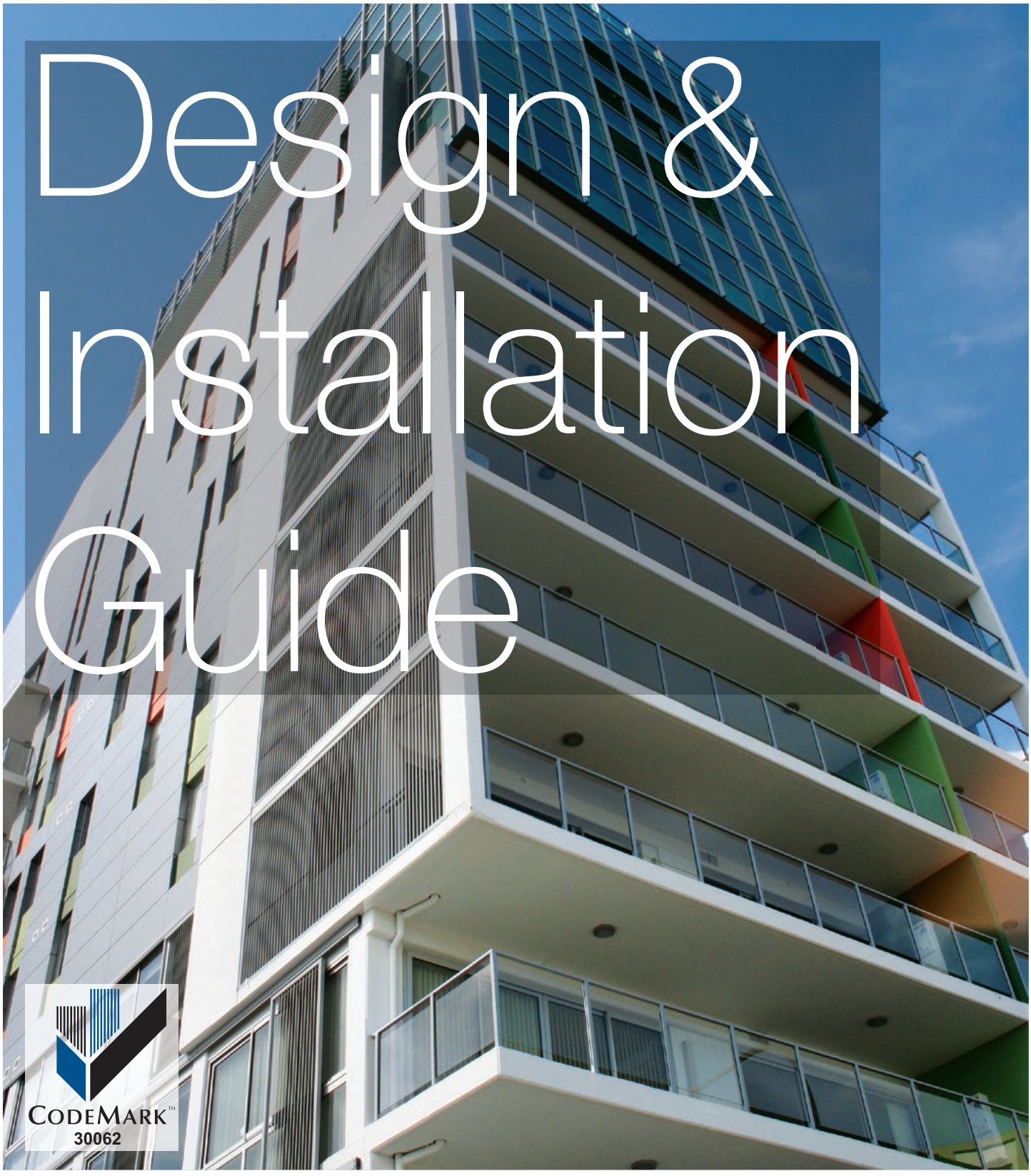
afs logicwall®

December 2023

Design & Installation Guide



CodeMark™ 30062

Logicwall® Design Guide Incorporating: Applications, Properties, Structural Design, Internal & External Design, Performance, Architectural Detail, Trade - Coordination, Installation & Certification

CSR

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Contents

LEGAL STATEMENTS

IMPORTANT LEGAL STATEMENTS

Reasonable efforts have been made to ensure the accuracy of this publication; however, any information and data contained herein is subject to change without notice. To ensure the information you are using is correct, AFS recommends you review the latest technical information available on the AFS website www.afsformwork.com.au, or alternatively call AFS customer support on 1300 727 237 or CSR DesignLink® on 1800 621 117 to speak to a Technical Representative (email) designlink@csr.com.au.

DISCLAIMER

Disclaimer: The products referred to in this document have been manufactured by or on behalf of CSR Building Products Limited ("CSR") to comply with the relevant section of the National Construction Code (NCC) and any relevant Australian Standards. While any design or usage guidelines set out in this document have been prepared in good faith by CSR, they are of a general nature only and are intended to be used in conjunction with project specific design and engineering advice.

It is the responsibility of the customer to ensure that CSR's products are suitable for their chosen application, including in respect of project-specific matters such as, but not limited structural adequacy, acoustic, fire resistance/combustibility, thermal, and weatherproofing requirements. All information relating to design/ installation/application of these products is offered without warranty and no responsibility can be accepted by CSR for errors and omissions, or for any use of the relevant products not in accordance with CSR's technical literature or any other relevant industry standards. For current technical and warranty documentation relating to CSR's products, visit the AFS website at www.afsformwork.com.au

DEFINITIONS

The use of the terms 'AFS Logicwall®' and 'AFS Logicwall® Walls' throughout the AFS Logicwall® Design Guide are as follows;

AFS Logicwall®: Refers to AFS Logicwall® panels as permanent formwork prior to being installed & corefilled with concrete. AFS Logicwall® Walls: Refers to AFS Logicwall® walls installed with concrete corefill incorporated.

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Section A
Introduction

Logicwall® Introduction, Product Description, Product Benefits, Dimensions and Components, Typical Panel, Construction Process overview.

CSR

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INTRODUCTION

AFS has a history in the construction industry of manufacturing and supplying innovative prefabricated building systems.

AFS has focused on its major product, AFS Logicwall®, which through much research and development has become a leading proprietary walling system for the multi-unit residential construction market. The buildings which make up this market are apartments, hotels/motels, accommodation buildings, nursing homes, aged care facilities, office blocks and shopping centres, etc.

These buildings require large amounts of party/separation walls, corridor walls and lift and stair shafts. In most cases they also require boundary walls, external facade walls and blade walls, balcony upstands, basement and retaining walls. AFS Logicwall® can be utilised effectively in all these areas, providing benefits for all parties concerned whilst complying with the relevant NCC requirements.

Product Description

AFS Logicwall® is a CodeMark certified permanent formwork system for load bearing reinforced concrete walls.

It consists of lightweight sandwich panels created by bonding hard-wearing fibre cement sheets to galvanised steel stud frames. The panels are quickly and simply hand erected on site and then core-filled with concrete to achieve load bearing walls. The fibre cement sheeting remains in place as sacrificial formwork, and provides an excellent substrate for applied finishes such as skim coating, acrylic render and paint.

The panels can vary in size and thickness to suit a variety of architectural and engineering design requirements. The structural capability of the product when filled with concrete makes it an ideal solution for the construction of buildings such as:

- Multi-unit residential apartments
- Hotels and motels
- Commercial offices
- Shopping centres
- Hospitals
- Correctional centres

Product Benefits

Speed

The system is renowned for its fast and simple construction leading to earlier project completion.

Structural Capacity

The high strength, thinner walls provide more internal space and reduce the dead load on the structure. The walls act as deep beams and transfer walls, which reduce floor slab thickness and eliminates conventionally formed beams and column. The system offers high lateral load resistance and wind and seismic load capacity.

Performance

The monolithic character of the system offers consistent, performance for acoustic, weather tightness, fire and thermal to meet the requirements of the NCC.

Quality

The system delivers finished, solid-feel concrete walls lined both sides with durable, finished fibre cement sheets ready for skim coating and painting. The system provides accuracy in floor to floor wall alignment resulting in straight and plumb walls.

Efficiency

There is a reduction of trades including blockwork, rendering and plasterboard, resulting in major cost and time savings. There is minimal wastage on site leading to a cleaner, safer workplace. Materials handling, including cranage, is reduced significantly, by up to 80%.

Dimensions and Components

AFS Logicwall® comes in five panel thicknesses: 120mm, 150mm, 162mm, 200mm and 262mm. The standard panel width is 1100mm. However, the panels can be manufactured to any width from 200mm up to 1100mm and any height from 200mm up to 4200mm. Heights exceeding 4200mm can be manufactured upon request and will be regarded as a special order to suit the architectural requirements for each project.

TABLE A1: Logicwall® Single Reinforcement Carriers

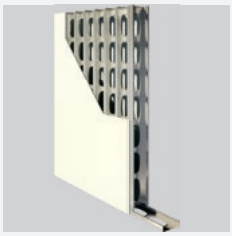
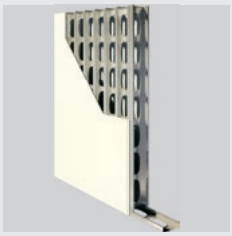
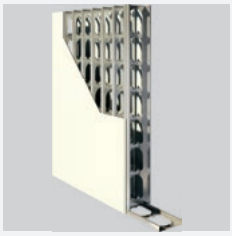
Logicwall® System		Sheet Thickness (mm)	Stud Width (mm)	Cavity Size (mm)	Overall Thickness (mm)	Filled Wall Mass (kg/m²)	Unfilled Wall Mass (kg/m²)
LW120		6mm x 2 layers = 12 mm	108	108	120	290	26
LW150		6mm x 2 layers = 12 mm	136	136	148	360	26.5
LW162		6mm x 2 layers = 12 mm	150	150	162	394	26.5
LW200		6mm x 2 layers = 12 mm	188	188	200	480	27

TABLE A2: Logicwall® Double Reinforcement Carriers

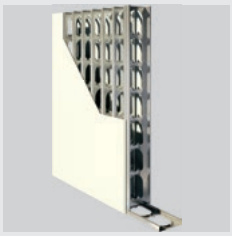
Logicwall ® System		Sheet Thickness (mm)	Stud Width (mm)	Cavity Size (mm)	Overall Thickness (mm)	Filled Wall Mass (kg/m²)	Unfilled Wall Mass (kg/m²)
LW200D		6mm x 2 layers = 12 mm	188	188	200	480	27
LW262D		6mm x 2 layers = 12 mm	250	250	262	630	27.5

TABLE A3: Components and Accessories

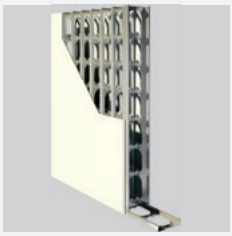
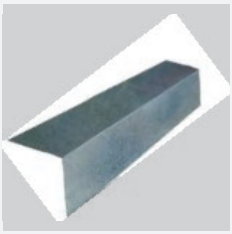
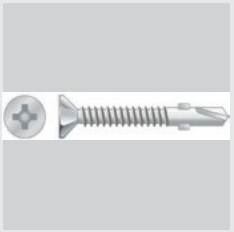
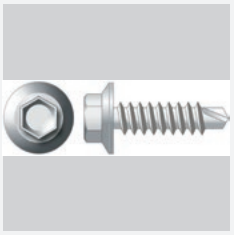
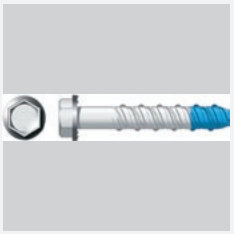
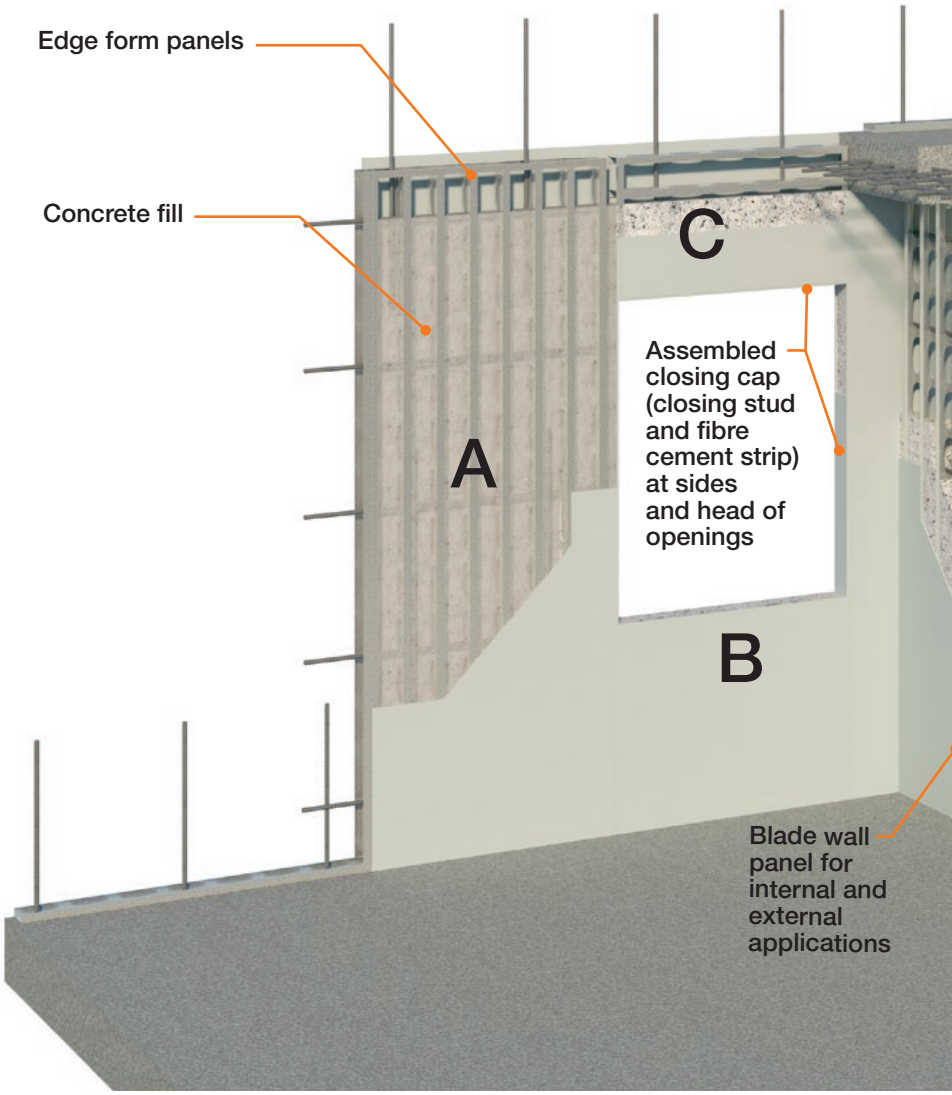
Item	Description	
Standard Logicwall® Panel	6mm fibre cement sheet bonded to galvanised steel stud frame	
Corner Panel	Prefabricated 90° corner panel with factory installed horizontal corner reinforcement	
Sills and Lintels	Infill panels for above and below window and door openings	
Floor Track	To secure the panel to the slab or footing	
Floor Track Pin	For fastening floor track to slab	
Panel End Caps	To close the panel ends and finish windows and door openings	
Squints	Temporary galvanised angle used for providing temporary additional support where walls change direction at angles other than 90°	

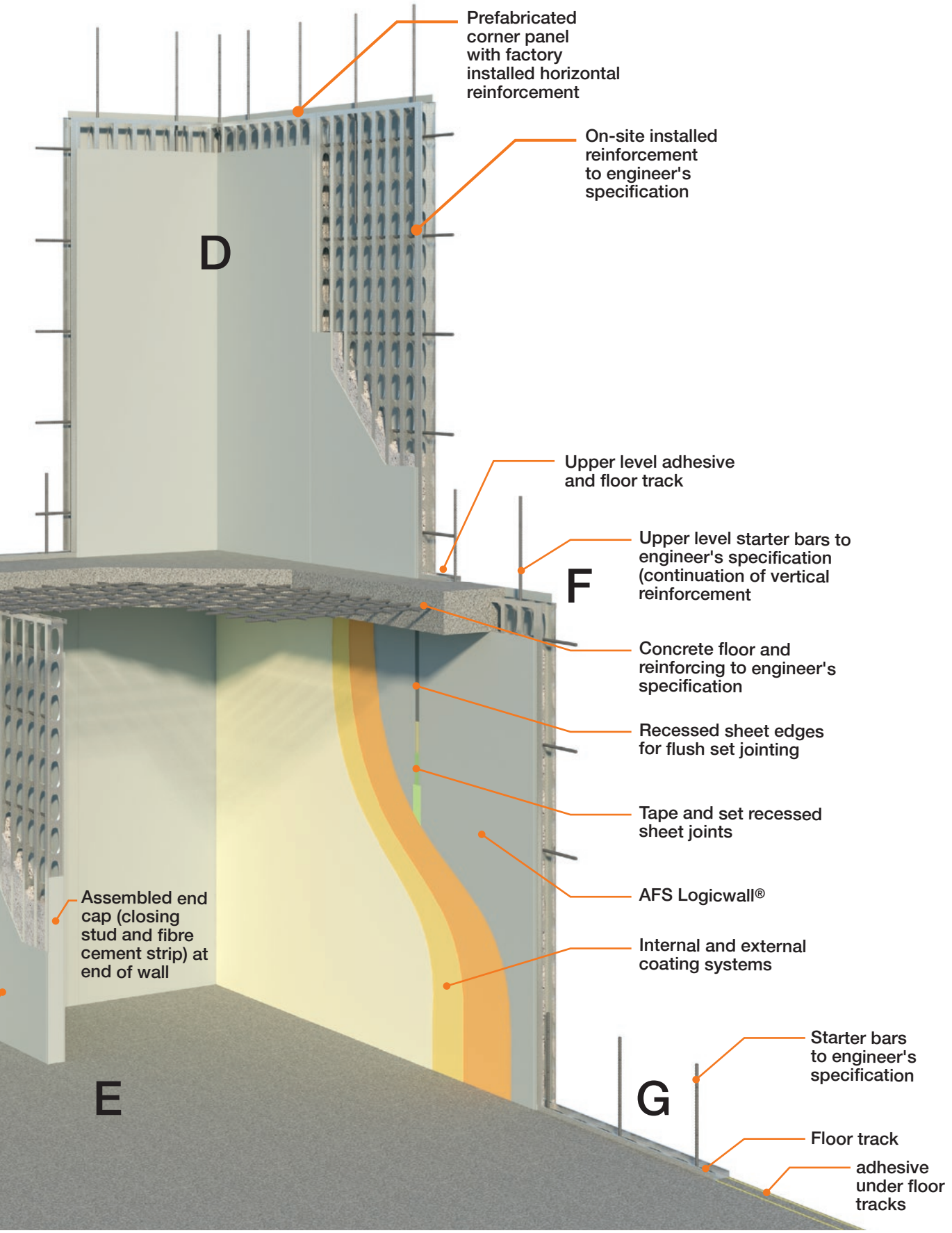
Table A3: Components and Accessories (continued)

Item	Description	
Screws	For mechanically fixing panel joints, end caps and panels to floor track.	
Panel Adhesive	For bonding end caps, floor track and panel joints.	
Wall Braces	Purpose engineered adjustable braces for supporting and plumbing walls during core fill process	
Brace Screws	For temporary fixing of wall braces to AFS Logicwall® panels	
Panel Lifter	For safe and easy installation of AFS Logicwall® panels	
Excalibur Bolts	For temporary fixing of wall braces to floor slab	

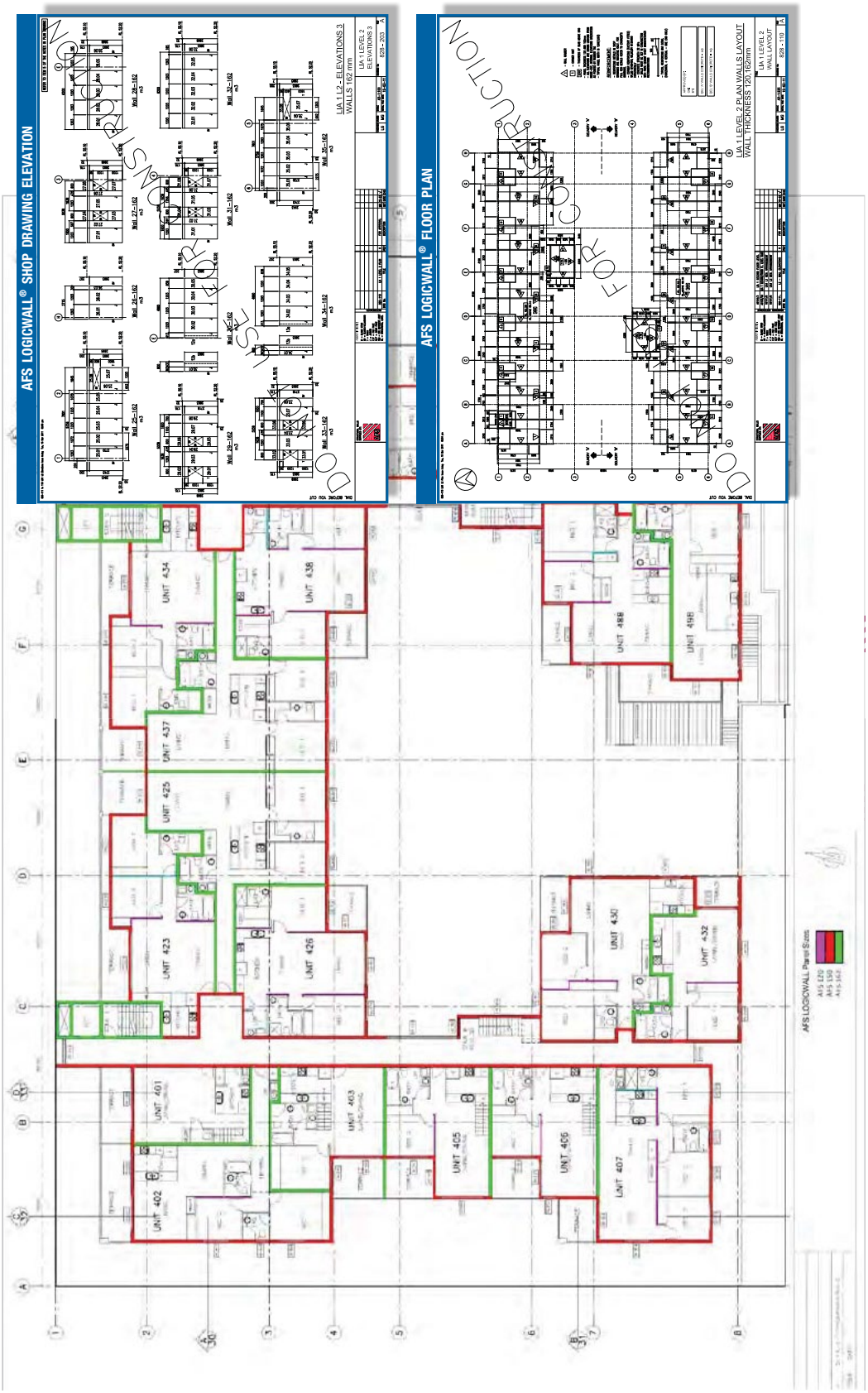
Typical Panel and Component Layout

A Standard Panel
B Sill Panel
C Lintel Panel
D Corner Panel
E End Cap
F Edge Form
G Floor Track




Prefabricated corner panel with factory installed horizontal reinforcement
On-site installed reinforcement to engineer's specification
D
Upper level adhesive and floor track
Upper level starter bars to engineer's specification (continuation of vertical reinforcement
F
Concrete floor and reinforcing to engineer's specification
Recessed sheet edges for flush set jointing
Tape and set recessed sheet joints
AFS Logicwall®
Internal and external coating systems
Assembled end cap (closing stud and fibre cement strip) at end of wall
E
G
Starter bars to engineer's specification
Floor track
adhesive under floor tracks

Sample Plan Layout



Construction Process Overview

Shop Drawings

AFS Logicwall® panels are custom made to schedules prepared from the construction drawings of the project and each panel is shop drawn and coded for easy identification on site.

Production

AFS Logicwall® is precision manufactured in facilities capable of producing large volumes of panels with short lead times. The controlled environment and automated machinery helps deliver quality with consistency.

Delivery

AFS's in house transportation and logistics team ensures that orders are shipped arriving onsite securely and on time. The panels are flat stacked, creating pallets which are easily delivered to site and craned onto the floor slab ready for placement.

Unloading

AFS recommends the use of an approved and certificate pallet lifter for the unloading of panels and packs on site. Pallet lifter safety guide handbook is available upon request. Care must be taken to avoid damage to the panel edges, ends and surfaces. To ensure optimum performance, store panels under cover and keep them dry prior to erecting. If the panels become wet, allow to dry before erecting and core filling.

Site Erection

Following set out, the Logicwall® panels are hand lifted into place over a steel floor track and reinforcement starter bars. The panels are braced with adjustable braces and then plumbed and straightened.

Openings and Services

Window and doorway openings are formed with sill and lintel panels which are also scheduled and manufactured to size. Steel door frames are installed with the panels. Horizontal and vertical reinforcement steel and electrical services are placed in the walls. The panel openings and ends are closed with the end cap system

Concrete Core Filling

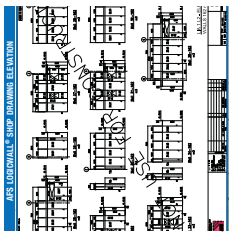
The erected panels are then core filled with concrete with a mix design that is suitable for filling AFS Logicwall® using concrete pumping methods. This is mostly done from the formed deck of the next slab or off a scaffold. The concrete walls are then ready to perform as a load bearing structure for the next floor slab or roof structure.

Finishing of Walls

Once the concrete core fill has gained strength and the walls are permanently braced by the floor or roof structure at the top of the walls the temporary braces are removed. The panels are then prepared and joints set with specified setting methods. The walls are then ready for applied finishes such as skim coating and painting.

The AFS Logicwall® system has contributed to the delivery of quality structural internal and external finished walls for buildings ready to occupy.

Shop Drawings



Production

Delivery

Site Erection

Openings/Services

Concrete Core Fill

Finishings of Walls

Completion

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Section B Applications

Logicwall® Applications, External & internal Walls, Corridor Walls, Party Walls, Balustrades, Blade Walls, Lift Shafts, Retaining Walls, Service Shafts and Stair Shafts.

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Contents

B1. Applications

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Building Type Applications

AFS Logicwall® is a permanent formwork for reinforced concrete walls. So wherever there is an application for reinforced concrete walls up to 250mm thick, AFS Logicwall® is likely to be applicable. The particular application will be subject to engineering assessment. The best applications for AFS Logicwall® are for building structures which utilise load bearing wall construction and call for high levels of fire and acoustic performance.

For external applications, AFS Logicwall® must be protected by an appropriate water proofing system. The applications outlined in this chapter, including all charts, are based upon AFS Logicwall's most common applications in multi-residential medium rise buildings.

Balustrades

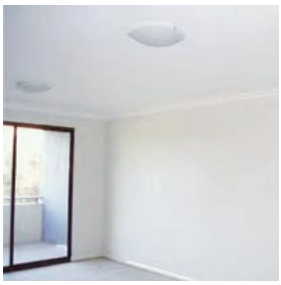
Blade Column

External Blade Walls

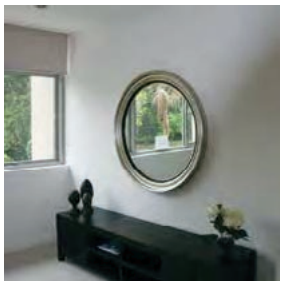
External Facade Walls

Internal Corridor Walls

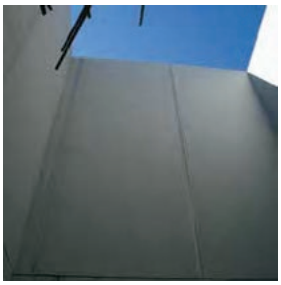
Internal Partition Walls



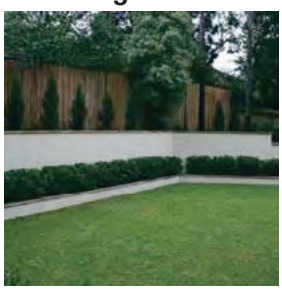
Internal Party Walls



Lift Shafts



Retaining Walls



Basement Walls*

Service Shafts

Stair Shafts

*Alternative basement walls can be constructed using afs rediwall®, another product by afs.


Logicwall®
Party walls
Logicwall®
Boundary walls
Logicwall®
Corridor walls
Logicwall®
Balustrades
Logicwall®
Garden/Landscape
walls
Logicwall®
Basement walls


Logicwall®
Façade walls
Logicwall®
Balustrades
Logicwall®
Blade walls
Logicwall®
Lift & Stair shafts
Logicwall®
Retaining walls
Logicwall®
Blade Columns

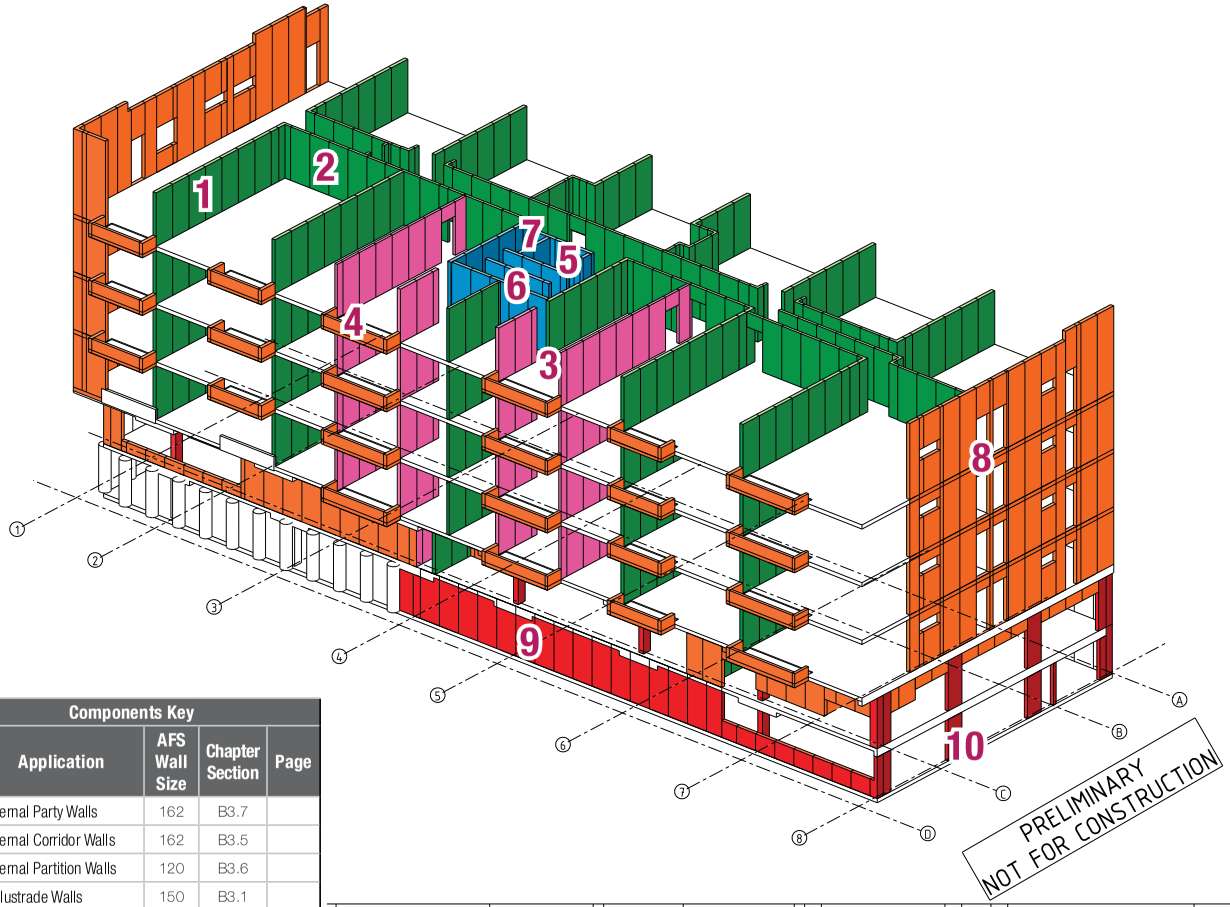
SYMBOL LEGEND

1 - AFS WALL NUMBER

1 - AFS CORNER UNIT NUMBER

200 - THICKNESS OF SLAB ABOVE

AFS LOGICWALL® PANEL LAYOUT



IMPORTANT NOTES

GENERAL:

1. THE BUILDER SHALL READ LOGICWALL DRAWINGS IN CONJUNCTION WITH ALL ARCHITECTURAL, ENGINEERING AND OTHER CONSULTANTS DRAWINGS AND SPECIFICATIONS AND OTHER WRITTEN INSTRUCTIONS AS MAY BE ISSUED DURING THE COURSE OF THE PROJECT. ALL DISCREPANCIES ARE TO BE REFERRED TO THE ARCHITECT AND ENGINEER.
2. ALL DIMENSIONS SHOWN ON THESE DRAWINGS ARE BASED ON INFORMATION SUPPLIED TO AFS AND SHOULD BE THOROUGHLY CHECKED.
3. DIMENSIONS SHALL NOT BE SCALED FROM THE AFS SUPPLIED DRAWINGS.

REINFORCEMENT:

1. REINFORCING DETAILS IN SHOP DRAWINGS ARE INDICATIVE ONLY. FOR FULL REO REQUIREMENTS REFER TO ENGINEER'S DRAWINGS AND DETAILS.
2. FOR AFS WALLS CONCRETE STRENGTH REFER TO ENGINEERS DETAILS.
3. WALLS MUST BE SET IN CONJUNCTION WITH FIBRE CEMENT SHEET MANUFACTURER RECOMMENDATIONS.

PANELS:

1. ALL ELEVATIONS ARE DRAWN LOOKING FROM INSIDE OUT. INTERNAL ORIENTATION IS AS POINTED BY WALL NUMBER TAG.
2. TYPICAL PANEL WIDTH IS 1100 WITH TYPICAL CONSTRUCTION TOLERANCE OF 3mm (i.e. 1103 TOTAL PANEL WIDTH)
3. REFER TO LEGEND ON EACH DRAWING FOR SYMBOL DESCRIPTIONS.

APPROVED BY:

NAME:

COMPANY:

DATE:

SIGNATURE:

AFS SHOP DRAWING APPROVALS

FOR APPROVALS, WE REQUIRE THE FOLLOWING ITEMS TO BE CHECKED:

ARCHITECT:

1. ALL MAJOR LAYOUT DIMENSIONS
2. ALL PANEL/FLOOR R.L.'s
3. LOCATION AND SIZE OF OF DOOR, WINDOW AND OTHER STRUCTURAL OPENINGS
4. GENERAL COMPLIANCE WITH ARCHITECTURAL DESIGN

ENGINEER:

1. SLAB THICKNESS
2. WALL THICKNESS
3. WALL REINFORCEMENT
4. SET DOWNS AND SLAB FOLDS
5. GENERAL COMPLIANCE WITH ENGINEERING DESIGN

BUILDER:

1. PROVIDE WRITTEN APPROVAL PRIOR TO MANUFACTURING SCHEDULES BEING ISSUED TO AFS

Components Key				
#	Application	AFS Wall Size	Chapter Section	Page
1	Internal Party Walls	162	B3.7	
2	Internal Corridor Walls	162	B3.5	
3	Internal Partition Walls	120	B3.6	
4	Balustrade Walls	150	B3.1	
5	Lift Shaft	200	B3.8	
6	Stair Shaft	200	B3.11	
7	Service Shafts	162	B3.10	
8	External Facade Walls	150	B3.4	
9	Basement / Retaining Walls	262	B3.9	
10	Blade Columns	262	B3.2	

DIAL BEFORE YOU CUT

UNLESS NO

ABBREVIATIONS:
B = BLADE
BV = BLADE-VILLABOARD
T = TRACK
J = JOINER
F/F = FAR FACE
N/F = NEAR FACE
SMJ = STR. MOVEMENT JOINT
FL = CONSTRUCTION LEVEL
SL = SLAB LEVEL

3D VIEW - LOOKING SOUTH WEST

APPROVAL ISSUE - NOT FOR CONSTRUCTION

REV	ISSUE DESCRIPTION	BY	DATE	CHD
A	APPROVAL ISSUE - NOT FOR CONSTRUCTION	MSD	15.08.2011	PBE

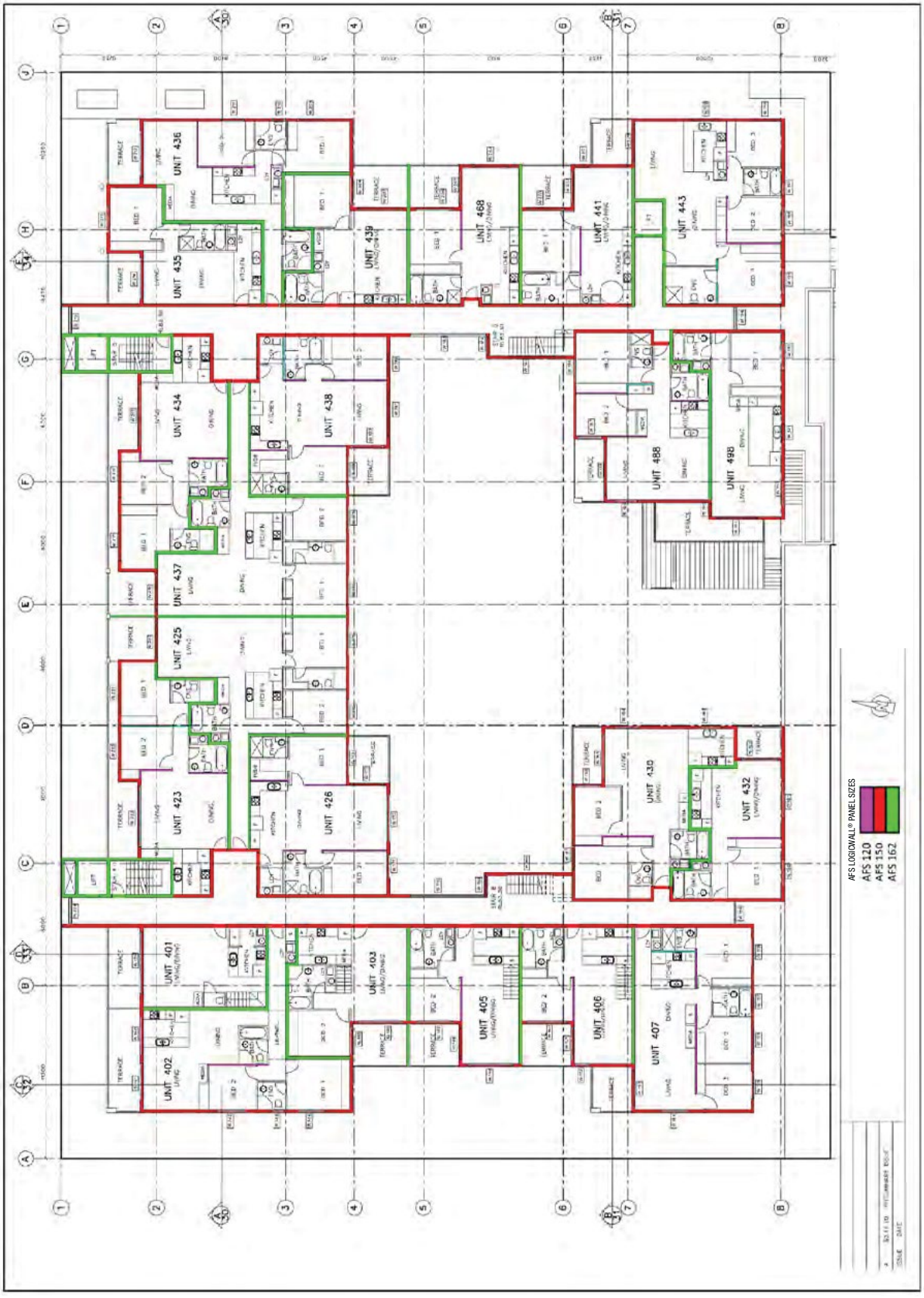
DRAWN	CHECKED	SCALE	DRAWING No	REV
MSD	PBE	NOT TO SCALE A1	AFS-0853-C-01	A

PRINT DATE 05.09.2011

TITLE: LOGICWALL DETAILS COVER SHEET

IF IN DOUBT, PLEASE ASK!

Typical Multi-Residential Panel Layout



Application Systems

The AFS Logicwall® systems shown relate to the typical applications shown for a multi-residential 3D layout on page 6 of this chapter.

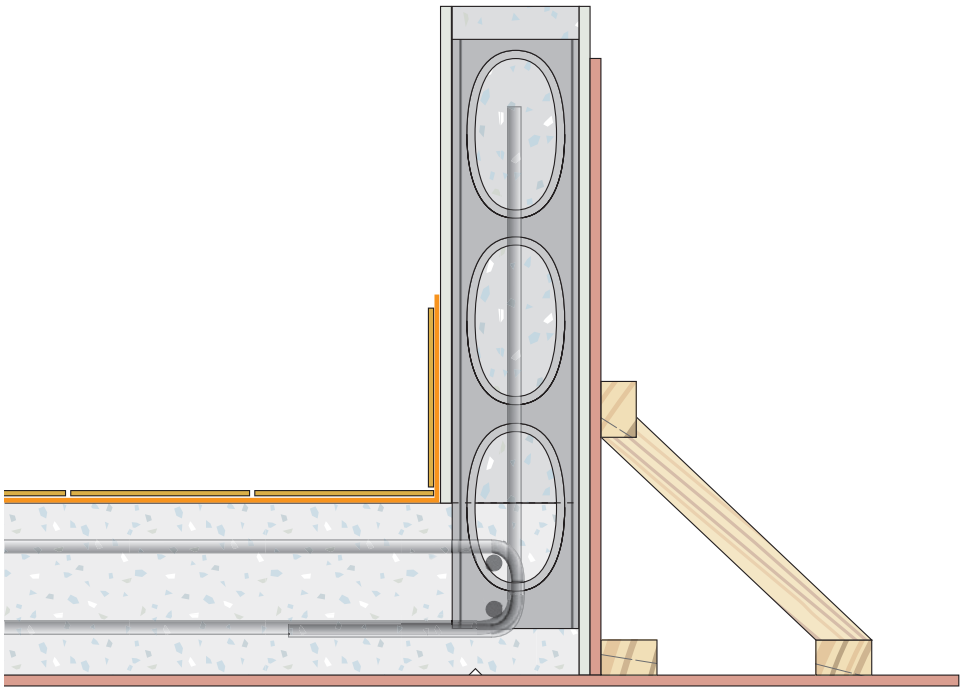
In the following tables of this chapter, the FRL values for Logicwall® LW120 and LW150 are noted in accordance with the CSIRO tests conducted as per the Australian Standard AS1530.4. For LW162, LW200D and LW262D the FRL values shown are based on the CSIRO report FC0-3084 titled "Likely performance of AFS Logicwall® systems".

For Logicwall® configurations outside the limits of the CSIRO fire tests and assessment, the FRL may be determined in accordance with AS3600-2018.

Balustrades

AFS Product Code	Application	Composition
LW120 LW150	Walls Serving as a solid upstand or hand rail	120mm or 150mm AFS Logicwall®

Diagram

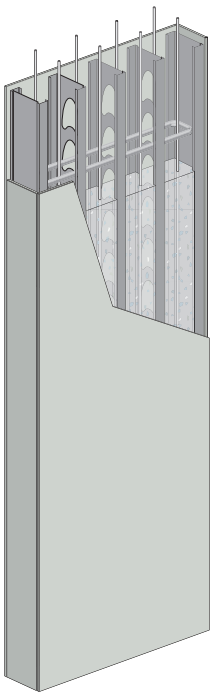


AFS Product Code	Acoustic		Fire
	R_w	$R_w + C_{tr}$	(FRL)
LW120	51	46	240/240/180
LW150	54	50	240/240/180

Blade Columns

AFS Product Code	Application	Composition
LW200D LW262D	A building element or wall section serving as a loadbearing element	200mm or 262mm AFS Logicwall®

Diagram

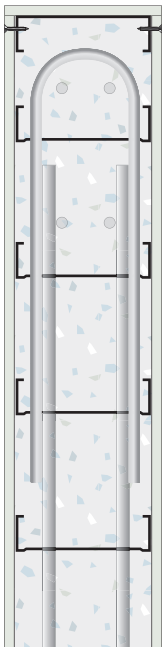


AFS Product Code	Acoustic		Fire (FRL)
	R_w	$R_w + C_{tr}$	
LW200D	58	53	240/240/240
LW262D	62	57	240/240/240

External Blade Walls

AFS Product Code	Application	Composition
LW150 LW162 LW200 LW200D LW262D	External wall serving as an architectural, load bearing blade wall	150mm,162mm 200mm or 262mm AFS Logicwall®

Diagram



AFS Product Code	Acoustic		Fire
	R_w	$R_w + C_{tr}$	(FRL)
LW150	54	50	240/240/180
LW162	55	50	240/240/240
LW200D	58	53	240/240/240
LW262D	62	57	240/240/240

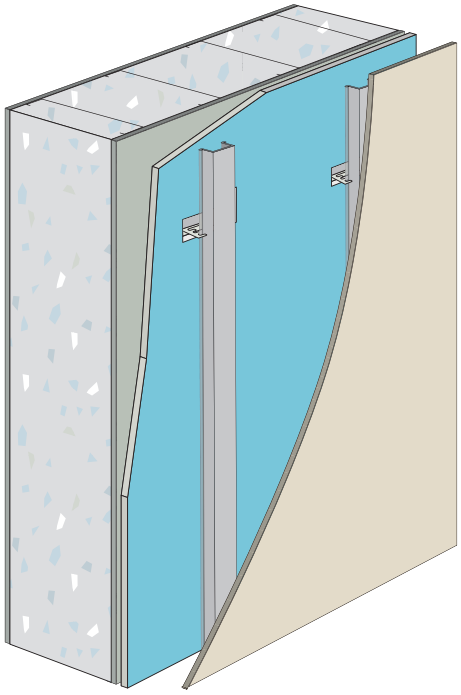
External Facade Walls

External walls serving as building envelope.

AFS Product Code	Application	Composition
LW120 LW150	External facade walls	120mm or 150mm AFS Logicwall® with 10mm foil board insulation or equivalent furring channel and plaster board

Diagram

External



Internal

AFS Product Code	Acoustic		Fire	Thermal	
	R_w	$R_w + C_{tr}$	(FRL)	$R_{(win)}$	$R_{(sum)}$
LW120	51	43	240/240/180	1.28	1.20
LW150	53	44	240/240/180	1.30	1.23

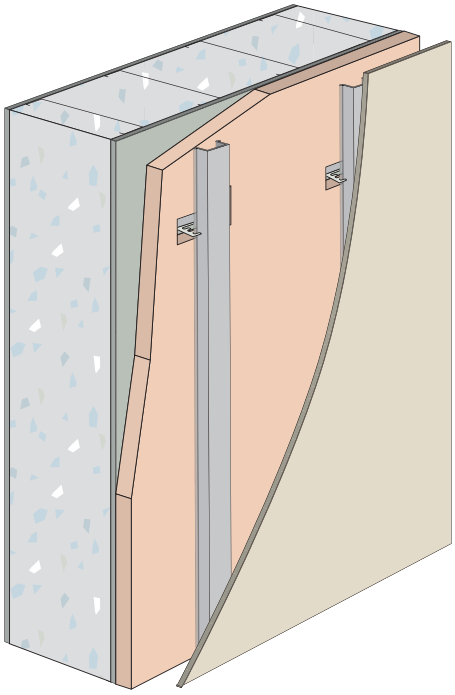
External Facade Walls (continued)

External walls serving as building envelope.

AFS Product Code	Application	Composition
LW120 LW150	External facade walls	120mm or 150mm AFS Logicwall® with 30mm foil board insulation, furring channel and plasterboard

Diagram

External



Internal

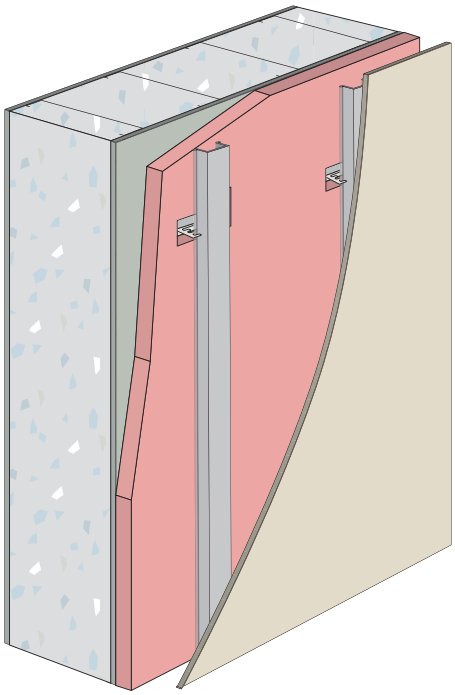
AFS Product Code	Acoustic		Fire	Thermal	
	R_w	$R_w + C_{tr}$	(FRL)	$R_{(win)}$	$R_{(sum)}$
LW120	51	43	240/240/180	1.78	1.72
LW150	53	44	240/240/180	1.80	1.74

External Facade Walls (continued)

AFS Product Code	Application	Composition
LW120 LW150	External facade walls	120mm or 150mm AFS Logicwall® with 40mm foil board insulation, furring channel and plasterboard

Diagram

External



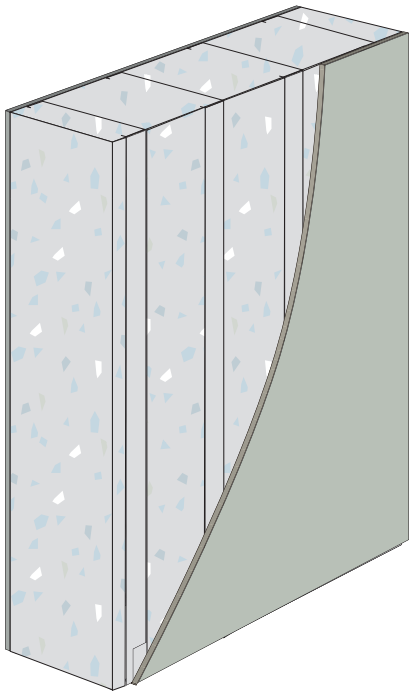
Internal

AFS Product Code	Acoustic		Fire	Thermal	
	R_w	$R_w + C_{tr}$	(FRL)	$R_{(win)}$	$R_{(sum)}$
LW120	51	43	240/240/180	2.04	1.96
LW150	53	44	240/240/180	2.06	1.95

Internal Corridor Walls

AFS Product Code	Application	Composition
LW150 LW162	Walls separating sole occupancy units from common areas, lobbies and stair shafts.	150mm or 162mm Logicwall®

Diagram

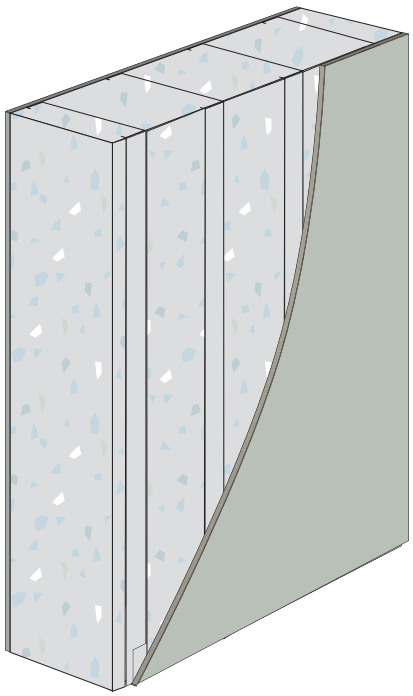


AFS Product Code	Acoustic		Fire
	R_w	$R_w + C_{tr}$	(FRL)
LW150	54	50	240/240/180
LW162	55	50	240/240/240

Internal Partition Walls

AFS Product Code	Application	Composition
LW120 LW150	Load bearing walls within sole occupancy units	120mm or 150mm Logicwall®

Diagram

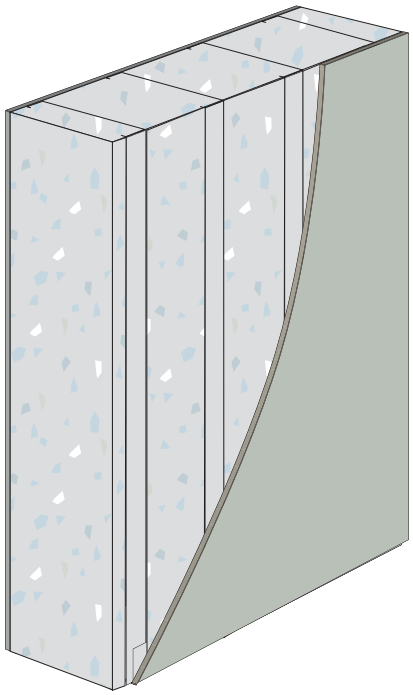


AFS Product Code	Acoustic		Fire
	R_w	$R_w + C_{tr}$	(FRL)
LW120	51	46	240/240/180
LW150	54	50	240/240/180

Internal Party Walls

AFS Product Code	Application	Composition
LW162 LW200 LW200D	Wall separating sole occupancy units - Habitable to Habitable	162mm or 200mm Logicwall®

Diagram

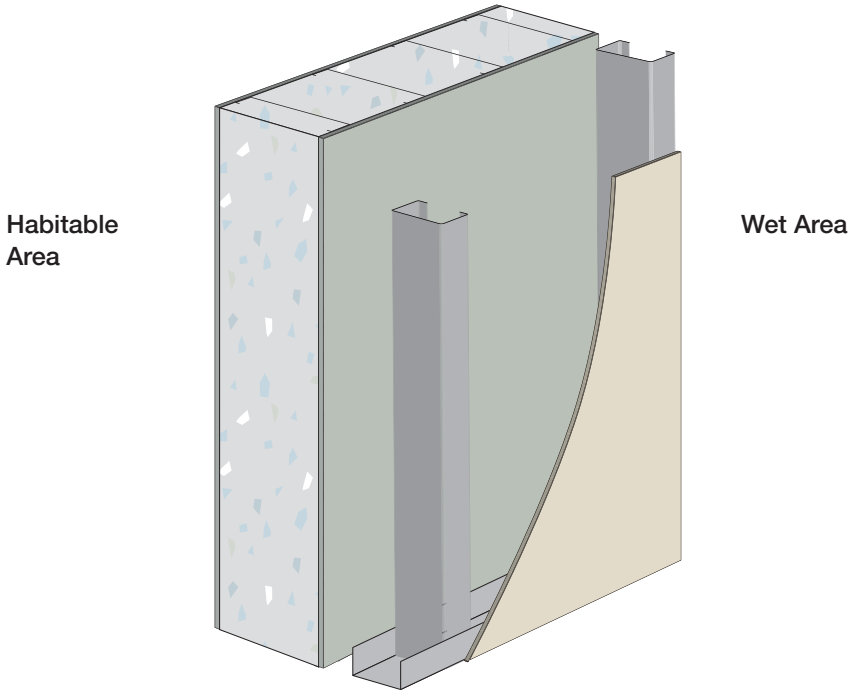


AFS Product Code	Acoustic		Fire
	R_w	$R_w + C_{tr}$	(FRL)
LW162	55	50	240/240/240
LW200D	58	53	240/240/240

Internal Party Walls (continued)

AFS Product Code	Application	Composition
LW150 LW162 LW200 LW200D	Wall separating sole occupancy units - Habitable to Wet Area	150mm, 162mm or 200mm AFS Logicwall® with additional discontinuous wall construction - i.e. 64mm stud wall with 20mm cavity and sheeted with a suitable wet area lining board (not less than 10kg/m^2 where there is no insulation in the cavity). Plumbing services must be installed within the discontinuous steel stud frame on wet area side of AFS Logicwall®.

