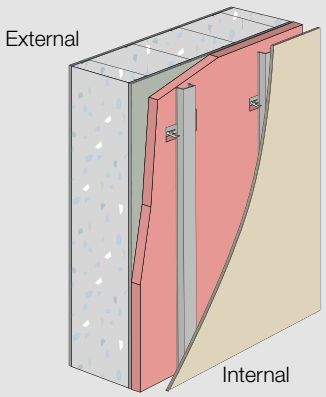
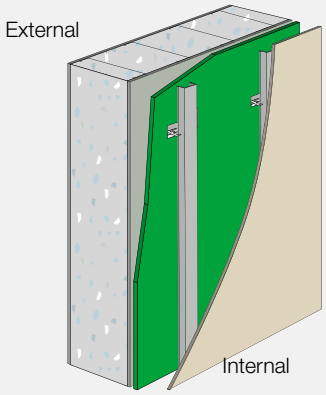
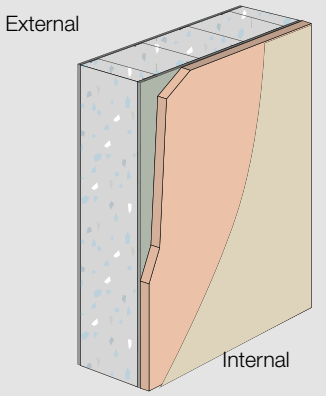
Various AFS Logicwall® systems have been assessed by thermal consultants James M Fricker Pty Ltd (JMP) in accordance with AS/NZS 4859 Parts 1 and 2: 2018.

The following tables provides a few examples of Logicwall® systems along with their Total R-values to suit different climate zones.

Thermal System Options

TABLE G4: Thermal System Options

AFS Product Code	Composition	Diagram	Total R-Values	
			Summer	Winter
LW120 with Antiglare Bubble Foil	6mm FC Sheet 108mm concrete 6mm FC Sheet 20mm reflective air gap R0.15 generic antiglare bubble-foil insulation 28mm reflective air gap 10mm plasterboard		1.79	1.75
LW120 with Antiglare Bubble Foil	6mm FC Sheet 108mm concrete 6mm FC Sheet 20mm reflective air gap R0.14 generic antiglare bubble-foil insulation 28mm reflective air gap 10mm plasterboard		1.84	1.81
LW120 with 25mm PIR	6mm FC Sheet 108mm concrete 6mm FC Sheet 25mm PIR (24kg/m^3) with bright RFL 28mm reflective air gap 10mm plasterboard		2.16	2.04
LW150 with 10mm EPS	6mm FC Sheet 138mm concrete 6mm FC Sheet 10mm SL Class (13.5kg/m^3)EPS with RFL 28mm reflective air gap 10mm plasterboard		1.30	1.22

AFS Product Code	Composition	Diagram	Total R-Values	
			Summer	Winter
LW150 with 25mm EPS	6mm FC Sheet 138mm concrete 6mm FC Sheet 25mm SL Class (13.5kg/m^3) EPS with RFL 28mm reflective ¬air gap 10mm plasterboard		1.69	1.61
LW150 with Two Air Gaps and 10mm EPS	6mm FC Sheet 138mm concrete 6mm FC Sheet 28mm reflective air gap 10mm SL Class (13.5kg/ m^3) EPS with RFL 28mm reflective air gap 10mm plasterboard		1.98	1.93
LW150 with external PIR foam and render system	3.6mm external acrylic render 40mm rigid foam 6mm FC sheet 138mm concrete 6mm FC sheet		2.13	1.98

Structural Durability Compliance AS3600

The Logicwall® system is designed for the construction of both reinforced and non-reinforced concrete walls. Once constructed the formwork system does not contribute to the structural capacity of the wall which acts as a normal concrete structure. When used and constructed in accordance with AFS Logicwall® manual instructions, the AFS Logicwall® system comply with the durability requirements of AS3600. (Refer Chapter L - “Certification”, report #10655/01 by Mahaffey Associates and report #J0815172 by Professor Mark Bradford)

Weatherproofing

AFS Logicwall® System will comply with the weatherproofing performance verification requirements as per Volume 1 and 2 of National Construction Code (NCC) 2019. Refer Chapter L – ‘Certification’ for weatherproofing verification report dated MAY 2019 by AECOM.

Non-Combustibility

In accordance with NCC vol.1 Clause C1.9 (e) (iv), Fibre reinforced Cement sheeting may be used wherever a non-combustible material is required.

With reference to C1.9(d), the adhesive (equivalent to sealant) used to fix the fibre cement formwork sheet to the steel studs is deemed to be exempt form the non-combustibility requirements of C1.9 (a) and (b).