Diagram

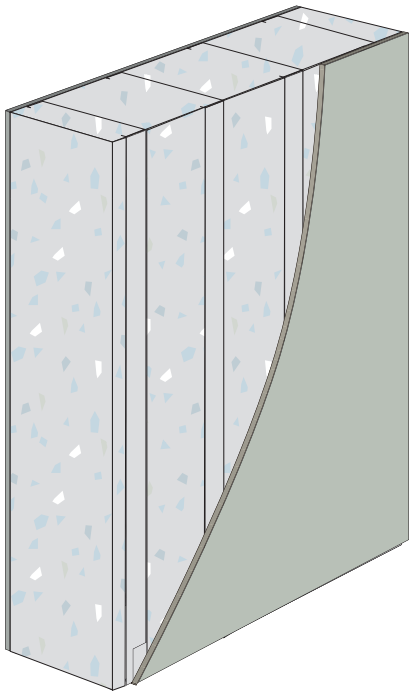


AFS Product Code	Acoustic		Fire
	R_w	$R_w + C_{tr}$	(FRL)
LW150	64	56	240/240/180
LW162	64	56	240/240/240
LW200D	70	62	240/240/240

Internal Party Walls (continued)

AFS Product Code	Application	Composition
LW162 LW200 LW200D	Wall separating sole occupancy units - Wet Area to Wet Area with no services	162mm or 200mm AFS Logicwall®

Diagram

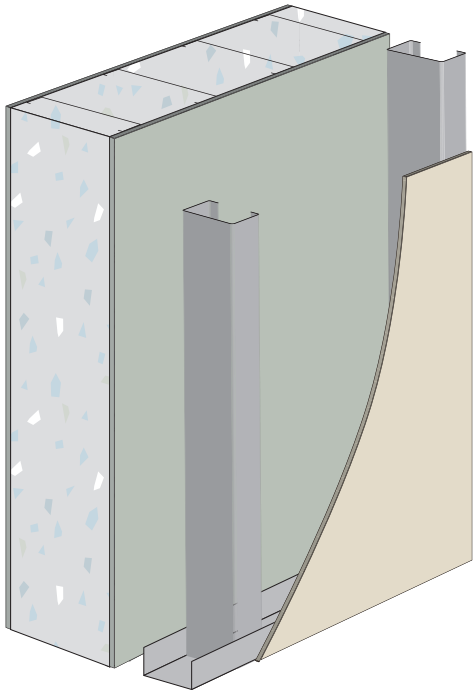


AFS Product Code	Acoustic		Fire
	R_w	$R_w + C_{tr}$	(FRL)
LW162	55	50	240/240/240
LW200D	58	53	240/240/240

Lift Shafts

AFS Product Code	Application	Composition
LW162 LW200 LW200D LW262D	Walls separating lift shafts from sole occupancy units	162mm, 200mm or LW262 AFS Logicwall® with additional discontinuous wall construction - ie. 64mm stud wall with 20mm cavity and sheeted with a suitable lining board (not less than 10kg/m^2 where there is no insulation in the cavity).

Diagram



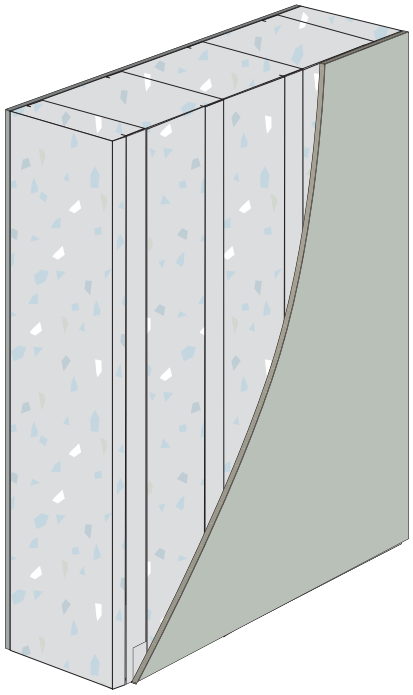
Habitable Area

AFS Product Code	Acoustic		Fire
	R_w	$R_w + C_{tr}$	(FRL)
LW162	64	56	240/240/240
LW200D	70	62	240/240/240
LW262D	71	63	240/240/240

Lift Shafts (continued)

AFS Product Code	Application	Composition
LW150 LW162 LW200 LW200D LW262D	Walls separating lift shafts from common areas and stair shafts	150mm, 162mm, 200mm or 262mm AFS Logicwall®

Diagram

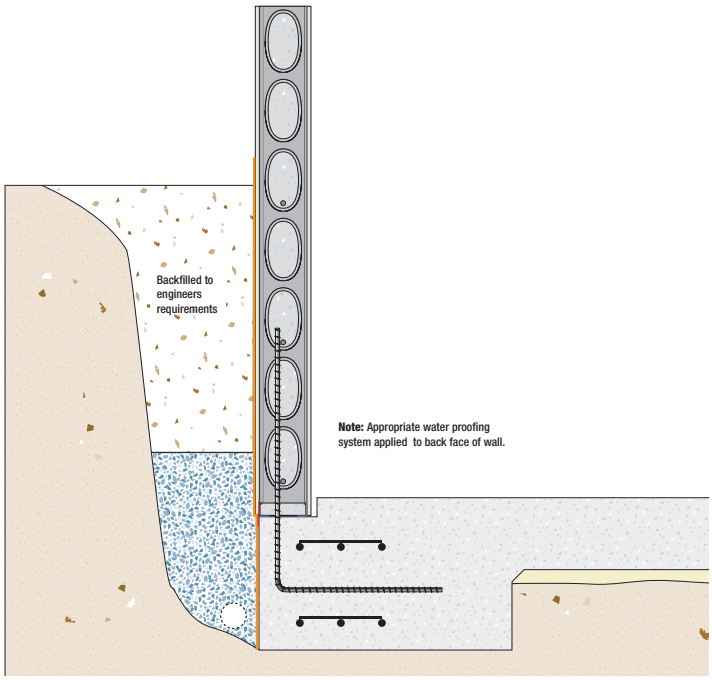


AFS Product Code	Acoustic		Fire
	R_w	$R_w + C_{tr}$	(FRL)
LW150	54	50	240/240/180
LW162	55	50	240/240/240
LW200D	58	53	240/240/240
LW262D	62	57	240/240/240

Retaining Walls and Basement Walls

AFS Product Code	Application	Composition
LW120 LW150 LW162 LW200 LW200D LW262D	A wall serving to retain earth or similar elements e.g - where a deep excavation has occurred or in a basement situation.	120mm, 150mm 162mm, 200mm or 262mm AFS Logicwall®

Diagram



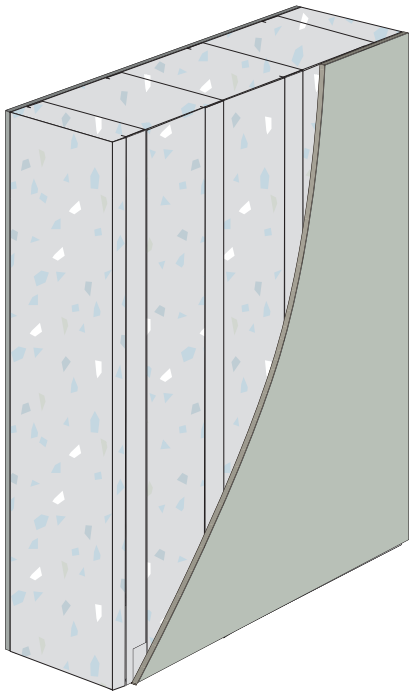
AFS Product Code	Acoustic		Fire
	R_w	$R_w + C_{tr}$	(FRL)
LW120	51	46	240/240/180
LW150	54	50	240/240/180
LW162	55	50	240/240/240
LW200D	58	53	240/240/240
LW262D	62	57	240/240/240

Alternatively basement or retaining walls can be constructed using Rediwall®, another product of AFS.

Service Shafts

AFS Product Code	Application	Composition
LW120 LW150	Walls separating ventilation/ service risers from sole occupancy units or common areas	120mm, 150mm AFS Logicwall®

Diagram

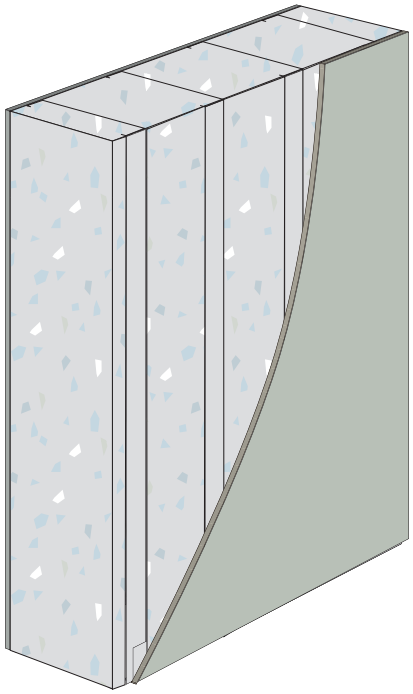


AFS Product Code	Acoustic		Fire
	R_w	$R_w + C_{tr}$	(FRL)
LW120	51	46	240/240/180
LW150	54	50	240/240/180

Stair Shafts

AFS Product Code	Application	Composition
LW150 LW162 LW200 LW200D	Walls separating stair shafts from sole occupancy units or common areas	150mm, 162mm, 200mm AFS Logicwall®

Diagram



AFS Product Code	Acoustic		Fire
	R_w	$R_w + C_{tr}$	(FRL)
LW150	54	50	240/240/180
LW162	55	50	240/240/240
LW200D	58	53	240/240/240

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Section C Properties

Logicwall® Properties, Concrete Core Fill, Steel Studs, Panel Facing Sheet, Adhesive, Materials Handling, Storage and Safety.

CSR

Contents

C1. Properties

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Concrete Core Fill

The concrete supplier is responsible to provide a mix design that is suitable for filling AFS Logicwall®. The concrete core fill mix must be designed with enhanced flow characteristics. Such concrete is available from most of the major concrete suppliers concrete suppliers. The installer is responsible for achieving a dense homogeneous mass of concrete in each pour whilst avoiding blowouts. For details, refer to Core filling of walls in the installation guide (Section K) of this manual.

Steel Studs

The AFS Logicwall® studs which comprise the frame inside the panel are roll formed from Galvabond G2 0.55BMTZ275 coil steel. This is a hot-dipped zinc-coated commercial forming steel with a spangled surface and conforms to AS1365 and AS1397.

A material specification sheet is available upon request. The AFS Logicwall® steel studs are a patented designed stud with large flared hole penetrations at 200mm centres to facilitate concrete flow and self compaction.

Steel Stud Properties

TABLE C1: Gross Stud Properties (without hole punch)

Type	BMT (mm)	t_w (mm)	Astud (mm^2)	I_{xx} (mm^4x10^3)	rx (mm)
LW120	0.55	108	102.9	180.0	41.96
LW150	0.55	138	117.6	309.9	51.34
LW162	0.55	150	125.3	391.8	55.92
LW200	0.55	188	146.2	678.2	68.11
LW262	0.55	250	180.3	1,378.8	87.45

TABLE C2: Net Stud Properties (with hole punch)

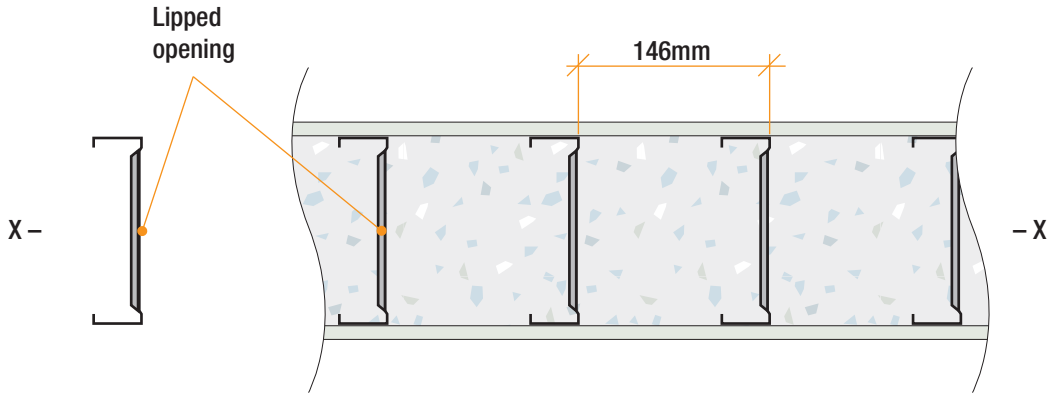
Type	Stud Spacing (mm)	t_w (mm)	t_{total} (mm)	D_{punch} (mm)	A.stud (net) (mm^2)	I_{xx} (mm^4x10^3)	A_c% (mm)	$f_{.stud}$ (MPa)	EQ Factors	
									μ	K_{co}
LW120	146	108	120	70	63.69	164.2	47.1%	300	0.741	0.235
LW150	146	136	148	100	68.09	276.5	52.3%	300	0.756	0.260
LW162	146	150	162	100	75.79	358.4	47.2%	300	0.742	0.236
LW200	146	188	200	134	77.99	602.9	50%	300	0.75	0.25
LW262	146	250	262	211	115.39	1303.5	39.7%	300	0.75	0.25

TABLE C3: Studs

Studs	MPa
f_{sy}	300
f_u	340

Steel Stud Spacing

Fig C1: Steel Stud Plan



Steel Stud Spacing (continued)

Fig C6: LW120 – 108 Stud

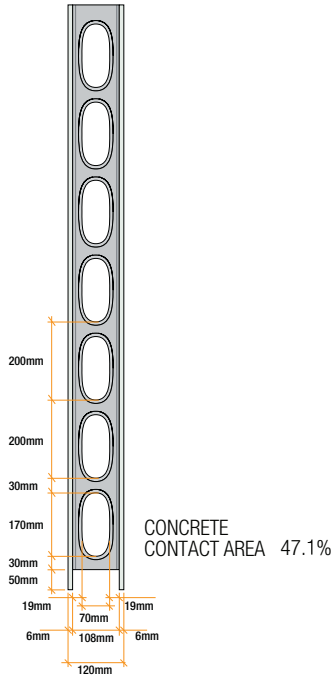


Fig C5: LW150 – 136 Stud

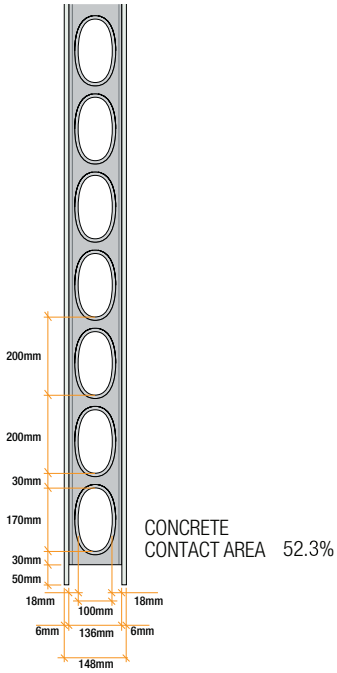


Fig C4: LW162 – 150 Stud

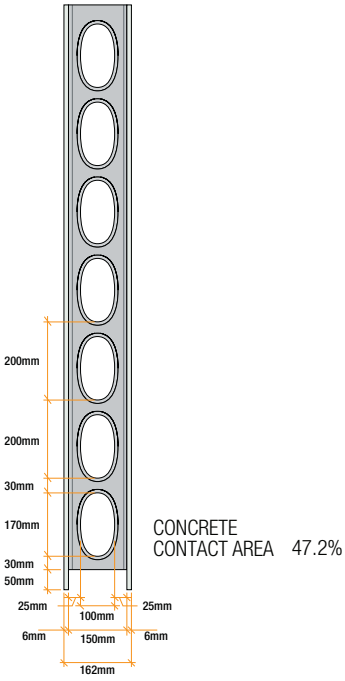


Fig C3: LW200 – 188 Stud

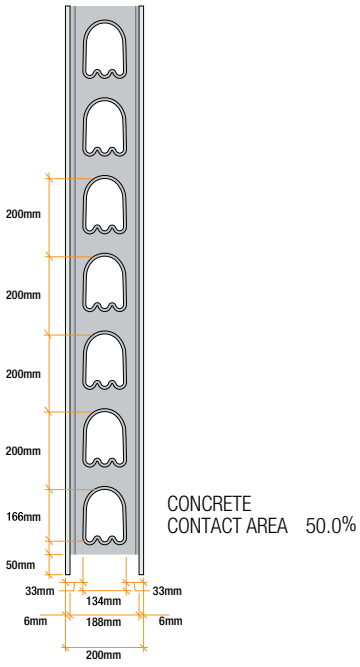
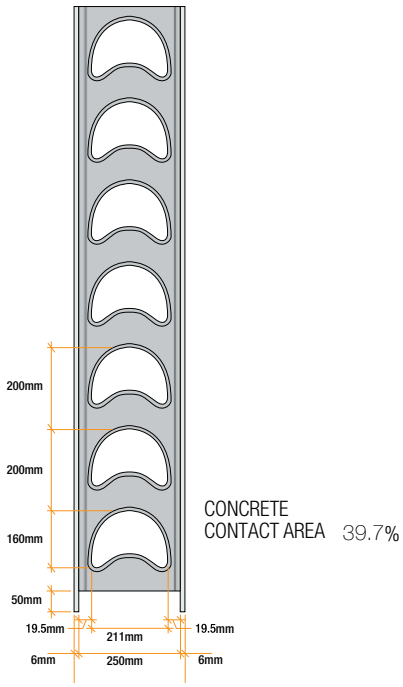


Fig C2: LW262 – 250 Stud



Panel Facing Sheet

AFS Logicwall® is faced with 6mm recessed edge, fibre cement sheeting which is bonded and pressed to the galvanized stud frame. The sheeting is an autoclaved, cellulose fibre reinforced cement sheet which is resistant to permanent water damage and will not rot. The sheets have a recess at both long edges for specified jointing methods. The fibre cement sheet becomes the wall face and provides a suitable substrate for applied finishes and conforms to AS2908.2 – Cellulose Cement Products Part 2 Flat Sheets.

Adhesive

The fibre cement sheets are bonded to the steel stud frame using AFS Logicwall® specified adhesive. This has been specially designed to withstand the concrete pressures at infill stage.

AFS Logicwall® adhesive is a polyurethane product that is both an adhesive and a sealant.

Materials Handling, Storage and Safety

Handling and Storage

AFS Logicwall® panels should be stacked flat, off the ground on a level platform or on support members which extend the full width of the panels and are spaced at a maximum 800mm centres. Pallets of panels must be craned onto the working deck as close as possible to the erection location.

Pallet Lifter

AFS recommend the use of an approved and certified pallet lifter for the unloading of panels and packs on site. Pallet lifter safety guide handbook available upon request. Care must be taken to avoid damage to the panel edges, ends and surfaces. To ensure optimum performance, store panels under cover and keep dry prior to erecting. If the panels become wet, allow to dry before erecting and core filling.

Panel Lifter

Although panels can be placed by hand for panels over 3.3m in height, AFS recommends the use of lifting bars as shown in drawing P2445 AFS-LB-LW Rev1 – Logicwall® lifting bar details, prepared and certified by MYD consulting engineers. Refers to Certification section L for afs lifting bar certification.

Fig C7: Lifter

Safety

Breathing in the dust liberated when cutting or grinding the fibre cement sheet on AFS Logicwall® panels is hazardous. It is the builder's responsibility to ensure that safe work practices are adopted. These include the following:

– Minimise dust by using hand methods to cut fibre cement sheets, i.e. tungsten-tipped score and snap knife; hand guillotine or hand saw.

– If power tools are used, they should be fitted with an efficient and well maintained on tool dust extraction device with a HEPA M class filter. Use a plunge saw with a specifically designed fibre cement blade.

– Work in the open air and within external openings (such as doors and windows in buildings) is recommended.

- Local mechanical ventilation/extraction may be required to control airborne dust levels.

- If generated dust cannot be avoided follow personal protection recommendations. Use a vacuum fitted with a HEPA M class filter instead of sweeping when cleaning dust generated from fibre cement panels.

– The Personal Protective Equipment required may vary from site to site and from time to time, and it is the responsibility of every individual to ensure that they use the appropriate equipment to safeguard themselves and those around them.

The basic toolkit should include, but not necessarily limited to:

A- Dust masks

B - Safety gloves

C - Hearing protection

D - Barrier cream / lotion

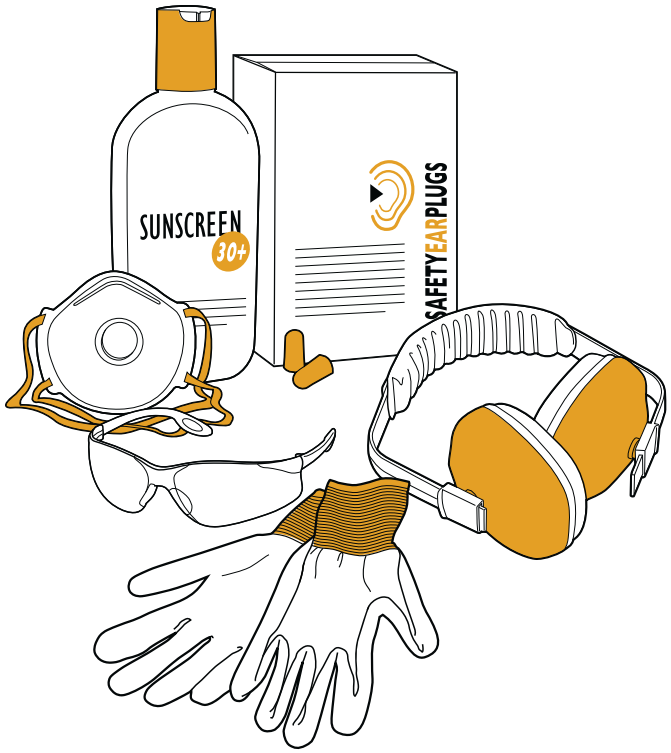
E - Eye protection

Material Safety Data Sheets

MSDS sheets for the following components are available on request:

- FC Sheet
- AFS Adhesive
- Steel Stud

Fig C8: Personal Protective Equipment



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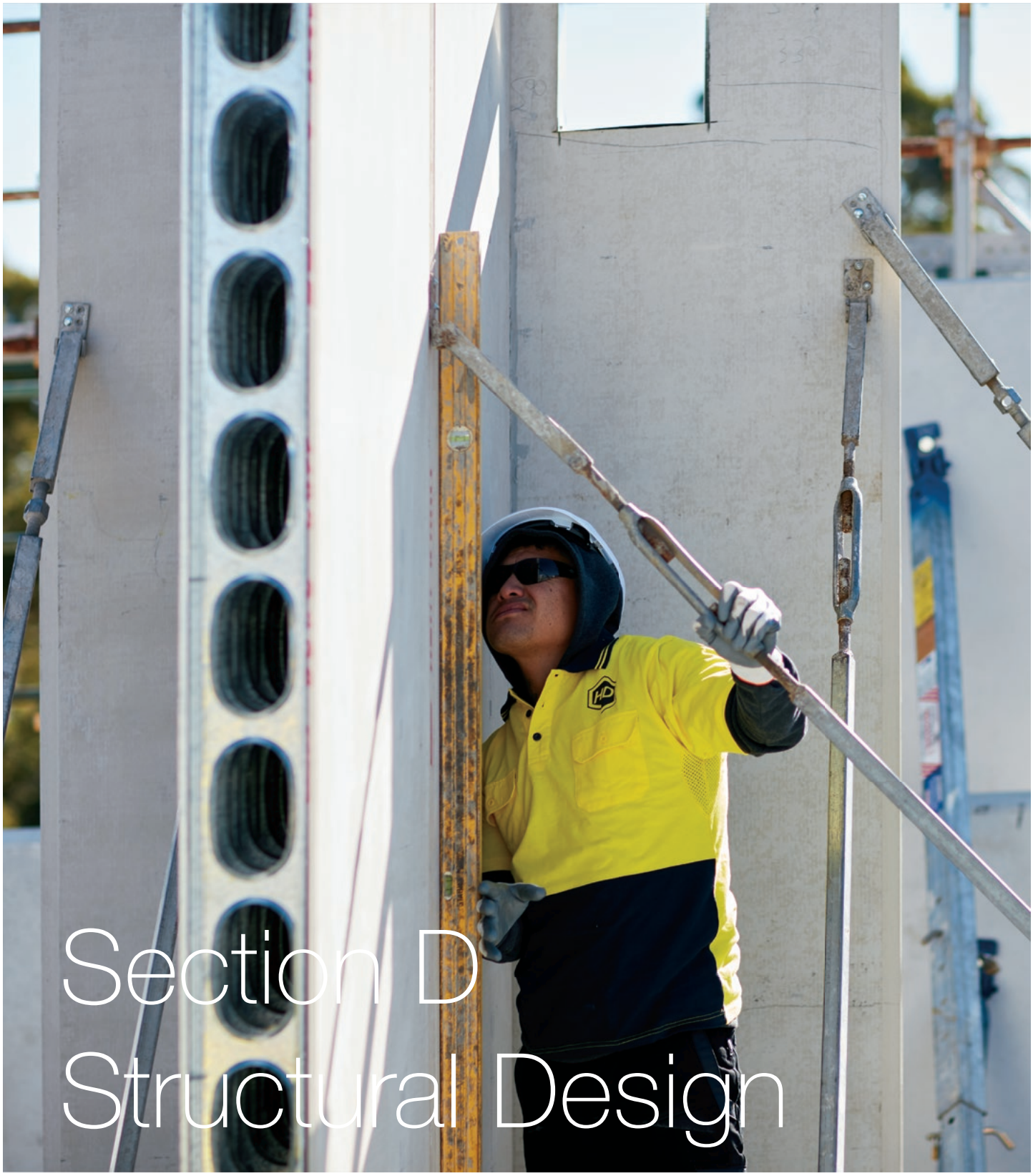

Section D
Structural Design

Logicwall® Structural Design, Design for Earth Quake Actions, Non-Ductile Walling, Limited Ductile Walling, Wall Details, Core Filling of Walls

CSR

Contents

Definition of Terms Used in this Section

t_w	Effective structural concrete wall width
$t_{w.fire}$	Effective wall width for fire
S_{web}	Web spacing
S_{punch}	Vertical punch spacing
A_c	Percentage of web opening
Align	Allowance for on-site mis-alignment of web openings
N_{layers}	Number of Reinforcement layers
d_h	Distance to centre of horizontal bar from the Logicwall® concrete face
$f'_{c.max}$	Maximum concrete strength
f_y	Steel yield stress
Bar Max	Max reinforcement bar size
e	The eccentricity of the load measured at right angle to the plane of the wall
H_{wu}	Unsupported wall height
H_{we}	Effective wall height
t_{total}	total wall width
D_{punch}	Horizontal width of punch
A_{stud}	Area stud
I_{xx}	Stud moment of inertia
μ	Structural ductility factor [AS3600-2018]
S_p	Structural performance factor [AS3600-2018]

D1. Structural Design

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Introduction

AFS Logicwall® is a CodeMark certified permanent formwork for load bearing insitu concrete walls. Its lightweight, sandwich panels are created by bonding durable compressed fibre cement sheets to galvanised steel stud frames.This section of the Logicwall® Design Guide provides guidelines for the structural design of walls constructed using Logicwall® and are designed as reinforced concrete walls in accordance with the AS3600 (2018) Concrete Structures Code. The following areas of structural design are discussed in this section:

- Non ductile wall design
- Limited ductile wall design

Non ductile and limited ductile wall design of Logicwall® shall be carried out in accordance with AS3600 (2018)

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.

Wall Properties

TABLE D1: Wall Properties

Wall Type	Stud Spacing	t_w	t_{total}	D_{punch}	A.stud	Ixx	A_c%	$f_{y.stud}$	EQ Factors	
	(mm)	(mm)	(mm)	(mm)	(mm^2)	($mm4x10^3$)		MPa	μ	K_{co}
LW120	146	108	120	70	63.69	164.2	47.1%	300	0.741	0.235
LW150	146	136	148	100	68.09	276.5	52.3%	300	0.756	0.260
LW162	146	150	162	100	75.79	358.4	47.2%	300	0.742	0.236
LW200	146	188	200	134	77.99	602.9	50%	300	0.75	0.25
LW262	146	250	262	211	115.39	1303.5	39.7%	300	0.75	0.25

Fire Performance

TABLE D2: FRL by CSIRO Fire Test

FRL by testing and assessment to AS1530.4

Type	t_{fire}	$H_w$max	N*max	FRL
	(mm)	(mm)	(kN/m)	(Ade/Int/Ins)
LW120	120	3000	233	240/240/180*
LW150	145	3000	233	240/240/180**
LW162	160	3000	233	240/240/240***
LW200D	200	3000	233	240/240/240***
LW262D	260	3000	233	240/240/240***

*FRL Determined by CSIRO Fire Test Number FSV1513A with minimum reinforcement.
**FRL determined by CSIRO Fire Test Number FSV1038 with minimum reinforcement.
***FRL determined by CSIRO Fire Assessment Report FCO-3084B.

FRL by AS3600-2018

Where design is outside the limits given in the above table FRL shall be determined in accordance with AS 3600-2018.

Where calculating structural capacity for a fire load the area of the exposed stud flange is to be excluded

TABLE D3: AS3600 FRL (Ade/Int/Ins#2) – Exposed 1 Side

	Cl 5.8.1#1	30/30/180	60/60/180	90/90/180	120/120/180	180/180/240	240/240/240
Wall	t_{fire}	$N^*f/ØN_u$	$N^*f/ØN_u$	$N^*f/ØN_u$	$N^*f/ØN_u$	$N^*f/ØN_u$	$N^*f/ØN_u$
LW120	120	0.70	0.53	0.35	0.18		
LW150	145	0.70	0.70	0.70	0.25		
LW162	160	0.70	0.70	0.70	0.70		
LW200/ LW200D	200	0.70	0.70	0.70	0.70	0.58	
LW262D	260	0.70	0.70	0.70	0.70	0.70	0.62
LW262D	260	0.70	0.70	0.70	0.70	0.70	0.62

#1 Cl 5.8.1: $t_{fire} = t_w + t_{FCsheet}$ rounded up to the nearest 5mm
#2 FRP Based on CSIRO Fire Tests

FRP Insulation

FRP for Insulation in the previous tables is determined by CSIRO testing for walls less than LW200 and in accordance with AS3600-2018 Table 5.7.1 for walls greater than LW200.

Electrical boxes, chases or other hollows in walls must maintain a minimum separation and concrete thickness as given in the AS3600-2018 FRP Insulation Table below.

TABLE D4: Fire Resistance Periods (FRPs) for walls for insulation

FRP for installation (min)	Effective thickness (mm)
30	60
60	80
90	160
120	120
180	150
240	175

Flexural Capacity

The flexural strength of Logicwall® is obtained by the stud flanges acting as reinforcement therefore from classic beam theory ignoring axial forces and any vertical reinforcement:

$$\text{Ø}M_u = f_{stud}\, t_w\, A_{flange} \left(1\text{-}0.6\, \frac{A_{flange}}{bt_w} \frac{f_{stud}}{f'_c}\right)$$

Where:

Ø = 0.8	strength reduction factor
M_u	ultimate flexural capacity
f_{stud}	yield strength of vertical studs
A_{flange}	area of stud flange
f'_c	characteristic compressive strength of concrete

Since the stud flanges are potentially exposed to fire they can only be used for wind loads in accordance with AS/NZS1170.2.

If flexural capacity other than wind loads is required then the wall may be reinforced and designed as a normal reinforced concrete wall.

Lintels

Lintel tables have been prepared based on a wall with minimum reinforcement for bending and shear capacity. If additional capacity is required, extra reinforcement can be designed and detailed by the engineer.

Reinforcement Requirements

The individual cells within AFS Logicwall® allow horizontal shrinkage and thermal movements in the concrete with the internal studs acting as crack inducers. This allows AFS Logicwall® to provide crack control without additional reinforcement. The vertical studs can be considered as non fire-rated vertical reinforcement.

For fire-rated reinforced walls to AS3600-2018 Cl11.7.1 use minimum vertical reinforcement ratio (p_w) of 0.0015 or the value required by structural analysis.

Due to the presence of the steel studs in AFS Logicwall® steel congestion should be avoided to facilitate adequate compaction of concrete. As a guide steel ratios in excess of 0.02 in a single layer should not be used unless the amount and disposition of the reinforcement will not prevent the proper placement and compaction of the concrete at splices and at junctions of members.

Minimum Reinforcement

For walls required to have tensile forces from any load combination AS3600-2018 11.7 Minimum reinforcement shall apply.

Examples of such walls are:

- Walls resisting lateral loads
- Walls acting as deep beams
- Walls with load combinations of bending and compression producing tension stress.
- Where reinforced AFS Logicwall® walls do not require a high degree of crack control for tensile forces we recommend a minimum reinforcement spacing of 400mm.

Notes: AS3600 does not recognise the use of plain concrete in wall elements, though some International standards offer guidance in this area. Use of AFS Logicwall® walls unreinforced will require reference to other codes such as ACI 318 and BS8110.1 where it can be shown that no tensile forces result from any load combination of bending and compression.

TABLE D5: Minimum Reinforcement for Reinforced Walls (p) = A_{st}/A_{conc}

Location	Vertical (p)	Horizontal (p)
Internal (A1, A2)	0.0025 (0.0015 Cl.11.7.1(a))	0.0015
External (B1, B2)	0.0025 (0.0015 Cl.11.7.1(a))	0.0025
Limited Ductile	0.0025	0.0025
Deep Beam	AS3600 Sect 12	AS3600 Sect 12

Steel ratios in excess of 0.02 should not be used unless the amount and disposition of the reinforcement will not prevent the proper placement of the concrete in walls and at splices and junction members.

Reinforcement Detailing Constraints

For heavily loaded walls where reinforcement ratio is high, it is critical that reinforcement is detailed carefully to avoid congestion within the wall which creates difficulties when core filling and may result in voids or insufficient concrete compaction.

When detailing reinforcement to be placed in Logicwall® the following spacing constraints must be noted:

- For single reinforcement carrier walls the reinforcement is centrally placed at minimum horizontal centres.
- For double reinforcement carrier walls, LW200D and LW262D, the reinforcement is located toward each face of the wall with concrete cover as shown.
- Typical total reinforcement rates are less then 0.01. Rates in excess of 0.02 are not recommended as it creates possible congestion issues.
- Areas with higher reinforcement concentrations such as laps and corners should be reviewed.

D2. LOGICWALL® Design For Earthquake Actions

Logicwall® is to be designed to cater for earthquake actions as per AS1170.4 Earthquake Actions and AS3600-2018 Section 14 Design for Earthquake Actions. The design and detailing of the wall will depend on the Structural System selected by the designer for the building from AS3600 – 2018, Table 14.3 Structural Ductility Factor and Structural Performance Factor. This will normally be either Non-Ductile Structural Walls or Limited Ductile Structural Walls.

D3. Non Ductile Wall Design

The use of the Simplified Design Method in AS3600 – 2018 Section 11.5 is limited to Non-Ductile Walls by Cl 14.4.4.1 and Cl 11.5.2 Limitations on the use of the Method. Non-Ductile Logicwall® are to designed to Section 2.2 and 14.4, with clause 14.4.4.1 stating *"Walls shall be designed in accordance with Section 10 or Section 11 as appropriate except that the simplified design method for walls subjected to vertical compression forces provided in Clause 11.5 of this standard shall only be used for non-ductile walls."*

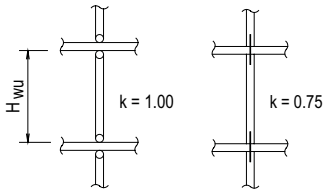
Axial Capacity

AFS Logicwall® can be designed in accordance with Section 11 of AS3600 – 2018.

$$\text{Ø}N_u = \text{Ø}(t_w\text{-}1.2e\text{-}2.e_a)0.6f_c$$ [AS3600 Cl.11.5.3]

Where:

Ø = 0.65	strength reduction factor
N_u =	ultimate strength per unit wall length
t_w =	thickness of the wall
e =	eccentricity of the load measured at right angles to the plane of the wall
$e_a = \frac{H_{we}^2}{2500t_w}$	an additional eccentricity
$H_{we} = kH_{wu}$	effective height of a braced wall



[AS3600 Cl.11.5.3]

11.5.2 Limitation on use of method

"Structural walls designed using Clause 11.5.3 Shall –

(a) be limited to a maximum design axial stress of 3 MPa unless vertical and horizontal reinforcement is provided on both wall faces and divided equally between the two wall faces;

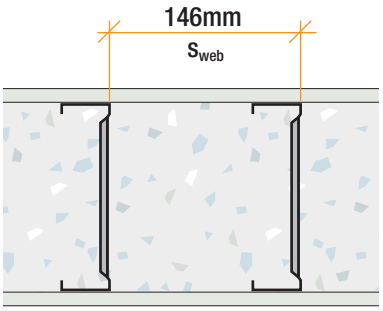
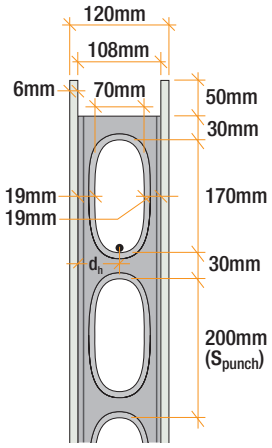
(b) not constructed on sites with soil classifications of De or Ee, as defined in AS 1170.4, and where subjected to earthquake design actions; and

(c) have a ratio of effective height to thickness that does not exceed 20 for singly reinforced wall or 30 for doubly reinforced walls.

Otherwise, the wall shall be designed as a column in accordance with Section 10."

D3.1. LOGICWALL® LW120

LW120 Structural Capacities

LW120 Panel	Plan	Elevation
		

LW120 Axial Capacity ØN$_u$ (kN/m)

t_w	S_{web}	S_{punch}	A_c	N_{layers}	d_h	$f'_{c.max}$	Slend. Limit	Max. H_{wu}
108	146	200	47%	1	54	40	20	2880

	k = 0.75	e <= 1/6t_w		
H_{wu}	H_{we}	25 MPa	32 MPa	40 MPa
2880	2160	324*	324*	324*
Bearing capacity at standard bottom plate		1001	1281	1601

*AS3600-2018 Section 11.5.2 Limitations on use of Simplified Design Method

LW120 Reinforcement

LW120		Vertical Bars (min. N12 - 350)			
Allowable Bars		N12	N16	N20	N24
Horizontal Bars (min. N12 - 350)	N12				
	N16				
	N20				
	N24				

Horizontal Bar Spacing 200/300*/400
Vertical Bar Spacing 150 to 350
$f'_{c.max}$ 40 MPa, Concrete mix as per spec
*Average spacing

Acceptable
With Caution
Not Recommended

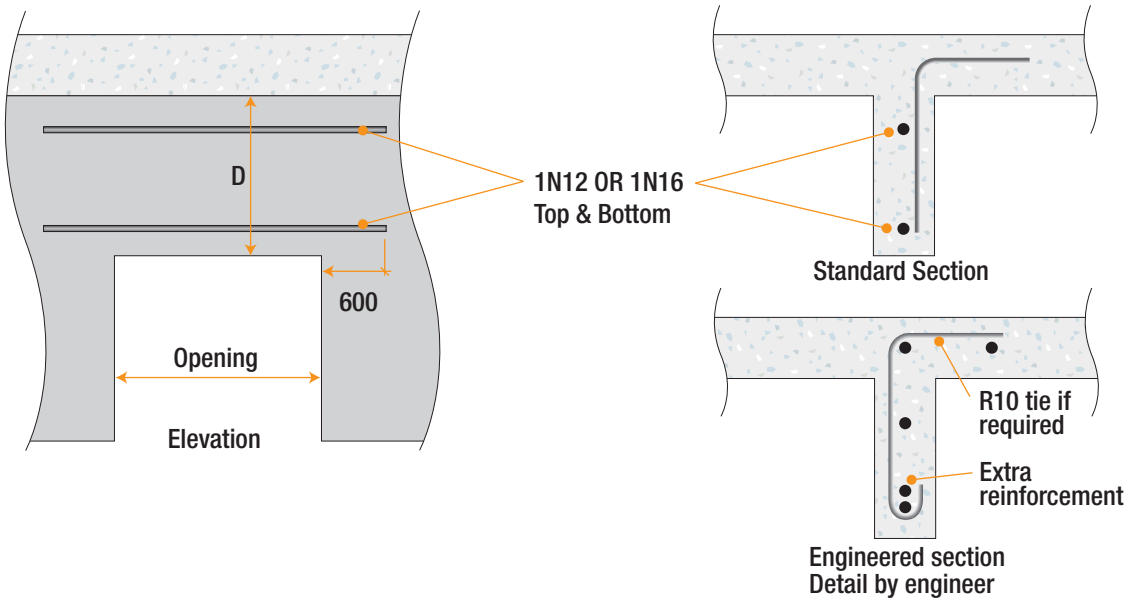
LW120 Flexural Capacity

	Non Fire Rated Flexural Capacity, stud only		
	25 MPa	32 MPa	40 MPa
$ØM_u$(kNm/m)	12.5	12.6	12.7

Non fire rated capacity, for local wind loads only (ignoring any extra reinforcement)

LW120 Standard Lintels

Capacity given is for standard lintel, with minimum reinforcement and not ties. Engineer can achieve higher capacity by detailing additional reinforcement.



LW120 Standard Lintels with Vertical Studs UDL w*(kN/m)

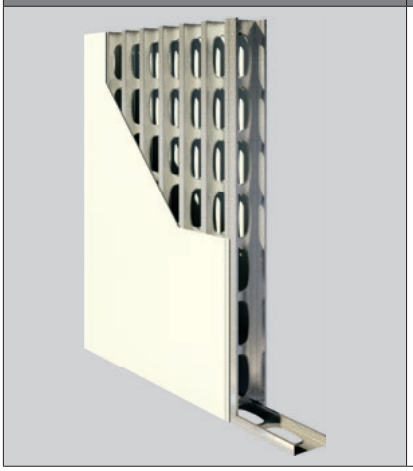
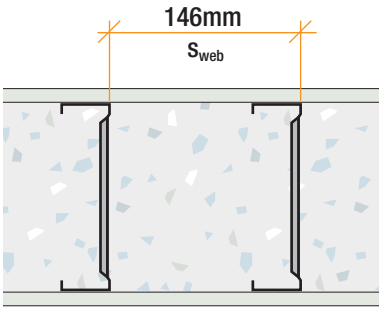
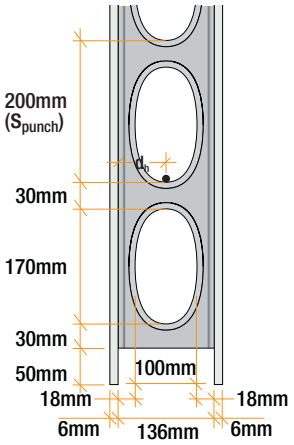
	1N12 Top & Bottom, Depth (mm)					1N16 Top & Bottom, Depth (mm)				
D	300	450	600	900	1200	300	450	600	900	1200
d_{eff}	200	350	500	800	1100	200	350	500	800	1100
Span (mm)										
3900	6.0	10.7	15.5	25.1	34.6	10.3	19.0	27.6	41.5	41.5
3600	7.0	12.6	18.2	29.4	38.0	12.1	22.3	32.4	45.0	45.0
3300	8.3	15.0	21.7	35.0	41.4	14.4	26.5	38.6	49.1	49.1
3000	10.1	18.2	26.2	38.7	45.6	17.4	32.0	46.7	54.0	54.0
2700	12.5	22.4	32.4	43.0	50.6	21.5	39.6	53.9	60.0	60.0
2400	15.8	28.4	39.8	48.4	57.0	27.2	50.1	60.6	67.5	67.5
2100	20.6	37.1	45.5	55.3	65.1	35.5	64.4	69.3	77.1	77.1
1800	28.1	47.3	53.1	64.5	75.9	48.3	75.1	80.9	90.0	90.0
1500	40.4	56.8	63.7	77.4	91.1	69.5	90.2	97.0	108.0	108.0
1200	62.4	71.0	79.6	96.7	113.9	104.1	112.7	121.3	135.0	135.0
900	83.2	94.7	106.1	129.0	151.9	138.8	150.3	161.7	180.0	180.0
$ØM_u$(kNm/m)	8.3	14.9	21.5	34.7	47.9	14.2	26.2	38.2	62.2	86.2
$V_{u.max}$(kN)	108.0	189.0	270.0	432.0	594.0	108.0	189.0	270.0	432.0	594.0
$ØV_u$ (kN)	37.4	42.6	47.7	58.0	68.3	62.5	67.6	72.8	81.0	81.0
	f'_c = 25MPa, 50 cover (min)					f'_c = 25MPa, 50 cover (min)				

= Limited by shear

Based on testing (Refer report No C2004-02, titled "Lateral load resistance of AFS wall panels" by University of Centerbury, NewZealand) with $Ø_{bend}$ =0.8 , $Ø_{shear}$ =0.7 and k_{co} against steel = 0 as per clause 8.4.3 of AS3600-2018

D3.2. LOGICWALL® LW150

LW150 Structural Capacities

LW150 Panel	Plan	Elevation
		

t_w	S_{web}	S_{punch}	A_c	N_{layers}	d_h	$f'_{c.max}$	Slend. Limit	Max. H_{wu}
136	146	200	52%	1	69	50	20	3630

LW150 Axial Capacity $ØN_u$ (kN/m)

	k = 0.75	e<= 1/6t_w			
H_{wu}	H_{we}	25 MPa	32 MPa	40 MPa	50 MPa
3630	2720	408*	408*	408*	408*
Bearing capacity at standard bottom plate		1328	1700	2124	2656

*AS3600-2018 Section 11.5.2 Limitations on use of Simplified Design Method

LW150 Reinforcement

LW150		Vertical Bars (min. N12 - 325)			
Allowable Bars		N12	N16	N20	N24
Horizontal Bars (min. N12 - 350)	N12				
	N16				
	N20				
	N24				

Horizontal Bar Spacing 200/300*/400
Vertical Bar Spacing 150 to 350
$f'_{c.max}$ 40 MPa, Concrete mix as per spec
*Average spacing

Acceptable
With Caution
Not Recommended

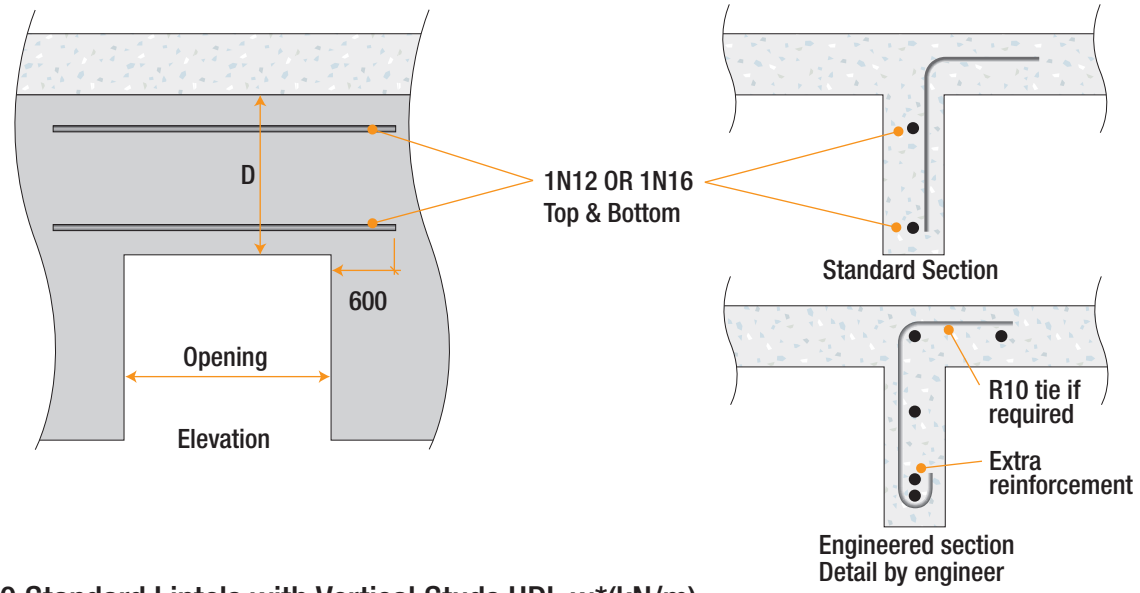
LW150 Flexural Capacity

	Non Fire Rated Flexural Capacity, stud only			
	25 MPa	32 MPa	40 MPa	50 MPa
ϕM_u(kNm/m)	15.9	16.0	16.0	16.1

Non fire rated capacity, for local wind loads only (ignoring any extra reinforcement)

LW150 Standard Lintels

Capacity given is for standard lintel, with minimum reinforcement and no ties engineer can achieve higher capacity by detailing additional reinforcement.



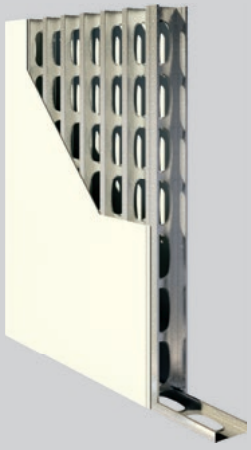
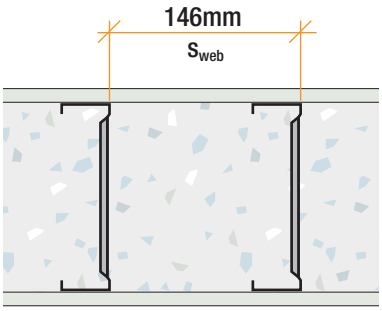
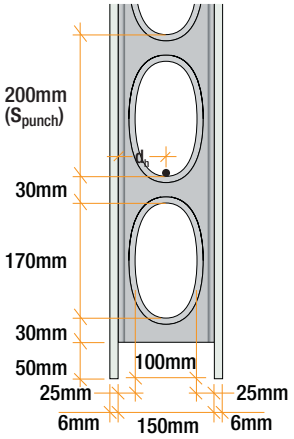
LW150 Standard Lintels with Vertical Studs UDL w*(kN/m)

	1N12 Top & Bottom, Depth (mm)					1N16 Top & Bottom, Depth (mm)				
D	300	450	600	900	1200	300	450	600	900	1200
d_{eff}	200	350	500	800	1100	200	350	500	800	1100
Span (mm)										
3900	6.1	10.8	15.6	25.1	34.7	10.6	19.2	27.9	45.3	52.3
3600	7.1	12.7	18.3	29.5	40.7	12.4	22.6	32.8	52.9	56.7
3300	8.5	15.1	21.8	35.1	48.5	14.7	26.9	39.0	57.7	61.8
3000	10.2	18.3	26.4	42.5	56.0	17.8	32.5	47.2	63.5	68.0
2700	12.6	22.6	32.6	51.6	62.2	22.0	40.1	58.2	70.5	75.6
2400	16.0	28.6	41.2	58.0	70.0	27.9	50.8	67.3	79.3	85.0
2100	20.9	37.3	52.6	66.3	80.0	36.4	66.3	76.9	90.6	97.1
1800	28.4	50.8	61.4	77.4	93.4	49.5	81.7	89.7	105.8	113.3
1500	40.9	64.0	73.6	92.8	112.0	71.3	98.1	107.7	126.9	136.0
1200	64.0	80.0	92.0	116.1	140.1	110.6	122.6	134.6	158.6	170.0
900	90.7	106.7	122.7	154.7	186.7	147.5	163.5	179.5	211.5	226.7
ϕM_u(kNm/m)	8.4	15.0	21.6	34.8	48.0	14.6	26.6	38.6	62.6	86.6
$V_{u.max}$(kN)	136.0	238.0	340.0	544.0	748.0	136.0	238.0	340.0	544.0	748.0
ϕV_u (kN)	40.8	48.0	55.2	69.6	84.0	66.4	73.6	80.8	95.2	102.0
	f'_c = 25MPa, 50 cover (min)					f'_c = 25MPa, 50 cover (min)				
	= ϕV_{uc} governs, otherwise ϕM_u									

Based on testing (Refer report No C2004-02, titled "Lateral load resistance of AFS wall panels" by University of Centerbury, NewZealand) with ϕ_{bend} =0.8 , ϕ_{shear} =0.7 and k_{co} against steel = 0 as per clause 8.4.3 of AS3600-2018

D3.3. LOGICWALL® LW162

LW162 Structural Capacities

LW162 Panel	Plan	Elevation
		

t_w	S_{web}	S_{punch}	A_c	N_{layers}	d_h	$f'_{c.max}$	Slend. Limit	Max. H_{wu}
150	146	200	47.2%	1	75	50	20	4000

LW162 Axial Capacity $ØN_u$ (kN/m)

	k = 0.75	e<= $1/6t_w$			
H_{wu}	H_{we}	25 MPa	32 MPa	40 MPa	50 MPa
4000	3000	450*	450*	450*	450*
Bearing capacity at standard bottom plate		1391	1781	2226	2782

*AS3600-2018 Section 11.5.2 Limitations on use of Simplified Design Method (3MPa)

LW162 Reinforcement

LW162		Vertical Bars (min. N12 - 300)			
Allowable Bars		N12	N16	N20	N24
Horizontal Bars min. N12 - 350)	N12				
	N16				
	N20				
	N24				

Horizontal Bar Spacing 200/300*/400
Vertical Bar Spacing 150 to 350
$f'_{c.max}$ 50 MPa, Concrete mix as per spec
*Average spacing

Acceptable
With Caution
Not Recommended

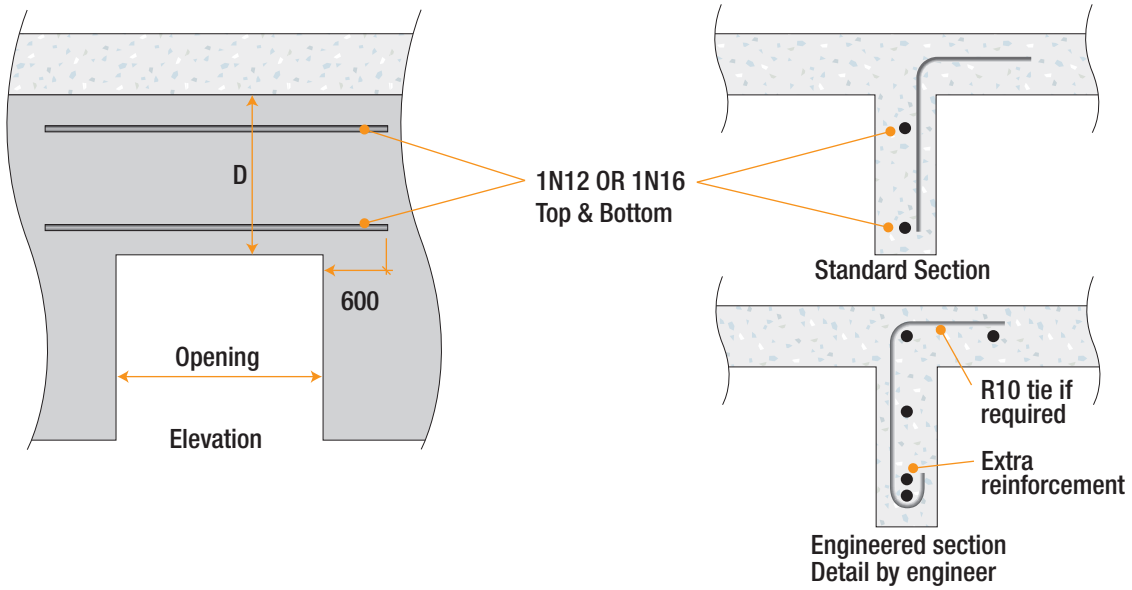
LW162 Flexural Capacity

	Non Fire Rated Flexural Capacity, stud only			
	25 MPa	32 MPa	40 MPa	50 MPa
$ØM_u$(kNm/m)	17.6	17.7	17.7	17.8

Non fire rated capacity, for local wind loads only (ignoring any extra reinforcement)

LW162 Standard Lintels

Capacity given is for standard lintel, with minimum reinforcement. Engineer can add extra reinforcement to achieve higher capacity.



LW162 Standard Lintels with Vertical Studs UDL w*(kN/m)

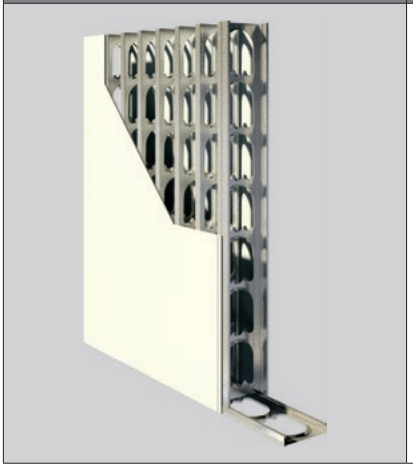
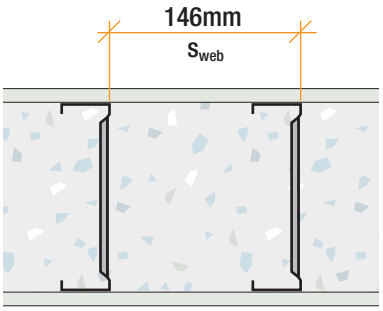
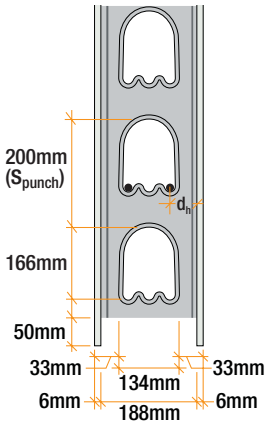
	1N12 Top & Bottom, Depth (mm)					1N16 Top & Bottom, Depth (mm)				
D	300	450	600	900	1200	300	450	600	900	1200
d_{eff}	200	350	500	800	100	200	350	500	800	100
Span (mm)										
3900	6.1	10.9	15.6	25.2	34.7	10.6	19.3	28.0	45.4	55.5
3600	7.1	12.7	18.3	29.5	40.8	12.5	22.7	32.9	52.1	60.1
3300	8.5	15.2	21.8	35.2	48.5	14.9	27.0	39.1	56.9	65.6
3000	10.3	18.3	26.4	42.5	55.4	18.0	32.7	47.3	62.6	72.1
2700	12.7	22.7	32.6	51.0	61.6	22.2	40.3	58.4	69.5	80.1
2400	16.1	28.7	41.3	57.4	69.3	28.1	51.0	66.3	78.2	90.2
2100	21.0	37.4	51.9	65.5	79.2	36.7	66.6	75.7	89.4	103.0
1800	28.6	51.0	60.5	76.5	92.4	50.0	80.4	88.4	104.3	120.2
1500	41.1	63.1	72.6	91.8	110.9	72.0	96.5	106.0	125.1	144.3
1200	64.3	78.9	90.8	114.7	138.6	108.6	120.6	132.5	156.4	180.3
900	89.2	105.2	121.1	152.9	184.8	144.8	160.8	176.7	208.6	240.4
$ØM_u$(kNm)	8.4	15.0	21.6	34.8	48.0	14.7	26.7	38.7	62.7	86.7
$V_{u.max}$(kN)	150.0	262.5	375.0	600.0	825.0	150.0	262.5	375.0	600.0	825.0
$ØV_u$ (kN)	40.1	47.3	54.5	68.8	83.2	65.2	72.3	79.5	93.9	108.2
	f'_c = 25MPa, 50 cover (min) for all w* tables					f'_c = 25MPa, 50 cover (min) for all w* tables				

= ϕV_{uc} governs, otherwise ϕM_u

Based on testing (Refer report No C2004-02, titled "Lateral load resistance of AFS wall panels" by University of Centerbury, NewZealand) with $Ø_{bend}$ =0.8 , $Ø_{shear}$ =0.7 and k_{co} against steel = 0 as per clause 8.4.3 of AS3600-2018

D3.4. LOGICWALL® LW200 & LW200D

LW200D Structural Capacities

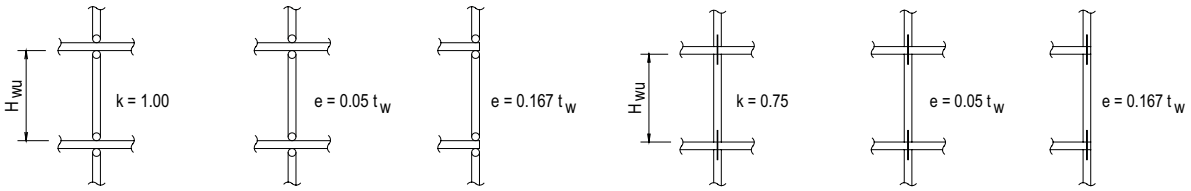
LW200 & LW200D Panel	Plan	Elevation
		

LW200

t_w	S_{web}	S_{punch}	A_c	N_{layers}	d_h	$f'_{c.max}$	Slend. Limit	Max. H_{wu}
188	146	200	50.0%	1	94	50	20	5010

LW200D

t_w	S_{web}	S_{punch}	A_c	N_{layers}	d_h	$f'_{c.max}$	Slend. Limit	Max. H_{wu}
188	146	200	50.0%	2	41	65	30	7520



LW200 Axial Capacity ØN$_u$ (kN/m) Non-Ductile 1 Layers simplified method.

	k = 0.75	Discontinuous Floor e <= 1/6t_w			
H_{wu}	H_{we}	25 MPa	32 MPa	40 MPa	50 MPa
5010	3760	564*	564*	564*	564*
Limit with bottom plate		1742	2230	2787	3859
*AS3600-2018 Sect 11.5.2 Limitations on use of Simplified Design Method					

LW200D Axial Capacity $ØN_u$ (kN/m) Non-Ductile 2 Layers

	k = 0.75	Continuous Floor e = $0.05t_w$					Discontinuous Floor e <= $1/6t_w$				
H_{wu}	H_{we}	25 MPa	32 MPa	40 MPa	50 MPa	65 MPa	25 MPa	32 MPa	40 MPa	50 MPa	65 MPa
6000	4500	883	1130	1413	1766	2295	626	802	1002	1252	1628
5000	3750	1140	1459	1823	2279	2963	883	1130	1413	1766	2296
4500	3375	1250	1601	2001	2501	3251	994	1272	1590	1988	2584
4200	3150	1311	1679	2098	2623	3409	1055	1350	1688	2109	2742
3900	2925	1368	1751	2189	2736	3557	1111	1423	1778	2223	2890
3600	2700	1421	1818	2273	2841	3693	1164	1490	1862	2328	3026
3300	2475	1469	1880	2350	2938	3819	1212	1552	1940	2425	3152
3000	2250	1513	1937	2421	2026	3934	1256	1608	2010	2513	3267
2700	2025	1553	1988	2485	3106	4038	1296	1659	2074	2593	3370
2400	1800	1589	2033	2542	3177	4130	1332	1705	2131	2664	3463
2100	1575	1620	2074	2592	3240	4212	1363	1745	2182	2727	3545
1800	1350	1647	2109	2636	3295	4283	1391	1780	2225	2782	3616
Bearing capacity at standard bottom plate		1795	2297	2871	3589	4666	1795	2297	2871	3589	4666
Bottom plate may be deleted by the designer											

LW200 Reinforcement

LW200		Vertical Bars (min. N12 - 350)			
Allowable Bars		N12	N16	N20	N24
Horizontal Bars (min. N12 - 350)	N12				
	N16				
	N20				
	N24				

Horizontal Bar Spacing 200/300*/400
Vertical Bar Spacing 150 to 350
$f'_{c.max}$ 65 MPa, Concrete mix as per spec

Acceptable
With Caution
Not Recommended

LW200D Reinforcement

LW200D		Vertical Bars Each Face (min. N12 - 350)			
Allowable Bars		N12	N16	N20	N24
Horizontal Bars Each Face (min. N12 - 350)	N12				
	N16				
	N20				
	N24				

Horizontal Bar Spacing 200/300*/400
Vertical Bar Spacing 150 to 350
$f'_{c.max}$ 65 MPa, Concrete mix as per spec
*Average spacing

Acceptable
With Caution
Not Recommended

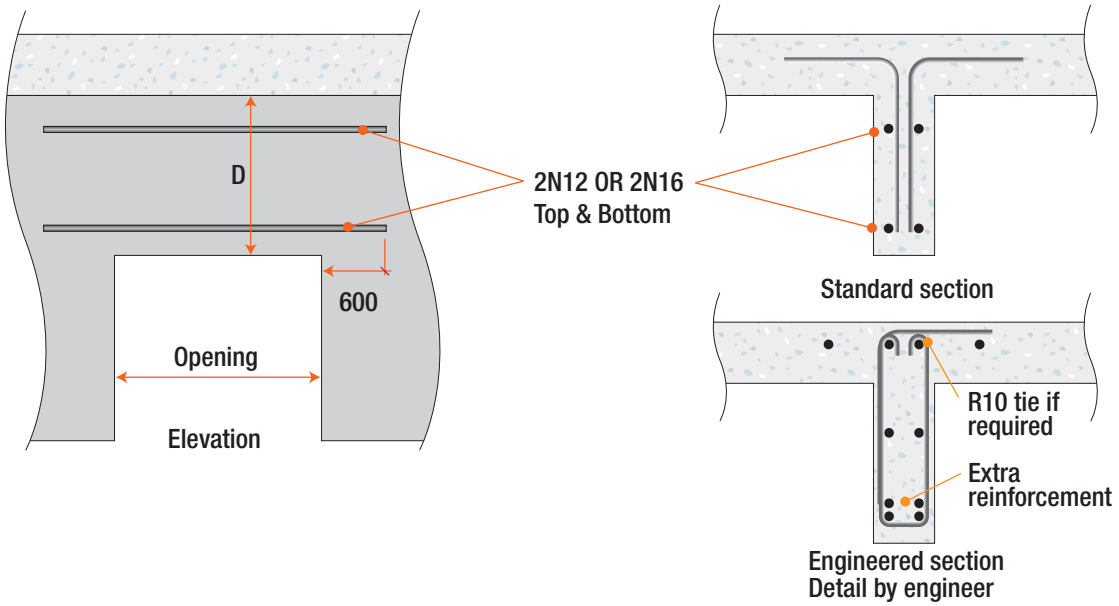
LW200 & LW200D Flexural Capacity (stud only)

	Non Fire Rated Flexural Capacity, stud only				
	25 MPa	32 MPa	40 MPa	50 MPa	65 MPa
$ØM_u$(kNm/m)	22.8	22.3	22.3	22.4	22.4

Non fire rated capacity, for local wind loads only (ignoring any extra reinforcement)

LW200D Double Reinforcement Lintels

Capacity given is for standard lintel, with minimum reinforcement. Engineer can add extra reinforcement to achieve higher capacity.



LW200D Standard Lintels with Vertical Studs UDL w*(kN/m)

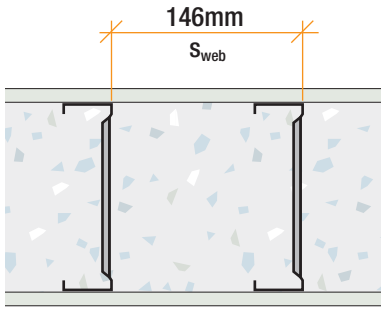
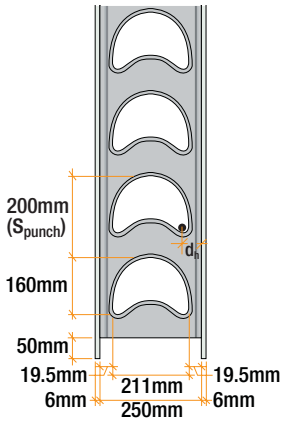
	2N12 Top & Bottom, Depth (mm)					2N16 Top & Bottom, Depth (mm)				
D	300	450	600	900	1200	300	450	600	900	1200
d_{eff}	200	350	500	800	1100	200	350	500	800	1100
Span (mm)										
3900	11.8	21.4	30.9	50.0	67.5	20.2	37.5	54.9	72.3	72.3
3600	13.9	25.1	36.3	58.7	73.2	23.7	44.1	64.4	78.3	78.3
3300	16.5	29.9	43.2	68.3	79.8	28.2	52.4	76.7	85.5	85.5
3000	20.0	36.1	52.3	75.1	87.8	34.1	63.5	92.8	94.0	94.0
2700	24.7	44.6	64.5	83.4	97.5	42.1	78.3	104.4	104.4	104.4
2400	31.3	56.5	78.0	93.9	109.7	53.3	99.1	117.5	117.5	117.5
2100	40.8	73.7	89.1	107.3	125.4	69.6	128.3	134.3	134.3	134.3
1800	55.6	93.4	104.0	125.2	146.3	94.8	149.7	156.7	156.7	156.7
1500	80.0	112.1	124.8	150.2	175.6	136.5	179.6	188.0	188.0	188.0
1200	124.3	140.1	156.0	187.7	219.5	208.7	224.5	235.0	235.0	235.0
900	165.7	186.9	208.0	250.3	292.6	278.2	299.4	313.3	313.3	313.3
$\emptyset M_u$(kNm)	16.4	29.6	42.8	69.2	95.6	27.9	51.9	75.9	123.9	171.9
$V_{u.max}$(kN)	188.0	329.0	470.0	752.0	1034.0	188.0	329.0	470.0	752.0	1034.0
$\emptyset V_u$ (kN)	74.6	84.1	93.6	112.6	131.7	125.2	134.7	141.0	141.0	141.0
	f'_c = 25MPa, 50 cover (min)					f'_c = 25MPa, 50 cover (min)				

= ϕV_{uc} governs, otherwise ϕM_u

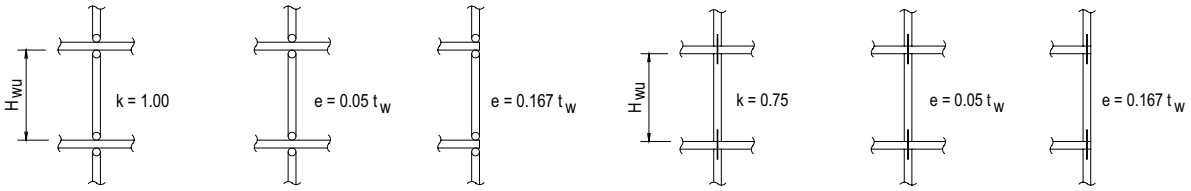
Based on testing (Refer report No C2004-02, titled "Lateral load resistance of AFS wall panels" by University of Centerbury, NewZealand) with $\emptyset_{bend}$ =0.8 , $\emptyset_{shear}$ =0.7 and k_{co} against steel = 0 as per clause 8.4.3 of AS3600-2018

D3.5. LOGICWALL® LW262D

LW262D Structural Capacities

LW262D Panel	Plan	Elevation
		

t_w	S_{web}	S_{punch}	A_c	N_{layers}	d_h	$f'_{c.max}$	Slend. Limit	Max. H_{wu}
250	146	200	50.0%	2	45	65	30	10,000



LW262D Axial Capacity ØN$_u$ (kN/m) Non-Ductile 2 layers

	k = 0.75	Continuous Floor e = 0.05t_w					Discontinuous Floor e <= 1/6t_w				
H_{wu}	H_{we}	25 MPa	32 MPa	40 MPa	50 MPa	65 MPa	25 MPa	32 MPa	40 MPa	50 MPa	65 MPa
6000	4500	1659	2124	2655	3319	4315	1318	1687	2109	2636	3427
5000	3750	1853	2371	2964	3705	4817	1511	1934	2418	3023	3929
4500	3375	1936	2478	3097	3872	5033	1595	2041	2551	3189	4146
4200	3150	1982	2537	3171	3963	5152	1640	2100	2625	3281	4265
3900	2925	2024	2591	3239	4049	5263	1683	2154	2693	3366	4376
3600	2700	2064	2642	3302	4128	5366	1723	2205	2756	3445	4479
3300	2475	2100	2688	3360	4200	5460	1759	2251	2814	3518	4573
3000	2250	2133	2731	3413	4267	5547	1792	2294	2867	3584	4659
2700	2025	2163	2769	3461	4327	5625	1822	2332	2915	3644	4737
2400	1800	2190	2803	3504	4380	5694	1849	2367	2958	3698	4807
2100	1575	2214	2834	3542	4428	5756	1873	2397	2996	3745	4869
1800	1350	2234	2860	3575	4469	5809	1893	2423	3029	3786	4922
Bearing capacity at standard bottom plate		2375	3039	3799	4749	6174	2375	3039	3799	4749	6174
Bottom plate may be deleted by the designer for core walls, shear wall. To be noted on drawings.											

LW262D Reinforcement

LW262D		Vertical Bars Each Face (min. N12 - 350)			
Allowable Bars		N12	N16	N20	N24
Horizontal Bars Each Face (min. N12 - 350)	N12				
	N16				
	N20				
	N24				

Horizontal Bar Spacing 200/300*/400
Vertical Bar Spacing 150 to 350
$f'_{c.max}$ 65 MPa, Concrete mix as per spec
*Average spacing

Acceptable
With Caution
Not Recommended

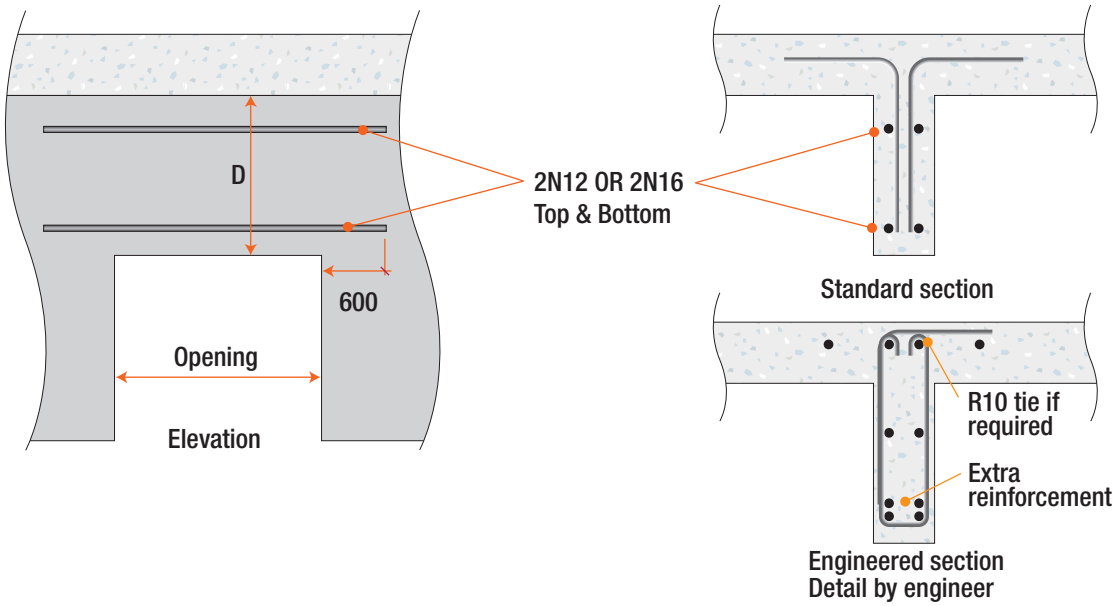
LW262D Flexural Capacity (stud only)

	Non Fire Rated Flexural Capacity, stud only				
	25 MPa	32 MPa	40 MPa	50 MPa	65 MPa
$\emptyset M_u$(kNm/m)	29.7	29.7	29.8	29.8	29.9

Non fire rated capacity, for local wind loads only (ignoring any extra reinforcement)

LW262D Double Reinforcement Lintels

Capacity given is for standard lintel, with minimum reinforcement. Engineer can add extra reinforcement to achieve higher capacity.



LW262 Standard Lintels with Vertical Studs UDL w*(kN/m)

	2N12 Top & Bottom, Depth (mm)					2N16 Top & Bottom, Depth (mm)				
D	300	450	600	900	1200	300	450	600	900	1200
d_{eff}	242	392	542	842	1142	242	392	542	842	1142
Span (mm)										
3900	12.1	21.6	31.1	50.2	69.3	20.9	38.3	55.6	90.3	96.2
3600	14.1	25.4	36.6	59.0	81.4	24.6	44.9	65.3	99.5	104.2
3300	16.8	30.2	43.5	70.2	93.1	29.2	53.5	77.7	108.5	113.6
3000	20.4	36.5	52.6	84.9	102.4	35.4	64.7	94.0	119.4	125.0
2700	25.2	45.1	65.0	95.2	113.8	43.6	79.9	114.1	132.7	138.9
2400	31.8	57.0	82.3	107.1	128.0	55.2	101.1	128.4	149.3	156.3
2100	41.6	74.5	98.6	122.5	146.3	72.2	132.0	146.7	170.6	178.6
1800	56.6	101.1	115.0	142.9	170.7	98.2	157.2	171.2	199.0	208.3
1500	81.5	121.3	138.0	171.4	204.8	141.4	188.7	205.4	238.8	250.0
1200	127.3	151.6	172.5	214.3	256.1	215.0	235.9	256.7	298.5	312.5
900	174.4	202.2	230.0	285.7	341.4	286.6	314.5	342.3	398.0	416.7
$ØM_u$(kNm)	16.7	29.9	43.1	69.5	95.9	28.9	52.9	76.9	124.9	172.9
$V_{u.max}$(kN)	250.0	437.5	625.0	1000.0	1375.0	250.0	437.5	625.0	1000.0	1375.0
$ØV_u$ (kN)	78.5	91.0	103.5	128.6	153.6	129.0	141.5	154.0	179.1	187.5
	f'_c = 25MPa, 50 cover (min)					f'_c = 25MPa, 50 cover (min)				

= ϕV_{uc} governs, otherwise ϕM_u

Based on testing (Refer report No C2004-02, titled "Lateral load resistance of AFS wall panels" by University of Centerbury, NewZealand) with $Ø_{bend}$ =0.8 , $Ø_{shear}$ =0.7 and k_{co} against steel = 0 as per clause 8.4.3 of AS3600-2018

D4. Non–Ductile Wall Detailing

Standard AFS wall detailing for Non-Ductile wall designs in accordance with AS3600-2018 Section 2.2 and the relevant clauses in Section 14.4.

Junctions

In general wall junctions are not required to transfer in plane lateral or shear loads across the junctions. Where transfer of in-plane lateral or shear loads across junctions is required the project engineer is to specify the AFS Special Junction Details on the structural documentation. If detailing is required beyond these special junctions AFS Technical Support is to be consulted and detailing reviewed.

Standard wall junctions

Standard junctions are used except where the structural documentation indicates otherwise. Core walls would generally be specified with special Junctions.

Standard Junctions – Single Reinforcement

Fig D1: Standard Cross Junction

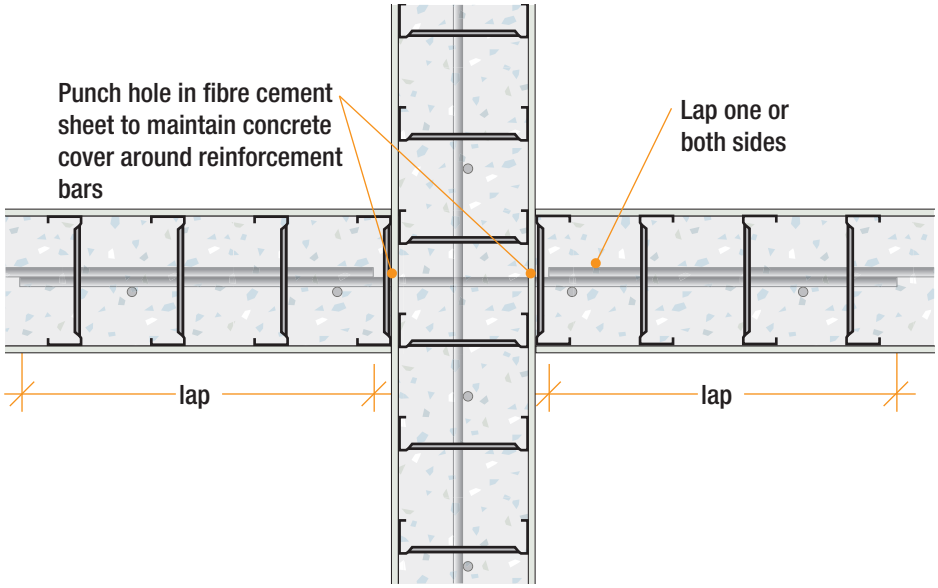


Fig D2: Standard AFS Open Corner Capping

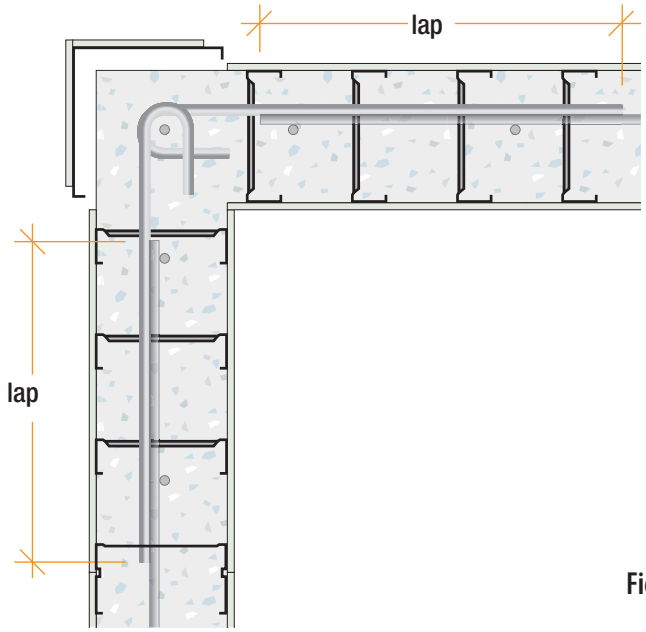


Fig D3: Standard T Junction Capping

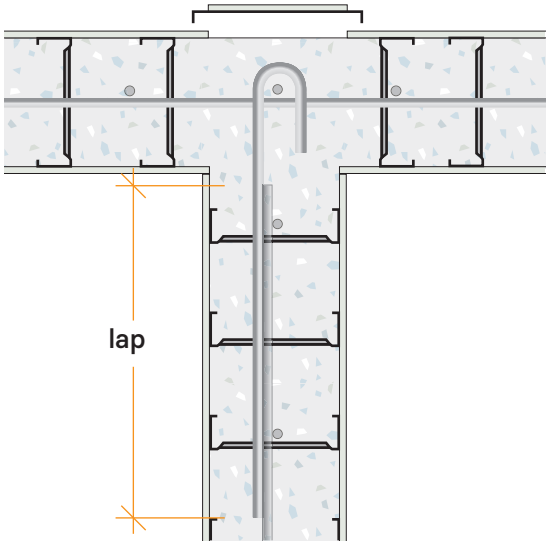


Fig D4: Standard Hook Bars

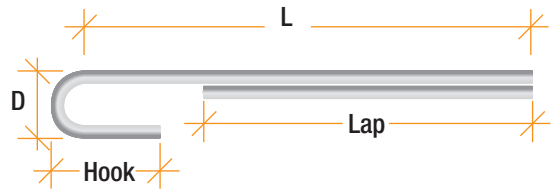


Fig D5: Standard Angle Junction

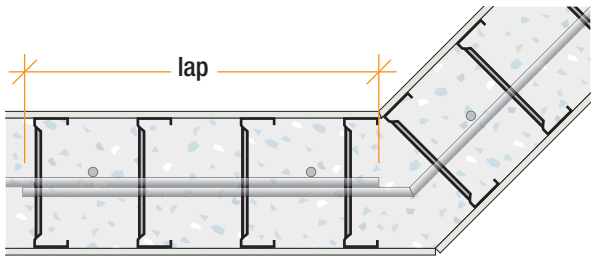


TABLE D6: Standard Hook Bar

Reo	D	L	Hook	Lap*	LW120	LW150	LW162	LW200
N12	60	550	70	450	Y	Y	Y	Y
N16	80	700	70	600	N	Y	Y	Y
N20	100	1000	80	900	N	N	N	Y

*non contact splice f'c>32MPa, Cover ≥ 30 AS3600 Cl13.1.2, 13.2.2

General notes:

- Standard details used unless specified by structural documentation
- Horizontal wall reinforcement to be stopped clear of junction as shown

Standard Junctions – Double Reinforcement

Fig D6: Standard Cross Junction

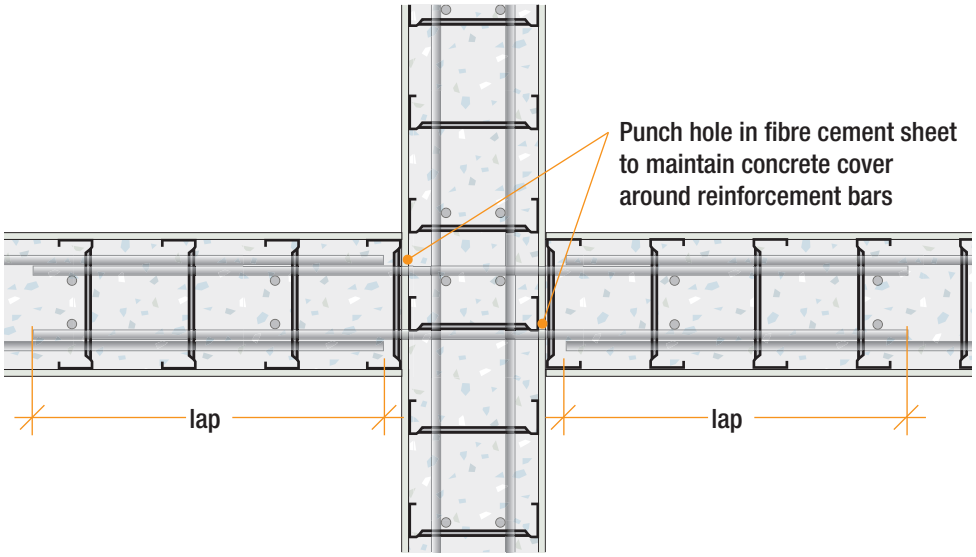


Fig D7: Standard AFS Open Corner Capping

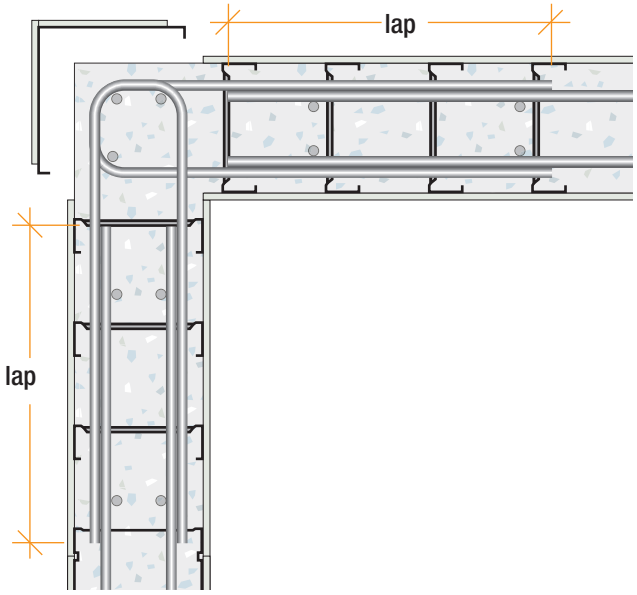


Fig D8: Standard T Wall Junction Capping

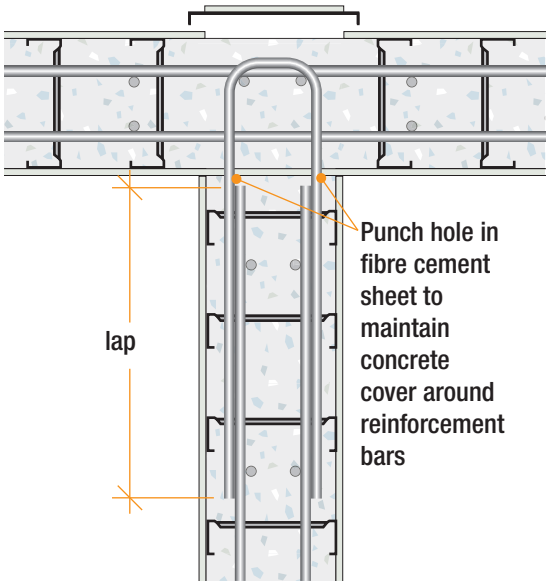


Fig D10: Standard U Bars

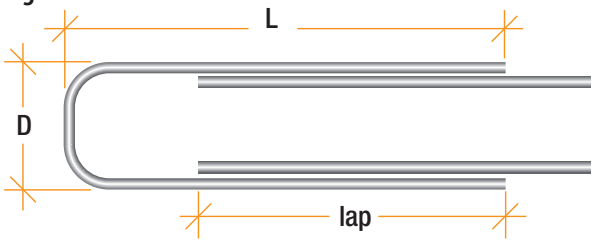


Fig D9: Standard Angle Junction

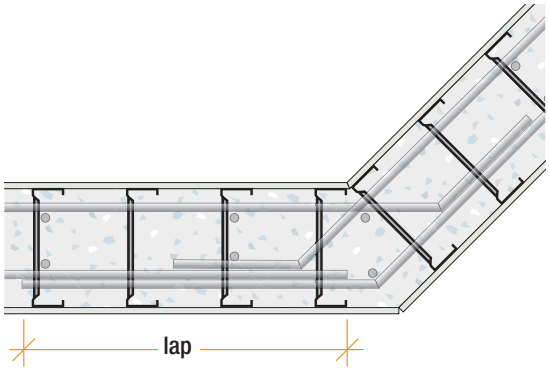


TABLE D7: Standard U Bar

Wall	Reo	D	L	Lap*
LW200D	N12	105	750	450
LW262D	N12	155	750	450
LW262D	N16	155	900	600

*non contact splice f'$_c$>32MPa, Cover ≥ 30 AS3600 Cl13.1.2, 13.2.2

Special junctions (where specified by the engineer)

Structural documentation is to specify where Special Junctions are to be used. If detailing is required beyond these special junctions AFS Technical Support is to be consulted and detailing reviewed. Special Junctions are only available for walls with two layers of reinforcement.

Special Junction Details will normally be specified for:

- Core walls
- Deep beams
- Any junction transferring inplane lateral or shear loads.

Special Junctions – Double Reinforcement

Fig D11: Special Cross Junction

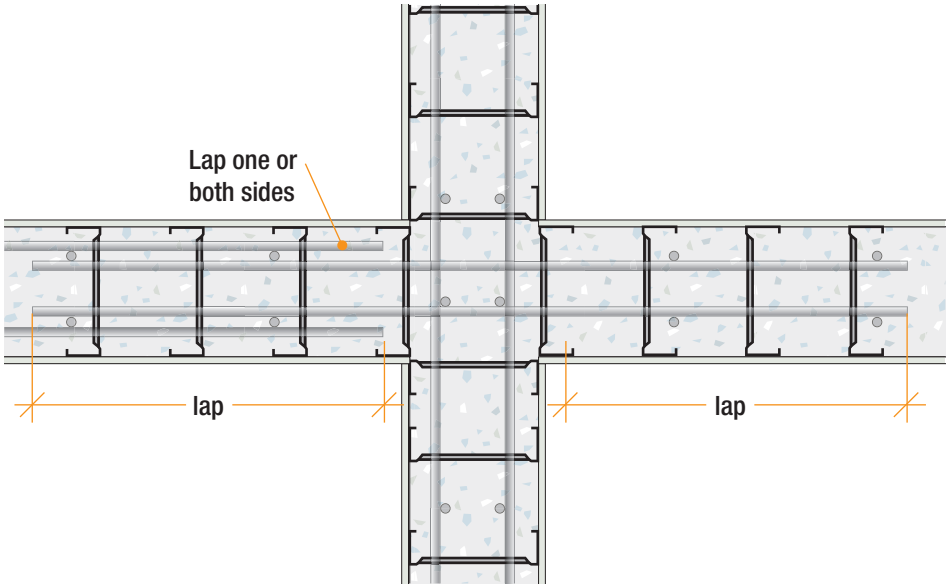


Fig D12: Special AFS Open Corner Capping

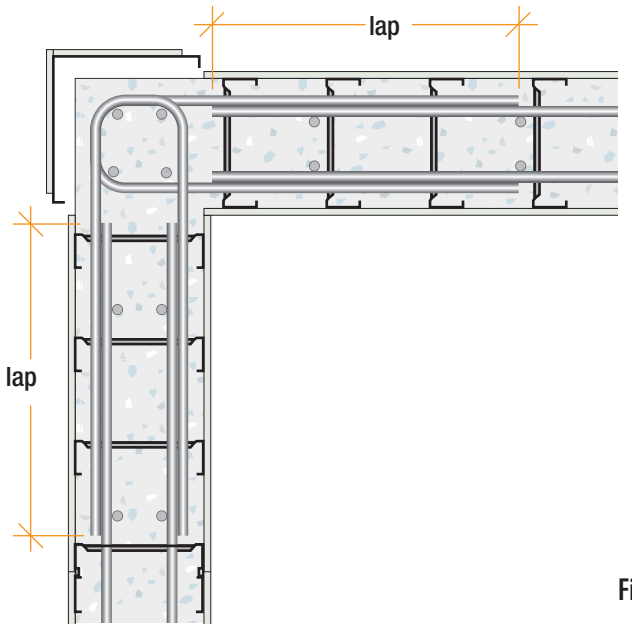


Fig D13: Special T Junction Capping

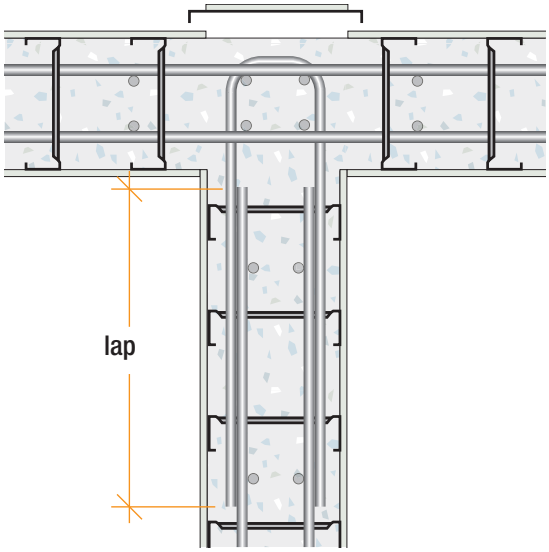
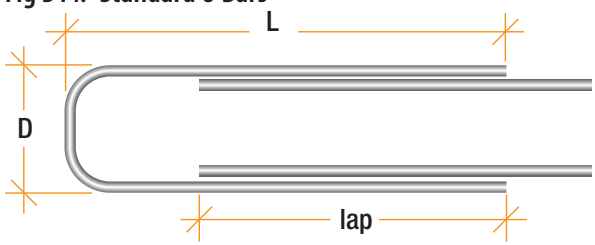


TABLE D8: Standard U Bar

Wall	Reo	D	L	Lap*
LW200D	N12	105	750	500
LW262D	N12	155	750	500
LW262D	N16	155	1050	800

*non contact splice f'$_c$>32MPa, Cover ≥ 30 AS3600 Cl13.1.2, 13.2.2

Fig D14: Standard U Bars



General notes:

- Standard details used unless specified by structural documentation
- Horizontal wall reinforcement to be stopped clear of junction as shown

Prefabricated Corners

Limited types of Prefabricated Corners are available on special order. These are limited by weight for fabrication and transport. Installation will require crane assistance.

Prefabricated AFS Logicwall® Corner Details

Fig D15: Standard L-Bar Factory Installed

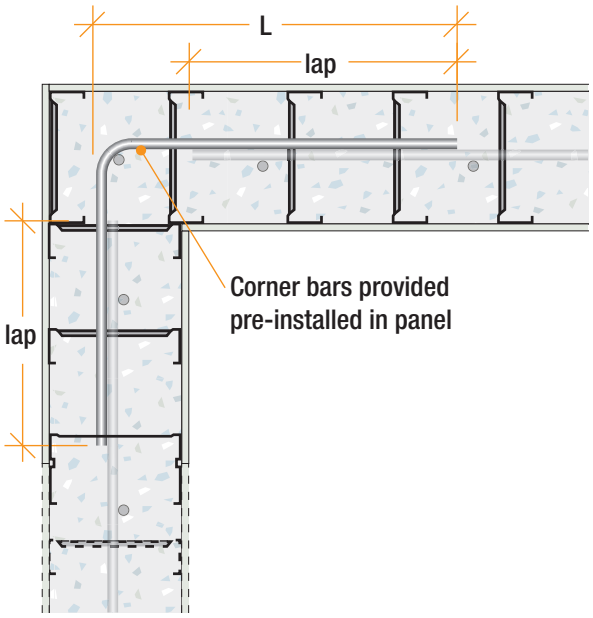


Fig D16: Standard U-Bar Factory Installed

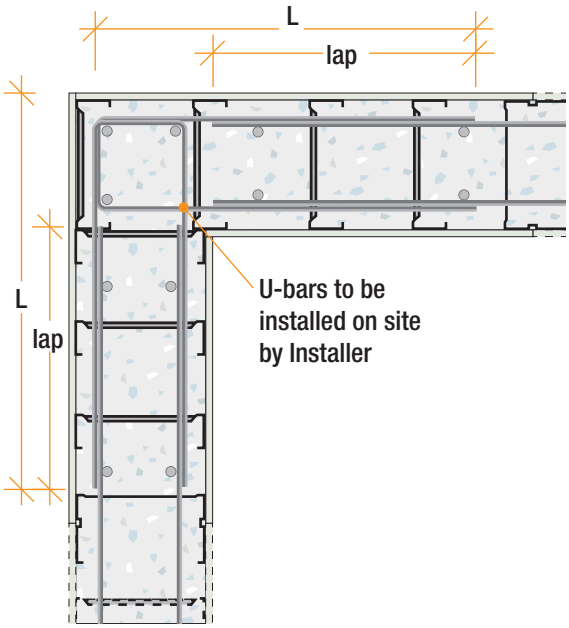


TABLE D9: Prefabricated AFS Logicwall® Corner Bar Details

Wall	Logicwall® Single Layer Corner N12 L Bar	Logicwall® Double Layer N12 U Bar	Lap*
LW120	550	–	450
LW150	550	–	450
LW162	550	–	450
LW200	550	600	450

General notes:

- Details used unless specified by structural documentation
- Horizontal wall reinforcement to be stopped clear of junction as shown
- * non contact splice f'_c>32MPa, Cover ≥ 30 AS3600 CL13.1.2, 13.2.2

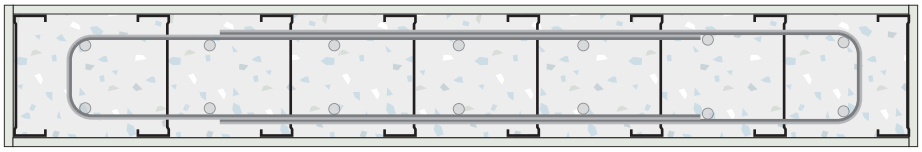
Non-Ductile Blade Walls/Columns

AFS uses the following definitions for Blade Walls/Columns.

Blade Walls

Blade walls are short walls designed as non-ductile walls without ligatures in accordance with Section 11 or as limited ductile less then 4 storeys as per Section 14, 11 and 10 of AS3600-2018. They are generally loaded concentrically, with concrete strength not greater than 50MPa and have no net tension in the strong or weak axis.

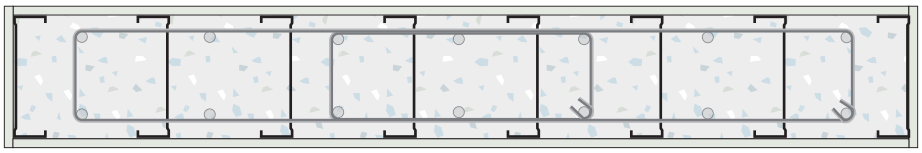
Fig D17: Logicwall® Blade Wall



Blade Columns

Are short wall designed as columns with ligatures to AS3600-2018 Sections 14 and 10.

Fig D18: Logicwall® Blade Column



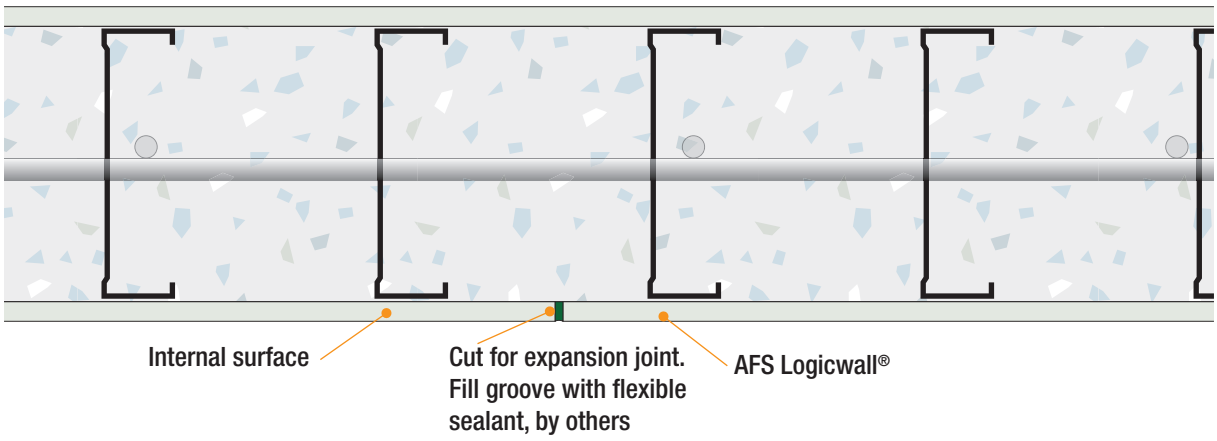
Joints

Various AFS standard joints maybe specified on the by the engineer on the structural documentation for non ductile walls as shown in the following sections

Sheet Surface Joint (Internal Surface Only)

Sheet surface joints are 6mm deep, (i.e. the full depth of the fibre cement sheet) to accommodate expansion the fibre cement sheet. These should be placed at max. 6.0m centres at the finishing stage, i.e. after wall is concrete filled at the time of setting the vertical recessed joints. Locations of sheet surface joints should be nominated by architect, as they can often be concealed behind glazing sections of cupboards. Fig D19 shows details of Logicwall® sheet surface joint.

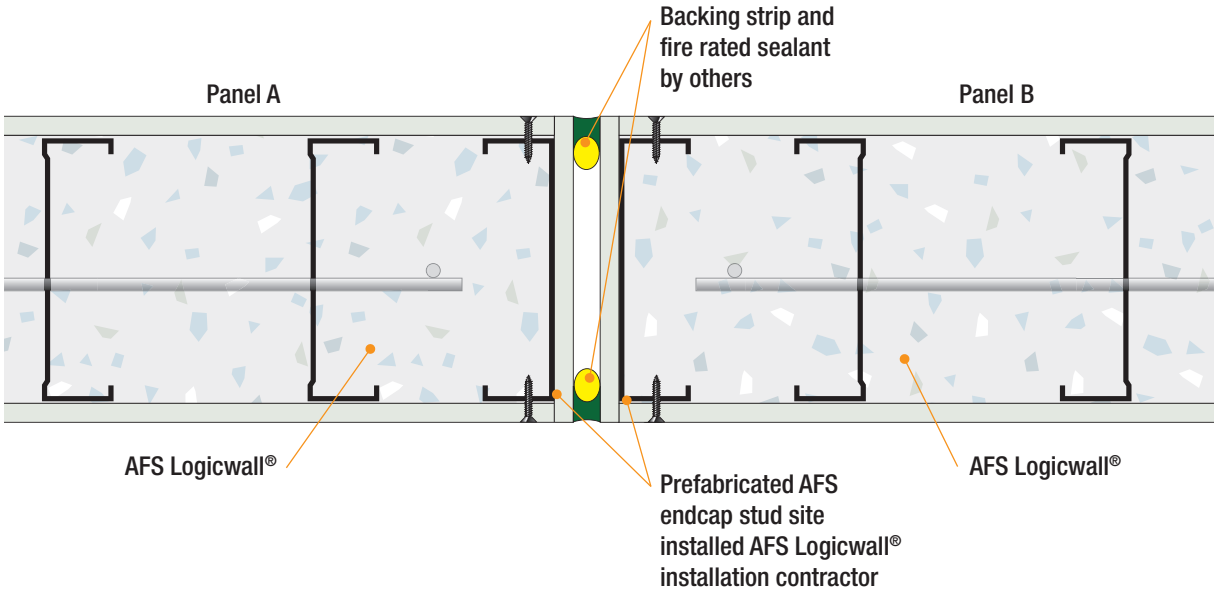
Fig D19: Logicwall® Sheet Surface Joint



Movement Joints

Movements joints will be required where specified in the project documentation. The structural concrete wall effectively has control joints at each stud so no additional crack control joints are necessary. Full depth "movement joints" may be required depending on the geometry of the structure and other considerations such as thermal loads, exposure and building joints. In general "movement joints" would not be required for walls less than 16m long. Structural movement joints will be placed in locations nominated by the structural engineer and must be documented on structural drawings. These will be installed at construction stage by the AFS Logicwall® installation contractor. Fig D20 shows details of Logicwall® movement joint.

Fig D20: logicwall® Movement joint



Note: Can be dowel jointed if required structurally. Must be clearly specified and negotiated with installers at time of tender. Installed where nominated by project engineer. Must be clearly documented on drawings. Typically not required in walls less than 16m in length.

Junction joints to structurally isolate walls either side of the junction and prevent transfer of inplane forces.

Fig D21: Logicwall® Corner Joint

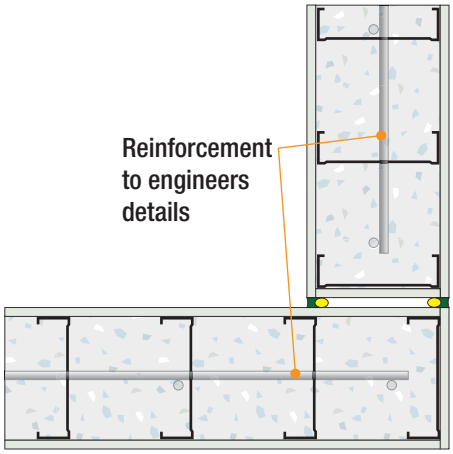
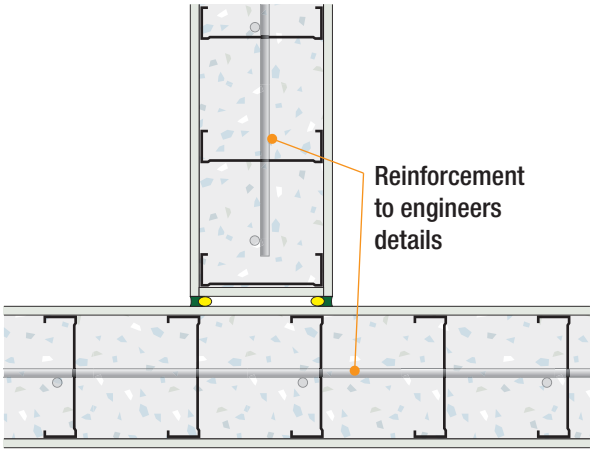


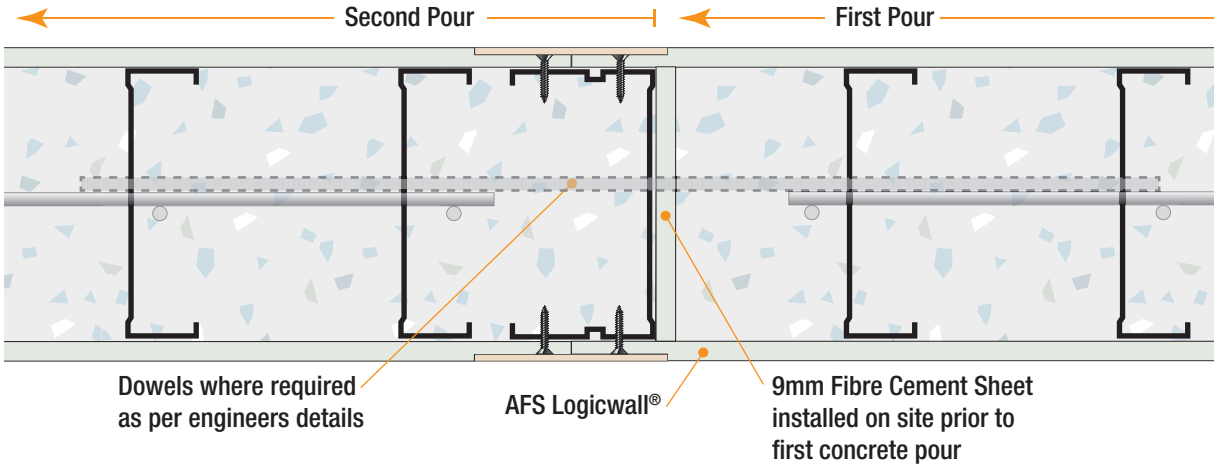
Fig D22: Logicwall® T joint



Construction Joint

Construction joints can be used wherever a pour break is required, walls may be split to prevent transfer of in-plane forces. Locations are to be specified on the project documentation.

Fig D23: Logicwall® Construction Joint



D5. Limited Ductile Wall Design

Limited Ductile Design

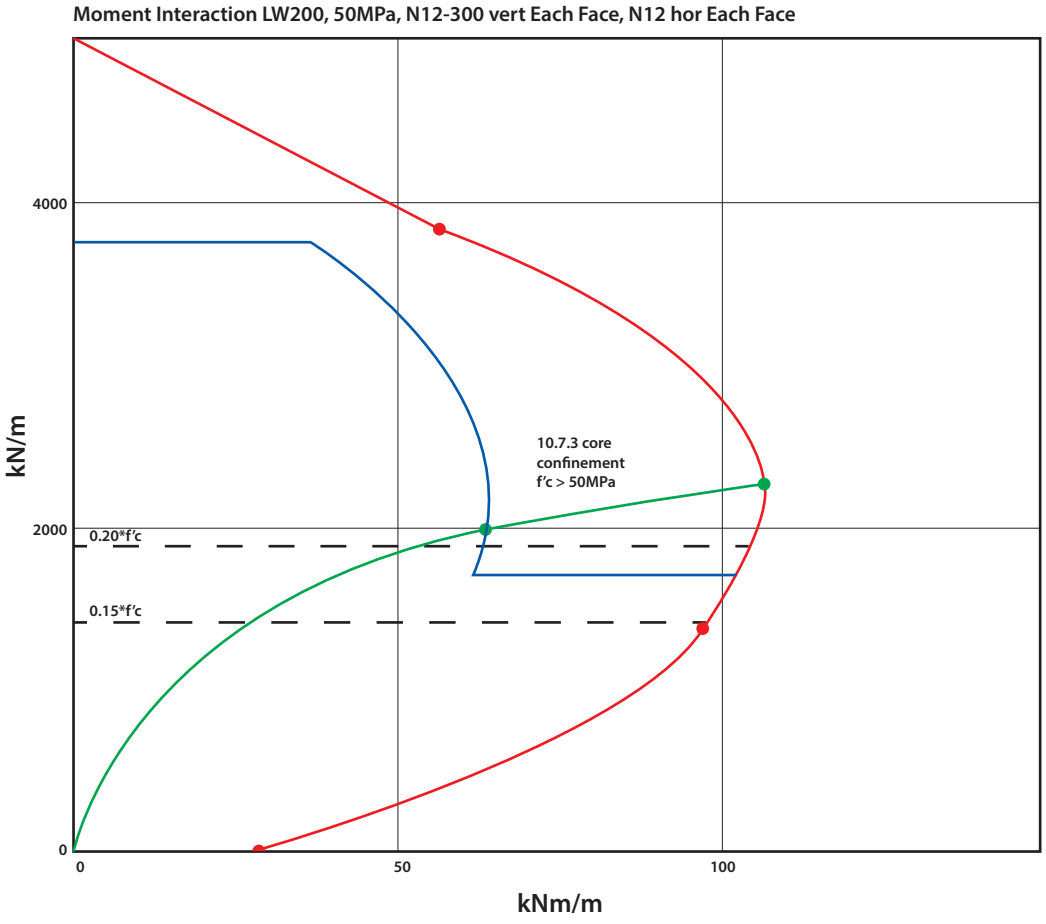
AFS Logicwall® can be designed to the requirements of AS3600-2018 Limited Ductile Walls. Limited Ductile Walls are to be designed to Section 2.2, Clause 14.4 and Clause 14.6 of AS3600-2018. Clause 14.6.1 requires the Limited Ductile walls to have reinforcement on each face and be detailed in accordance with the requirements of Clause 14.6.

Refer to the following sections for standard detailing to suit Logicwall® Limited Ductile Walls with boundary elements.

AFS Limited Ductile Walls are only to be installed by AFS approved experienced installers due to the additional detailing requirements. AFS detailing is to be used unless AFS Technical Support reviews and approves alternate detailing.

Below is a sample Moment Interaction curve showing LW200 capacity without core confinement.

Fig D24: Sample Moment Interaction



Limited Ductile Design Examples

The table below provides other design examples for Logicwall® over a range of reinforcement and concrete strengths.

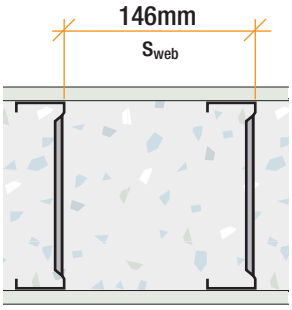
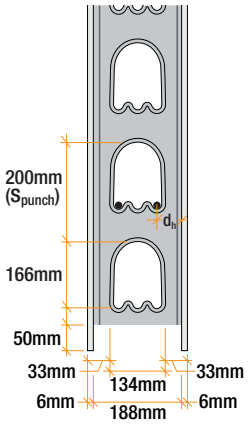
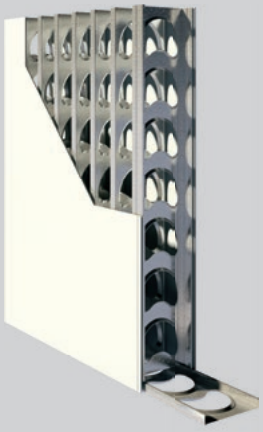
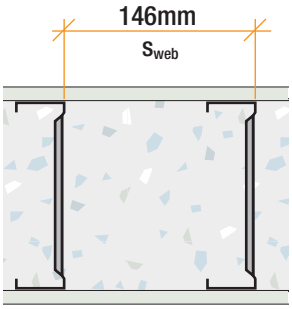
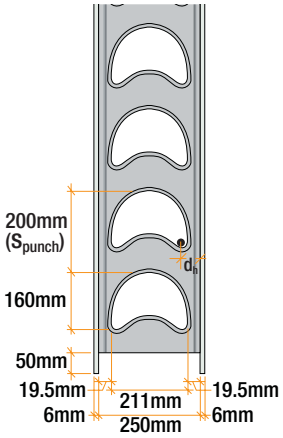
Panel		Plan	Elevation
LW200			
LW262D			

TABLE D10: Logicwall® Panel Properties

Wall Type	t_w	t_{fire}	N_{layers}	Slend. Limit	d_h	$f'_{c.max}$	A_c	Minimum Reinforcement
LW200D	188	146	2	30	41	50	50.0%	N12-200 Hor. N12-300 Vert.
LW262D	250	260	2	30	45	50	49.5%	N12-200 Hor. N12-375 Vert.

TABLE D11: Logicwall® Design Axial Force

Wall Description	Cl 11.7.4	H_{wu} K=0.75 (mm)	t_w (mm)	d_c (mm)	p	$ØN_u$ ØN(Cl 10.7.3) (kN/m)	14.6.2.1 $0.15*f'_c$ (kN/m)
LW200, 32MPa, N12-300 vertical Each Face, N12 Horizontal	Each Face (<1%)	3000	188	53	0.0040	1560 (-)	902
LW200, 50MPa, N12-300 vertical Each Face, N12 Horizontal	Each Face (<1%)	3000	188	53	0.0040	2250 (-)	1410
LW200, 50MPa, N16-220 vertical Each Face, N12 Horizontal	Each Face (<1%)	3000	188	53	0.0097	2370 (-)	1410
LW262, 32MPa, N12-300 vertical Each Face, N12 Horizontal	Each Face (<1%)	3000	250	57	0.0030	3040 (-)	1200
LW262, 50MPa, N12-300 vertical Each Face, N12 Horizontal	Each Face (<1%)	3000	250	57	0.0030	4470 (-)	1875
LW262, 50MPa, N20-250 vertical Each Face, N12 Horizontal	Each Face (<1%)	3000	250	61	0.0100	4820 (-)	1875

D5.1. Limited Ductile Wall Detailing

Standard AFS Wall Detailing for Limited Ductile Wall Designs in accordance with AS3600-2018 Section 2.2 and Clauses in 14.4 and 14.6. All limited Ductile Walls will have 2 Layers of reinforcement.

In general Wall fitments are not used in AFS Walls when designed in accordance to AS3600-2018 Clause 14.6 with f'_c <= 50 MPa. If fitments are required in small areas outside of boundary elements consult the AFS Technical Support for assistance.

Boundary Elements

AS3600-2018 Cl14.6.2 Boundary Elements requires Boundary Elements where extreme fibre compressive stress exceeds 0.15 f'c. The extent and detailing of the boundary elements are to be determined by the designer.

AFS Boundary Elements have special installation requirements and are only to be installed by AFS approved experienced installers. AFS detailing is to be used unless AFS Technical Suport reviews and approves alternate detailing.

Reinforcement

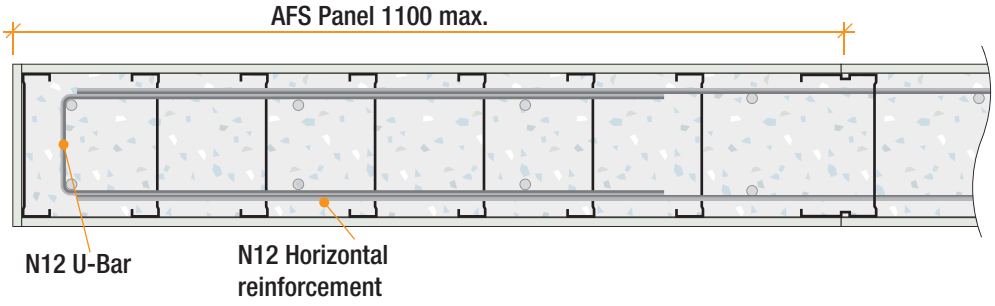
In accordance with AS3600-2018 Cl14.6.7 maximum vertical reinforcement for AFS Logicwall® shall be 2.1% (AS3600-2018 cl 14.6.7 21/f_{sy} at laps) including areas with boundary elements and laps. Minimum horizontal and vertical reinforcement shall be 0.0025.

Structures not more than four storeys

“For structures not more than four storeys above their structural base and where boundary elements are required” [AS3600 Cl14.6.2.2] the AFS standard end detail may be used as the boundary element.

AFS Standard Boundary Element will be used at all Boundaries unless specified in the project documentation.

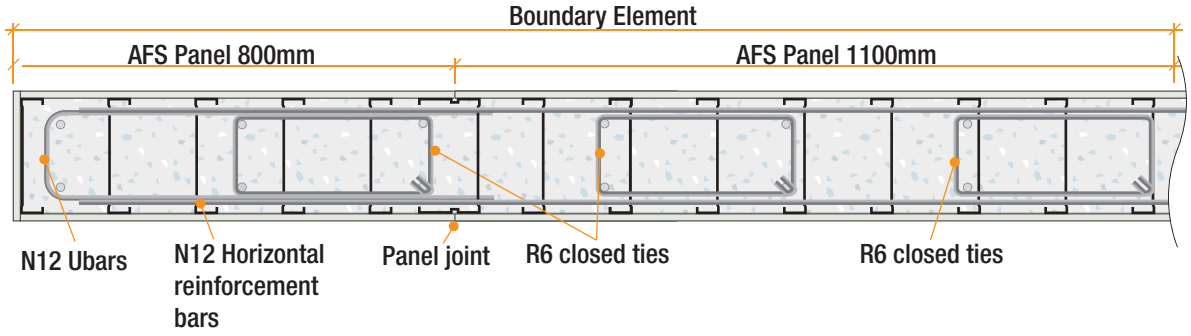
Fig D25: AFS Standard Boundary Element Not more than Four Storeys



Structures more than four storeys

For structures more than four storeys Cl14.6.2.3 requires boundary elements to conform to Cl10.7.4. The AFS Standard Boundary Element below can be installed during installation of the walls.

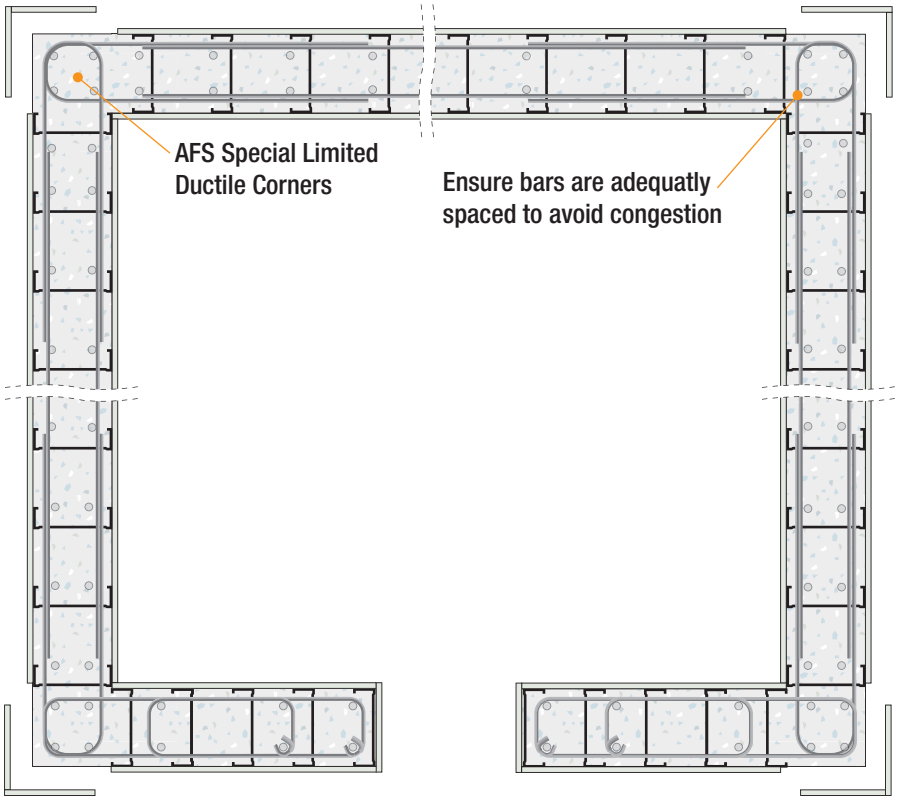
Fig D26: AFS Standard Boundary Element more than Four Storeys



Boundary elements closed fitments are to be spaced vertically in accordance with Cl 14.6.2 of AS3600-2018 as follows:

- Spaced at lesser of t_w and 200mm
- For structures more than four storeys as per Cl 14.6.2.3 of AS3600-2018.

Fig D27: AFS Limited Ductile Core Wall Detailing

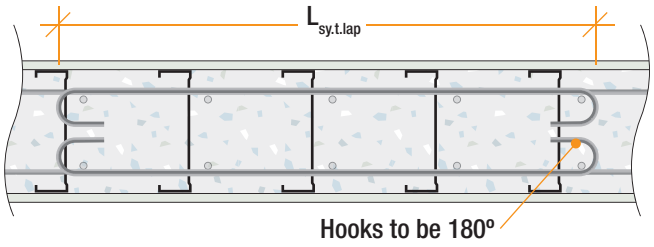


AFS Limited Ductile Wall Horizontal Reinforcement Wall Laps

AFS recommends Fig 14.6.7(D) of AS360-2018 only be used where required. Alternatives to the 14.6.7 detail are:

- Construction joints to split the walls and prevent transfer of in-plane lateral and shear loads.

Fig D28: Horizontal Wall Bar Lap Detail - 14.6.7(D)

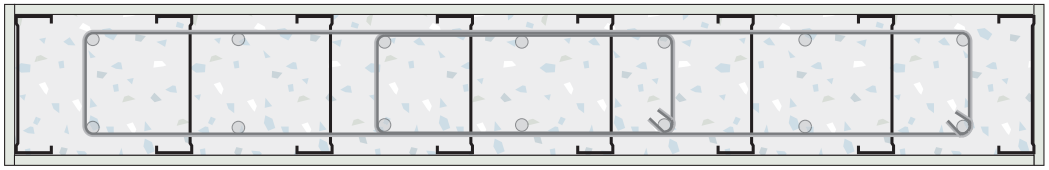


Blade Columns

Blade Columns

Are short wall designed as columns with ligatures to AS3600-2018 Sections 14 and 10.

Fig D29: Logicwall® Blade Column



Junctions

AFS Standard Junctions

Standard Junctions are not to be used with Limited Ductile Walls. Junction joints may be used to structurally isolate walls either side of the junction and prevent transfer of in-plane forces

AFS Special Junctions

Structural documentation is to specify where Special Junctions are to be used. If detailing is required beyond these special junctions AFS Technical Support is to be consulted and detailing reviewed.

Special limited Ductile Junction Details –Without Boundary Elements

Fig D30: Special Corner Type 1

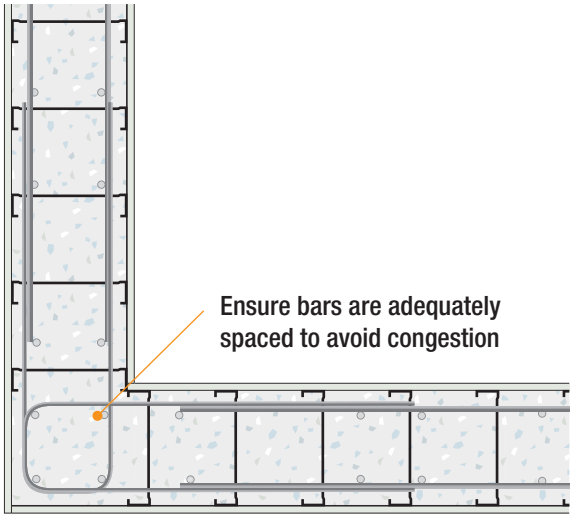


Fig D31: Special T junction

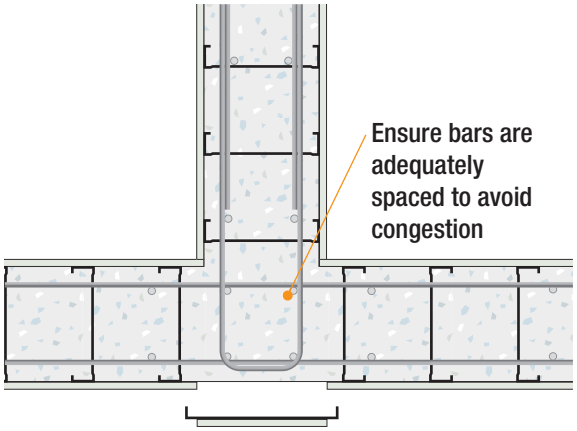
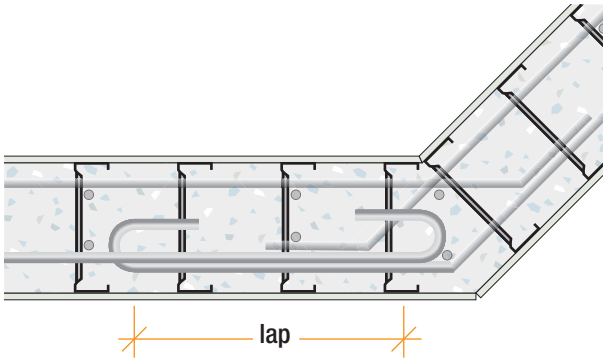


Fig D32: Special Angle Junction



N12 lap=450mm, N16 Lap=600

Fig D33: Standard U Bars

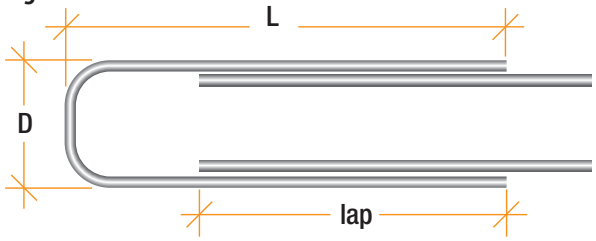


TABLE D12: Special U Bar

Wall	Reo	D	L	Lap*
LW200D	N12	105	750	500
LW262D	N12	155	750	500
LW262D	N16	155	1050	800

*non contact splice f'_c>32MPa, Cover ≥ 30 AS3600 Cl13.1.2, 13.2.2

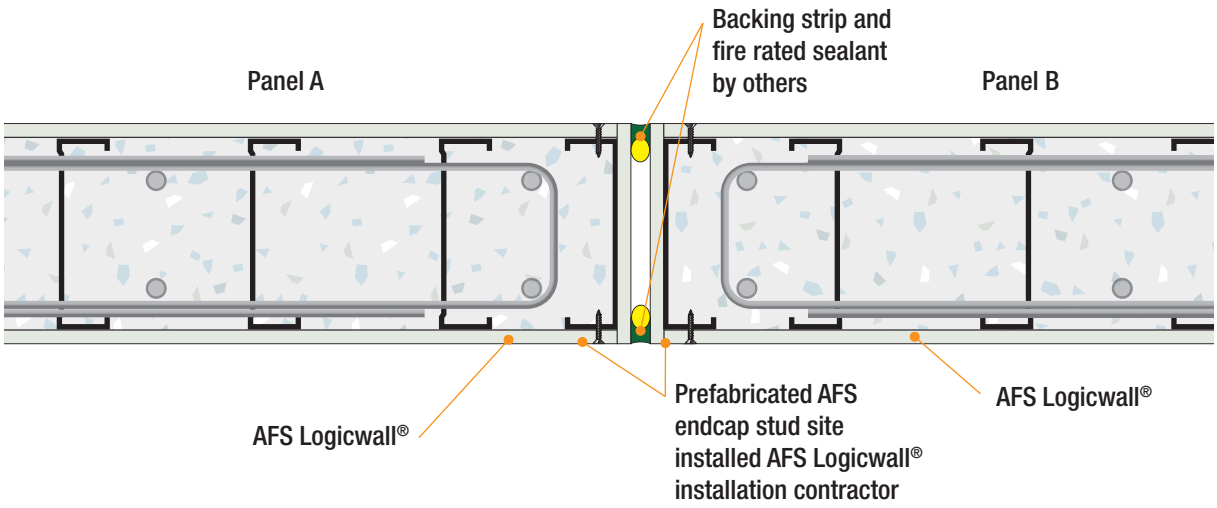
Movement Joints

Movement joints will be required over any building joints and where specified on the project documentation

The structural concrete wall effectively has control joints at each stud so no additional crack control joints are necessary. Full depth "movement joints" may be required depending on the geometry of the structure and other considerations such as thermal loads, exposure and building joints. In general "movement joints" would not be required for walls less than 16m long. Structural movement joints will be placed in locations nominated by the structural engineer and must be documented on structural drawings. These will be installed at construction stage by the AFS Logicwall® installation contractor.

The following method is recommended.

Fig D34: Logicwall® Movement joint

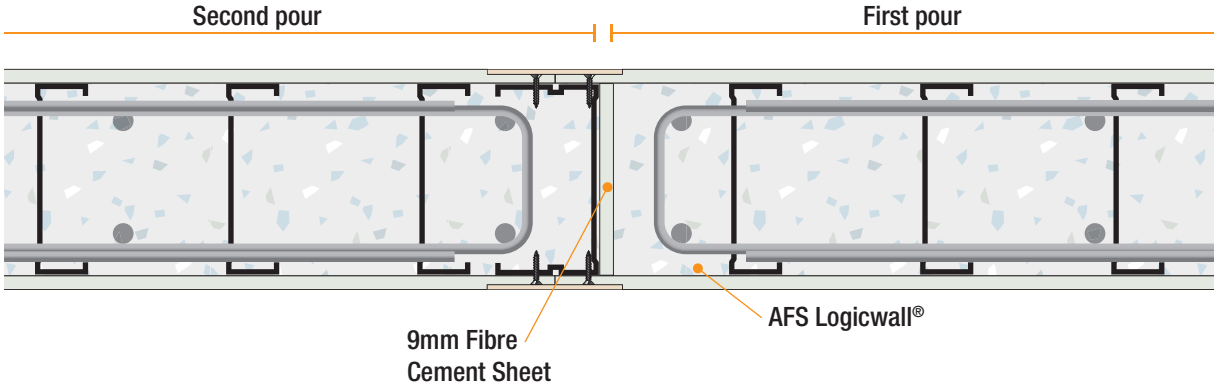


Note: Can be dowel jointed if required structurally. Must be clearly specified and negotiated with installers at time of tender. Installed where nominated by project engineer. Must be clearly documented on drawings. Typically not required in walls less than 16m in length.

Construction Joint

Construction Joints can be used wherever a pour break is required, walls may be split to prevent transfer of in-plane forces. Locations are to be specified on the Project Documentation.

Fig D35: Logicwall® Sheet Surface Joint



Wall Junctions Joints

Junction Joints to structurally isolate walls either side of the junction and prevent transfer of inplane forces.

Fig D36: Logicwall® Corner Joint

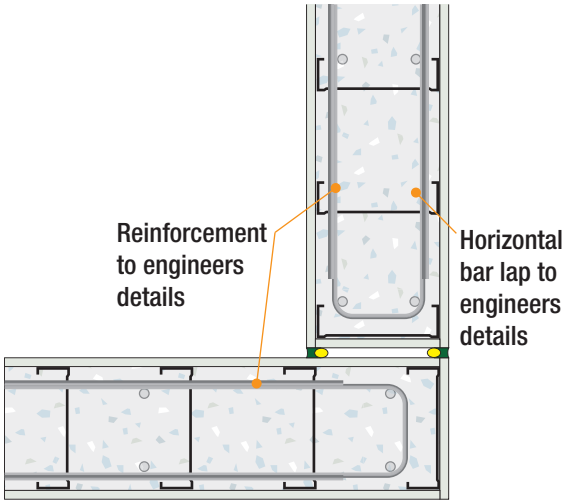
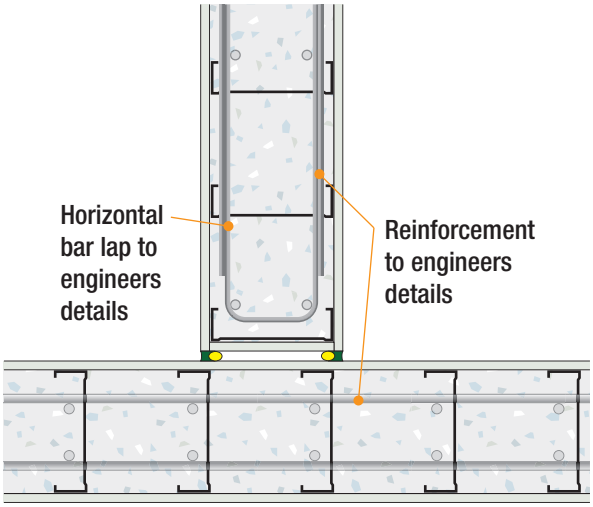


Fig D37: Logicwall® T joint



D6. CORE FILLING OF WALLS

Introduction

AFS Logicwall® is to be filled with AFS special concrete mix. The concrete mix and concrete placement technique is critical to the successful outcome of filling logicwall®.

AFS has carried out tests which achieved desired compaction and dense, homogeneous coverage of AFS Logicwall®.

This guide sets out the methods used by AFS to achieve suitable compaction.

Use of this guide or an equivalent procedure to achieve compaction of Logicwall® is entirely at the discretion of the contractor or installer.

The contractor or installer is responsible for achieving compaction and dense, homogeneous coverage of the concrete mix in Logicwall®. AFS accepts no responsibility for achieving compaction of the concrete in AFS Logicwall® or core filling of walls.

Refer to "Core Filling of Walls" on page K34 for further information.

Concrete Pour Limitations

When panel installation is complete and all appropriate bracing and checks completed, the walls can be filled with concrete.

The quantity of concrete that can be poured in a day must be assessed and determined in consideration of the following factors:

- Ease of access
- Number of passes (or lifts) that are required
- Concrete gelling time between passes
- Consideration of wet weather

For wet weather, on-site conditions should be assessed and the concrete pour either be delayed or be undertaken with caution, applying measures to suit the given conditions.

Additional Equipment Required for Concrete Pour

Prior to commencing a pour, ensure that a concrete vibrator with flexible shaft and 38mm head is ready for use, and that multiple shovels, trowels, screw guns, screws and at least one wheelbarrow are readily available.

afs logicwall®

December 2023

Section E
Internal Design Considerations

Logicwall® Internal Design Considerations, Levels of Finish, Movement Joints, Sheet Surface Joints, Wall Preparation, Joint Setting, Over Sheeting, Applied Finishes.

CSR

Contents

E1. Internal Design Considerations

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Introduction

AFS Logicwall® panels are faced with 6mm fibre cement sheets which, at the completion of the construction process, provide the wall face and substrate for applied finishes and decorating.

The fibre cement sheets bear similar features to plasterboard, however are much harder-wearing and more impact resistant.

The final finish of AFS Logicwall® is influenced by factors such as structural movement and sheet surface joints, correct alignment of panels at installation stage, glancing"or critical lighting, joint setting methods and the applied finishing system.

There are a number of methods for ensuring that the finished AFS Logicwall® meets end user expectations. for best results, these should be considered in the planning stages of a project and be clearly set out in specifications.

It is good practice to construct a reference area of finished AFS Logicwall® to provide a benchmark and to aid in judging quality of walls throughout a project.

Levels of Finish

Levels of finish are defined in AS/NZS 2589.1, and are intended to provide builders, installers and their customers with defined methods and practices necessary to meet the customer's expectations in terms of 'Level of Finish'.

It is essential for designers and builders to determine the level of finish required before construction commences, otherwise it may not be possible to attain the desired finish level without extensive corrective measures.

In general, Logicwall®, without further treatment such as skim coating or over sheeting, achieves Level 4 finish which is +/- 4mm across an 1800mm plane.

Level 5 finish should be used wherever gloss or semi-gloss paints are to be used, where paint is mid or dark coloured, or where critical light conditions occur such as from windows, skylights or silhouette and spot lighting. Level 5 finish can be achieved through skim coating Logicwall®. Refer to 'Joint Setting and Skim Coating' in this chapter.

For internal walls AFS recommends the adoption of one of 3 finishing systems;

1. Joint setting and patching only.
2. Joint setting, patching and skim coating.
3. Over-sheeting.
    A. Direct stick plasterboard
    B. Batten and Sheet
    C. Discontinuous Stud Wall

Lighting

The flatness of Logicwall® is influenced by factors such as the accuracy of the substrate, the installation methods, joint setting and finishing textures. A surface that appears perfectly flat in one lighting condition can seem uneven in another.

Critical lighting or glancing light is where the incident light from an artificial or natural source is nearly parallel to the surface. This condition exaggerates vertical joints and any minor imperfections making them obvious.

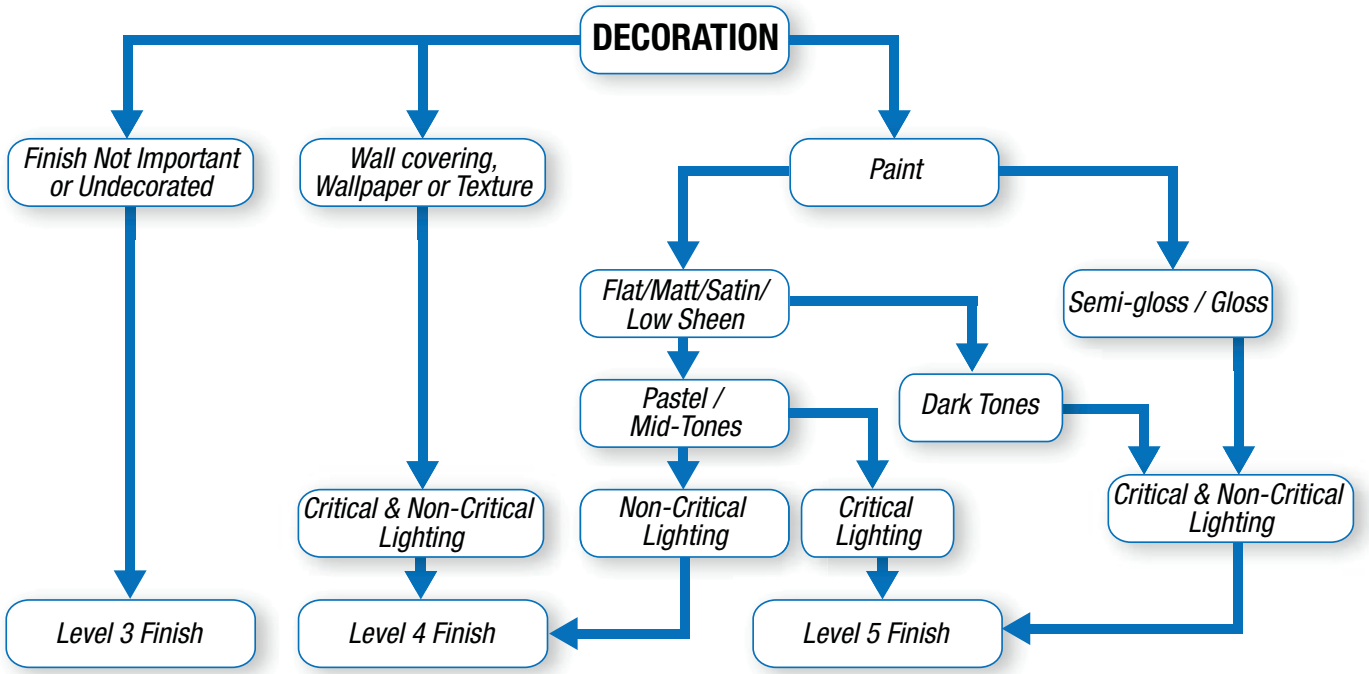
Ways to minimise the effect of critical or glancing light include:

- Use more rather than fewer lights and install at regular spacings to give a more even, diffused light and to minimise the shadows that occur from a single row or single light source.
- Design soft rather than harsh lighting conditions.
- Avoid placing windows immediately adjacent to the end of a wall.

Levels of Finish (continued)

- Provide sun shades over the window.
- Recess the window to stop the sunlight reaching the wall.Levels of finish (continued)

Fig E1: Process for determining appropriate level of finish

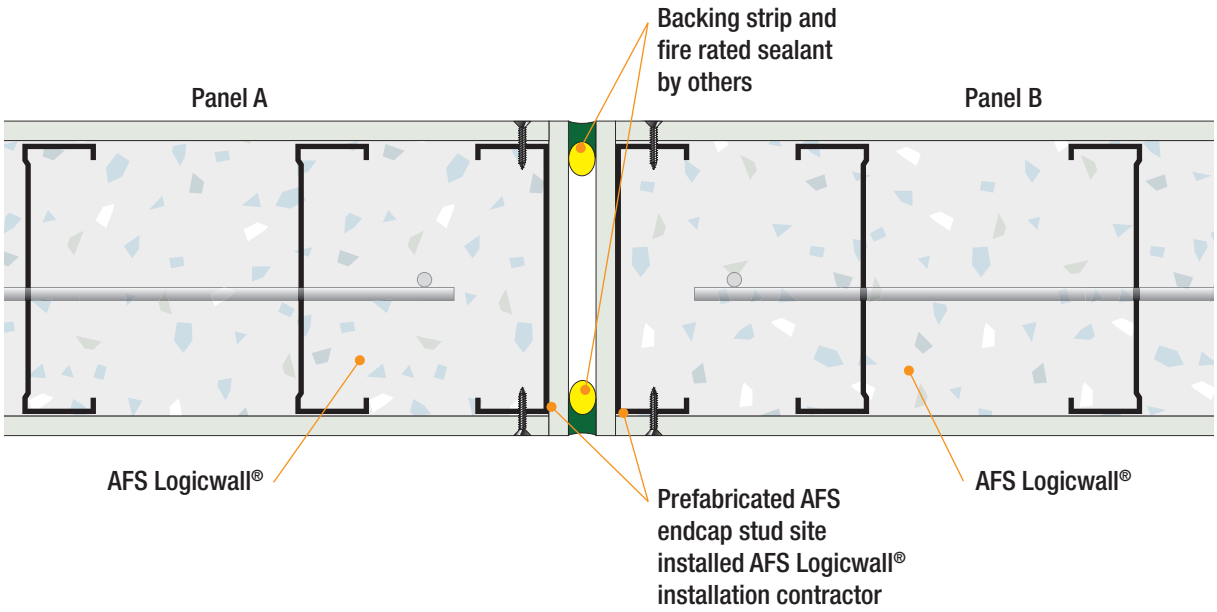


Movement Joints

Movement joints

The structural concrete wall effectively has control joints at each stud so no additional crack control joints are necessary. Full depth "movement joints" may be required depending on the geometry of the structure and other considerations such as thermal loads, exposure and building joints. In general "movement joints" would not be required for walls less than 16m long. Structural movement joints will be placed in locations nominated by the structural engineer and must be documented on structural drawings. These will be installed at construction stage by the AFS Logicwall® installation contractor. The following method is recommended.

Fig E2: Logicwall® Movement Joint

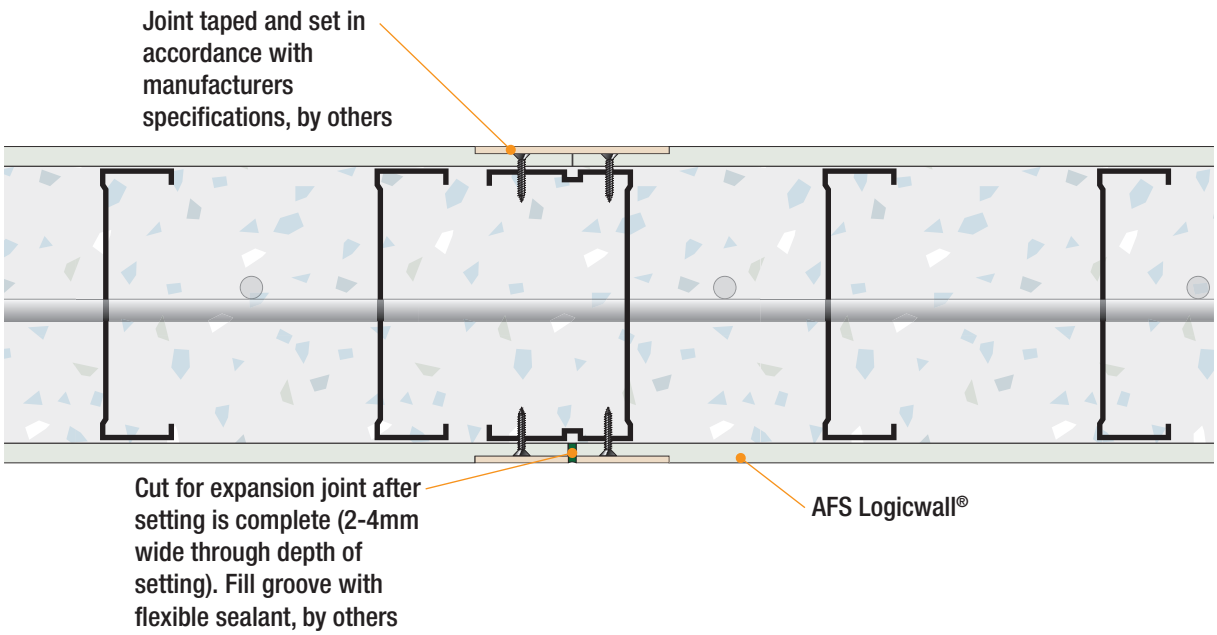


Note: Can be dowel jointed if required structurally. Must be clearly specified and negotiated with installers at time of tender. Installed where nominated by project engineer. Must be clearly documented on drawings. Typically not required in walls less than 16m in length.

Sheet Surface Joints

Sheet surface joints are 6mm deep, (i.e the full depth of the fibre cement sheeting) to accommodate the movement in the fibre cement sheet. These are placed at maximum 6m centres at finishing stage ie. after wall is concrete filled at time of setting the vertical recessed joints. Locations of sheet surface joints should be nominated by the architect as they can often be concealed behind glazing sections or cupboards. The following method is recommended:

Fig E3: Sheet Surface Joint

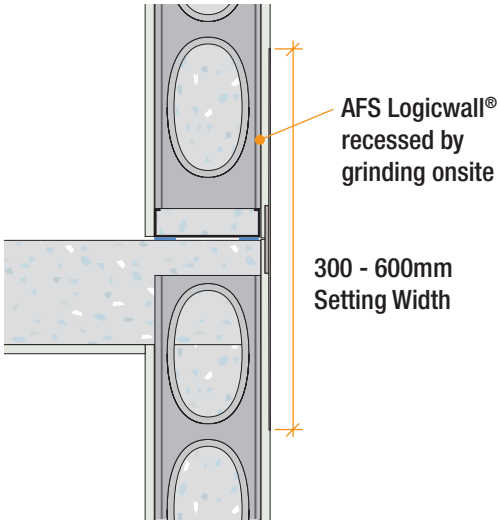


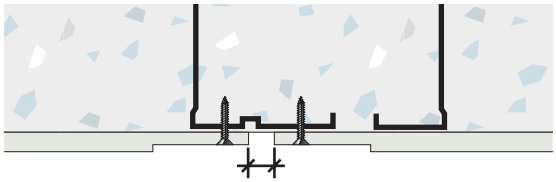
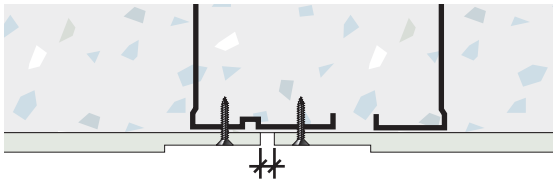
Wall Preparation

Prior to joint setting the panels may require preparation in the following areas and as outlined in the following table.

- Horizontal butt joints where setting rebate has been ground may need additional preparation. eg. Sanding of furry edges.
- Tolerance gaps between vertical panel joints greater than 5mm wide are to be filled with a suitable joint filler.
- Tolerance gaps between vertical panel joints less than 5mm wide are to be filled with the base coat of the setting system.
- Any misaligned panel joints should be ground flush to create a flat surface.
- Any proud screws should be removed or recessed just inside the sheet surface.
- Patching of scratches and dents in panel surfaces resulting from other trades throughout construction phase.

TABLE E1: Wall Preparation

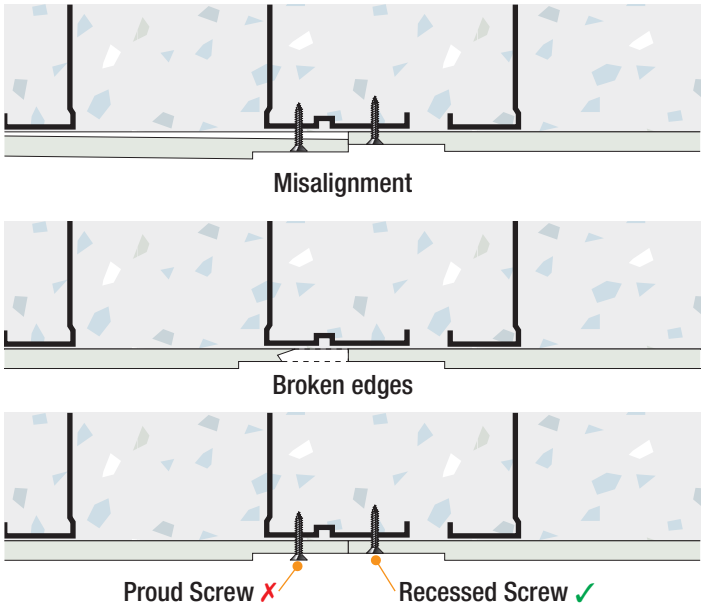
Horizontal Butt Joints	
Rebates are to be ground onsite with the joint to be treated as per CSR joint setting procedure. This rebate will not reflect standard rebated joints and will require additional preparation by the internal setting contractor.	

Tolerance Gaps	
• Tolerance gaps between vertical panel joints greater than 5mm wide are to be filled with a suitable joint filler. • Tolerance gaps between vertical panel joints less than 5mm wide are to be filled with the base coat of the joint setting system.	 Tolerance gaps greater than 5mm  Tolerance gaps less than 5mm

Wall Preparation

Wall prep work includes:

- Patching broken FC edges.
- Grinding flush protruding FC board or concrete.
- Removing screws or punching screws flush.



Scratches and Dents

AFS Logicwall® is a permanent formwork system which comes through the construction phase, resulting scratches and dents in the FC panel surface are to be patched by the internal setting contractor prior to and/ or following the first prep coat.

Note: This especially applies to reinforcement bar penetrations on corner panels, T junctions.

System One - Joint Setting Only

For joint setting AFS Logicwall® it is necessary to achieve a high strength joint to resist thermal movement and a smooth surface for decorating. There are two methods which are suitable.

Note: Being a permanent formwork system, there will be a percentage of joints that may require further treatment, such as grinding or feathering out the top coat plaster 300mm wide each side of the joint, to achieve an acceptable finish.

METHOD ONE - General thermal conditions.

(suitable for most applications):

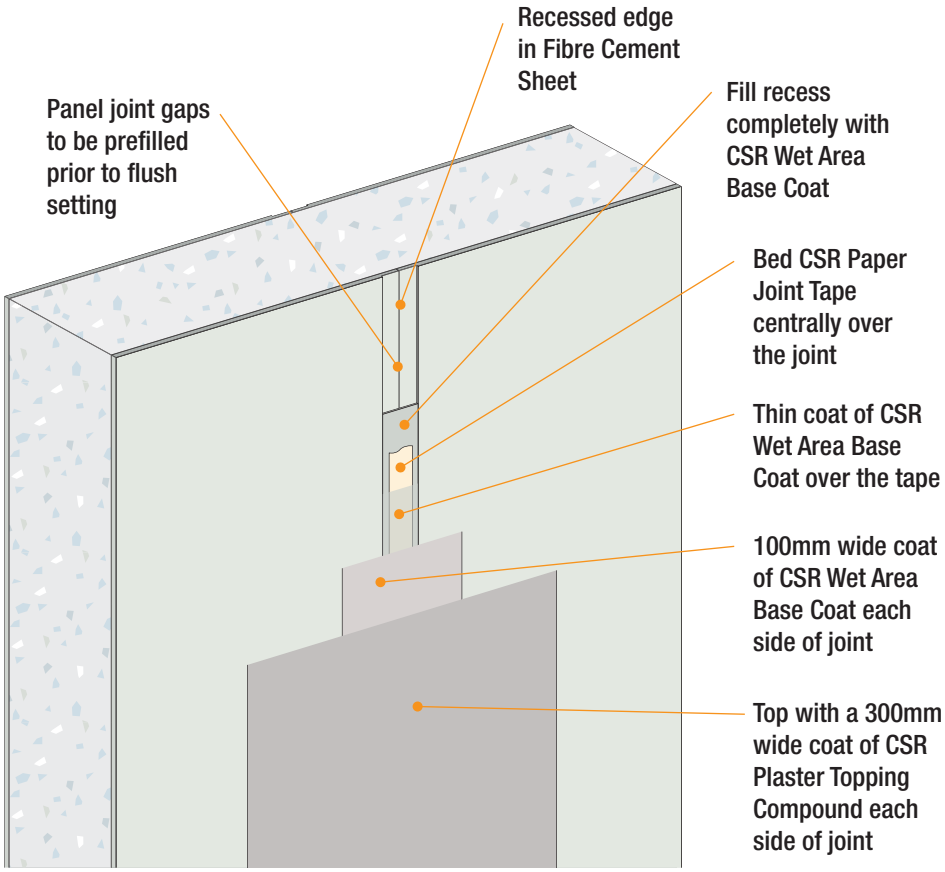
- Gap between fibre cement sheets at vertical panel joint is to be pre-filled with a suitable joint filler.
- In a bed of Gyprock® Wet Area Base Coat, immediately bed Gyprock® Paper Tape centrally over the joint. Press tape firmly into compound to avoid trapping air behind it.

  Trowel a thin layer of Wet Area Base Coat over the tape then allow to dry for 24 hours. It is important that the first layer of Wet Area Base Coat does not surface dry (skin) before the tape is bedded. This might involve working in cooler parts of the day, cutting tape to length in preparation, bedding and taping short lengths of one joint at a time.
- When the first layer is dry, apply a second layer of Wet Area Base Coat to a width of 100mm. Allow to dry for 24 hours.

  Note: "Mud" cracking of Wet Area Base Coat can appear on drying, especially in hot weather. This does not affect the performance of the joint and is covered by the topping compound.
- Top with CSR plaster topping compound 300mm wide or greater each side of the joint to achieve an acceptable finish. Allow it to dry before painting.

When it has set and completely dry, sand the compound smooth with 150 grit paper or with 220 grit sanding mesh. Avoid any heavy pressure which may scuff the joints.

Fig E4: Method One – Joint Setting Only



Note: The set joints in AFS Logicwall® may be visible in critical or glancing light conditions. AFS recommends to the designer or builder that under those circumstances further treatment should be applied as set out in Joint Setting and Skim Coating.

System One - Joint Setting Only (continued)

METHOD TWO - Extreme thermal conditions.

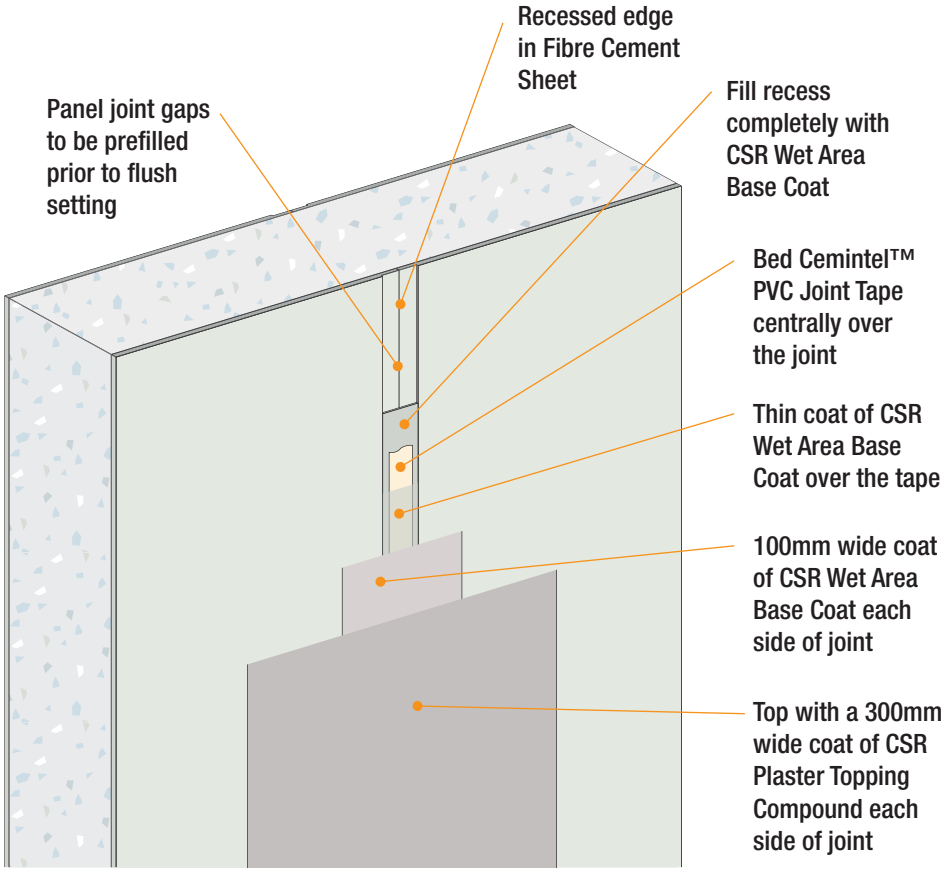
Testing (refer to appendix Section J) has shown that joints with this method have tensile strength similar to that of 6mm fibre cement sheet, and so can be expected to perform well in extreme conditions.

- Gap between fibre cement sheets at vertical panel joint is to be pre-filled with a suitable joint filler.
- In a bed of Gyprock® Wet Area Base Coat, immediately bed PVC Cemintel™ External Joint Tape centrally over the joint. Press tape firmly into compound to avoid trapping air behind it.

  Trowel a thin layer of Wet Area Base Coat over the tape then allow to dry for 24 hours. It is important that the first layer of Wet Area Base Coat does not surface dry (skin) before the tape is bedded. This might involve working in cooler parts of the day, cutting tape to length in preparation, bedding and taping short lengths of one joint at a time.
- When the first layer is dry, apply a second layer of Wet Area Base Coat to a width of 100mm. Allow to dry for 24 hours.

  Note: "Mud" cracking of Wet Area Base Coat can appear on drying, especially in hot weather. This does not affect the performance of the joint and is covered by the topping compound.
- Top with CSR plaster topping compound 300mm wide or greater each side of the joint to achieve an acceptable finish. Allow it to dry before painting.

Fig E5: Method Two – Joint Setting Only



Note: The set joints in AFS Logicwall® may be visible in critical or glancing light conditions. AFS recommends to the designer or builder that under those circumstances further treatment should be applied as set out in Joint Setting and Skim Coating.

System One - Joint Setting Only (continued)

METHOD ONE - Internal and External Corner Setting.

Fig E6: Internal Angle Joint Setting

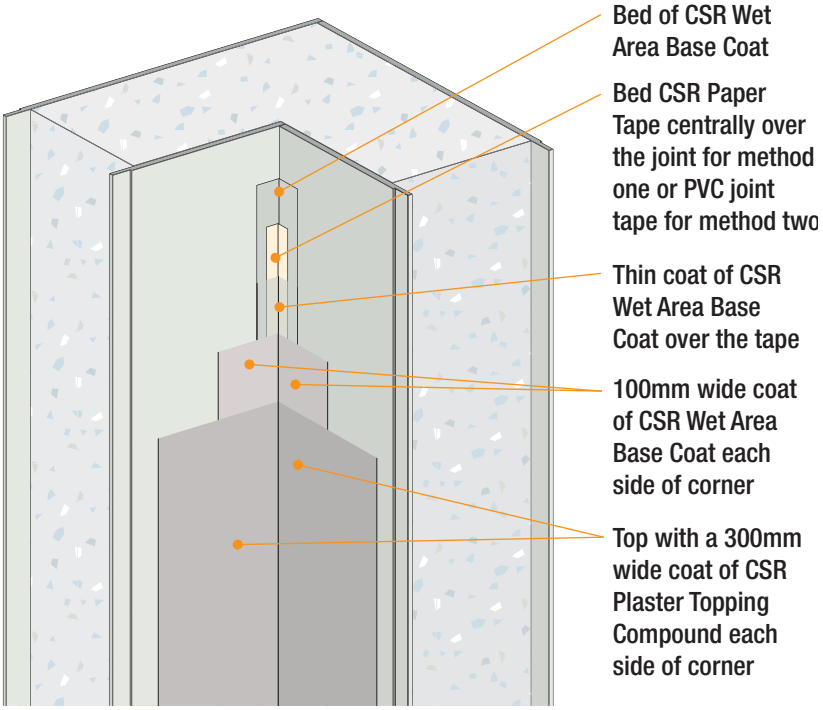
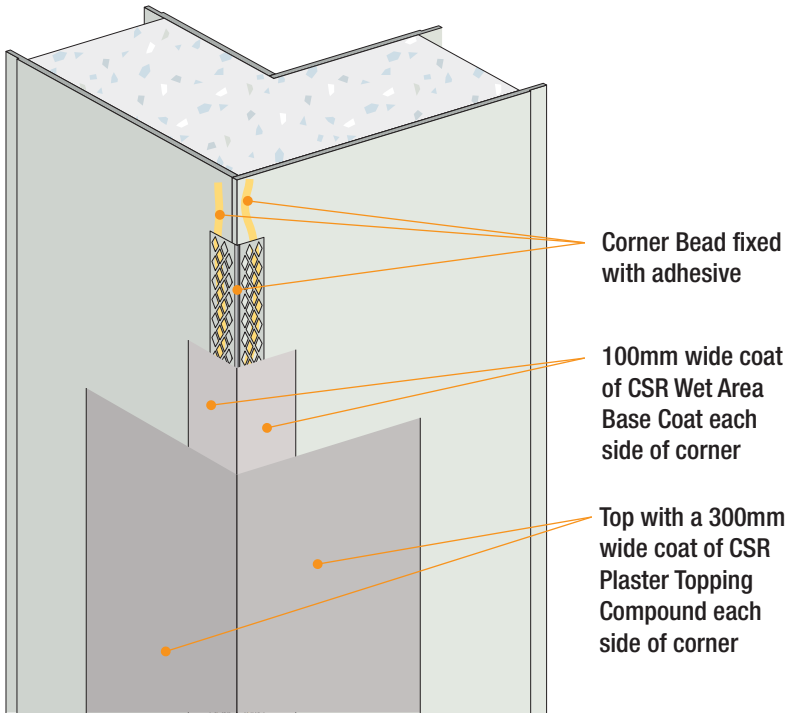


Fig E7: External Joint Setting



System Two - Joint Setting and Skim Coating

Skim coating is a term used to describe a thin finish coat, trowelled or airless sprayed onto the prepared wall surface, and then possibly sanded, to achieve a smooth and even finish. It is normally less than 1mm in thickness and is applied over the entire surface to fill imperfections in the joint work, smooth the board texture and provide a uniform surface for decorating. All joints must be set and finished in accordance with the previous section - System One - Joint Setting Only. All indents or gouges shall be filled to a flat finish in the plane of the surface of the board and the board must be kept free of any dirt, oil or other foreign matter which could cause a lack of bonding.

Roller Application

Skim Coat Material (recommended):

- Gyprock Total Joint Cement mixed to consistency suitable for roller application.

Roller Equipment (suggested):

- Large lambswool roller.
- Foam roller (without nap).

PROCEDURE

1. Prepare equipment and compound mix
2. Apply the first coat using a large lambswool roller.
3. Immediately follow with back rolling using a foam roller to flatten the surface. Allow to dry.
4. If required, apply subsequent coat(s) as described in Steps 2 and 3. Allow to dry. Sand and prepare for paint finish, using 150 to 180 grit sandpaper.

Achieving a Level 5 Finish

PREPARATION

'Level 5 Finish' cannot be achieved without a high degree of preparatory work. It is critical to achieving a successful outcome that each of these requirements is reached and checked prior to proceeding to the next step.

The following points should also be noted:

- The maximum permissible frame deviation is 3mm per 3 metre. Carefully check and correct any problem areas before proceeding.
- Recess and butt joints should be taped and set with a three coat system. Internal angles should be taped and set with a two coat system. External angles should be set with metal bead and a three coat system. Fastener heads and accessories should receive three coats of compound. Allow each coat to dry before proceeding.
- All indents or gouges shall be filled to a flat finish in the plane of the surface of the board. All joint compounds should be carefully sanded to a smooth finish free of tool marks and ridges.
- Wall linings must be kept free of any dirt, oil or other foreign matter which could cause a lack of bonding

What Kind of Skim Coating Compound Should be Used

CSR Gyprock Total Joint Cement should be used to conceal small imperfections in joints and on the surface of fibre cement sheets. It will also smooth the texture of sheet and create a more uniform surface to which final decoration can be applied.

How to Apply

1. Mix the CSR Gyprock Total Joint Cement with water to achieve roll on consistency. Water should be added to the compound gradually until the desired consistency is achieved. The goal is to have a compound thin enough that can be rolled smoothly, without sagging, with a paint roller.
2. Using a long nap roller cover (13mm), roll the compound evenly on the surface to be skimmed. It is best to work in small sections of 0.5-1.0 metre. It is highly desirable that excess compound be removed or smoothed off with trowel while compound is still wet.

Note: long nap roller cover should be fully cleaned before use and should be free from dirt, debris and loose fibres. It will minimise appearance of scratches on the surface after trowelling with broad knife.

3. Using wide broad knife, remove excess compound to achieve smooth flat finish. Broad knife should be pulled tightly across the surface of the fibre cement sheet. The key to roll skimming a wall is not to leave excess compound on the surface. Excess compound would need more sanding. Roll skimming works compound into pores of the fibre cement sheet to achieve similar consistency to that of joints and screw heads. Broad knife is bent gently with pressure applied to the right side of the knife therefore slightly floating the edge of compound so as not to leave the tool marks.
4. Once the compound is dry for 3-4 hours, depending on the temperature/humidity conditions, light sanding using 150 grit sandpaper would be required to remove any minor imperfections. If too much skimmed compound was left, it can require more sanding due to greater possibility of imperfections in thicker compound layer. A good light source aimed along the surface is necessary to see any imperfections that were not covered by roller skim coating. If minor imperfections can't be removed by further sanding, application of second

System Two - Joint Setting and Skim Coating (continued)

coat of roller skim (Step 1-4) should be considered before final decoration.

Important Note: The quality of roller skim coating is necessary to create very smooth walls. The taping and coating process are also important to allow for a flat wall. If the joints are too humped out or caved in even roller skim coating will not be able to correct these flaws.

5. The smooth flat skim coated surface is now ready for final decoration. 1 coat of quality fibre cement primer and 2 coat of paint should be applied according to paint manufacturer's recommendation. The prepared skim coated surface should be coated with a quality paint primer/sealer before application of final paint application. If primer is applied using spraying equipment, light sanding may be required around joint area and screw heads to remove any fibres raised during joint preparation stage. The application of high quality paint high solids primer/ sealer and paint will minimize decorating issues.

System Three - Over Sheeting

Over sheeting is a term used to describe the application of plasterboard veneer over the AFS Logicwall® and can be achieved by the following methods:

- Direct stick plasterboard
- Batten and sheeting or
- Discontinuous stud wall

As AFS Logicwall® applications vary from project to project, so do the architectural, acoustic and thermal requirements. The following options provide flexibility for the designer, particularly where an air gap or cavity is required.

METHOD ONE - Direct Stick Plasterboard

'Direct stick plasterboard' is a term used for directly adhering plasterboard lining to AFS Logicwall®. This system provides another alternative and flexibility for the designer when considering internal wall finishes.

PROCEDURE

1. Surface of AFS Logicwall® is to be clean, dry and free of dust, oil and other elements that may reduce adhesive performance.
2. Establish the basis of a true wall plane before commencing installation. Leveling pads that may be required where irregularities in the wall surface occur.
3. Apply daubs of plasterboard adhesive to the AFS Logicwall® surface or to the back of the plasterboard sheets at 450mm centres maximum vertically and "horizontally (plasterboard can be fixed horizontally or vertically). Hold sheets in position until adhesive sets by using temporary masonry nails.
4. Setting of the plasterboard joints is to be carried out in accordance with the setting methods provided by the appropriate plasterboard supplier.

Note: Where direct stick plasterboard is being applied to a wall requiring an acoustic rating, plasterboard adhesive may need to be troweled on to prevent a drummy effect when wall is impacted. Discuss with your acoustic consultant prior to installation.

Fig E8: Horizontal Fixing

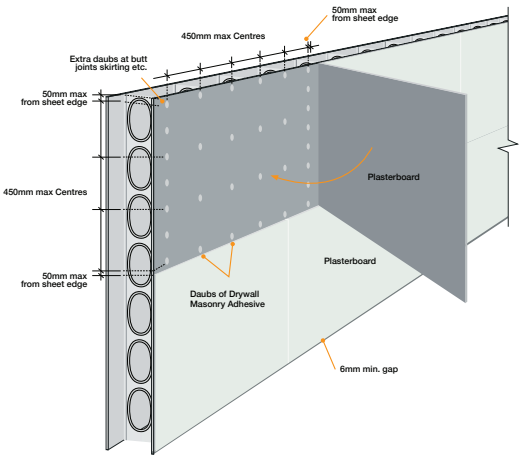
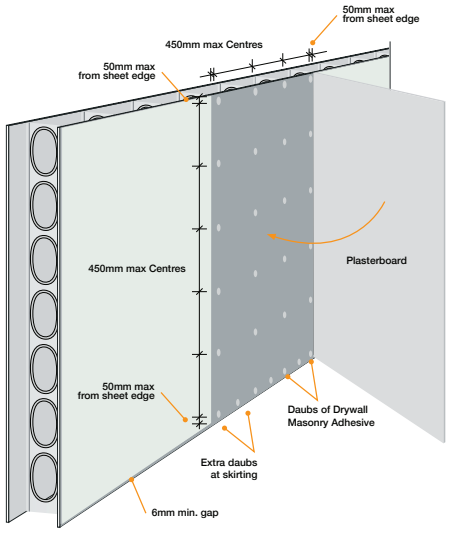


Fig E9: Vertical Fixing



System Three - Over Sheeting (continued)

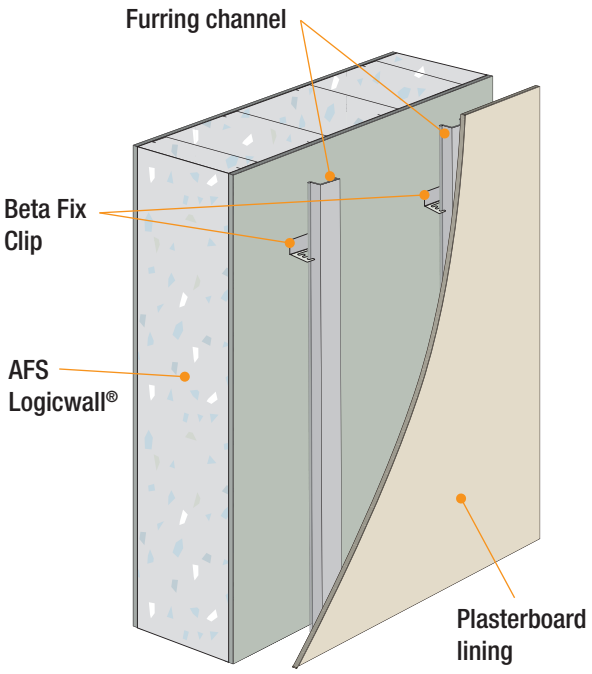
METHOD TWO - Batten and Sheeting

Batten and sheeting is a term used where timber or steel battens are fixed to the AFS Logicwall® and over sheeted with plasterboard or similar interior lining board. Most commonly 19mm or 28mm furring channel is used for battening walls.

PROCEDURE

1. Battens are fixed vertically at 600mm centres to the AFS Logicwall® using the contractors preferred masonry fixing system. Where furring channels are used, furring channel clips are fixed to the AFS Logicwall®. The furring channel is then clipped into the clip system. In some cases furring channels may require fixing using a resilient mounted clip system for acoustic purposes. For details on fixing options contact your furring channel supplier.
2. Insulate cavity where required.
3. Plasterboard, or similar interior lining system, is fixed to the battens using the standard fixing procedure provided by the interior lining supplier. Sheets can be fixed horizontally or vertically.
4. The interior lining board joints are set using the setting methods adopted by the interior lining board installer.

Fig E10: Batten and Sheeting



(Insulation can be installed within cavity to meet thermal requirements, typically for external facade walls)

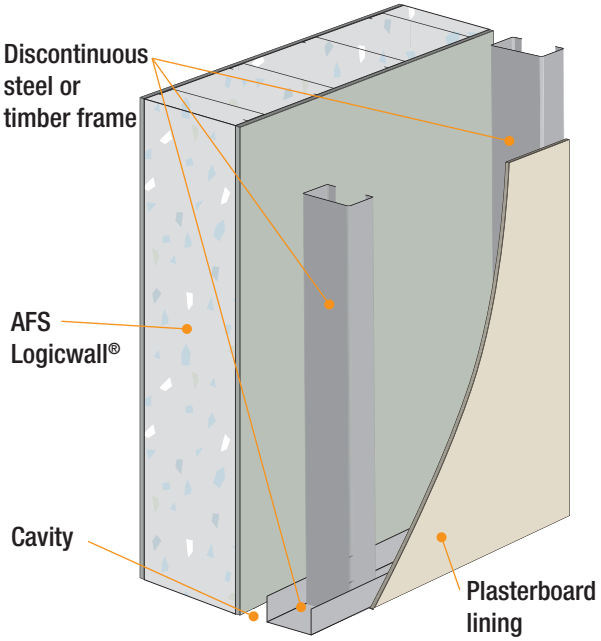
METHOD THREE - DISCONTINUOUS STUD WALL

'Discontinuous stud wall' is a term used where a separate stud wall is erected parallel to the AFS Logicwall® for the purposes of running services or to meet acoustic or thermal requirements. Steel or timber frames can be used, however steel stud and track is most common.

PROCEDURE

1. Determine the cavity size required and mark stud frame location on slab.
2. Assemble/erect frame according to procedure provided by supplier.
3. Insulate cavity where required.
4. Plasterboard, or similar interior lining system, is fixed to the stud wall using standard fixing procedure provided by the interior lining supplier. Sheets can be fixed horizontally or vertically, however horizontally is recommended.
5. The interior lining board joints are set using the setting methods adopted by the interior lining board installer.

Fig E11: Discontinuous Stud Wall



(Insulation can be installed within cavity to meet thermal requirements, typically for external facade walls)

Applied Finishes

Selection

Internal finishes applied to AFS Logicwall® can have a significant effect on the perceived quality of the installation, particularly where critical lighting conditions exist.

General rules when selecting the applied finish are:

- Textured or heavy patterned finishes tend to hide imperfections.
- Matt finishes minimise imperfection visibility.
- Semi-gloss and gloss finishes highlight imperfections.
- Lighter colours (compared to darker colours) are less likely to show imperfections and impact damage, and are more effective at diffusing the light and reducing shadow effects, particularly in smaller rooms.
- Gloss paints tend to highlight paint application variations eg. where a good wet edge has not been maintained when painting.
- Paint or thin wallpaper finishes are less tolerant of imperfections.
- Paint applied with a longer pile roller tends to mask imperfections better than paint applied with a short pile roller.

Decoration

AFS Logicwall® surfaces may be decorated in any of a variety of finishes including flat, semi-gloss or gloss paint, wallpaper or vinyl, texture or stipple.

Roll coated paints generally have a greater coating thickness and create a similar texture on both the plasterboard and the jointing compounds.

No building material has an absolutely flat surface and all that can be expected in practice is an appearance of flatness. The effect of glancing light on the appearance of flat surfaces is described in the CSIRO Division of Building Research Report No. L8 (Revised Edition). This report clearly demonstrates that surfaces which seem perfectly flat in diffuse light appear rough and uneven when light strikes nearly parallel to the surface.

Painting

Select a proprietary paint system and apply all paints strictly in accordance with the respective manufacturer's instructions.

The use of a preparatory coat over the entire surface is recommended prior to application of the finish coats due to the differing texture and porosity of uncoated fibre cement and areas which have received joint treatment.

AFS recommend proven paint systems, from suppliers such as Dulux, Wattly and Taubmans. It is the responsibility of the paint manufacturer to show compliance to all relevant performance requirements as per the latest NCC.

Fig E12 summarises Dulux recommended interior coating systems for AFS LogicaWall. For full system detail and application information refer the relevant Dulux Duspec Specification. For best results, apply finishing coats by roller. This helps to achieve a full even coat and a light, uniform texture over the entire surface. Refer to Australian Standard AS2311 "The Painting of Buildings" and/or paint manufacturer's recommendations for specific roller nap length for the desired finish.

Wallpaper and Vinyl

To enable eventual removal of wallpaper and vinyl without damaging the fibre cement, seal the surface with a pigment solvent-based sealer.

Tiling

Tiles shall be installed in accordance with AS3958.1. Allowance must be made for expansion/contraction by leaving a gap between adjoining tiles in corners. Fill gap with flexible wet area sealant.

Tiling to be in accordance with the tile adhesive manufacturer's instructions. A compatible tile adhesive must be used to fix tiles to proprietary membranes.

Applied Finishes

Fig E12: DuSpec INTERIOR Specification

AFS Logicwall® Minimum Coating System Requirements - Internal	
Minimum System Performance	Dulux Specification: AU_SD11656
• Preparatory basecoat relative to project surface level requirements. • Where level 5 finish is specified additional preparation will be required. • Premium Acrylic sealer Undercoat. • 2 coats of premium Acrylic Interior Matt or Low Sheen.	**PREPARATORY BASECOAT** • Required where a level 5 finish is specified. • Dulux Professional FastFinish level 5 Prep Coat. • Premium high film build prepcoat designed to even out surfaces and help to create a level 5 finish. • Applied by airless spray. Sand smooth when dry prior to application sealer undercoat.
	PRIMER • Dulux Professional FastFinish level 5 Prep Coat. • Acrylic sealer/ undercoat designed to aid system adhesion and opacity prior to application of Dulux premium interior Paints.
	DECORATIVE FINISHING COAT • Dulux Wash&Wear Low Sheen. • Premium Acrylic Coating for interior use.
	DECORATIVE FINISHING COAT • Dulux Wash&Wear Low Sheen. • Premium Acrylic Coating for interior use.
	Refer to the full Dulux Specification available at www.duspec.com.au for detailed instruction and advice.

afs logicwall®

December 2023

Section F
External Finishing

Logicwall® External Design Considerations, Movement Joints, Waterproofing, Slab Junctions, Flashings, Windows, Finishings, Cladding Systems, Durability.

CSR

Contents

F1. External Design Considerations

Disclaimer: The products referred to in this document have been manufactured by or on behalf of CSR Building Products Limited ("CSR") to comply with the relevant sections of the National Construction Code (NCC) and any relevant Australian Standards. While any design or usage guidelines set out in this document have been prepared in good faith by CSR, they are of a general nature only and are intended to be used in conjunction with project specific design and engineering advice.

It is the responsibility of the customer to ensure that CSR's products are suitable for their chosen application, including in respect of project-specific matters such as, but not limited structural adequacy, acoustic, fire resistance/combustibility, thermal, and weatherproofing requirements. All information relating to design/installation/application of these products is offered without warranty and no responsibility can be accepted by CSR for errors and omissions, or for any use of the relevant products not in accordance with CSR's technical literature or any other relevant industry standards. For current technical and warranty documentation relating to CSR's products, visit the AFS website at www.afsformwork.com.au

Introduction

AFS Logicwall® panels are faced with 6mm fibre cement sheets which, at the completion of the construction process, provide the wall face and substrate for applied finishes and decorating.

The fibre cement sheets contributes to the overall durability of the product.

The final finish of AFS Logicwall® is influenced by factors such as movement and sheet surface joints, correct alignment of panels at installation stage, joint setting methods and applied finishing system.

There are a number of methods for ensuring that the finished AFS Logicwall® meets the user expectations. For best results these should be considered in the planning stages of the project and be clearly set out in specifications.

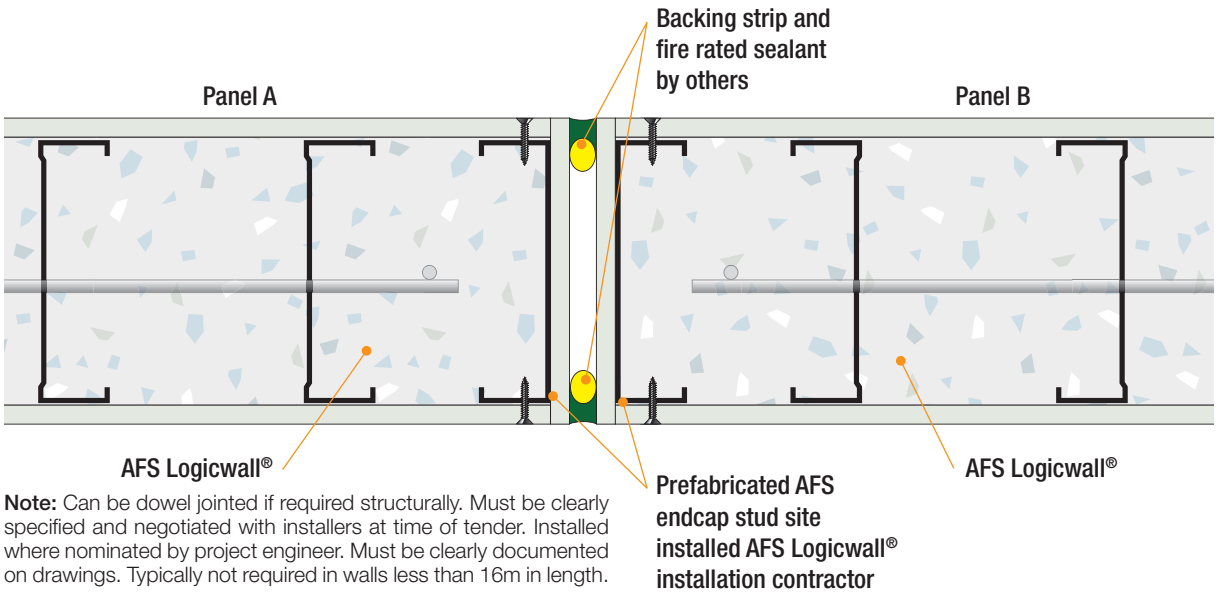
It is essential for the designers and builders to determine the level of finish required before construction begins otherwise it may not be possible to attain the desired finish level without extensive corrective measures.

For external wall application AFS Logicwall® can accommodate a range of external finishing solutions as set out in Finishing and Cladding Systems in this section.

Movement Joints

The structural concrete wall effectively has control joints at each stud so no additional crack control joints are necessary. Full depth "movement joints" may be required depending on the geometry of the structure and other considerations such as thermal loads, exposure or building joints. In general "movement joints" would not be required for walls less than 16m long. Structural "movement joints" will be placed in locations nominated by structural engineer and must be documented on structural drawings. These will be installed at construction stage by the AFS Logicwall® installation contractor. The following method is recommended.

Fig F1: Logicwall® Movement joint



Note: Can be dowel jointed if required structurally. Must be clearly specified and negotiated with installers at time of tender. Installed where nominated by project engineer. Must be clearly documented on drawings. Typically not required in walls less than 16m in length.

Waterproofing

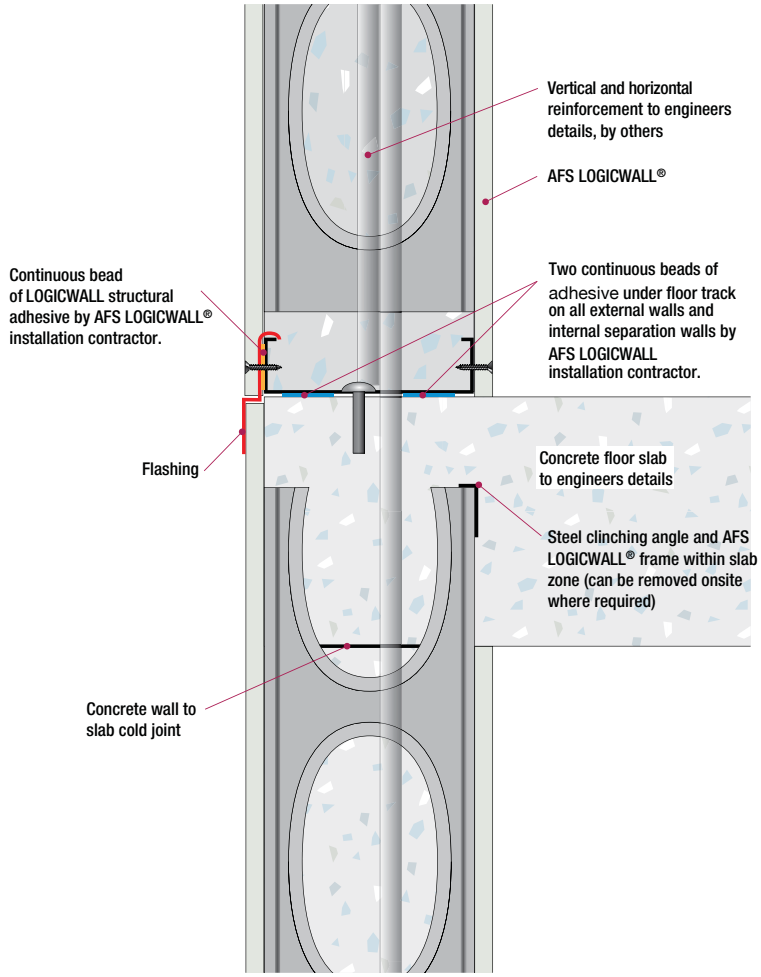
For any external façade design applicable to a building, it is essential that the system adopted is capable of withstanding the various environmental conditions which the façade is subject to during its life. In particular the prevention of water ingress into the building is critical.

AFS Logicwall® as an external façade, with an applied waterproofing coating performs as a successful barrier to water ingress and has been tried and proven on numerous buildings, many of which are in coastal locations. The system chiefly relies upon the following for waterproofing:

1. Adoption of horizontal slab junction details as recommended by AFS.
2. Appropriate location of flashings, especially to cap exposed parapet walls typically located on the top level of buildings.
3. Correct application of a quality external waterproofing coating system to supplier's specifications.
4. The water resistance of AFS Logicwall® itself, incorporating fibre cement facing sheets with water block technology properties.

Horizontal Slab Junctions

Fig F2: Unfinished Boundary Wall (adjacent to neighbouring building)



Horizontal Slab Junctions (continued)

Fig F3: Cover Strip Detail

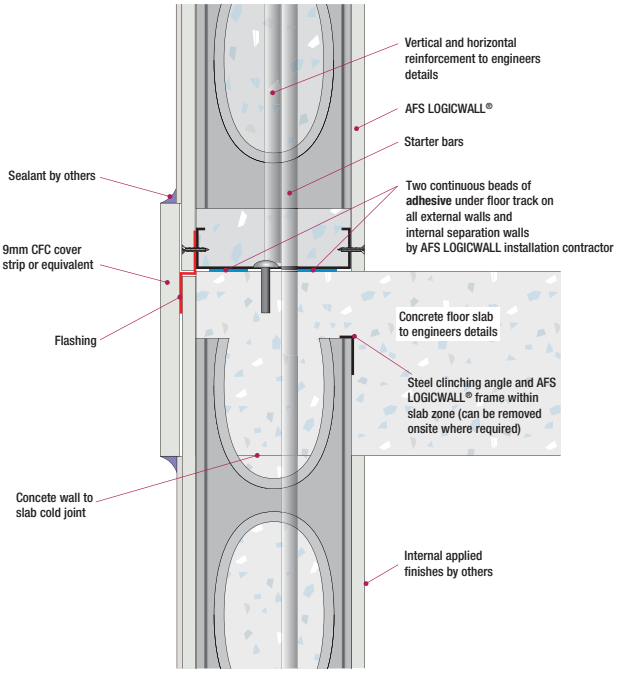
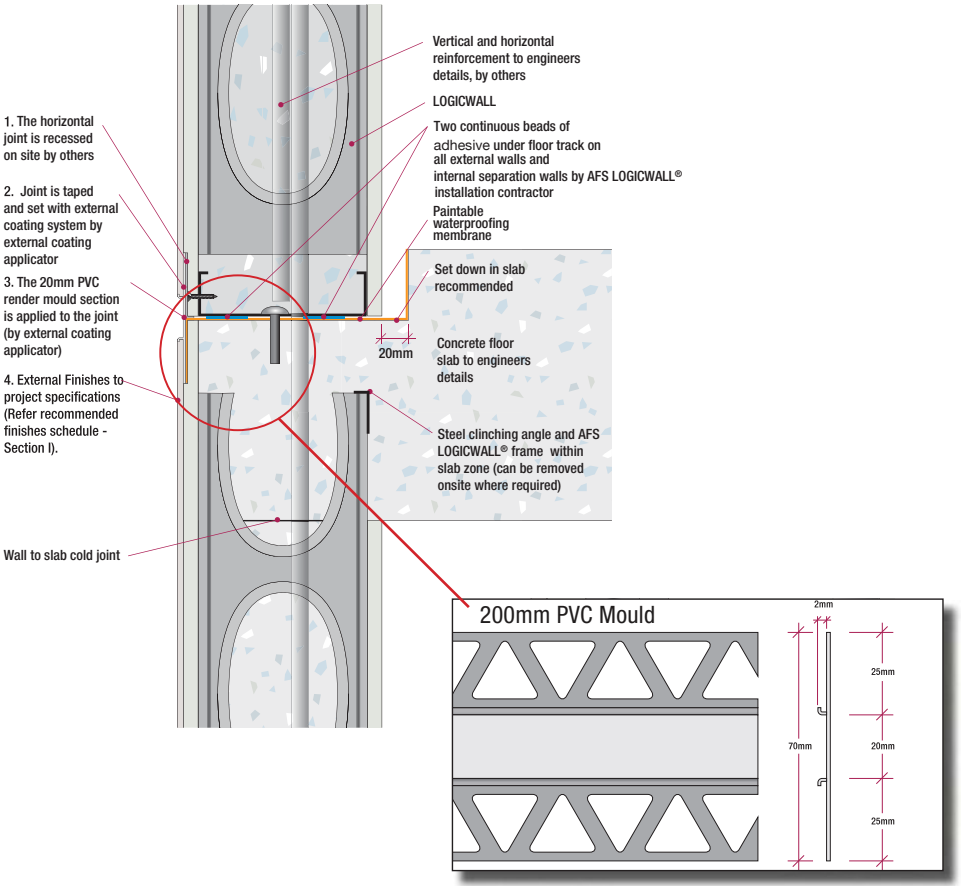


Fig F4: Cover Strip Detail



Horizontal Slab Junctions (continued)

Fig F5: Flexible Extrusion Details- Horizontal Express Joint with Waterproofing on Flat Plate Slab Edge

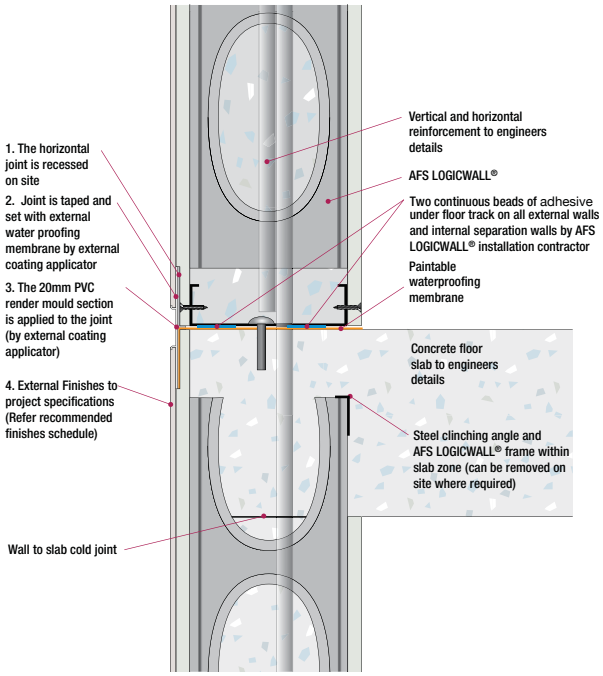
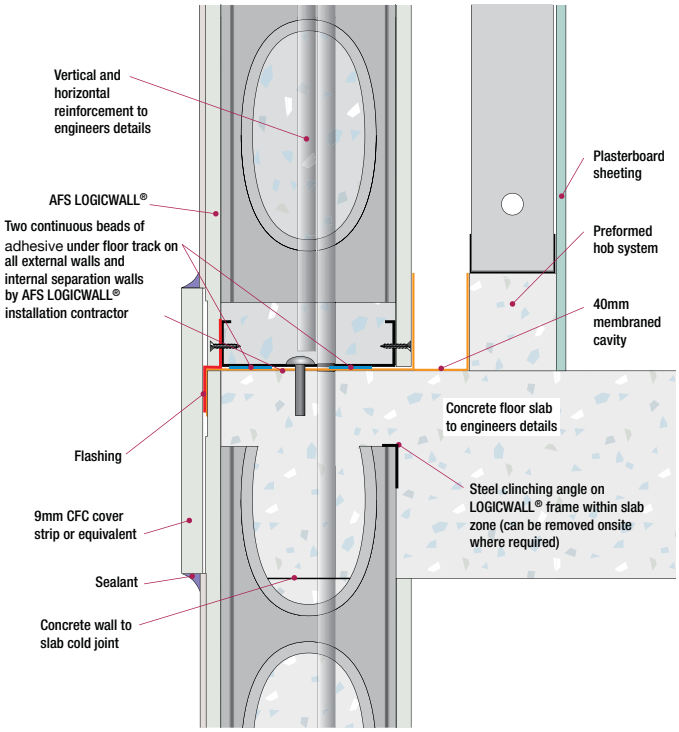


Fig F6: Cavity Wall with Hob Detail - Flat Slab



Flashings

The use of flashings applies to the following areas of AFS Logicwall® construction:

1. **Boundary Walls** – the cavity between the external AFS Logicwall® and the neighbouring building must be fully flashed to prevent water ingress onto the often uncoated AFS Logicwall®.

2. **For Boundary Walls not able to be sealed or coated due to proximity of the neighbouring building** – an Alcor flexible flashing (or similar) is required to prevent water ingress through the horizontal joint.

Fig F7: Boundary Wall Flashing

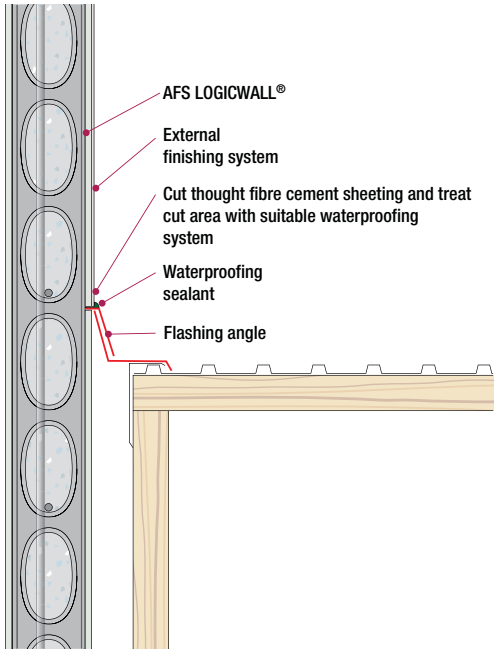
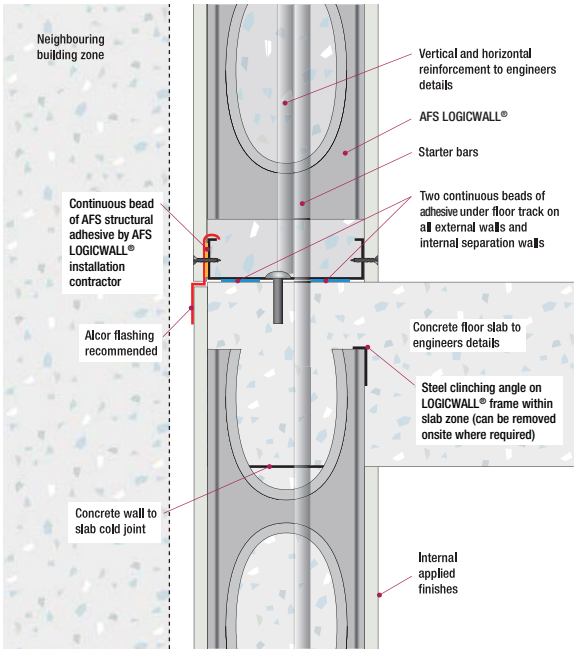
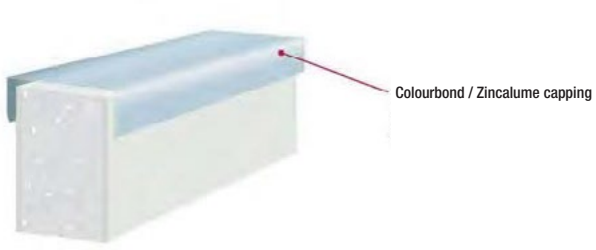


Fig F8: Boundary Wall Flashing - No access



3. **Top of Walls** – The exposed top of AFS Logicwall® is vulnerable to water ingress. It is mandatory that a flashing, Colourbond or Zincalume, is installed to cap the top of exposed AFS Logicwall® panels to prevent water ingress.

Fig F9: Wall Capping



Windows

AFS recommends the following two details for successful window installation in AFS Logicwall®, which both adopt a commercial or semi-commercial window section incorporating a sub-head and sub-sill.

Fig F10: Commercial Window Section Detail – Flat Reveal

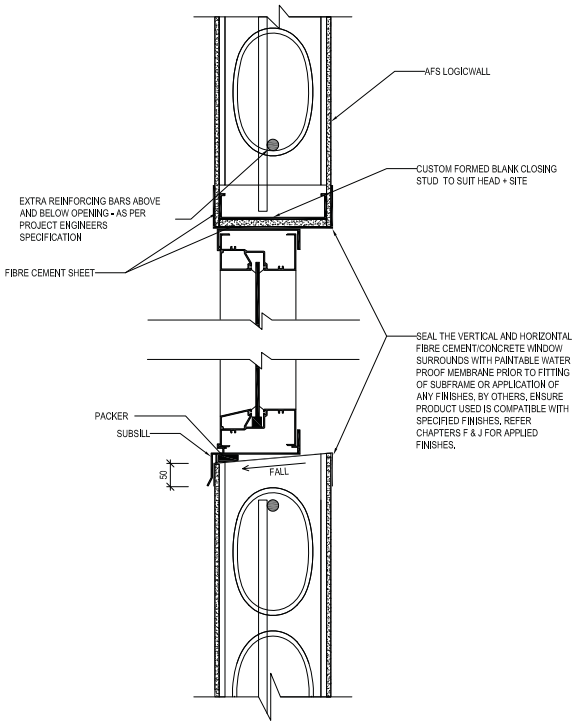
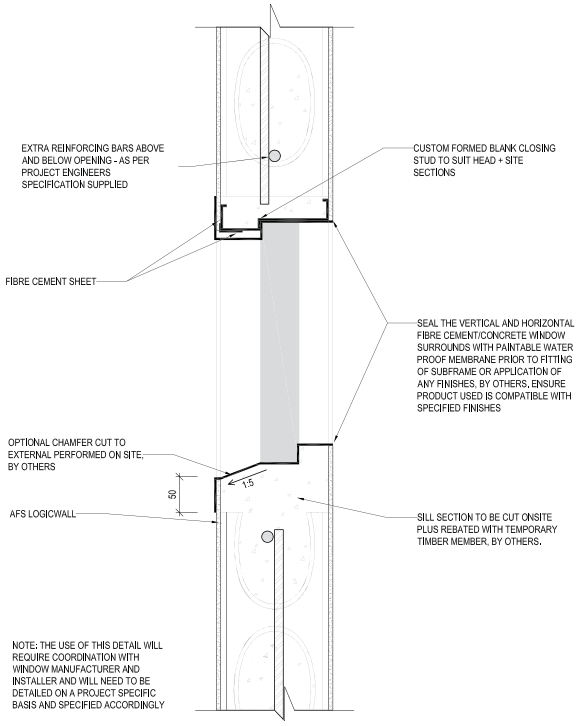


Fig F11: Commercial Window Section Detail – Rebated Head Reveal



Durability

Introduction

The ultimate durability of any building system relies on appropriateness of design and accuracy of construction methodology together with the performance of individual components and compatibility of related components

The durability and longevity of the exterior façade is heavily influenced by the compatibility of the finishing and weatherproofing systems with the structural dynamics of the AFS Logicwall® fibre cement faced, solid masonry core, panelised and flush jointed system.

The exterior façade of AFS Logicwall® comprises a fibre cement face incorporating a special water block technology which limits water penetrating into the sheet through the construction phase and provides a stable surface for the installation of the Weatherproofing Coatings system.

Movement Control

Failure to accommodate for normal masonry expansion and contraction in accordance with design specification will induce excessive joint stress and potential joint cracking and breakdown on the weatherproofing barrier.

Best practice defines suitable expansion/contraction relief joints be installed at natural building weak points (eg in line with openings (window / doors), at all horizontal multi-levels, and at all interfaces of different building construction materials) as defined by the engineer.

Flush jointing of panels (other than at defined movement joints) is a critical aspect of the façade system and requires specific attention. Rigid, cementitious jointing or render systems are not recommended and will limit system performance.

External Finishing

AFS Logicwall® external walls require the application of high quality external coating system to achieve:

a) A water resistant building envelope, and

b) an aesthetically pleasing building appearance.

Responsibilities of Coating Manufacturer

To supply quality facade coating systems and specifications together with technical advice and representation to AFS projects. It is the responsibility of the coating manufacturer to show compliance to all relevant performance requirements as per the latest NCC.

Materials & Application Warranty

The coatings system manufacturer shall warrant its products and systems in accordance with its documented warranty procedures and pursuant to Registered applicators providing co-workmanship warranties ensuring correct and proper installation in full accordance with coating systems manufacturer recommendations

AFS Logicwall® Wall Substrate Installation Standards & Alignments

AFS Logicwall® panels shall be installed in strict accordance with the AFS Systems Pty Ltd recommendations. For optimum finishing system efficiencies, AFS Logicwall® panel section alignment shall be true an plumb alignment variation of ±4mm. Where tolerances alternate remedial high build coating system recommendations may apply and shall be considered variations for contacting purposes. Additionally, it is important to ensure minimum variation of floor to floor alignment together with correct installation of control joints over large area and at floor to floor sections, window or other openings of structure to allow adequate movement of the building envelope.

Responsibilities of Applicator(s)

The nominated Applicator(s) shall deliver all materials and labour to complete the works to the agreed colour, time frame and standard in full accordance with the latest data provided by the coating manufacturer on the AFS Facade coating system.

External Coating Systems

The coating systems shall conform to AS4548 Guide to long-life coatings for Concrete and Masonry.

Long term performance of the Weatherproofing Envelope requires :

- Low water transmission.
- Adequate crackbridging capability to maintain a continuous film under dynamic stress resulting from thermal expansion and contraction and normal joint movement.
- Adequate water vapour permeability to allow for normal moisture vapour movement preventing vapour pressure from under the film to cause blistering.
- Refer to the manufacturer's specifications for detailed instructions and advice.Maintenance

Durability and longevity of the façade system requires periodic inspection and maintenance to identify and correct deleterious conditions.

Inspections should include examination of any abnormal coating staining or water run off concentration, flashings and seals as well as attention to potential moisture issues such as ground water drainage or build up of soils or other wastes against the façade face.

Specific attention should be given to control jointing failure or signs of excess movement which should be repaired immediately to prevent water ingress and potential surrounding coating issues.

Early signs of moulds or mildew (I.e. organic growth) must be addressed to prevent spread of the spoilage. Organic growths occur typically due the presence of excess moisture and nutrient. (I.e. dirt or mould spores deposited on the surface). The applied coating cannot “grow” mould. Identification of organic growth requires correction of contributory issue and cleaning of the surface including a suitable mould-mildew agent.

For optimum aesthetics and to extend system lifecycle, it is recommended to annually wash down the exterior surface using a suitable mild detergent solution and medium pressure wash (i.e. <1000 psi).

External Finishing (continued)

Minimum Coating System Performance Specification for AFS Logicwall®		
Water Transmission	AS4548.5 Appendix B	Less than 10g/24h/m²/kPa
Crack Bridging	AS4548.5 Appendix F	1 mm (minimum)
Moisture Vapour Permeability	AS4548.5 Appendix C	> 50 g /m2 /24h

Extending Lifestyle Performance

Ultimate lifecycle costs of the total façade system are optimised when coating systems (I.e the specified final weatherproofing barrier coat) are reinstalled typically after 10-15 years.

Lifecycle analysis confirms a 10-15 year recoating window together with periodic maintenance of the façade system prior to deterioration to be the most effective cycle to deliver optimum performance, aesthetics and cost efficiency.

The "Lifetime Warranty Process" requires inspection, necessary maintenance & cleaning on routine intervals – typically every few years (dependent on location and exposure) by a trained applicator and then subsequent re - top-coating prior to the Warranty Expiration.

At agreed intervals and/or as required relative to building or site issues, any touch ups (areas of stress/damage) may be addressed as Preventative Maintenance.

The “Lifetime Warranty Process” maximises the aesthetic and performance attributes of the facade system and minimises potential repair costs.

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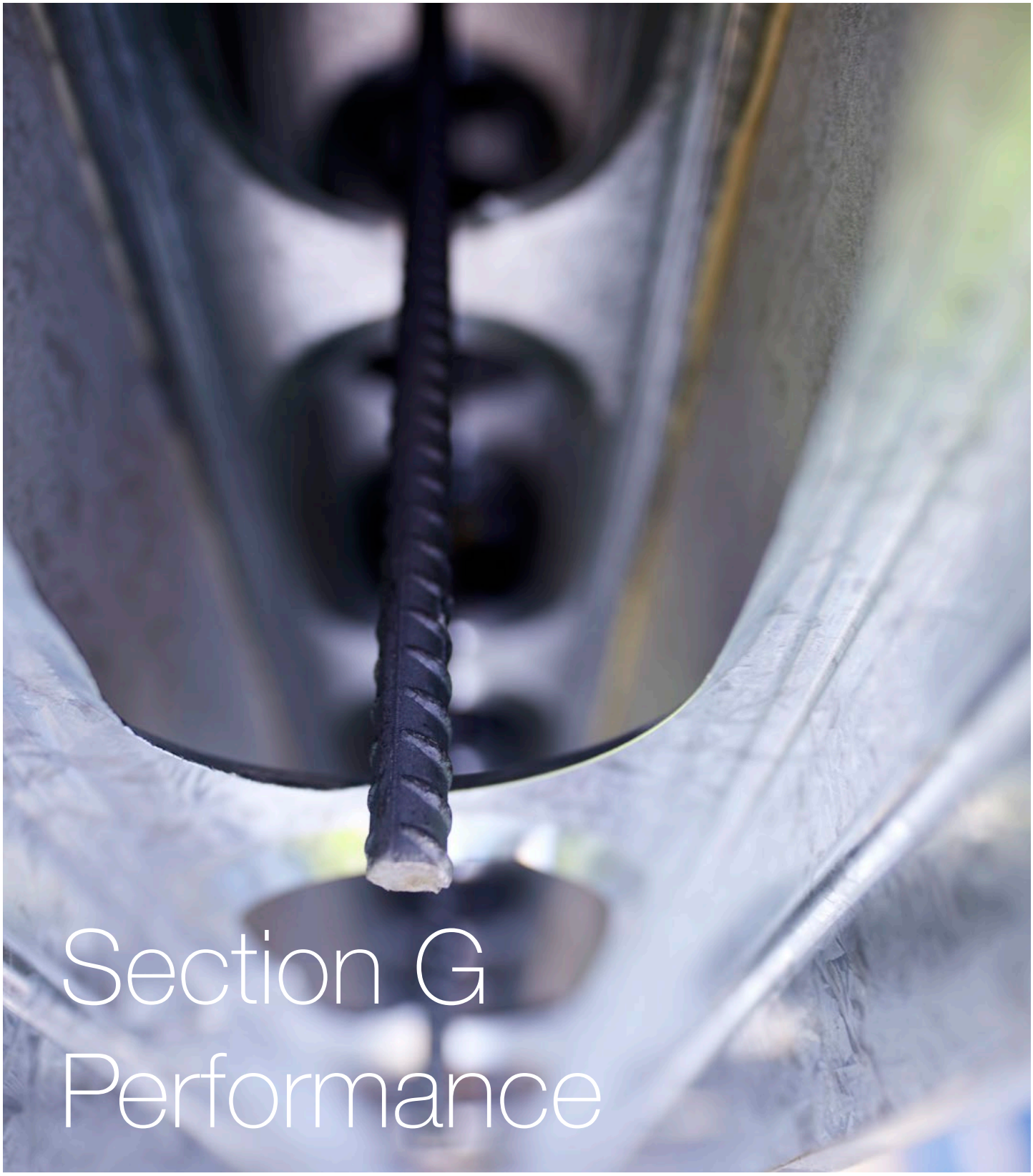

Section G Performance

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

CSR

Contents

Internal Design Considerations

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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 relevant requirements of the Building Code of Australia (NCC).

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 2022. These include the following:

Section B. Structure

- B1D2 (NCC2019 B1.1) Resistance to actions
- B1D3 (NCC2019 B1.2) Determination of individual actions

Section C. Fire Resistance:

- C1P1 (NCC2019 CP1) Structure Stability
- C1P2 (NCC2019 CP2) Avoid spread of fire
- C1P3 (NCC2019 CP3) Protect from spread of fire and smoke in patient care and aged care buildings
- C1P4 (NCC2019 CP4) Safe conditions Materials and assemblies
- C1P7 (NCC2019 CP7) Avoid spread of fire to emergency equipment

Section F. Health and Amenity

- F3P1 (NCC2019 FP1.4) Weatherproofing
- F7P2 (NCC2019 FP5.2) Sound transmission and insulation – Walls
- F7P4 (NCC2019 FP5.5) Sound transmission and insulation – Walls in age care buildings

Section G. Ancillary Provisions

- G5P1 (NCC2019 GP5.1) Bushfire resistance in bush fire prone areas

Sections J. Energy efficiency

- J1P1 (NCC2019 JP1) Energy efficiency

Deemed to Satisfy Provisions.

- Specification 1 (NCC2019 Schedule 5) Fire resistance of building elements
- C2D2 Specification 5 (NCC2019 C1.1 Spec C1.1) Fire-resisting construction
- C2D11(1)(b) (NCC2019 C1.10(a)(ii)) Fire Hazard properties

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

AFS Logicwall® wall panels have been fire tested and assesed to AS1530.4–2014 by CSIRO in Sydney.

Fire Resistance (continued)

Test Result (LW150)

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

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.

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.

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

CSIRO has written a fire report that confirms the use of proprietary fire stopping systems for service penetrations made in Logicwall® without the need to remove fibre cement sheeting. Refer to the CSIRO service penetration report for all details and limitations on service penetrations though Logicwall®.

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 2022 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®

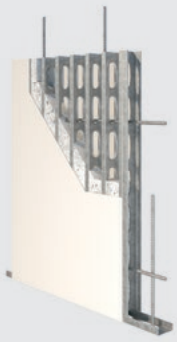
Wall Type	R_W	$R_W + C_{TR}$	Composition
LW120	51	46	 Consisting of a stand alone AFS Logicwall®. 120mm,150mm, 162mm, 200mm or 262mm
LW150	54	50	
LW162	55	50	
LW200	58	53	
LW262	62	57	

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

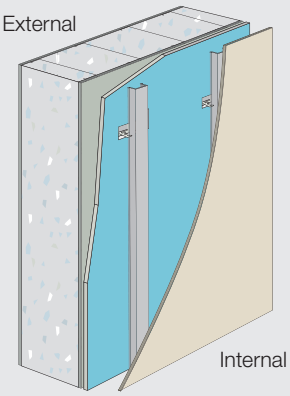
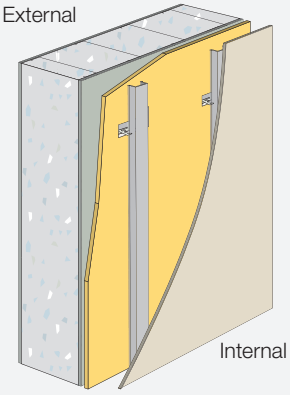
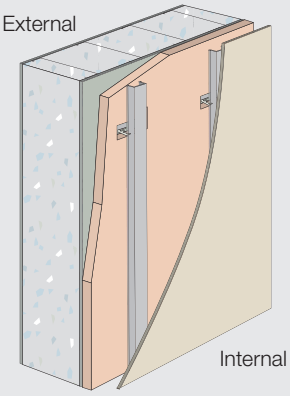
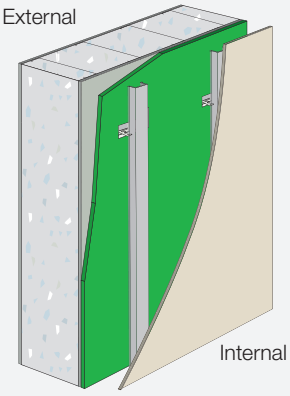
The NCC recognises the benefit of thermal capacity or mass, and so provides R concessions for heavyweight walls such as AFS Logicwall® walls.

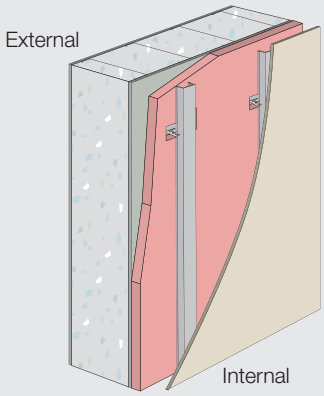
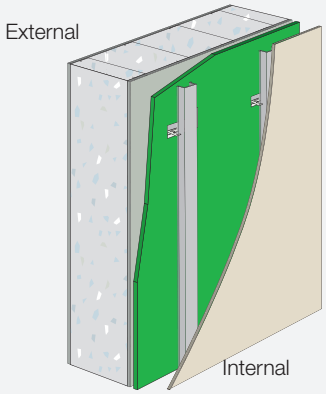
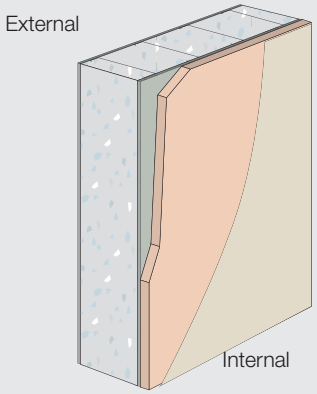
Heavy mass delays the transfer of outdoor temperature variations, improving indoor comfort. The concrete construction of AFS Logicwall® walls provides a significant thermal mass barrier to the external elements. If necessary additional insulation materials can be installed with AFS Logicwall® walls to 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.

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.

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/m³) 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/ m³) 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

Condensation

Airtightness 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.

Durability

The AFS Logicwall® system complies with the durability requirements of AS3600. (Refer Chapter L - "Certification", report #10655/01 by Mahaffey Associates and report #J0815172 by Professor Mark Bradford)

AFS Logicwall® is compliant to the relevant parts of the National Construction code (NCC 2022) for use in building internally and externally for Building Classes 1, 10 and class 2-9. TABLE G5 summerises the applications for standard Logicwall® detailing and finishes

TABLE G5: Logicwall® Exposure Zones

	Minimum Concrete Strength	Cover Required [AS3600-2018 Tbl 4.3]	Exposure Zone [AS3600-2018 Tbl 4.3]
All Logicwall®, Standard Finishes	25 MPa	30	Up to A2 Non-Industrial Temperate
	40 MPa	30	Up to B1 Near Coastal
	50 MPa	35	Up to B2 Coastal*
Centrally reinforced	40MPa	50 (Central Reo Only)	Up to C1 Spray Zone
All detailing and finishes in accordance with AFS Manuals * Refer NCC Note 5 Table 4.3			

Weatherproofing

AFS Logicwall® System will comply with the weatherproofing performance verification requirements as per Volume 1 and 2 of National Construction Code (NCC) 2022. Refer Chapter L – 'Certification' for weatherproofing verification report by Zavier Knight.

Non-Combustibility

In accordance with NCC 2022 C2D10(4), Fibre reinforced Cement sheeting may be used wherever a non-combustible material is required.

With reference to C2D10(4) the adhesive used to fix the fibre cement formwork sheet to the steel studs is deemed to be exempt form the non-combustibility requirements of C2D10(1) and (2)

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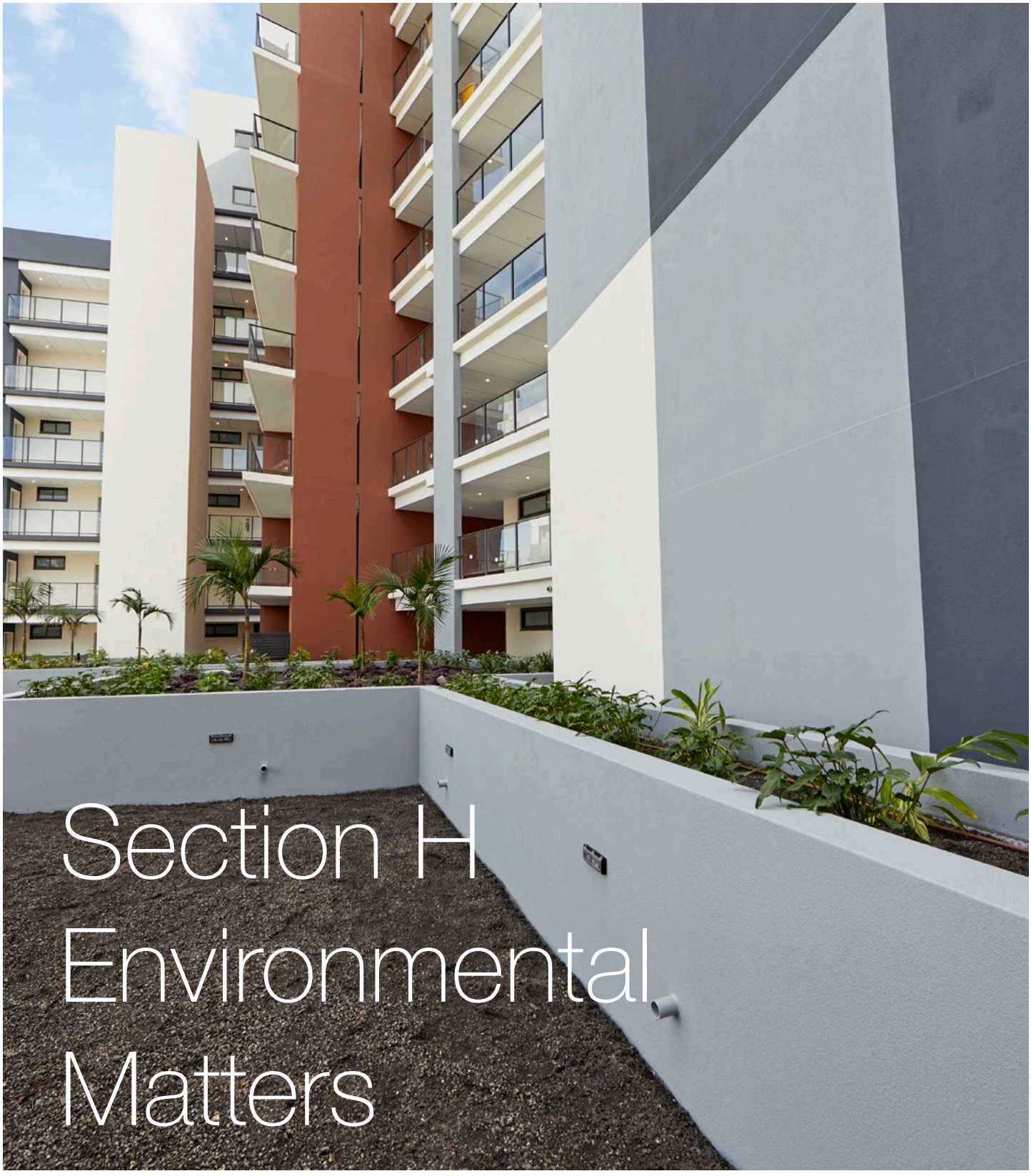

Section H Environmental Matters

Logicwall® Environmental Matters, Energy Efficiency, Core Environmental Performance Characteristics.

CSR

Contents

Environmental Matters

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Introduction

AFS as a company is committed to delivering products and manufacturing processes which are both innovative and environmentally responsible. The company has invested in and installed systems to target recycling of raw products, in particular galvanized steel and timber packaging products.

Energy Efficiency

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

The NCC recognizes the benefit of thermal capacities or mass, and so provides R concessions for heavyweight walls such as those incorporating AFS Logicwall®.

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. This in turn not only enhances occupant comfort, but also reduces heating/cooling costs and energy consumption whilst improving acoustic performance of the wall against outside noise.

Due to AFS Logicwall® walls being a uniform concrete monolithic mass, the air infiltration rate is practically zero eliminating he possibility of drafts and currents from outside. This contributes significantly to the thermal insulation of the building. Refer to section G4 of this manual for further details on Thermal Insulation

TABLE H1: Core Environmental Performance Characteristics

Core Environmental Performance Characteristics	
Applicable Standards	The nominated product has been tested for fire resistance and acoustic performance by CSIRO. Also, the nominated product has been independently tested for insulation properties.
Other evidence of Fitness for Purpose	As well as being tested for performance qualities, the nominated product has demonstrated market acceptance via numerous current installations across Australia.
Environmental Load Reduction	The nominated product produces a load reduction of greater than 30% for greenhouse gas emissions due to the savings associated with flyash and slag utilisation at a rate of 35% of the concrete. In addition there are savings in transport and savings in installation due to the modular design.
Material Requirements	The materials and manufacturing process required to produce these nominated products do not present any hazard to the manufacturing staff, the consumer of the final product or the environment.
Post-Consumer Recycling	It is necessary to bind the product to the concrete for the functionlaity of the product. The product may be separated during concrete recycling but it is designed for a very long life span.
Packaging Requirements	The nominated product is packaged on steel and cement board pallets with LDPE plastic wrap. All packaging materials comply with the conditions of this criterion
Compliance to Environmental Regulations	The AFS Systems Pty Ltd manufacturing facility is located within an industrial area and complies with all relevant environmental regulations. There are no discharges from the site other than the collection of solid, non-hazardous waste.
Compliance to Labour, Anti-Discrimination, and Regulations	AFS Systems Pty Ltd provides fair and safe working conditions for all staff

The results of the life cycle impact analysis demonstrated that walls incorporating the AFS Logicwall® product range exhibit an overall reduction greater than 30% of greenhouse gas emissions when compared to pre-cast concrete utilising 100% portland cement. By incorporating an additive mixture of no less than 35% of the required design cement content the walls are able to gain this level of reduced overall GHG and Cumulative Energy Demand Impact.

afs logicwall®

December 2023

Section I Architectural Detailing

Logicwall® Architectural Detailing, Finishes Scheduling, Slab Junction Detailing, Panel Joints, Wall Types, Cast in Elements, Acoustic and Thermal Details.

CSR

Contents

I1. Architectural Detailing

Disclaimer: The products referred to in this document have been manufactured by or on behalf of CSR Building Products Limited ("CSR") to comply with the relevant sections of the National Construction Code (NCC) and any relevant Australian Standards. While any design or usage guidelines set out in this document have been prepared in good faith by CSR, they are of a general nature only and are intended to be used in conjunction with project specific design and engineering advice.

It is the responsibility of the customer to ensure that CSR's products are suitable for their chosen application, including in respect of project-specific matters such as, but not limited structural adequacy, acoustic, fire resistance/combustibility, thermal, and weatherproofing requirements. All information relating to design/installation/application of these products is offered without warranty and no responsibility can be accepted by CSR for errors and omissions, or for any use of the relevant products not in accordance with CSR's technical literature or any other relevant industry standards. For current technical and warranty documentation relating to CSR's products, visit the AFS website at www.afsformwork.com.au

Introduction

"The architectural detailing and design of AFS Logicwall® for building projects requires the services of professional consultants, such as architects and engineers. This chapter has been prepared to assist consultants in project documentation and outlines a range of typical details." whilst examples of previously successful details are included throughout this chapter it does not replace the services of professional consultants nor is to be relied upon as a complete library of details as site conditions can vary from project to project.

Recommended Finishing Schedule

Amend to suit project.

External

Location	Logicwall® Requirements	Panel Joints	Finishing System(1) Minimum Coating System Performance Specification for AFS Logicwall®		
Marine, Coastal(2)	Refer AS3600	External Flush Set	Water Transmission	AS4548.5 Appendix B	Less than 10g/24h/ m^2/kPa
Near Coastal (1 to 50 km)	$f'c$ 40 Mpa minimum Central reinforcement only. All external fitting, fixtures, render strips to be UPVC or Stainless.	External Flush Set	Crack Bridging	AS4548.5 Appendix F	1 mm (minimum)
			Moisture Vapour Permeability	AS4548.5 Appendix C	> 50 g /m^2 /24h
Inland Tropical		External Flush Set			

Internal

System	Logicwall® Requirements	Panel Joints	Finishing System(1)
DULUX Interior	Standard AFS Logicwall®	Internal Flush Set	Refer to Dulux Specification: AU_SD11656 , Chapter E
System 1 - Joint Setting Only	Standard AFS Logicwall®	Internal Flush Set	not used
System 2 - Joint Setting and Skim Coating	Standard AFS Logicwall®	Internal Flush Set	Roller applied thin Gyprock Total Joint Cement
System 3 - Over Sheeting	Standard AFS Logicwall®	Internal Flush Set	Method 1 - Direct Stick Plasterboard finish to Architectural Specification Method 2 - Batten and sheet finish to Architectural Specification

(1) Refer AFS Data Manual for Details and specifications for finishes.

(2) All external fixtures, fixings, moldings etc in Coastal or Marine Environments AS2312 Classification D or greater to be UPVC or Stainless.

Note: All external steel fixtures, fixings, mouldings to be galvanized.

I2. Slab junction Details

Fig I1: Horizontal Expressed Joint With Rebate in Slab Edge

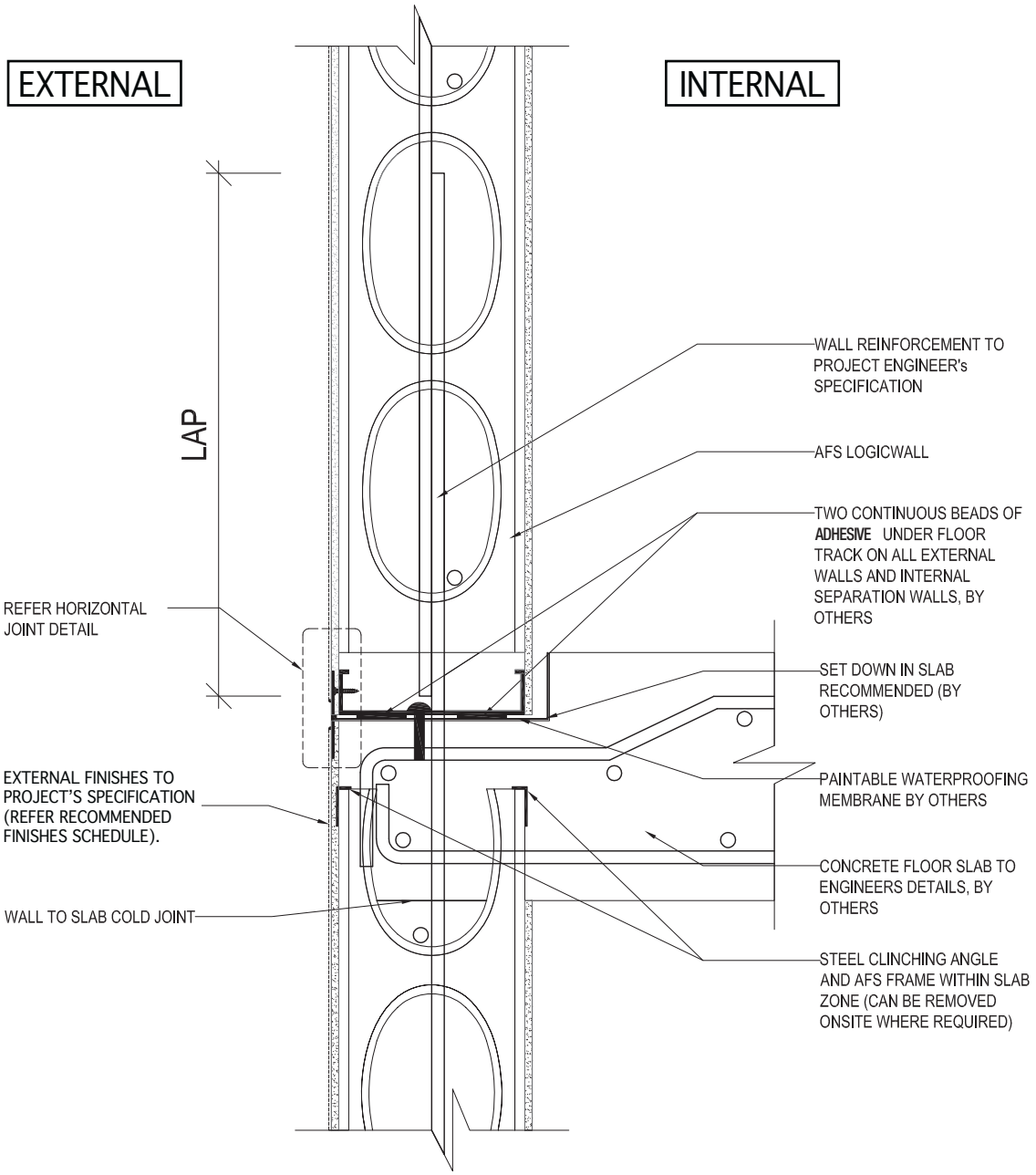


Fig I2: Horizontal Expressed Joint With Flat Plate Slab Edge

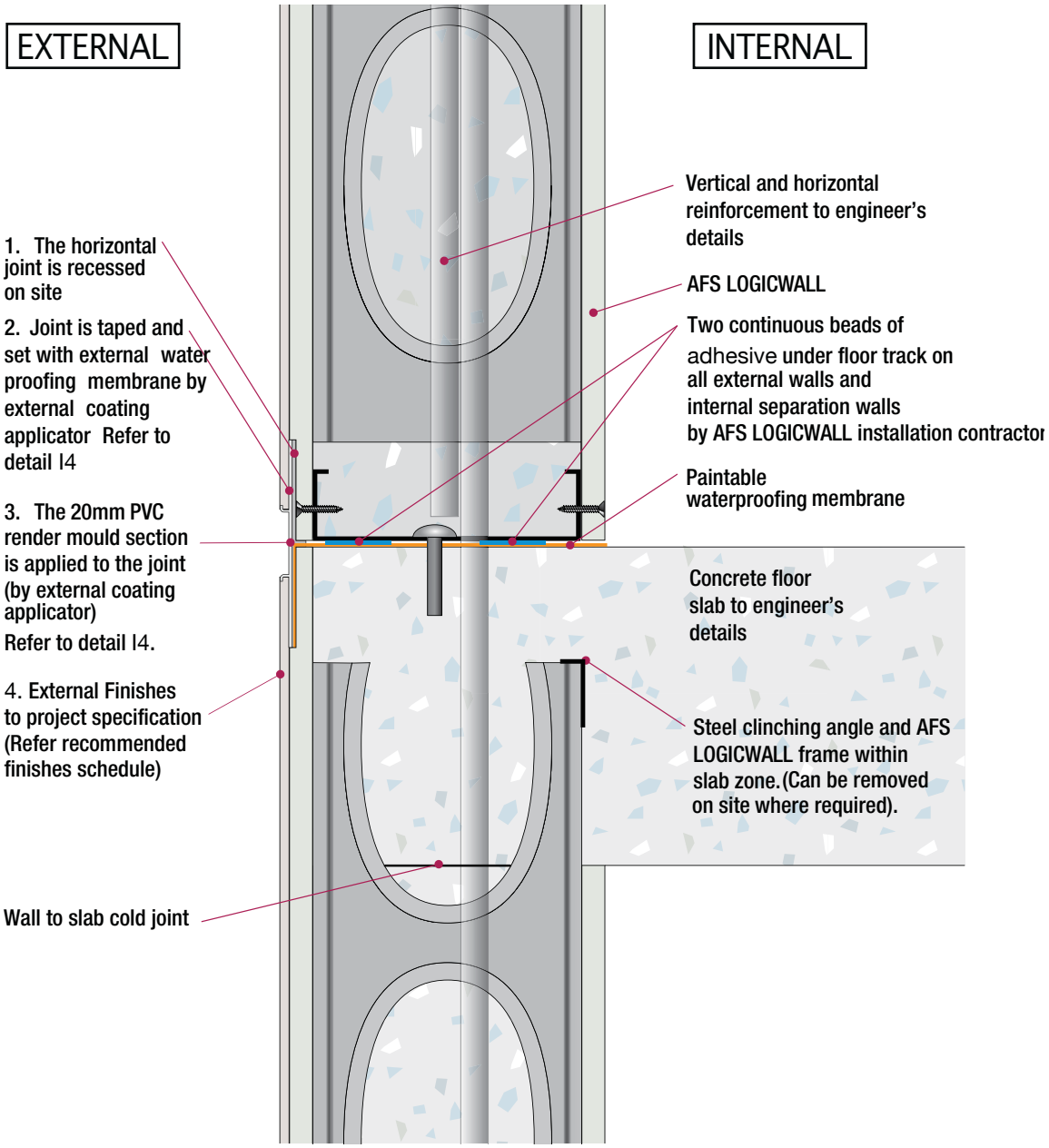


Fig I3: Horizontal Joint With Cover Plate On Slab Edge

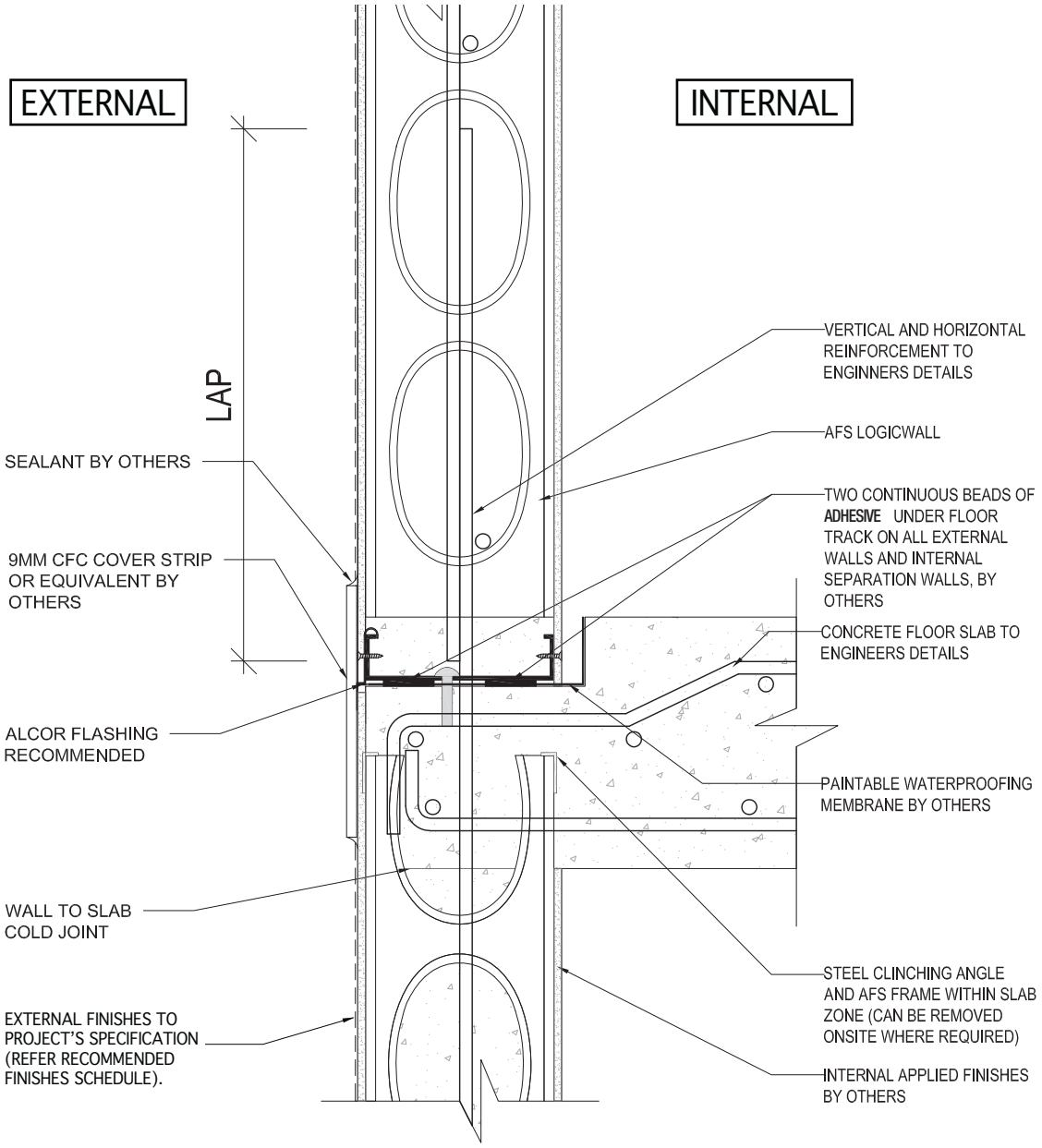
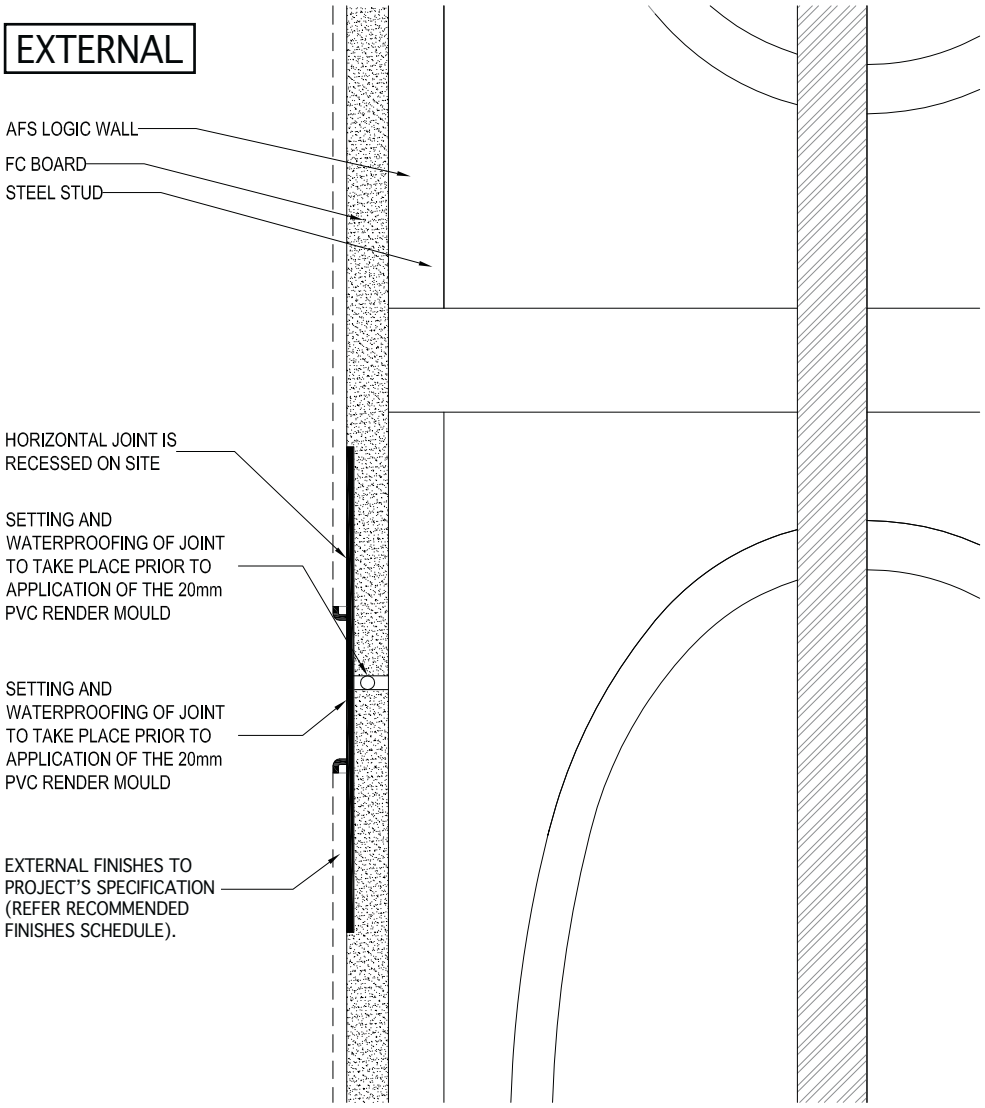


Fig I4: Horizontal 20mm Expressed Joint



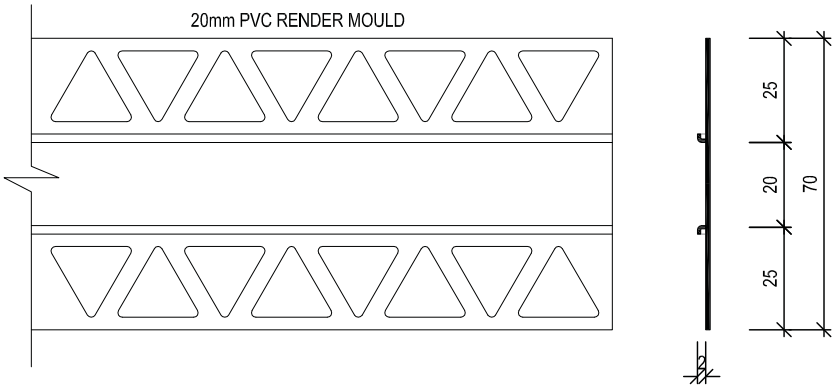


Fig I5: Cavity Wall Detail – Flat Slab

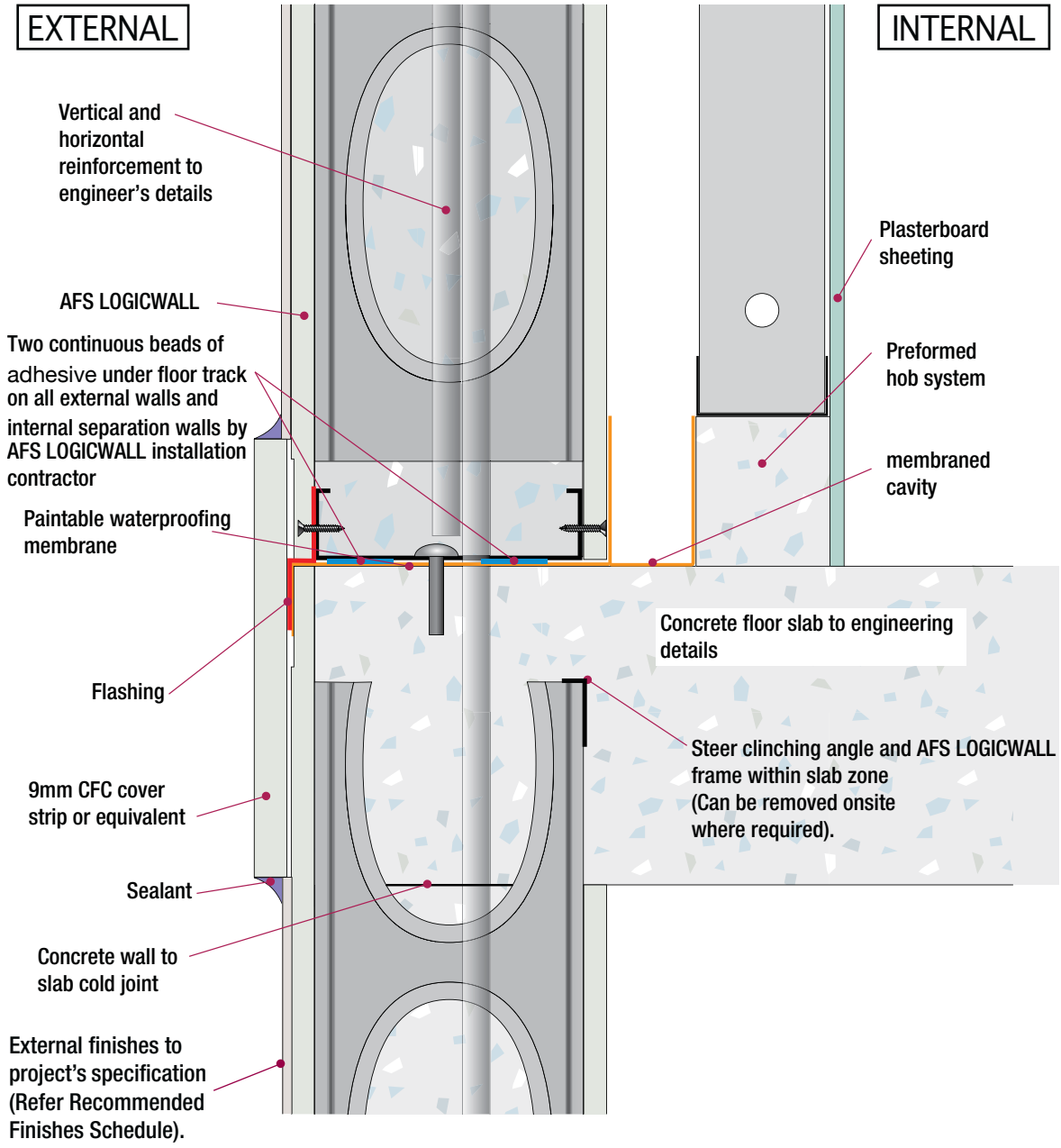


Fig I6: AFS Logicwall® Edgeform at Floor/Slab Junction

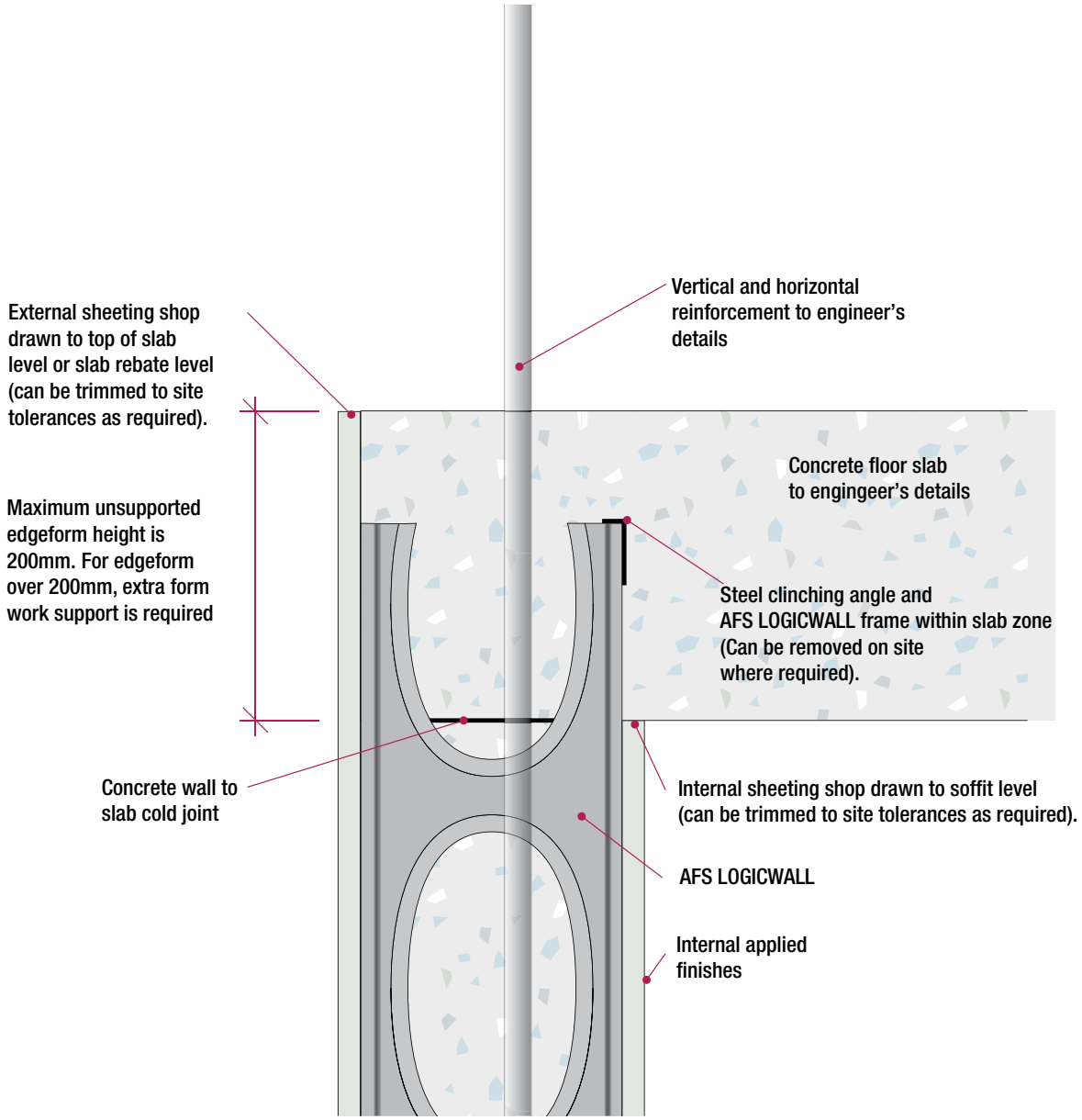


Fig I7: Slab Junction HOB Detail

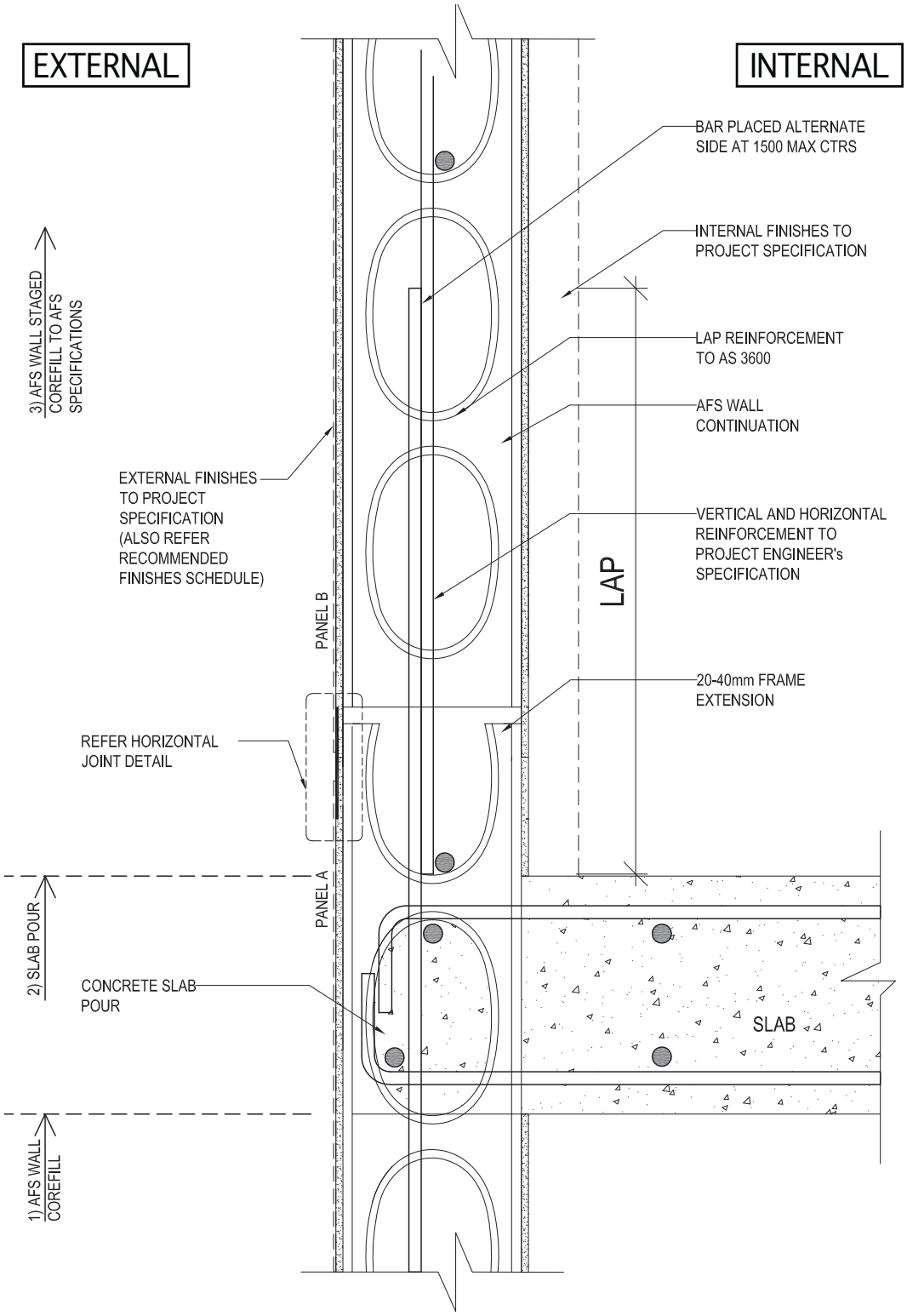


Fig I8: Edgeform At Floor/Slab Junction

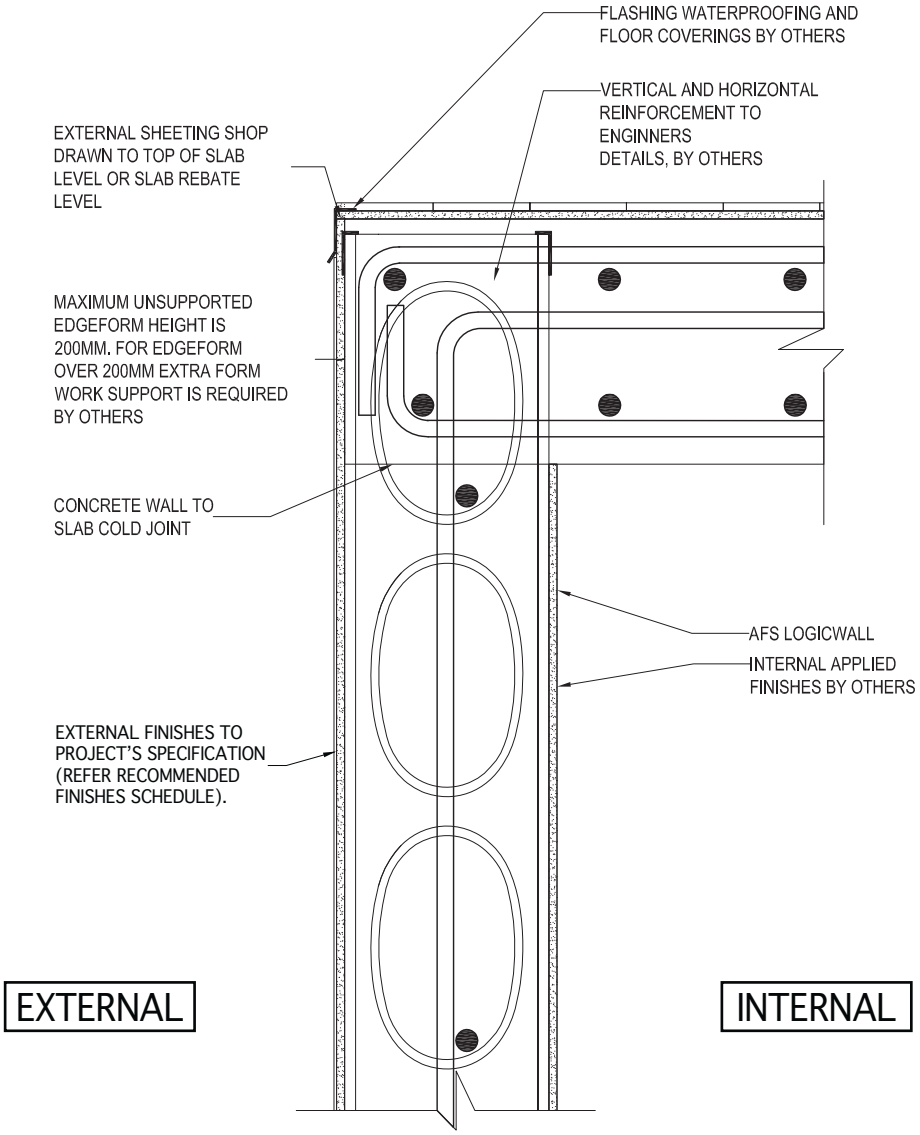


Fig I9: External Wall/Slab Junction For Typical Raft Slab

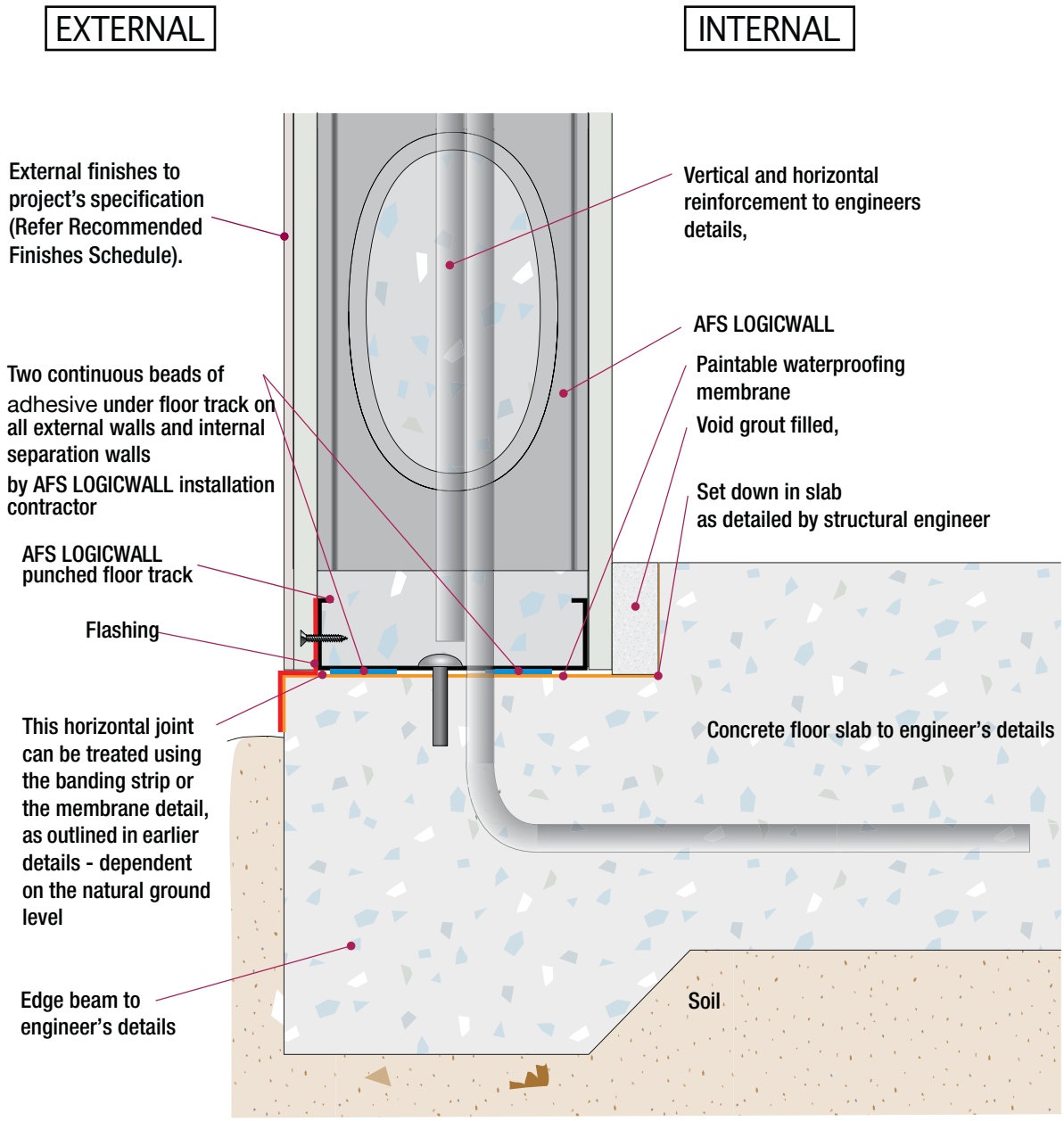
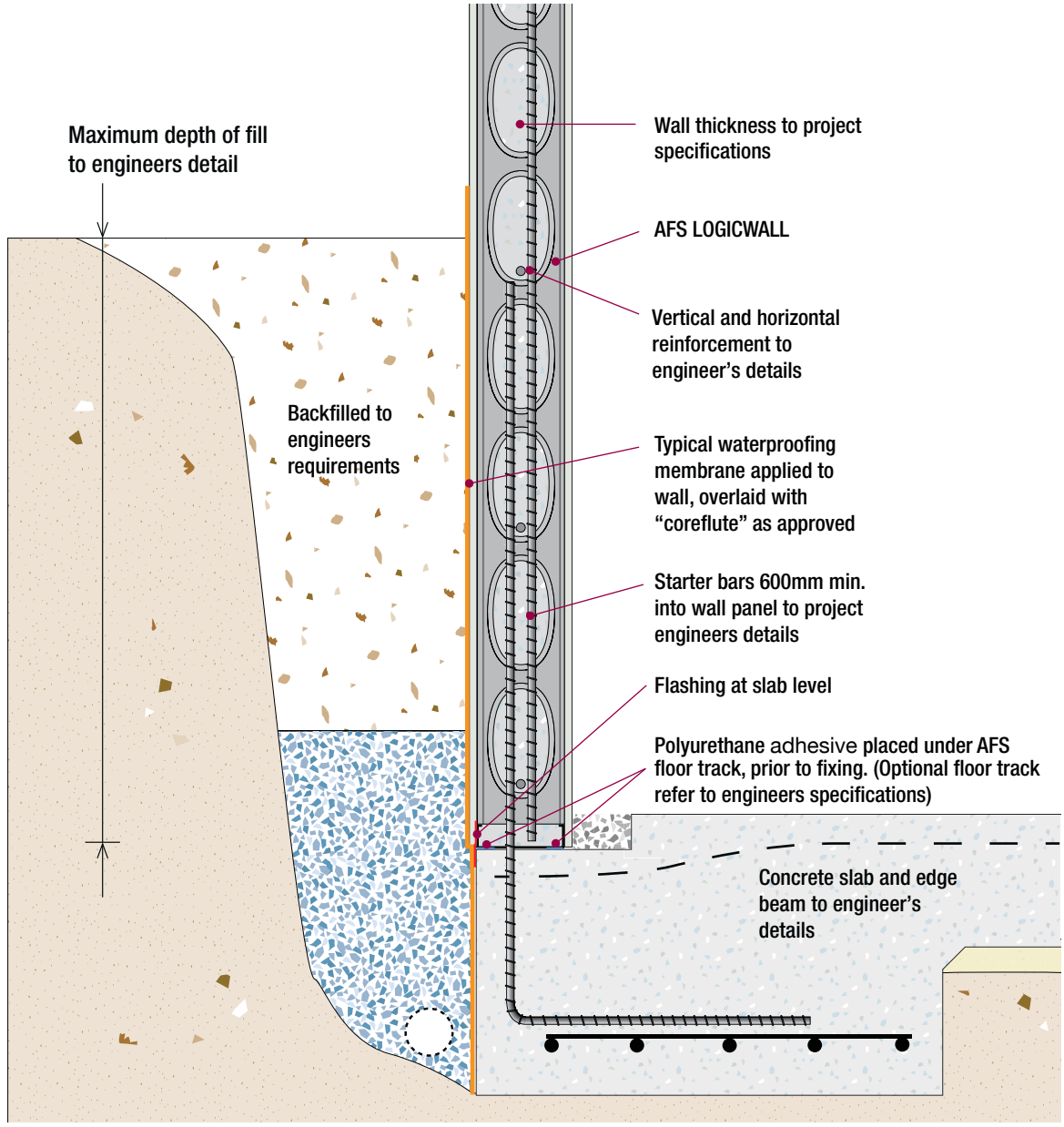
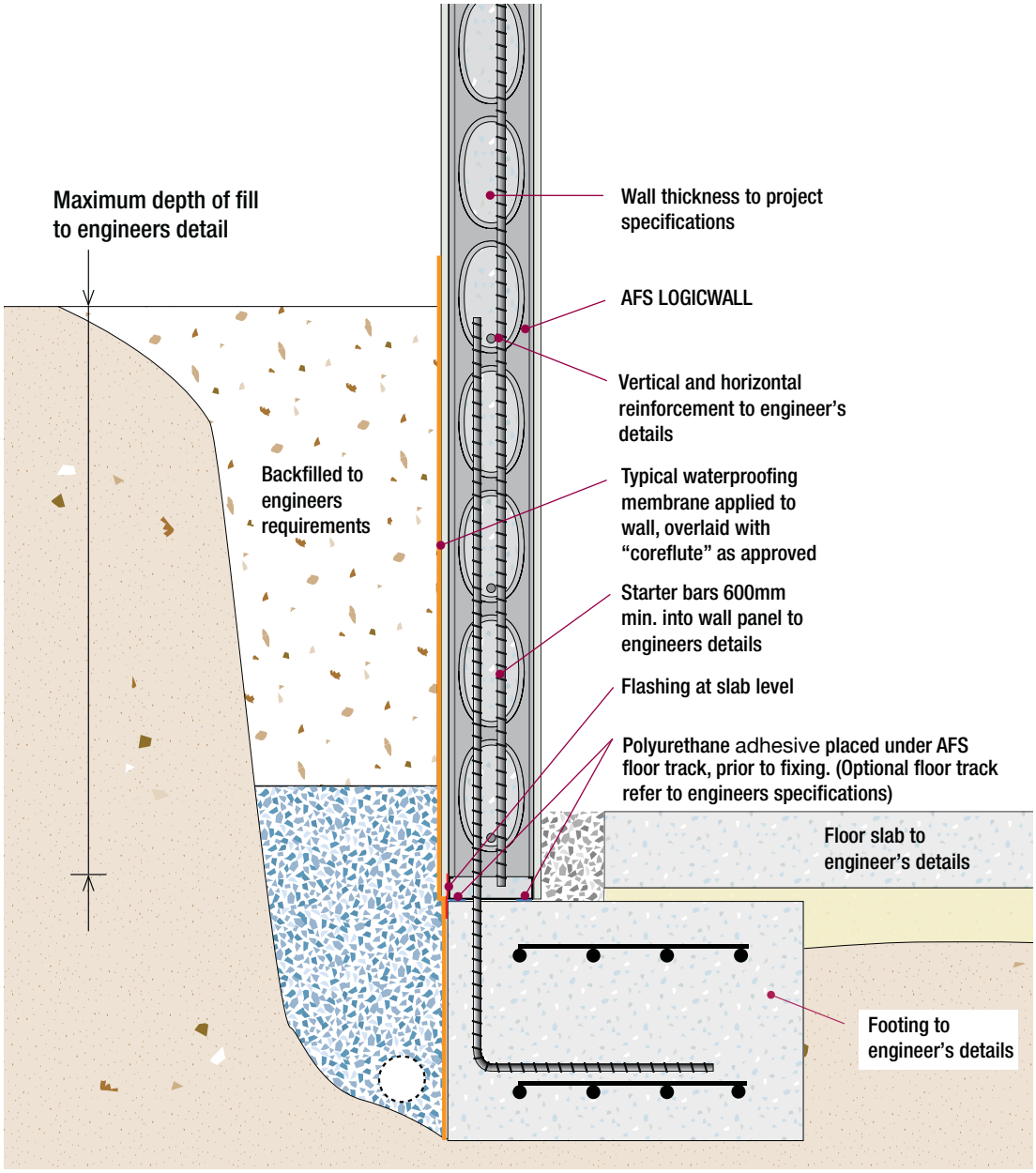


Fig I10: AFS Logicwall® Retaining Wall / Basement Wall Slab Junction



* Alternatively Basement Walls can be constructed using REDIWALL, another product by AFS.

Fig I11: AFS Logicwall® Retaining Wall / Basement Wall Footing Junction



* Alternatively Basement Walls can be constructed using REDIWALL, another product by AFS.

Fig I12: Wall Slab Junction, Beam System Parallel To AFS Logicwall®

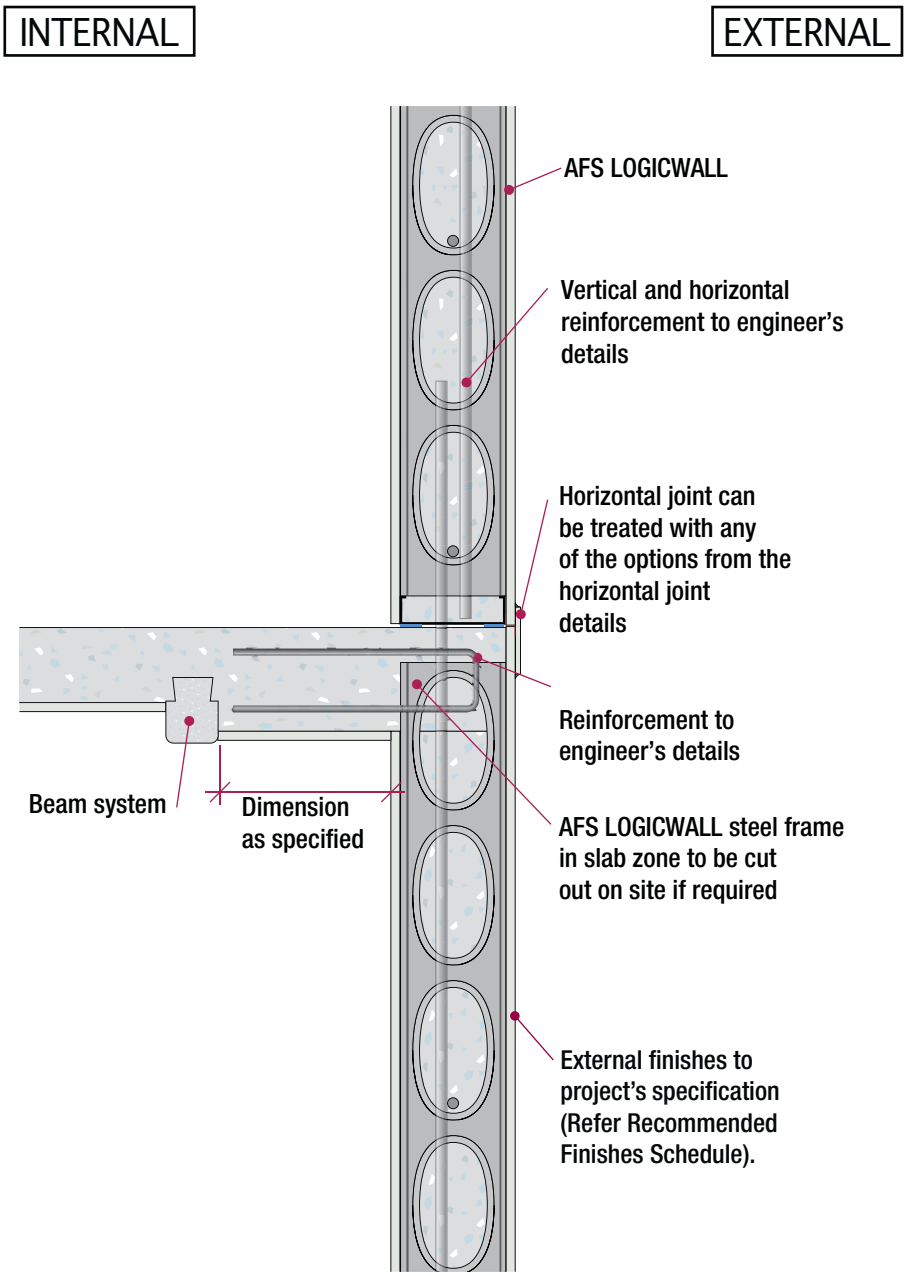


Fig I13: Wall Slab Junction, Beam System Perpendicular to AFS Logicwall®

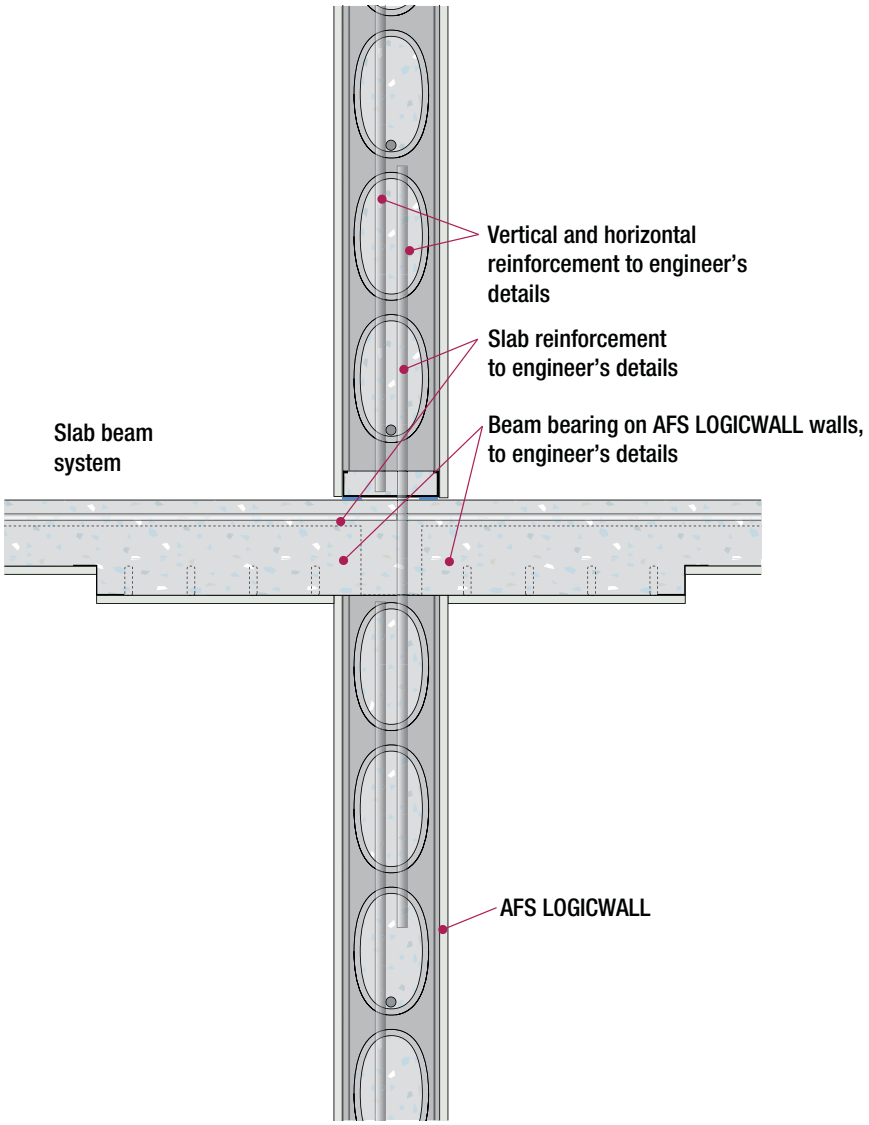


Fig I14: Wall Slab Junction, Beam System Perpendicular to AFS Logicwall® Façade Wall

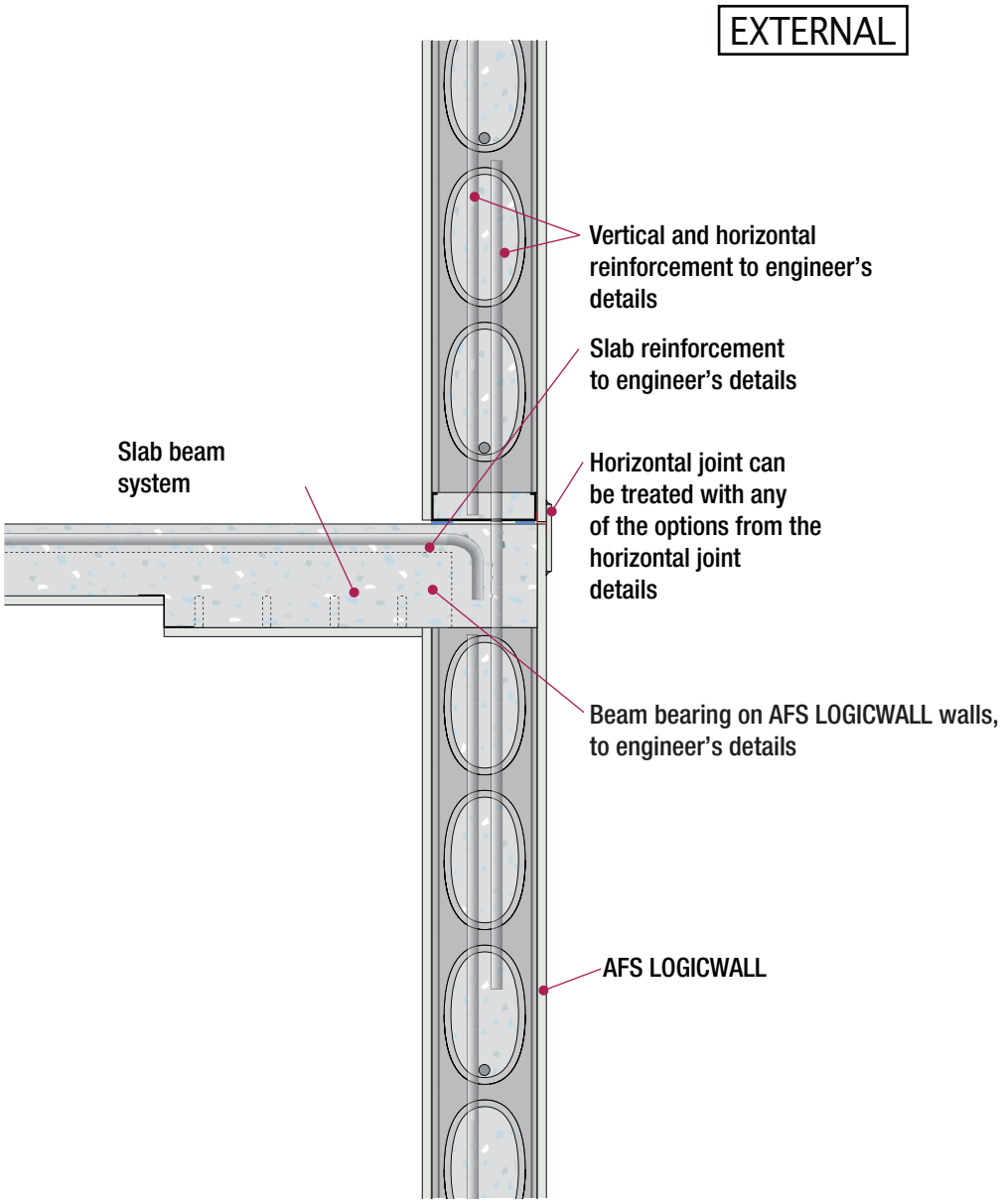


Fig I15: Permanent Formwork, Junction To AFS Logicwall® Façade Wall
(i.e. Bondek or similar metal floor system)

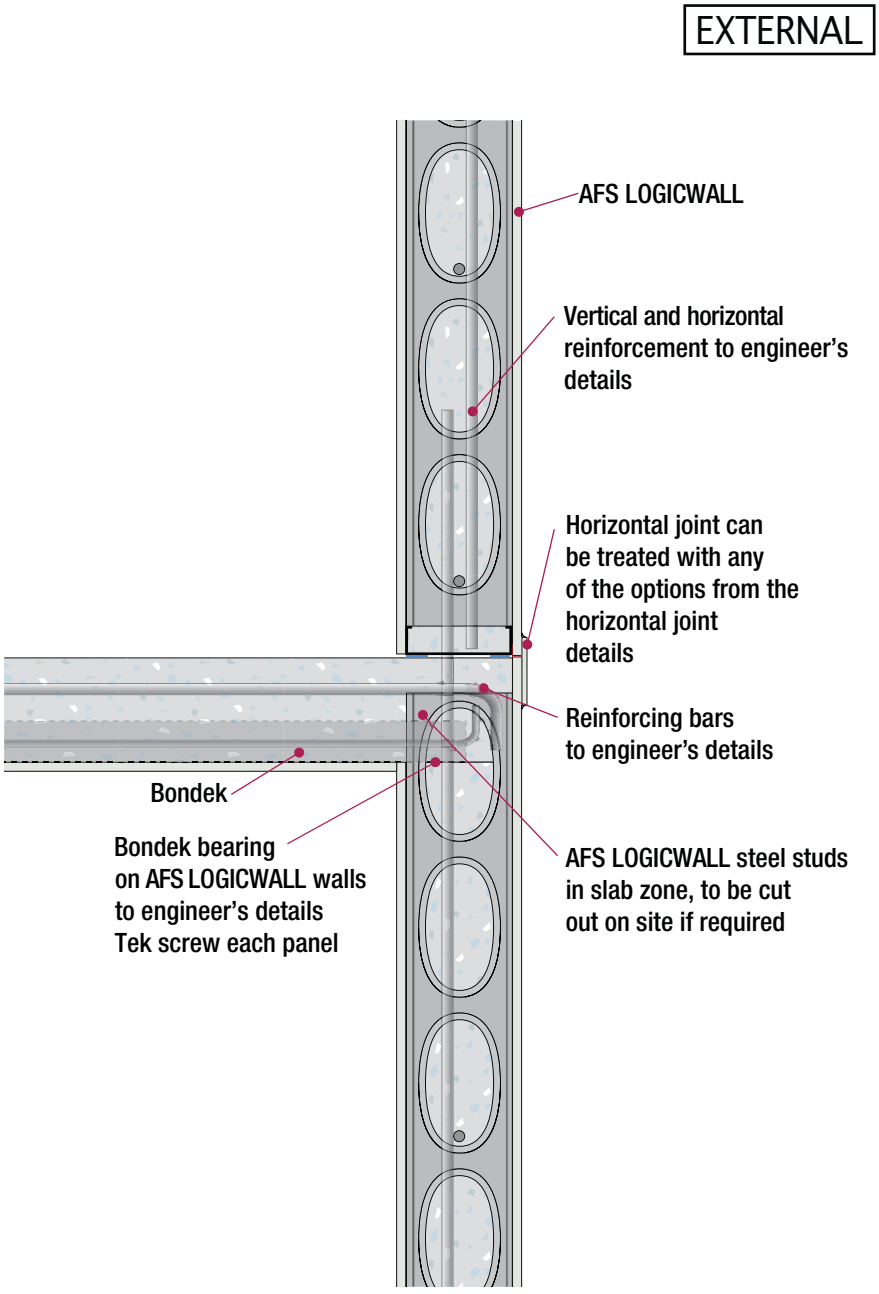


Fig I16: Permanent Formwork, Junction To Internal AFS Logicwall® (i.e. Bondek or similar metal floor system)

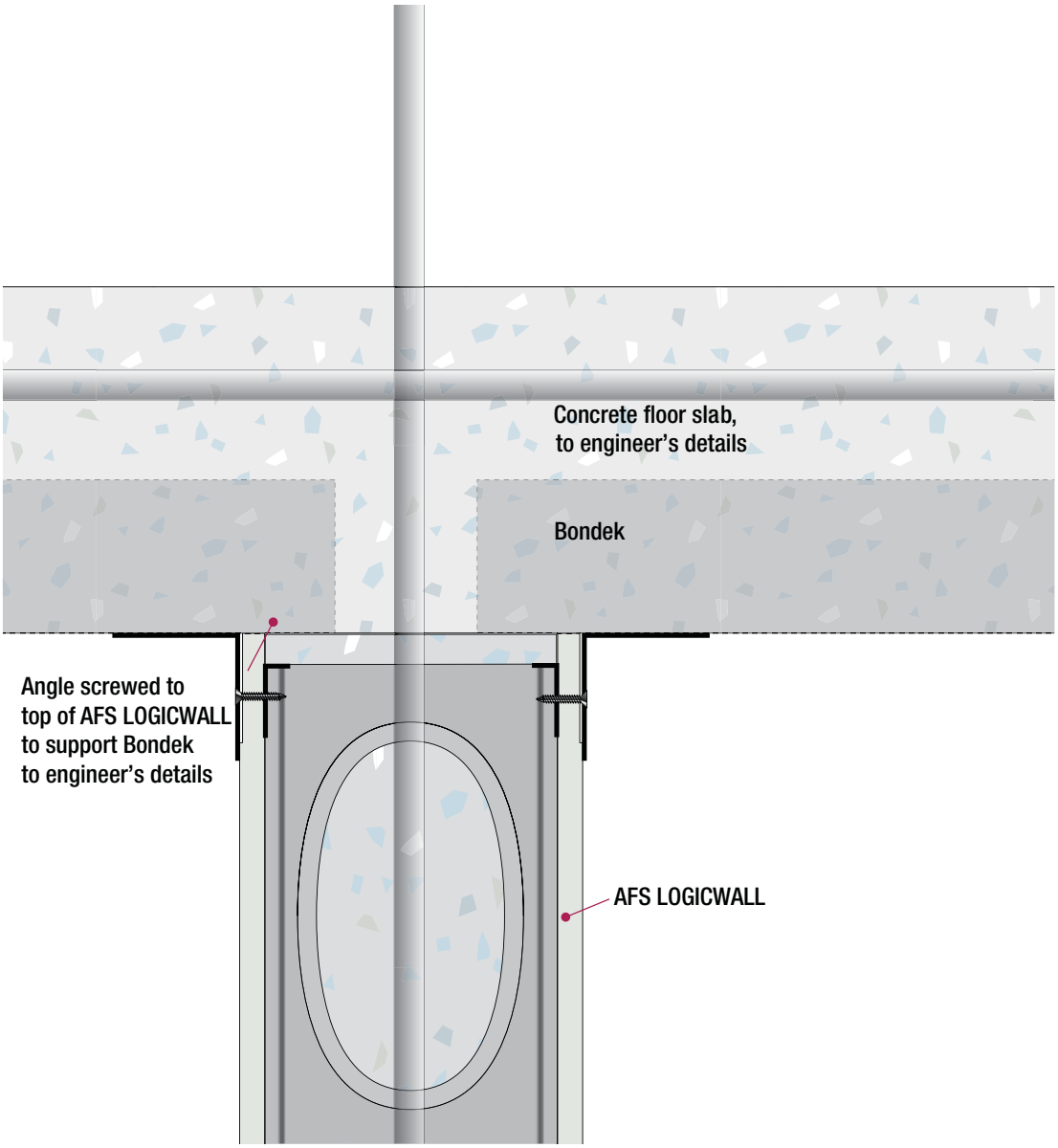
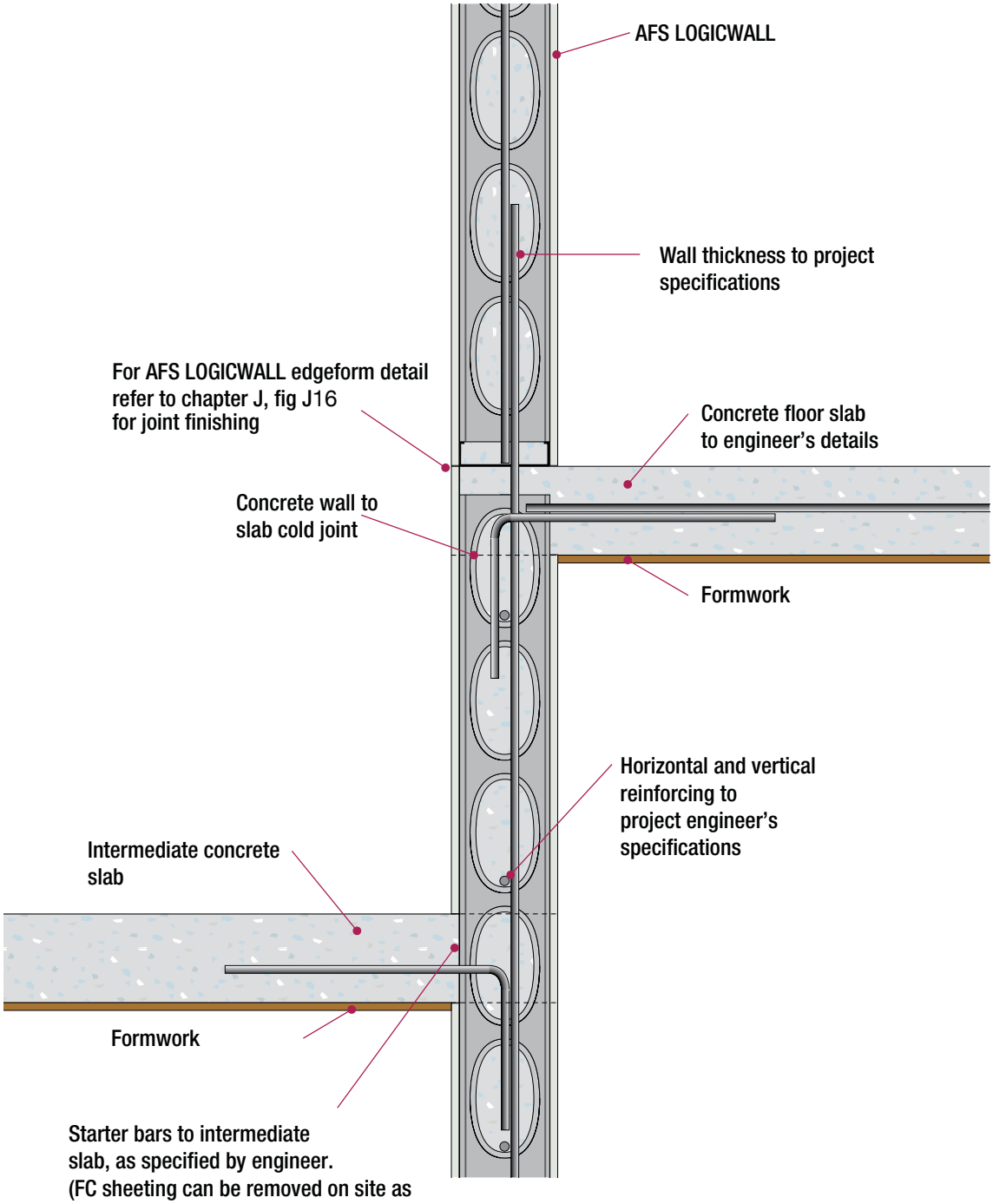
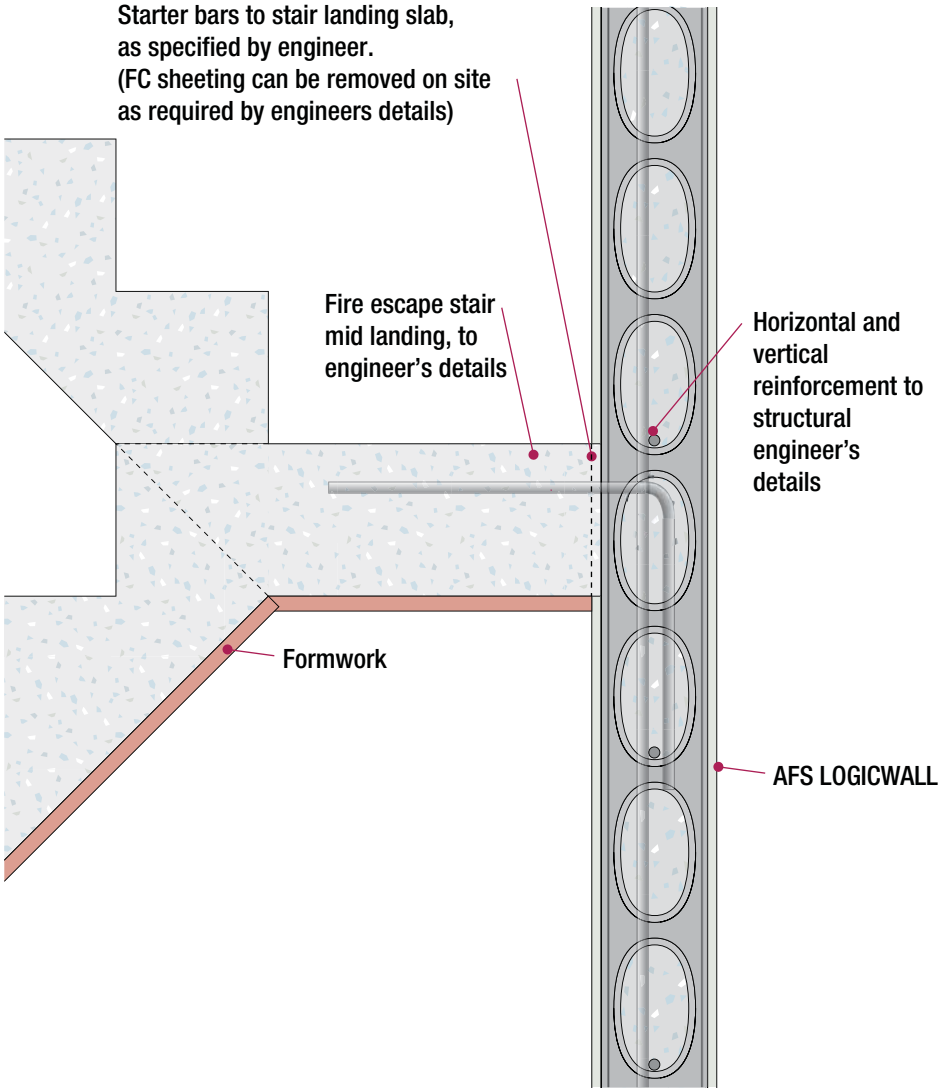


Fig I17: Step Floor/Stair Landing



NOTE: Consult AFS technical representative before specifying this detail.

Fig I18: AFS Logicwall® Wall Connections To Stair Mid Landing



I3. Post-tensioned Slabs

Fig I19: AFS Logicwall® Post-tensioned Detail

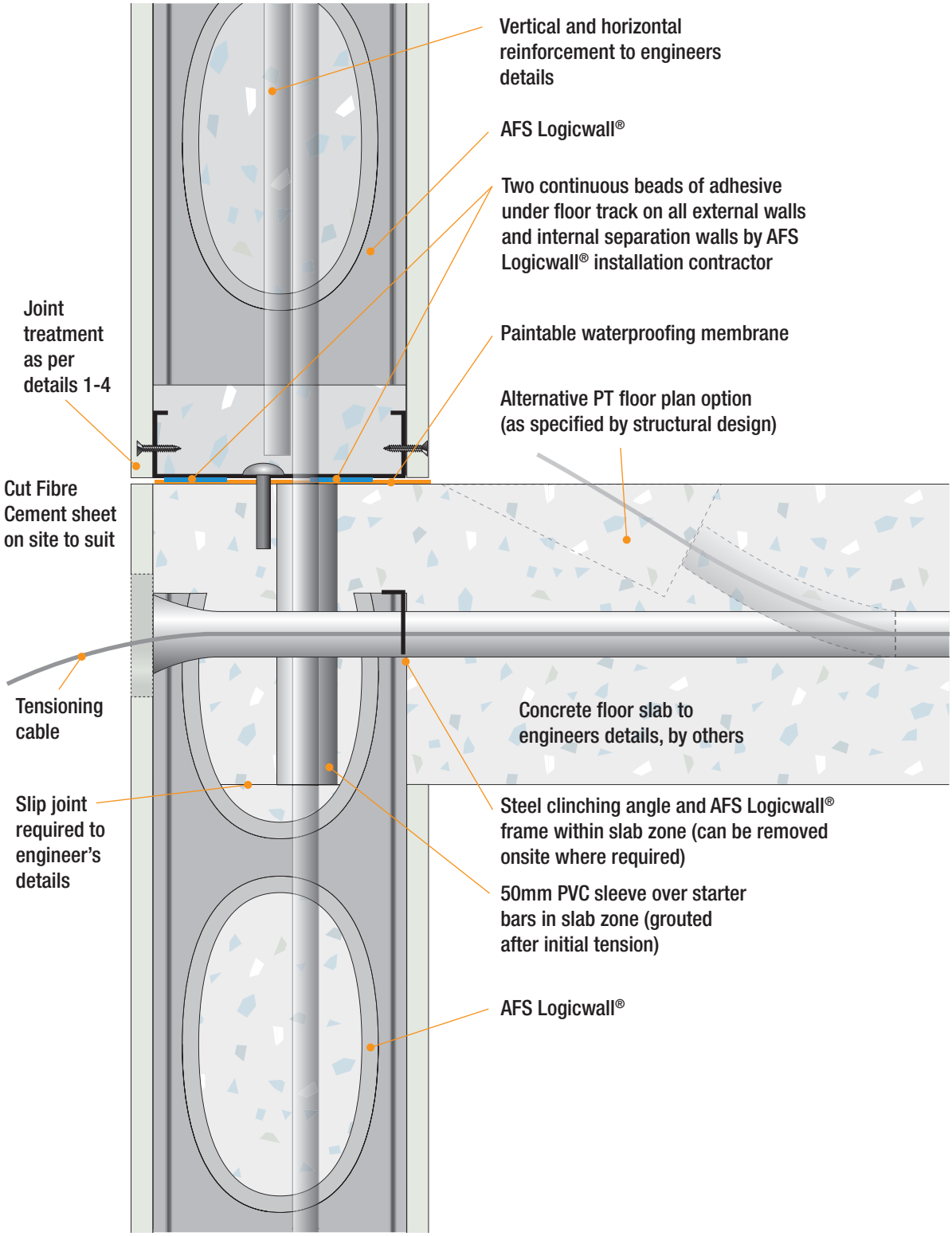
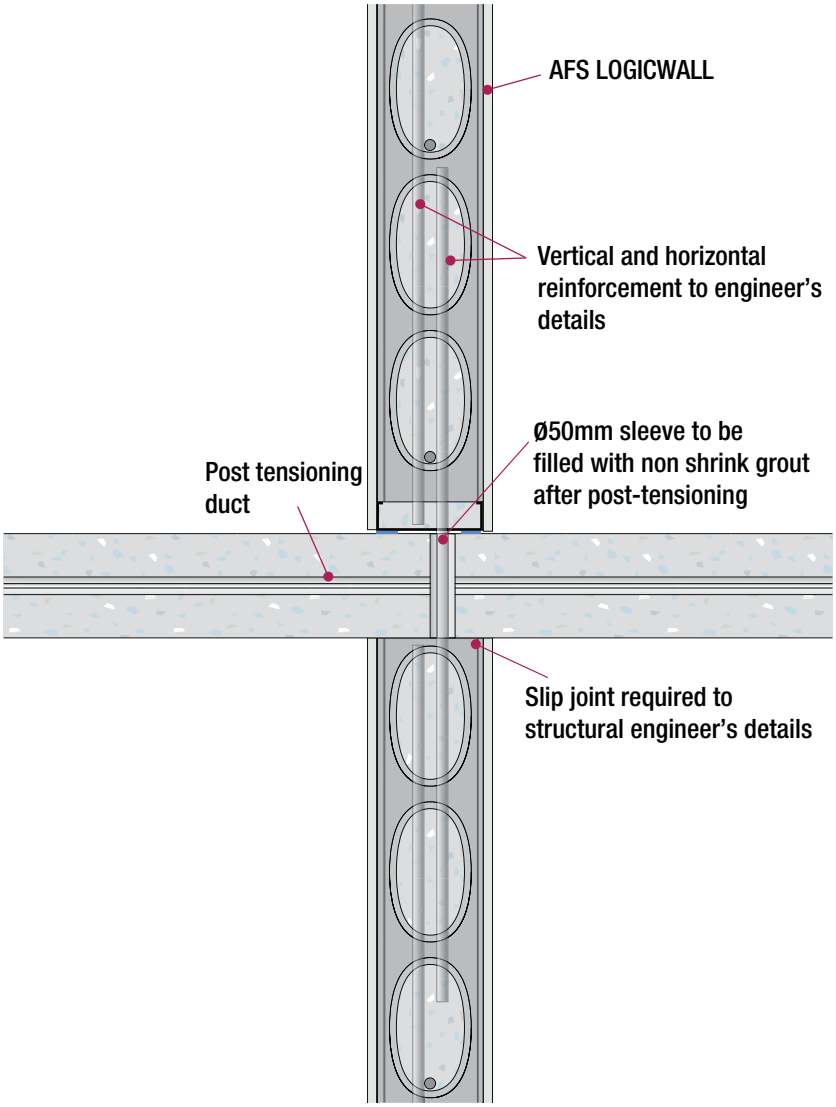


Fig I20: Post-tensioned Slab To AFS Logicwall® (Internal) Wall



I4. Corners and Tee Junctions

Fig I21: AFS Logicwall® Wall 90° Prefabricated Corner - Single Reinforcement Carriers (LW120, 150, 162, 200)

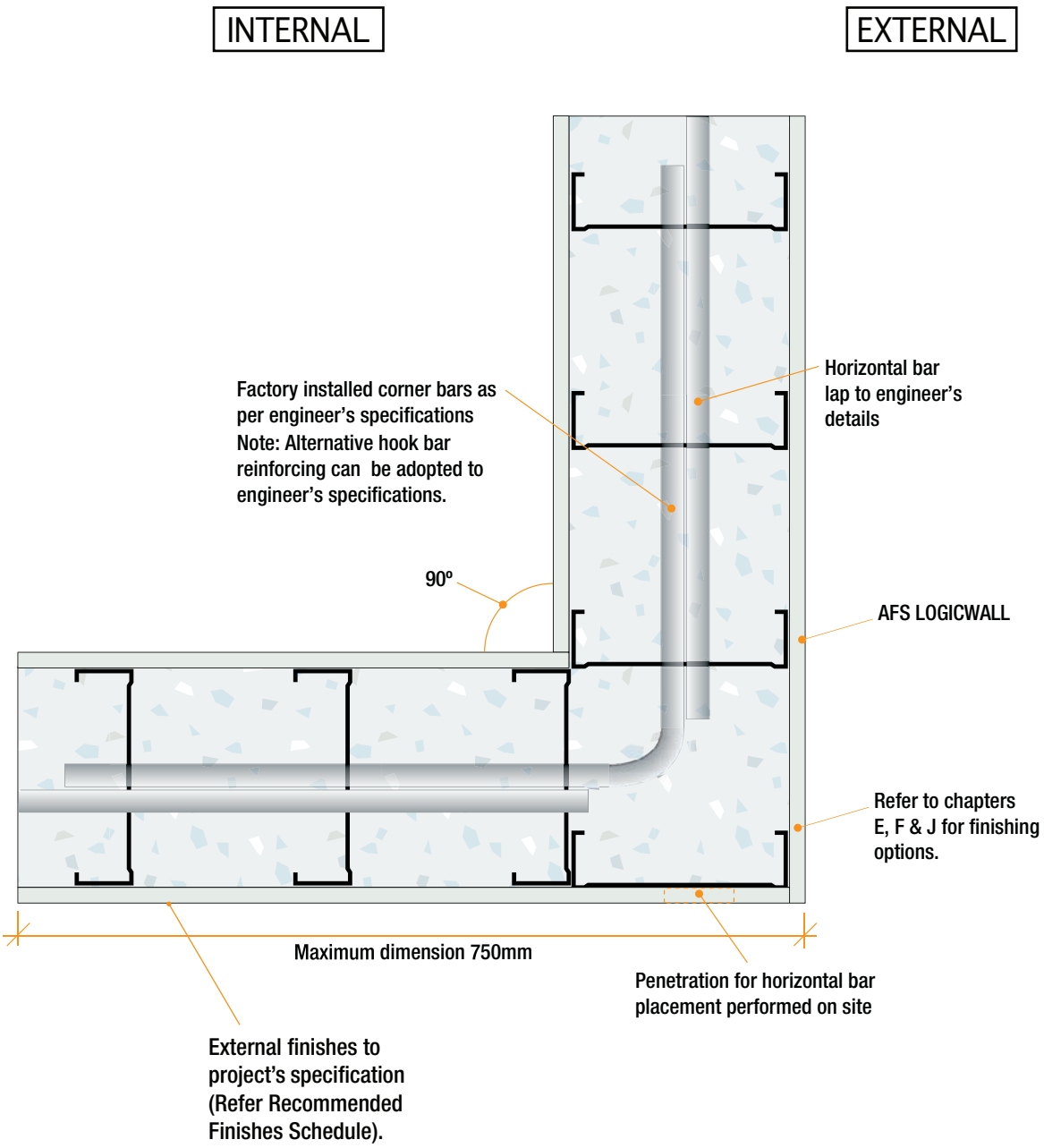


Fig I22: AFS Logicwall®Wall 90° Prefabricated Corner –
Double Reinforcement Carriers - with"U"bars (LW200D, 262D)

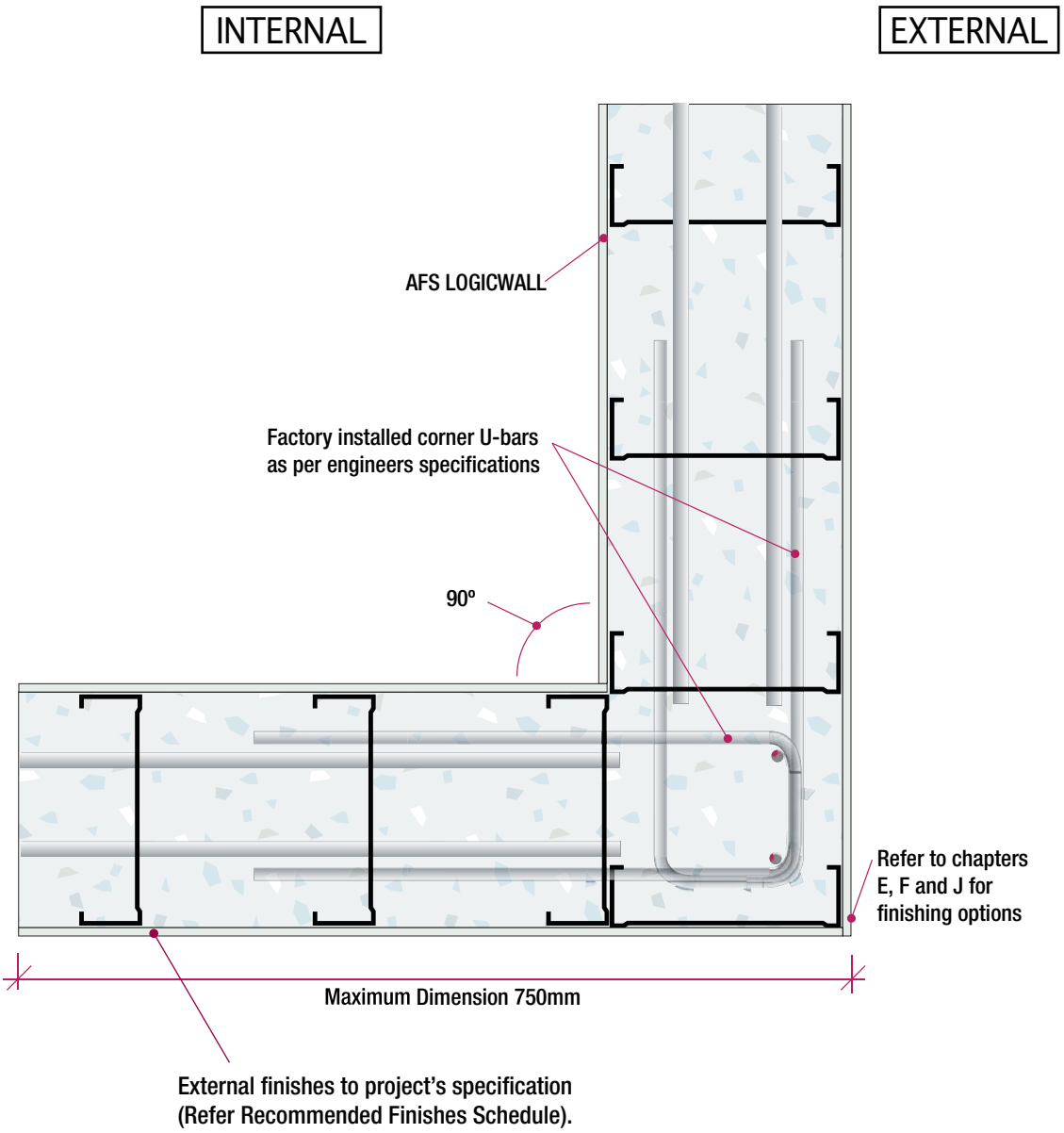


Fig I23: Step Floor/Stair Landing

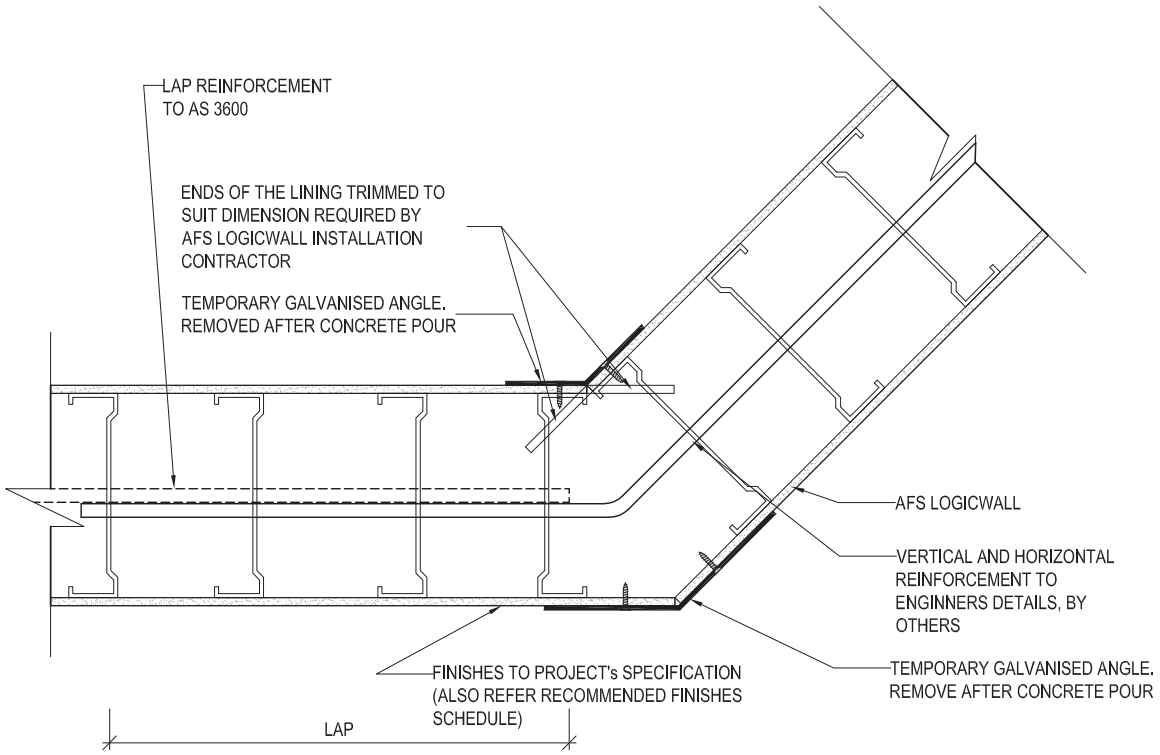


Fig I24: AFS Logicwall® Wall Tee Junction – Option 1

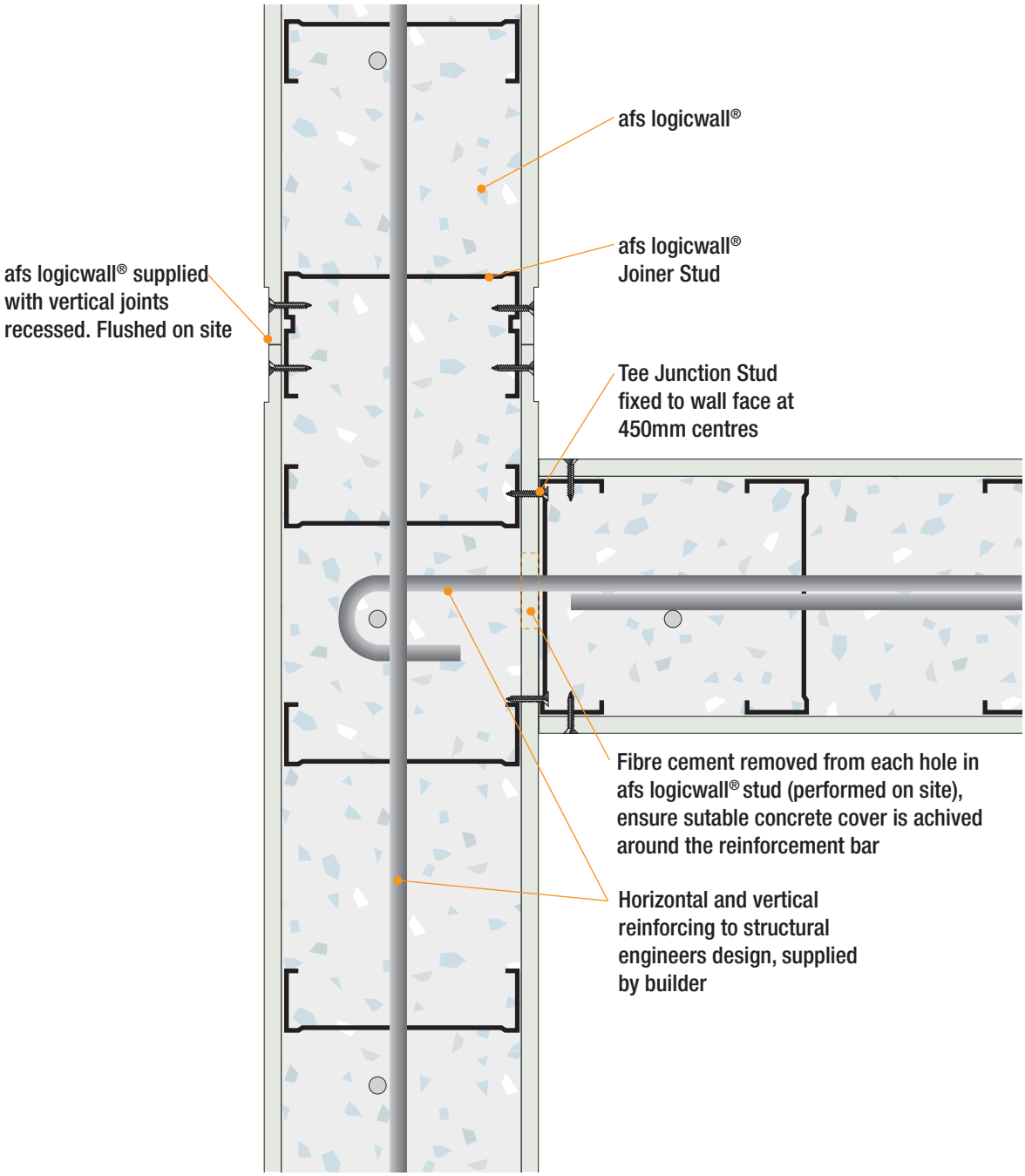


Fig I25: AFS Logicwall® Wall Tee Junction – Option 2

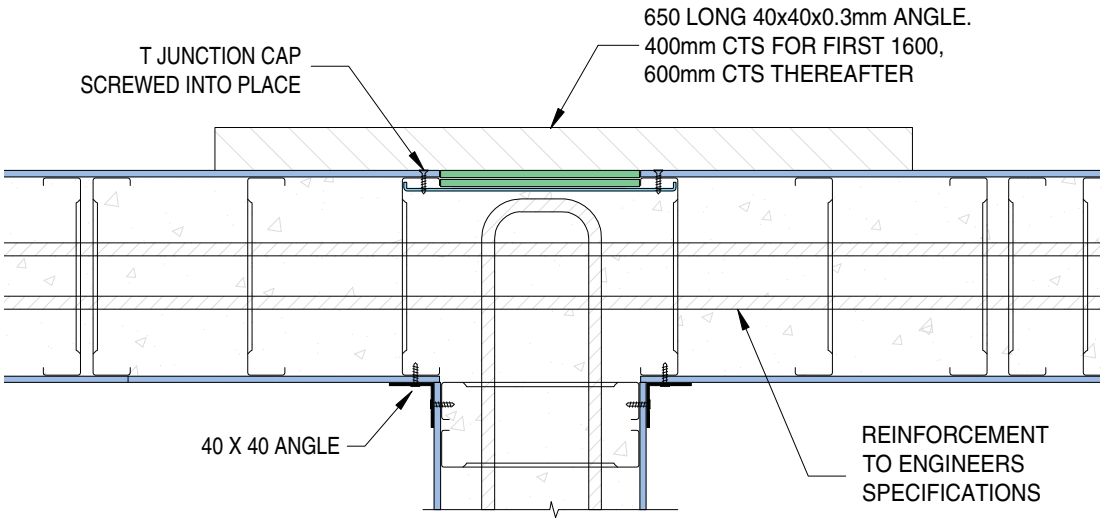
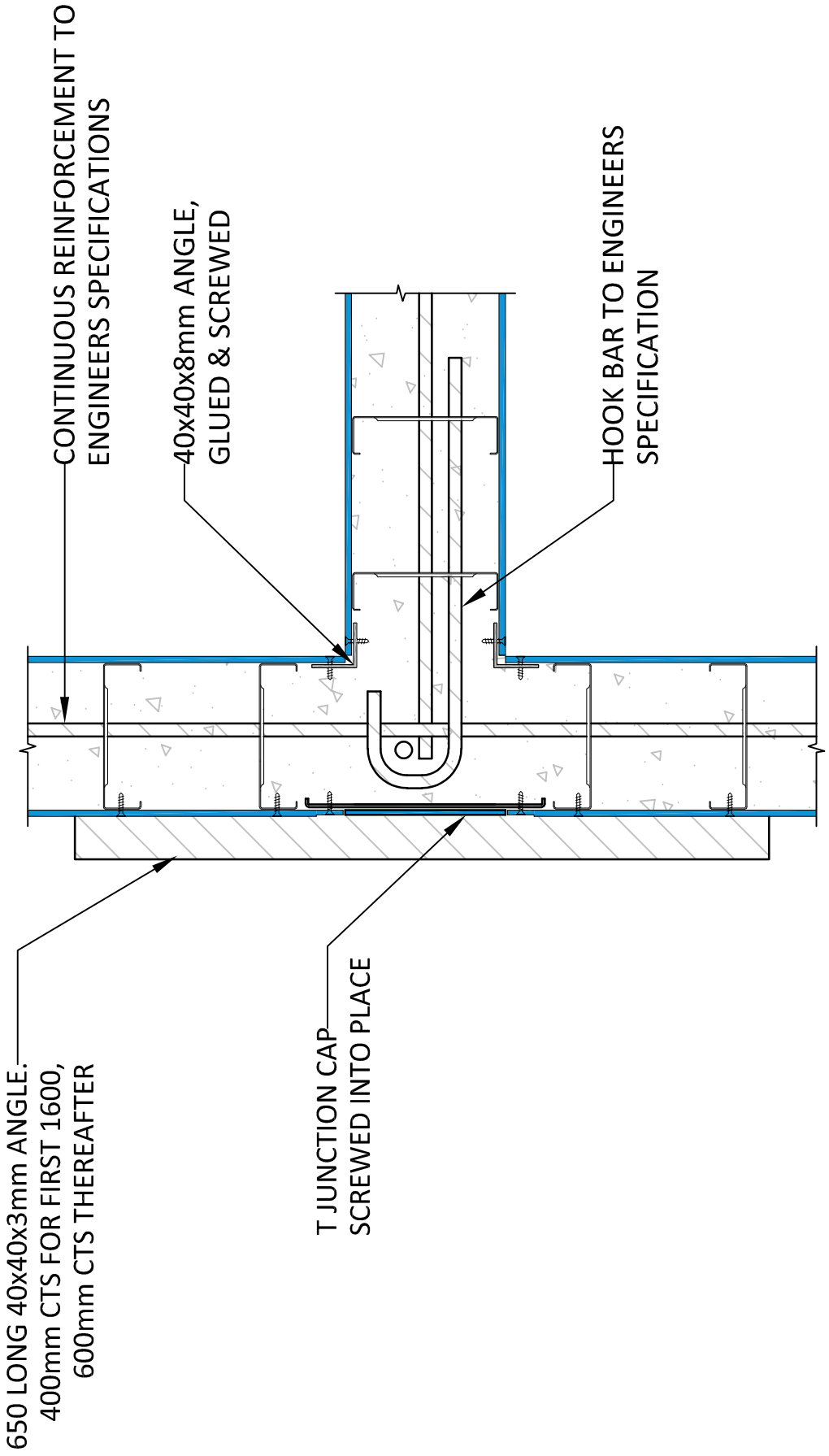
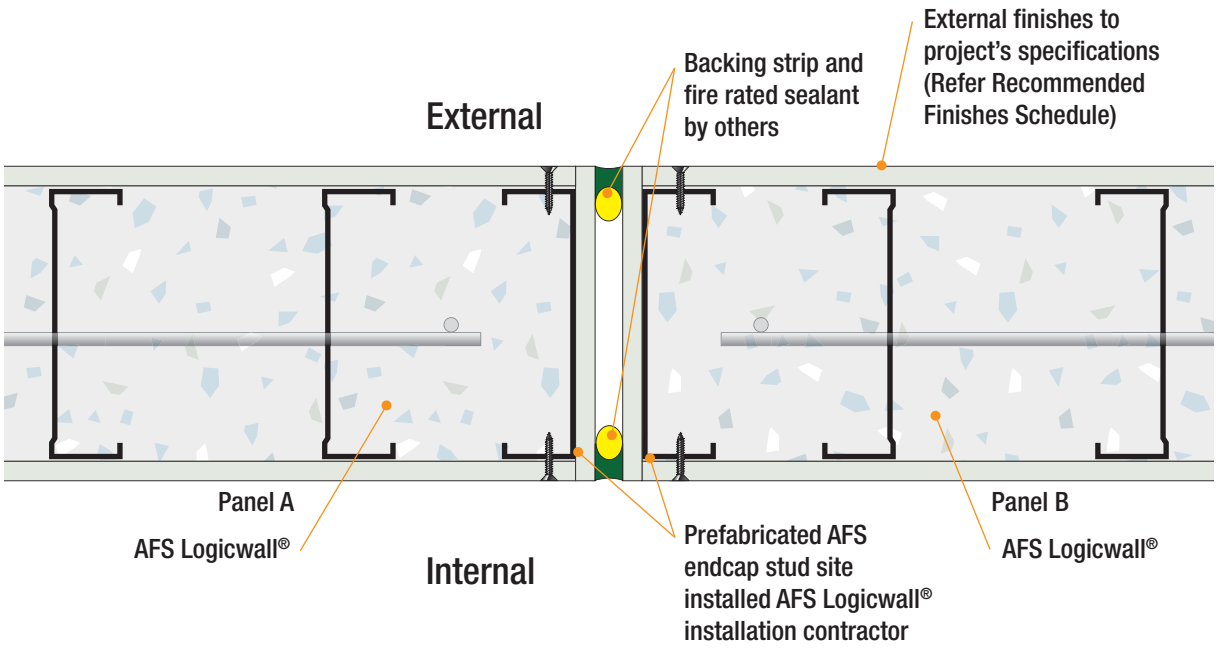


Fig I26: AFS Logicwall® Wall Tee Junction – Option 3



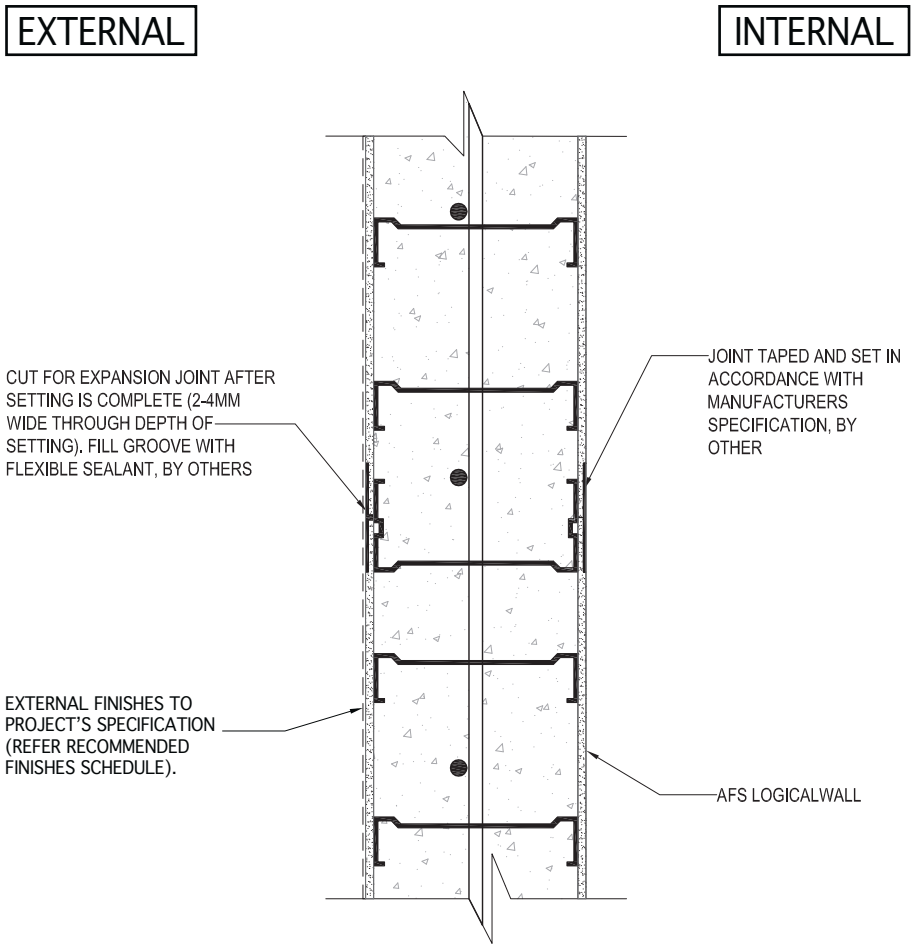
I5. Panel Joints

Fig I27: AFS Logicwall® Movement Joint



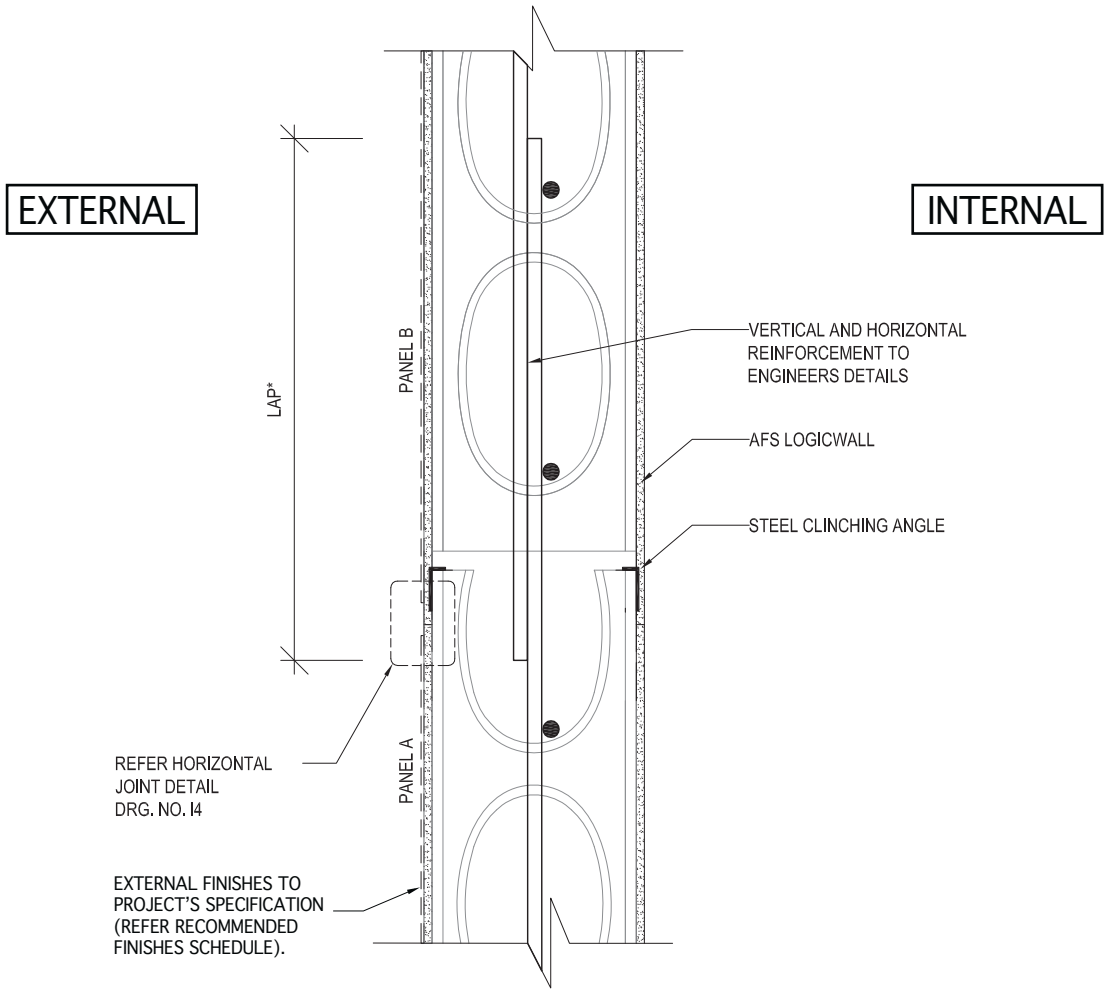
Note: Can be dowel jointed if required structurally. Must be clearly specified and negotiated with installers at time of tender. Installed where nominated by project engineer. Must be clearly documented on drawings. Typically not required in walls less than 16m in length.

Fig I28: AFS Logicwall® Fibre Cement Sheet Surface Joint (Vertical)



*NOTE: LOCATIONS FOR SHEET SURFACE JOINTS ARE TO BE NOMINATED BY PROJECT CONSULTANTS AND ARE REQUIRED NOMINALLY EVERY 6-8 METRES

Fig I29: Double Height Wall – Horizontal Joint



*NOTE: ISSUE REGARDING ACCESS, LIFTING AND BRACING NEED TO BE CONSIDERED WHEN SPECIFYING THIS DETAIL

I6. Boundary Walls

Fig I30: AFS Logicwall® Wall Adjacent To Existing Structure Flashing Detail

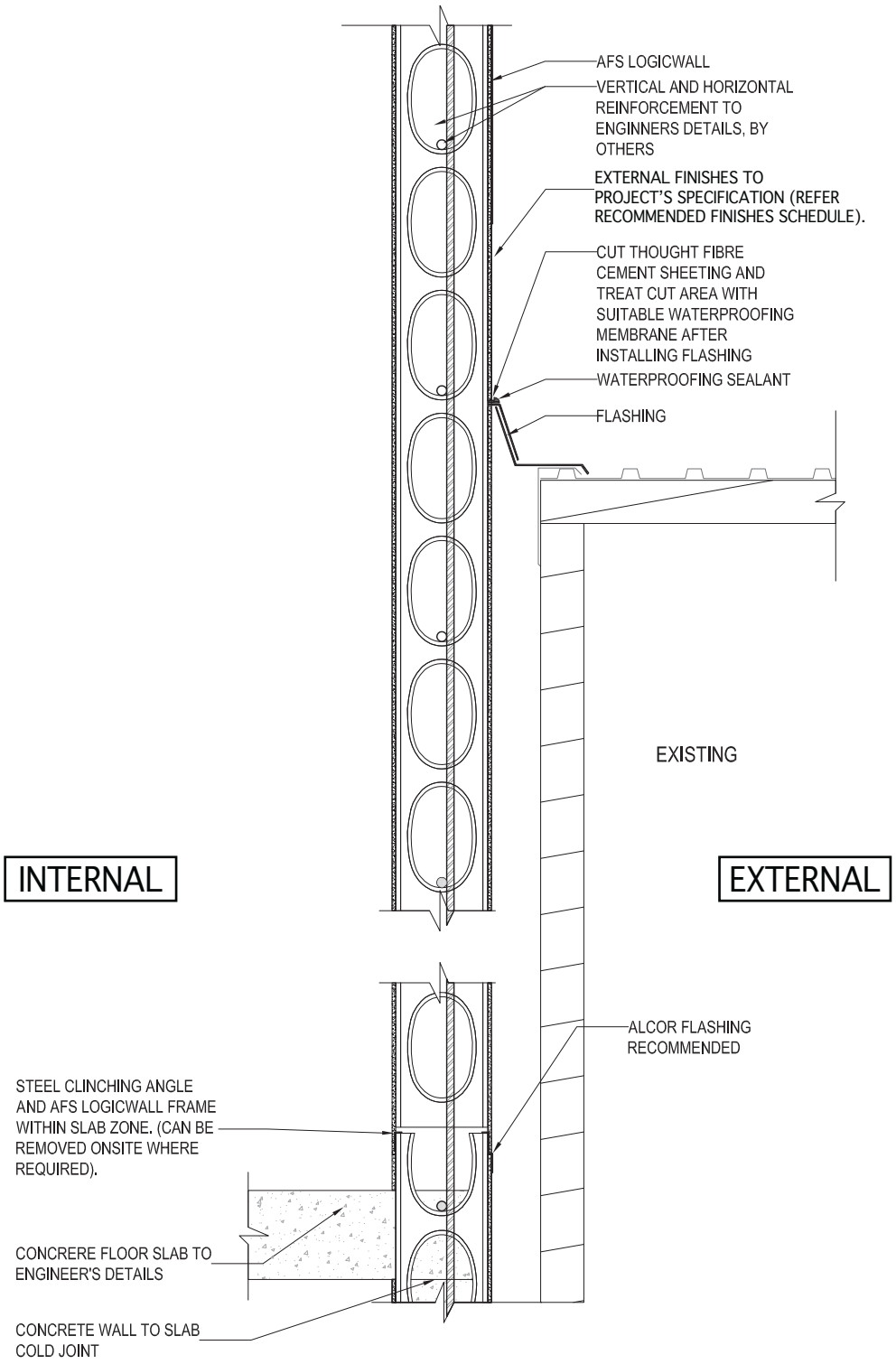
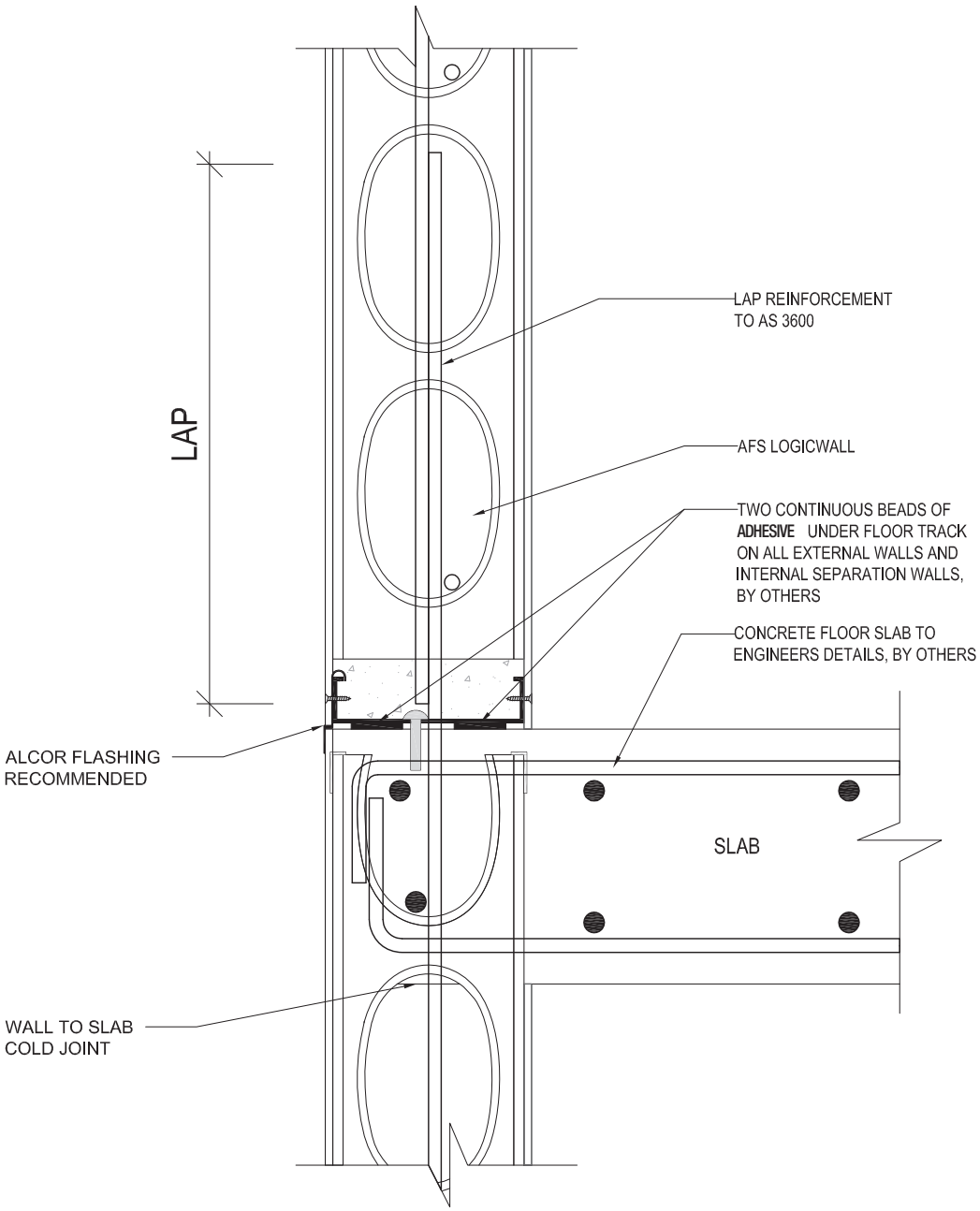
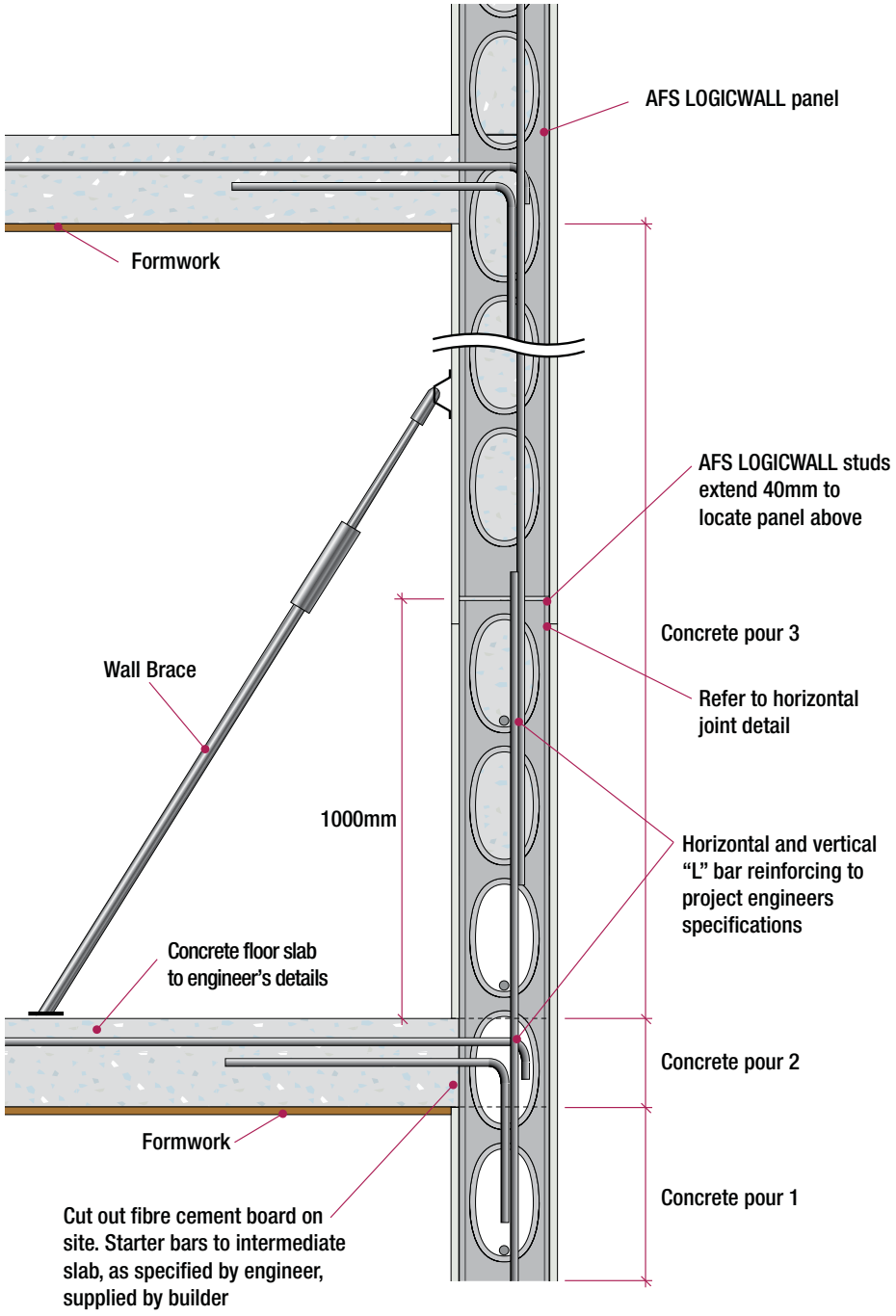


Fig I31: Unfinished Covered Boundary Wall Flashing Detail



This detail only applies where waterproof flashing is not achievable as per Fig I30

Fig I32: Safety Balustrade / Boundary Wall Detail



I7. Junctions With Other Wall Types

Fig I33: AFS Logicwall® / Plasterboard Wall Junction

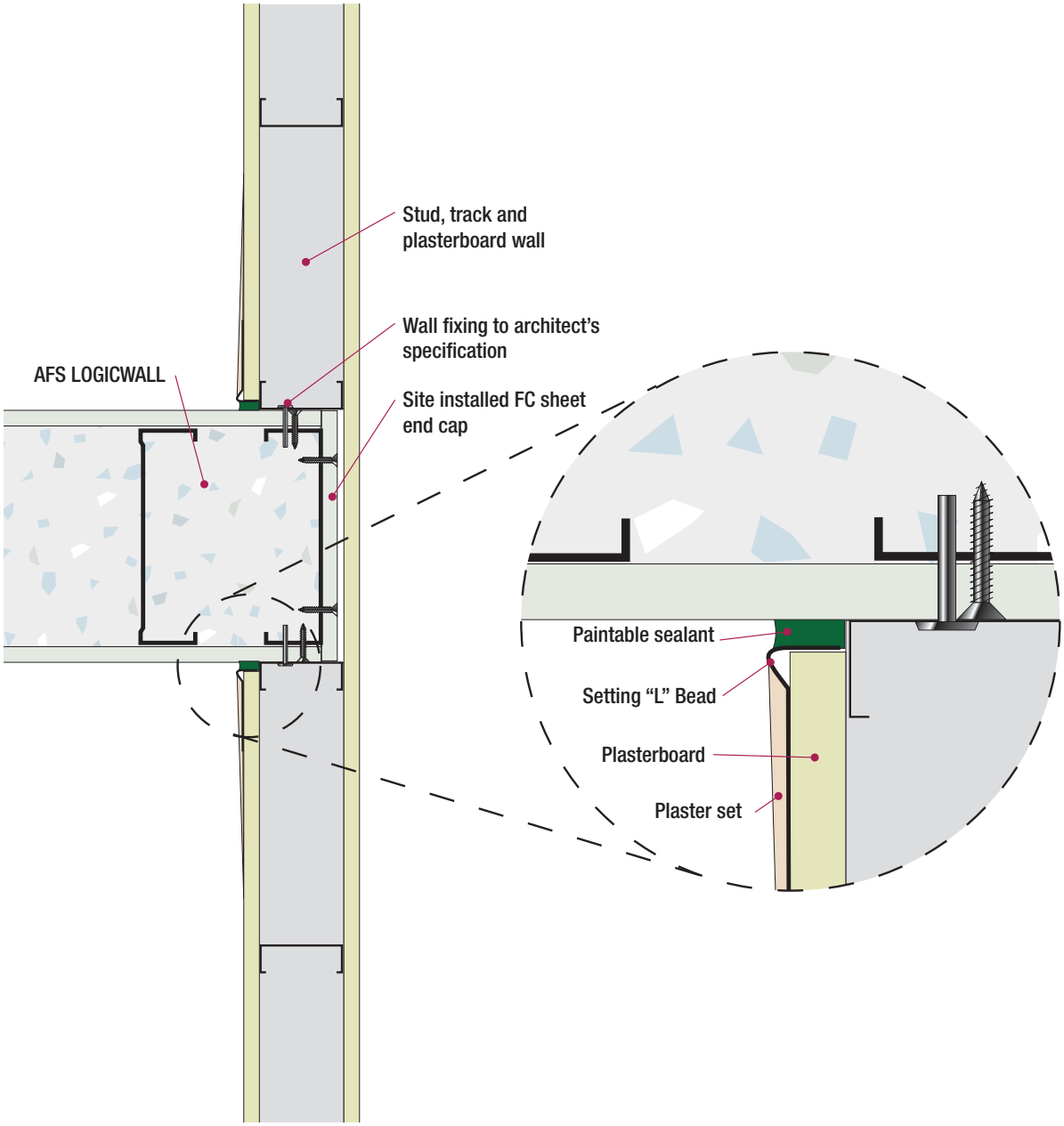


Fig 134: AFS Logicwall®/Double Brick Junction

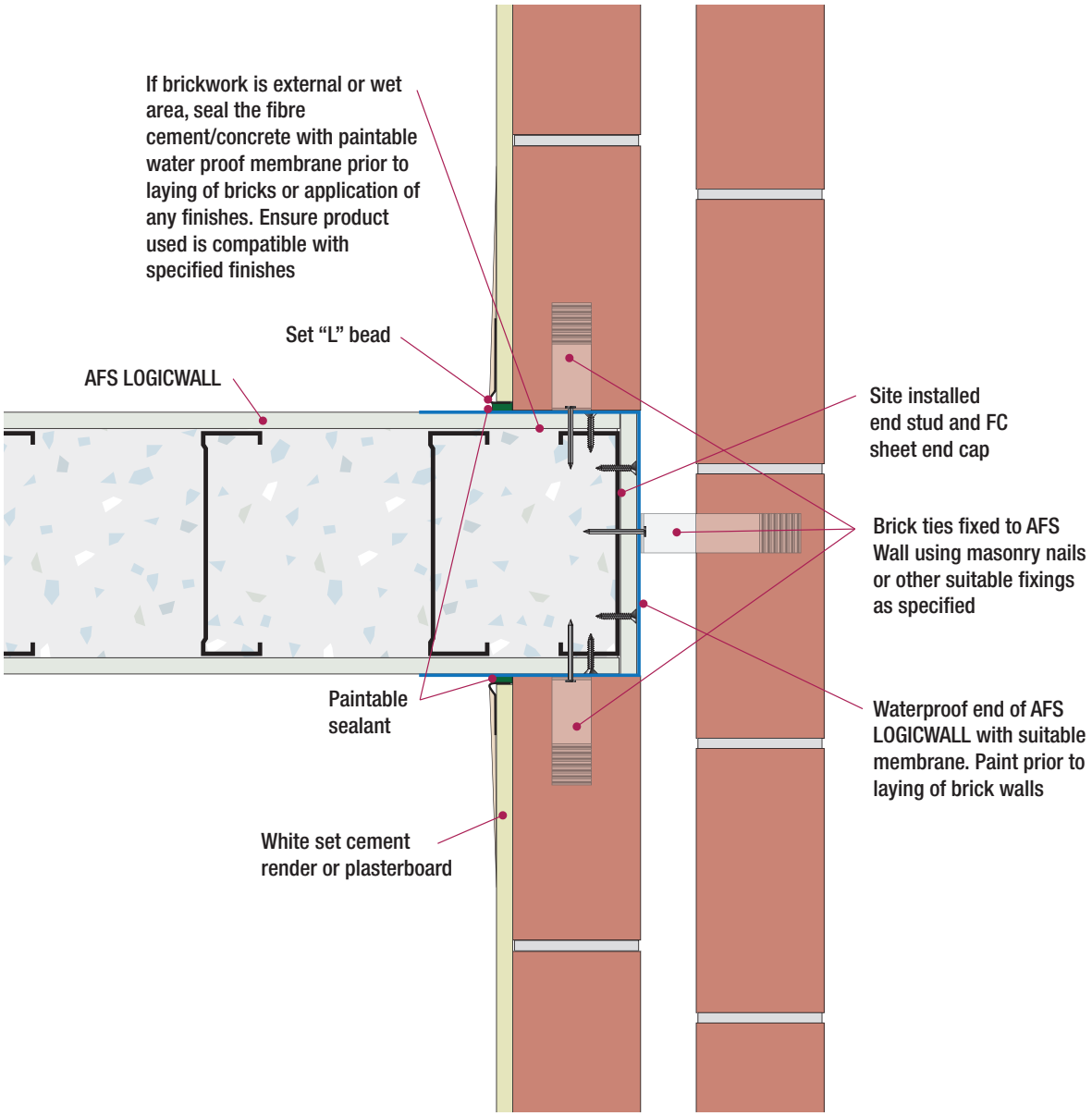


Fig I35: AFS Logicwall®/Brick Veneer Junction

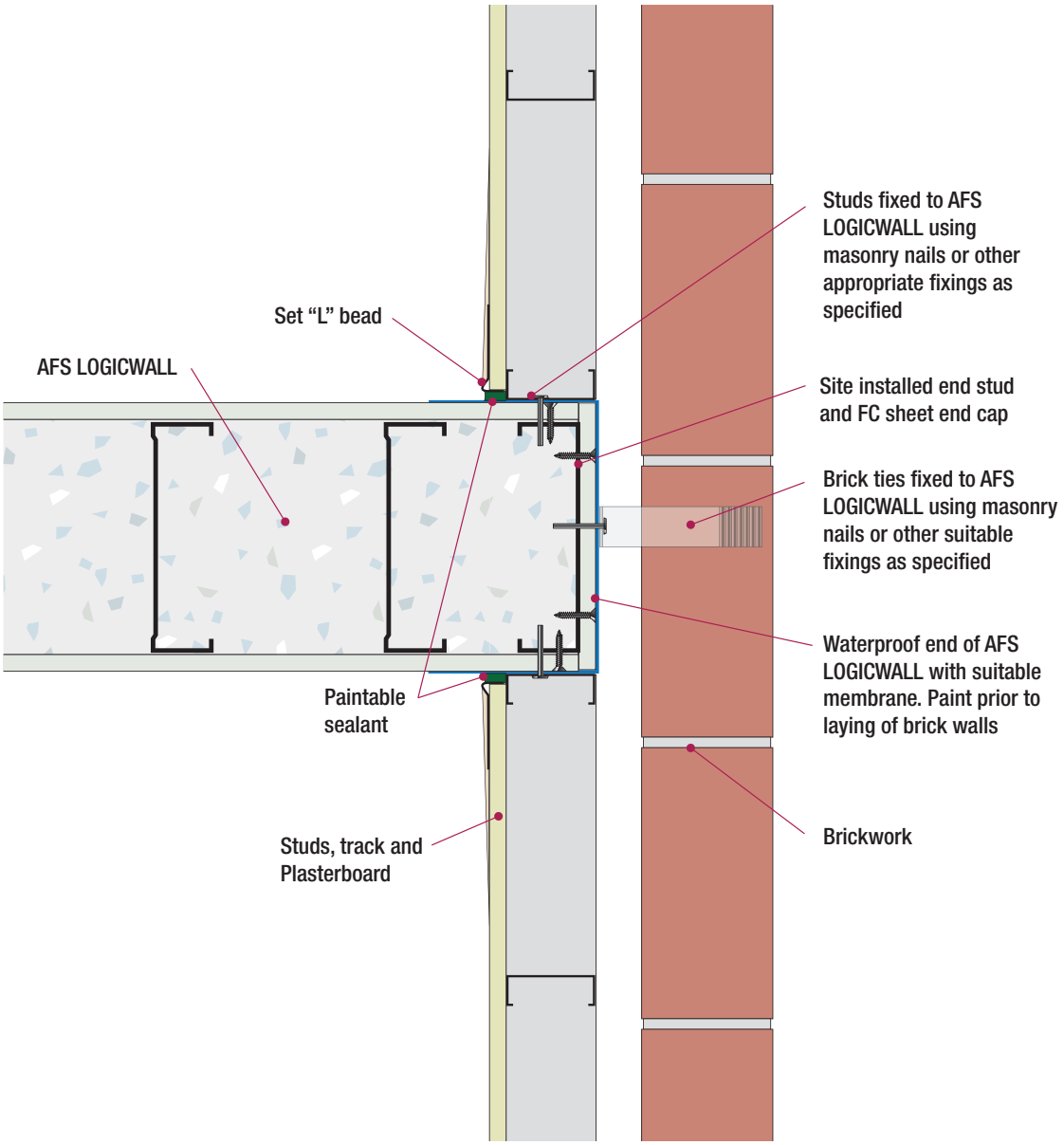


Fig 136: Brick Veneer Facade Over AFS Logicwall®

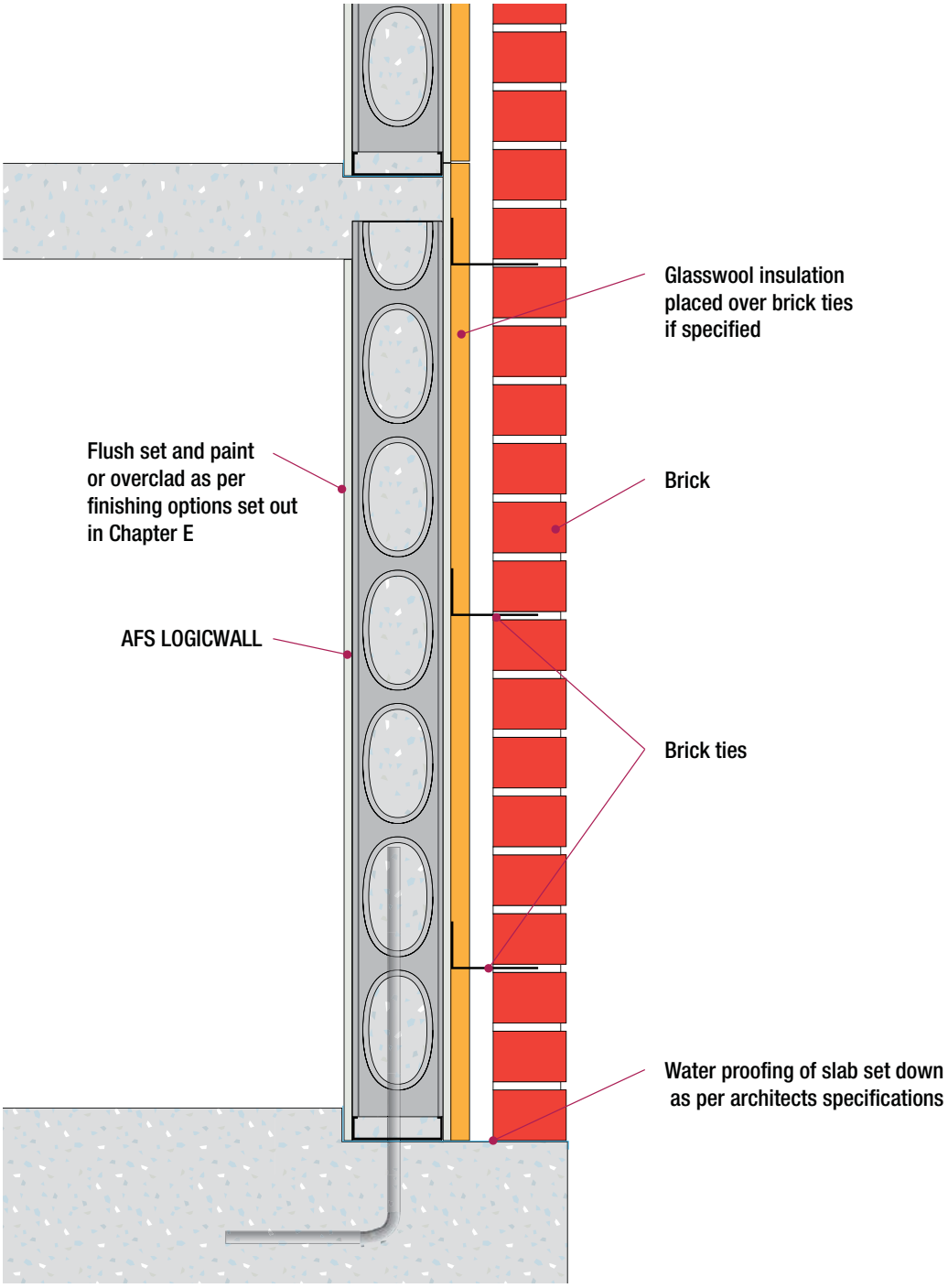


Fig I37: Fire Door Frames Manufactured to suit AFS Logicwall® Profile – Internal Fit

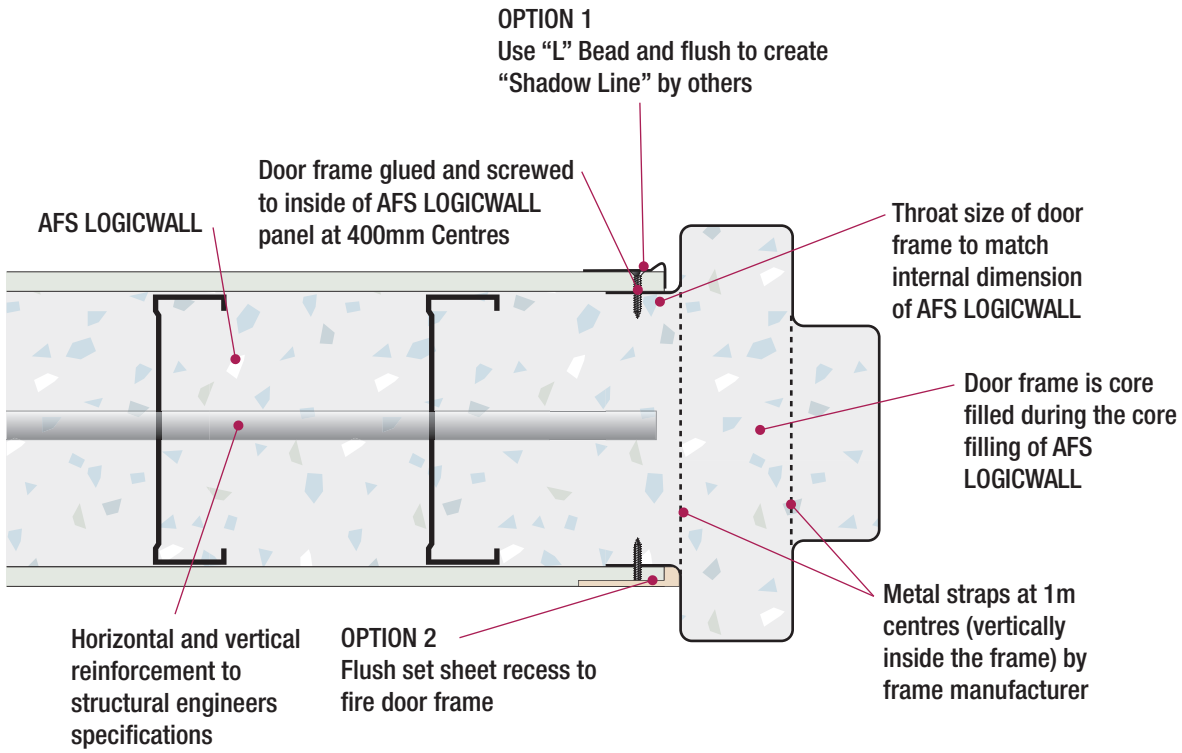


Fig I38: Fire Door Frames Manufactured to suit AFS Logicwall® Profile – Retro Fit Jamb

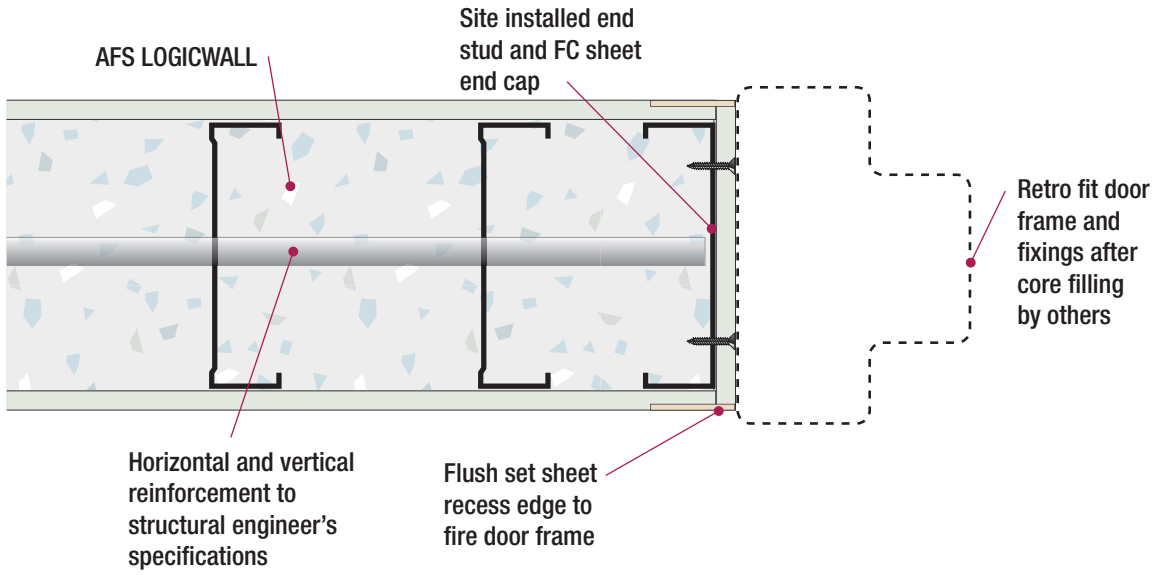


Fig I39: Alternative Non-Fire Rated Door Frames

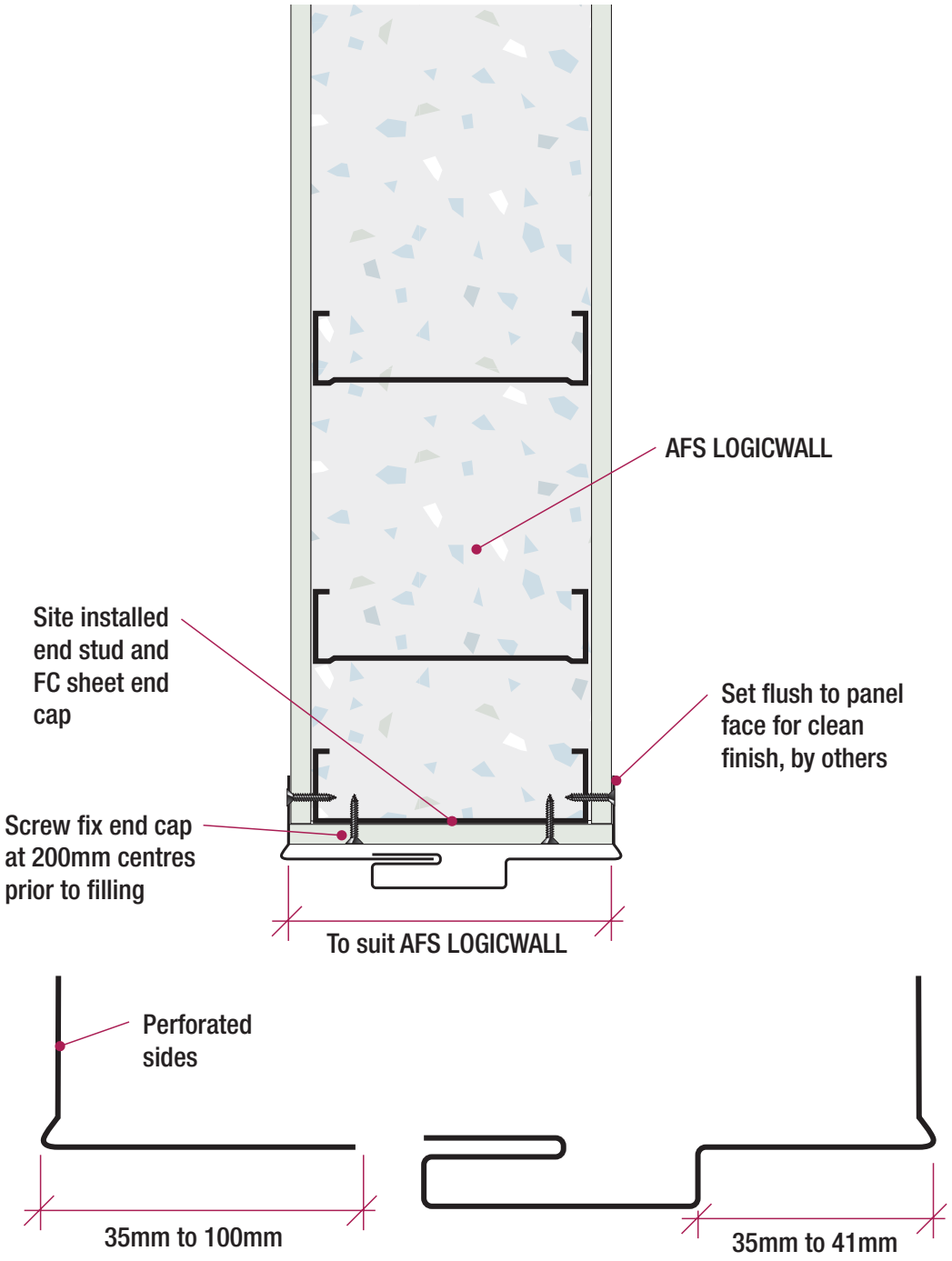


Fig I40: Commercial Window Section

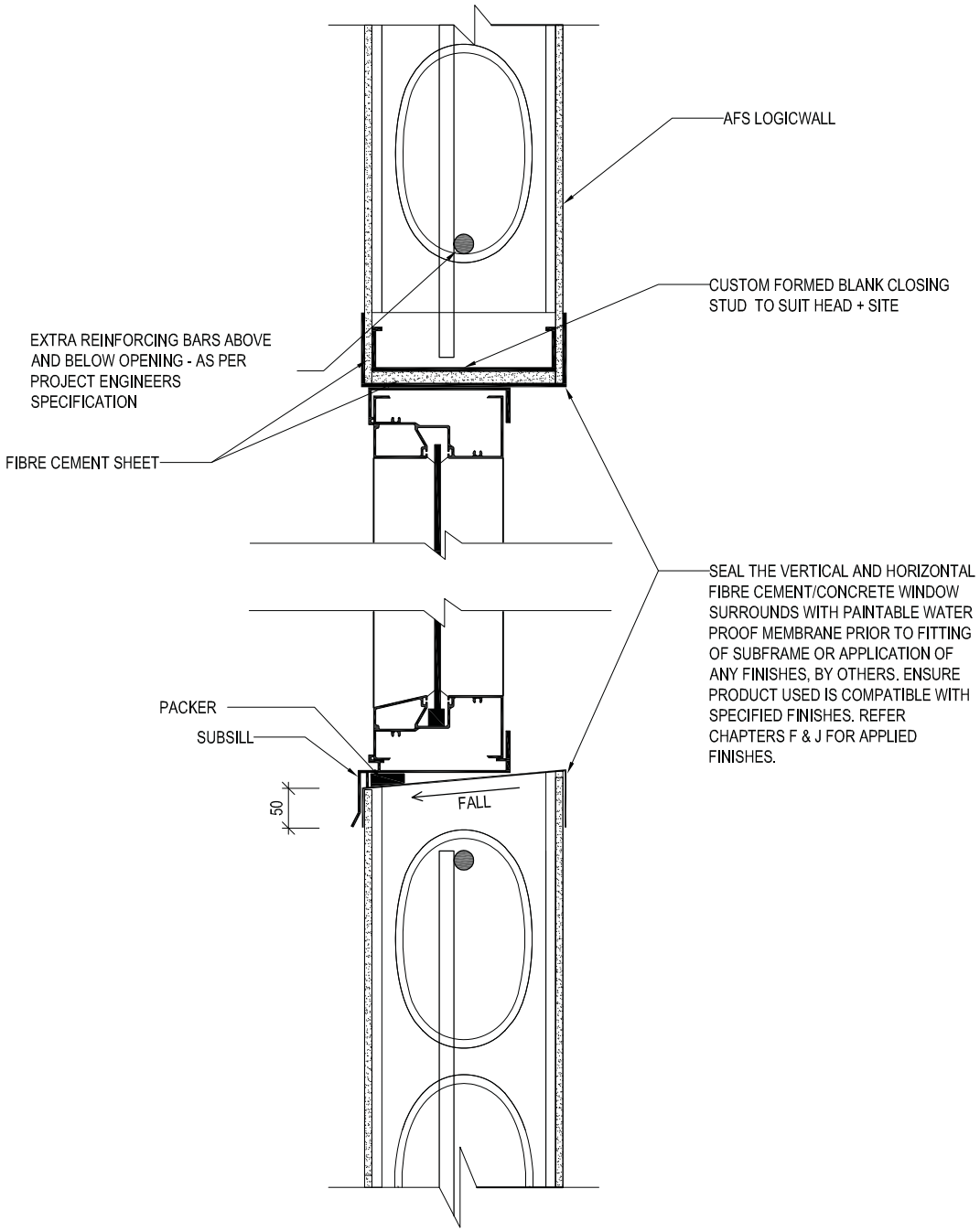


Fig I41: Rebated Window Section

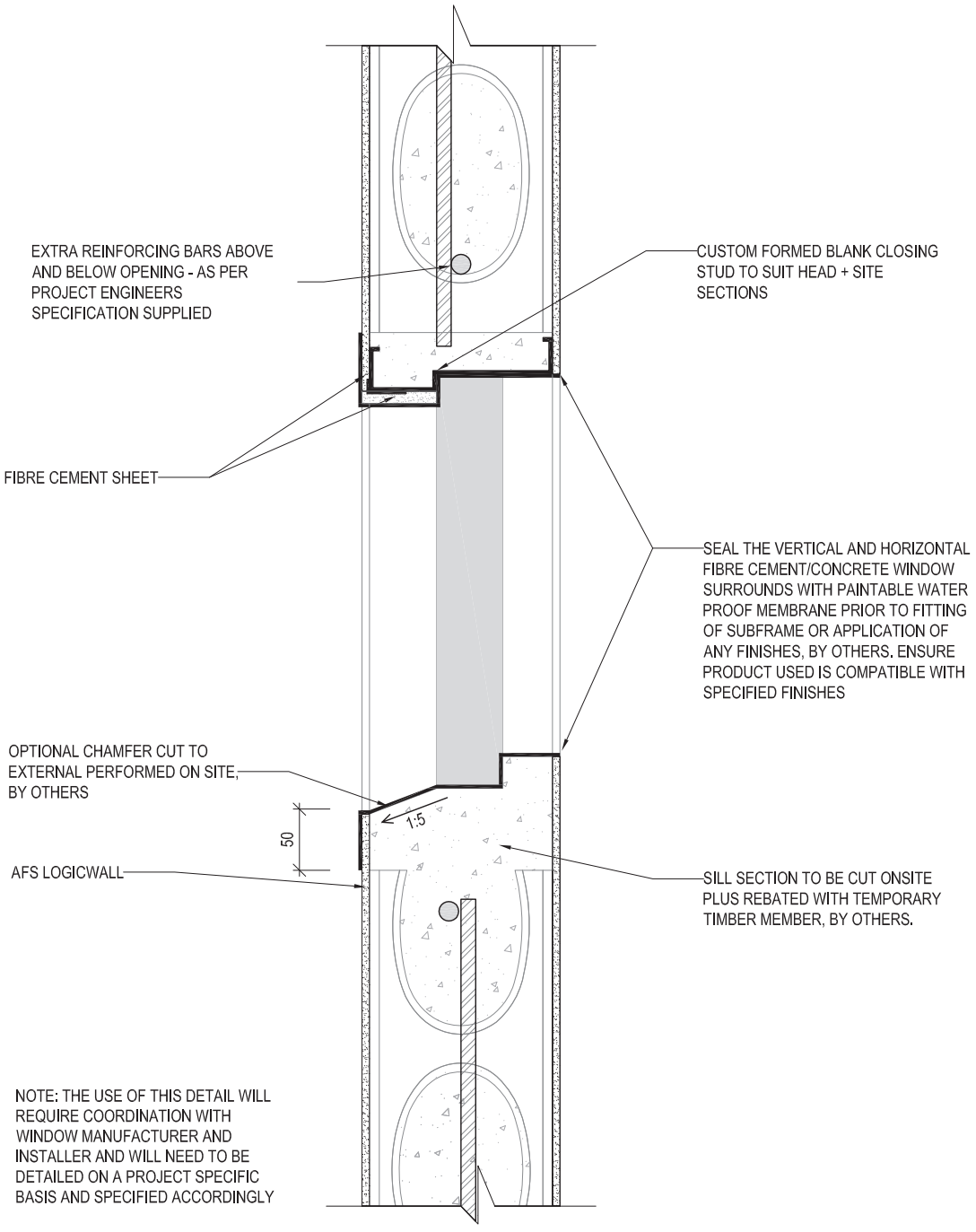
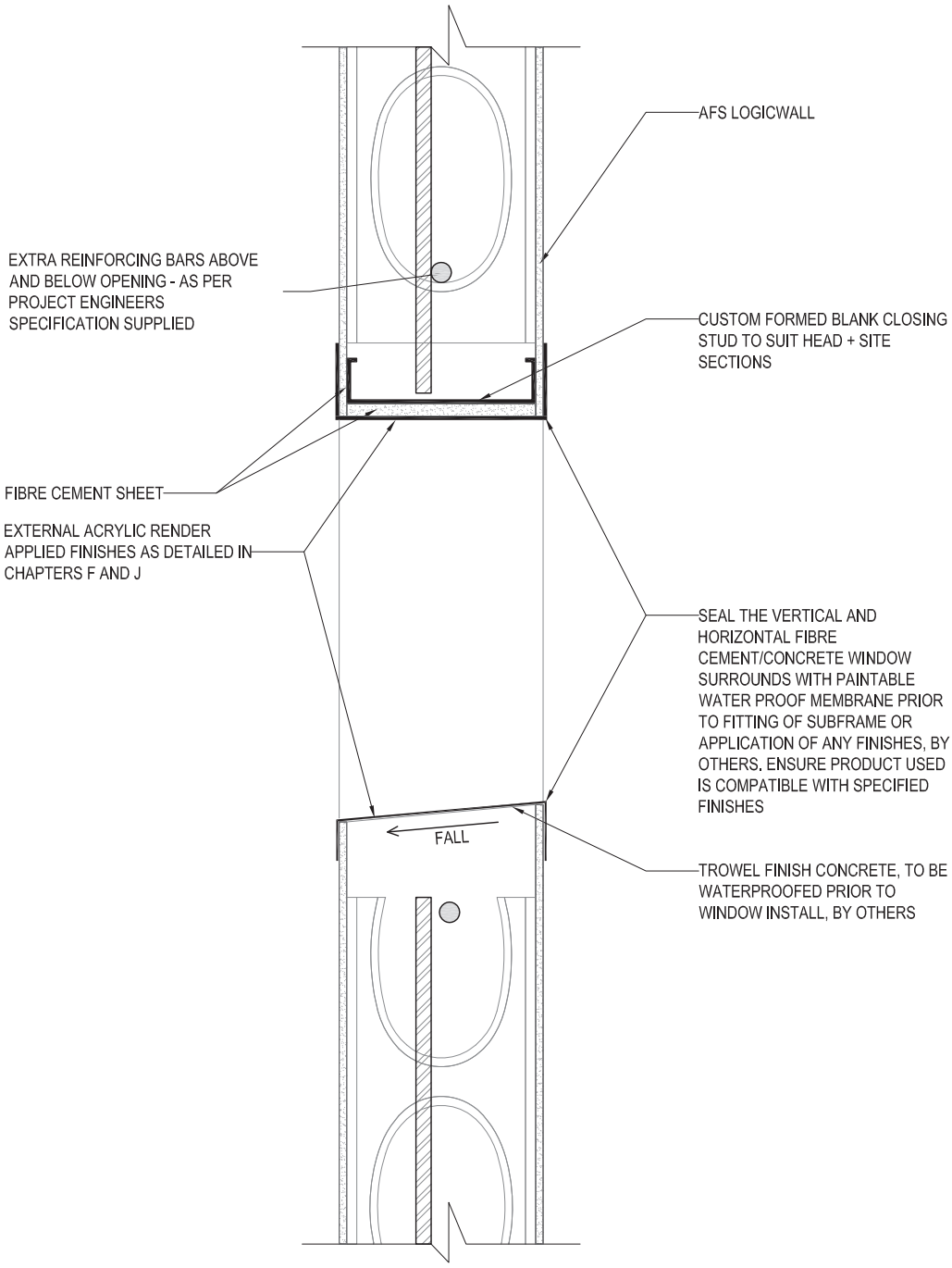
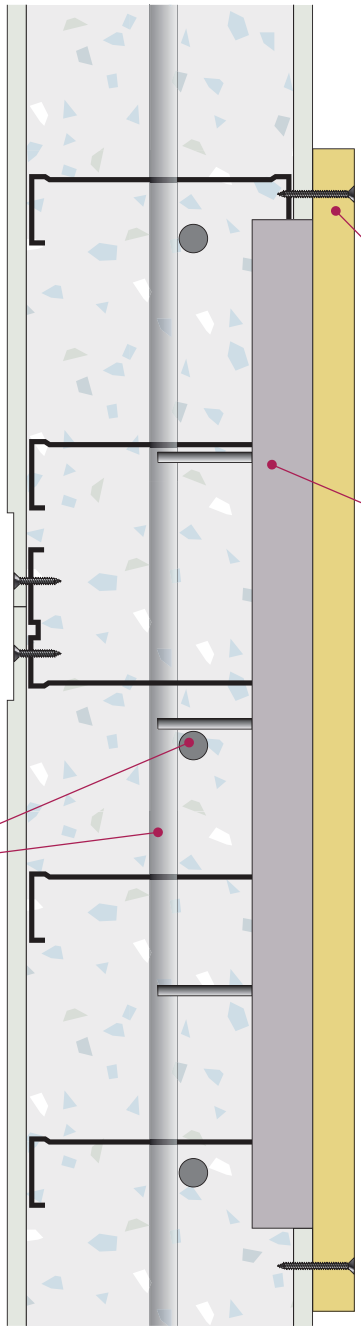


Fig I42: Opening in Walls



18. Cast in Elements

Fig 143: Cast In Lift Rails



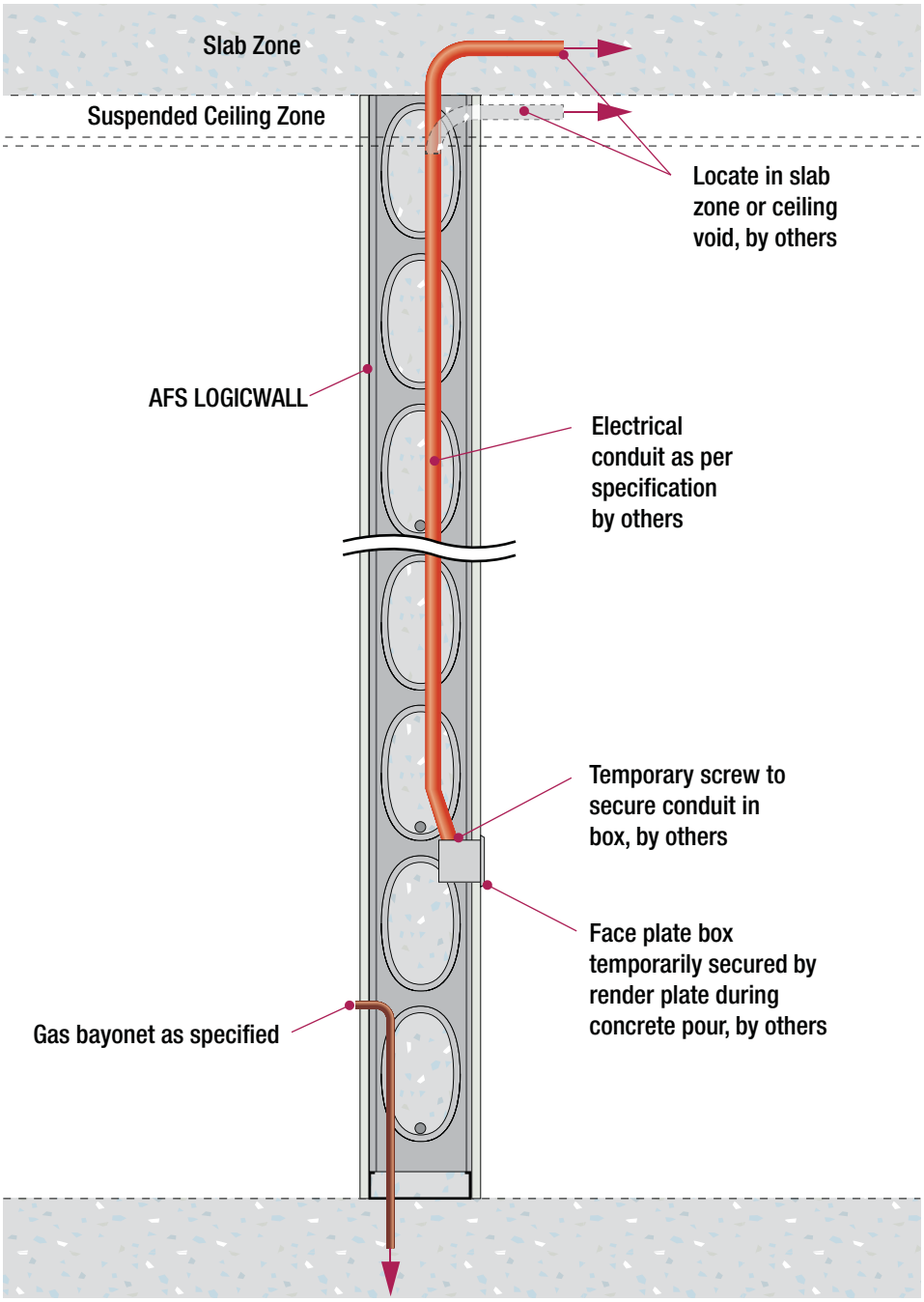
Temporary plywood screw fixed onto "liftrail" and onto AFS LOGICWALL panel. Remove after concrete pour

"Liftrail" assembly supplied by builder fitted into slot cut into AFS LOGICWALL on-site by AFS LOGICWALL installation contractor if negotiated at time of tender.

NOTE:
• Any and all "Cast-in" items should be clearly noted on drawings and it is the builders responsibility to negotiate with the AFS LOGICWALL installers as to who is responsible for the fitting/casting-in of these items.

Horizontal and vertical reinforcement to structural engineers details, by others

Fig I44: Services



19. Balcony Walls

Fig 145: Balustrade Wall

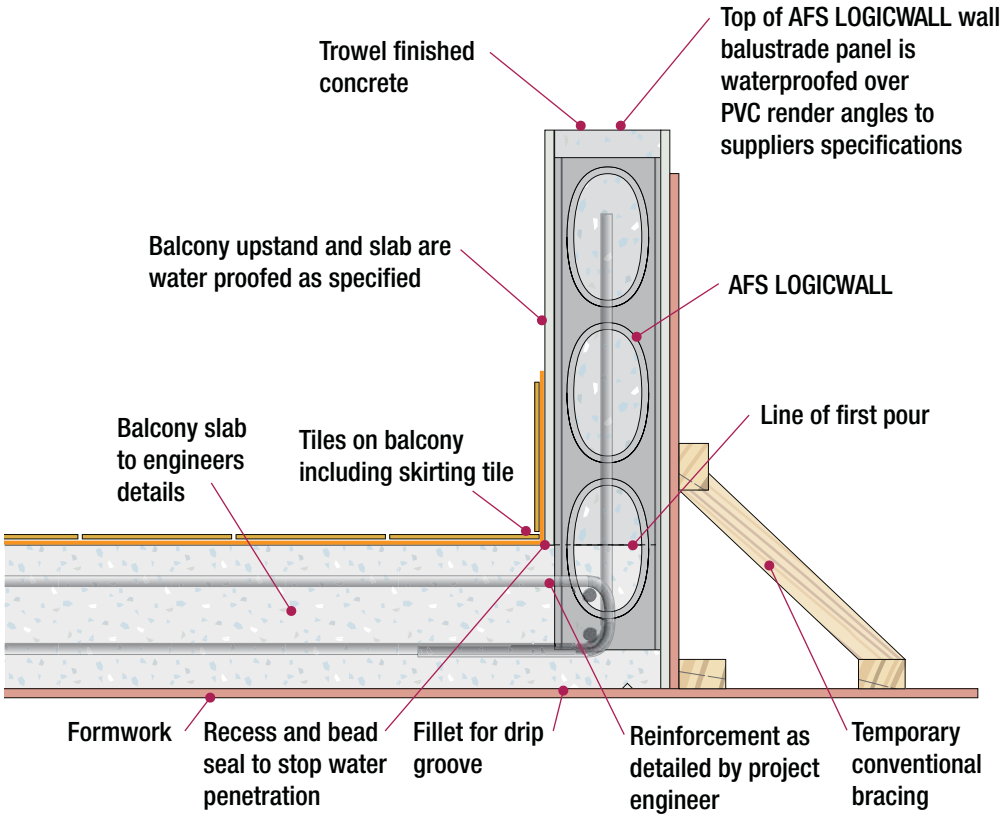


Fig 146: Balcony Dividing Wall

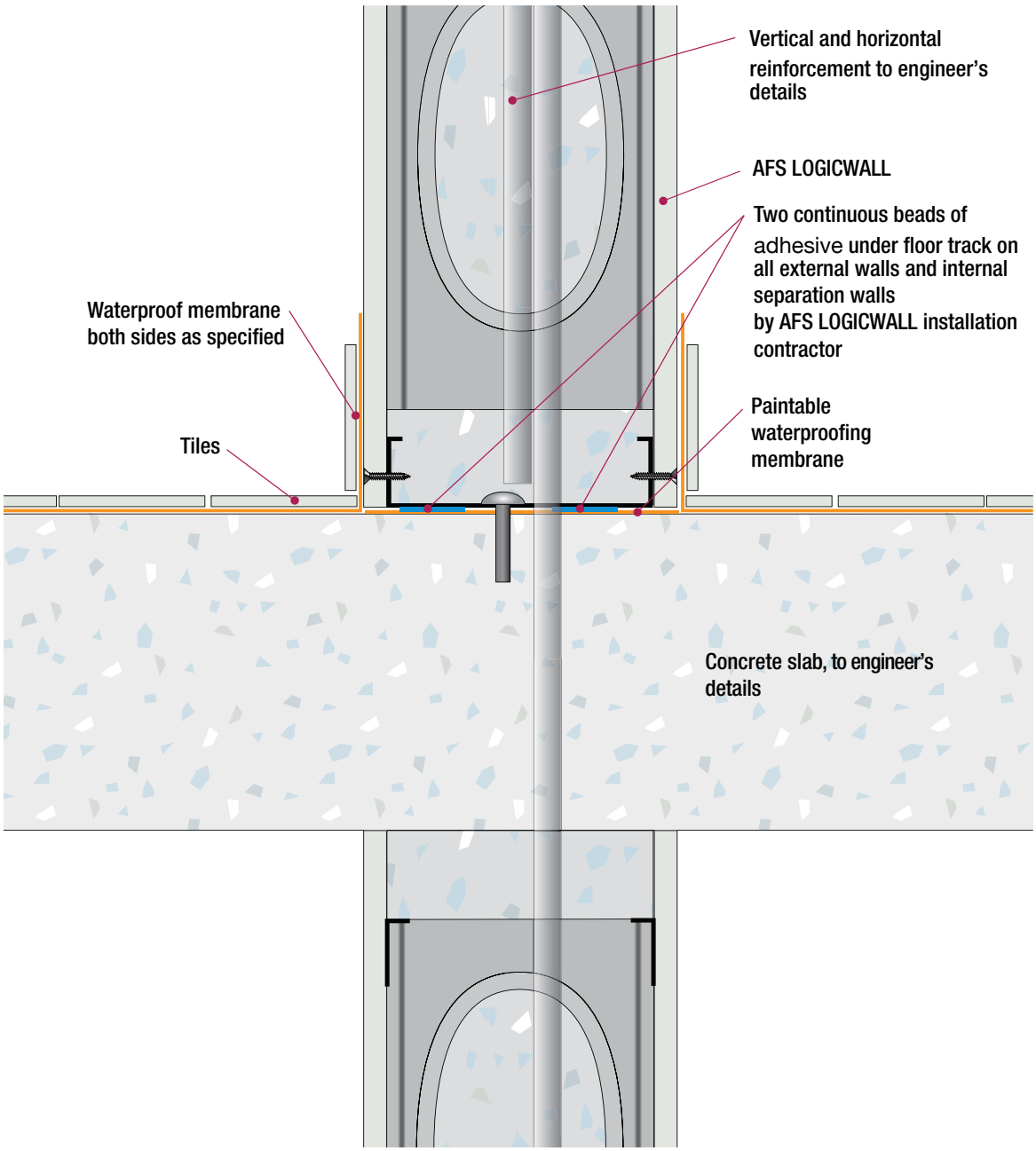


Fig I47: Balcony Wall Detail Without HOB

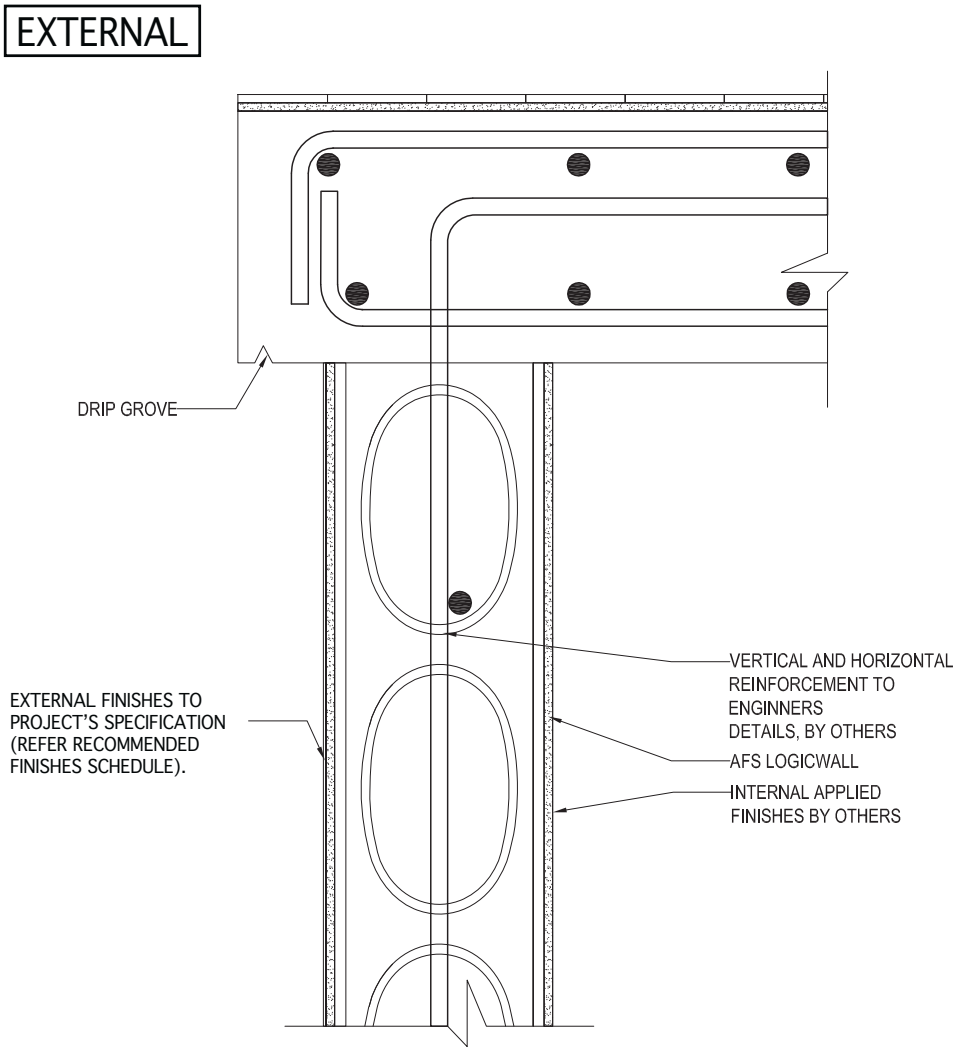
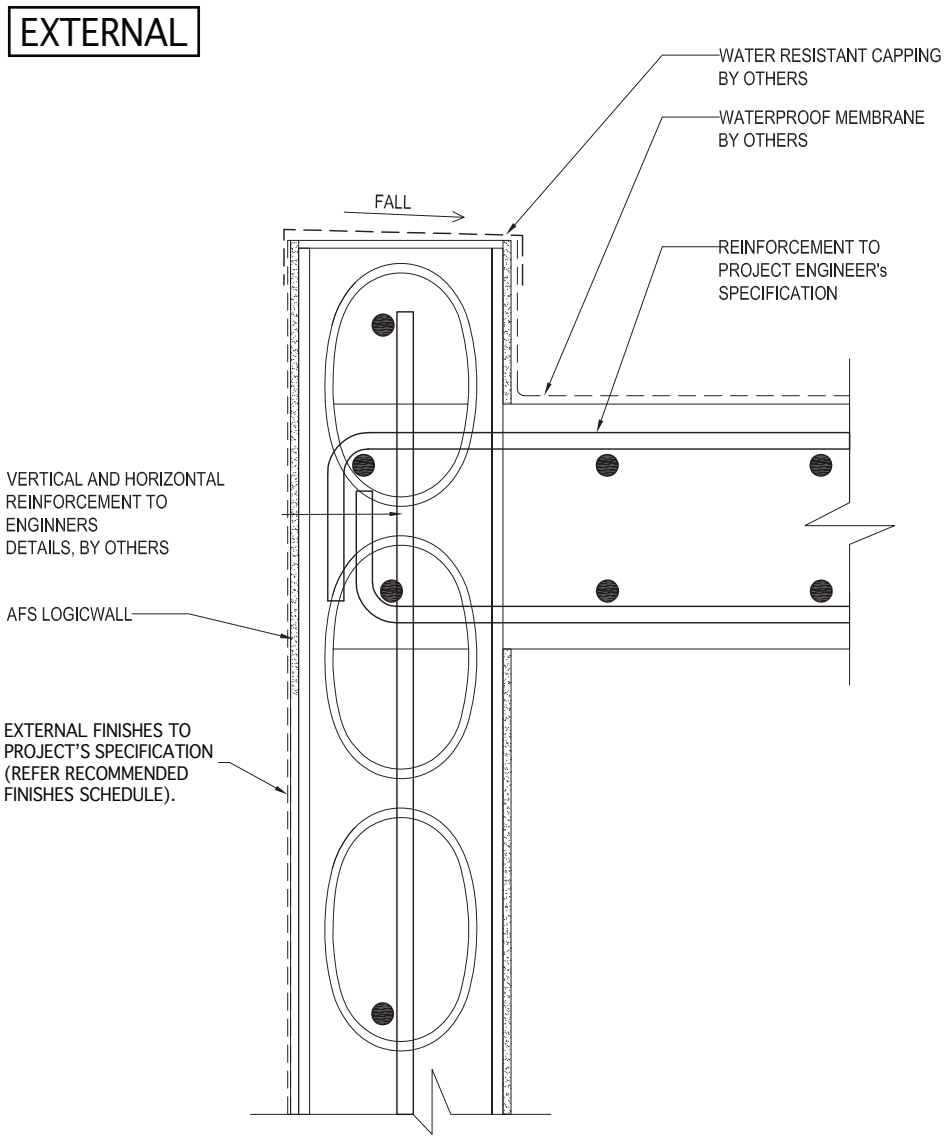


Fig I48: Balcony Wall Detail With HOB



I10. Timber Component Connections

Fig I49: AFS Logicwall® Wall Timber Floor Junction

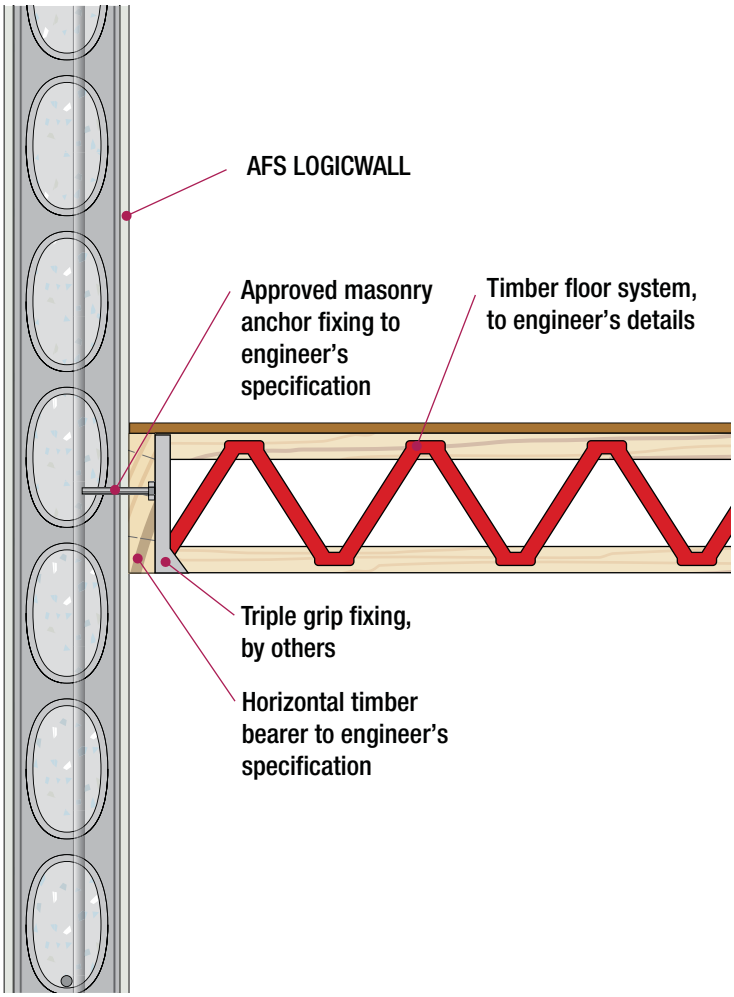
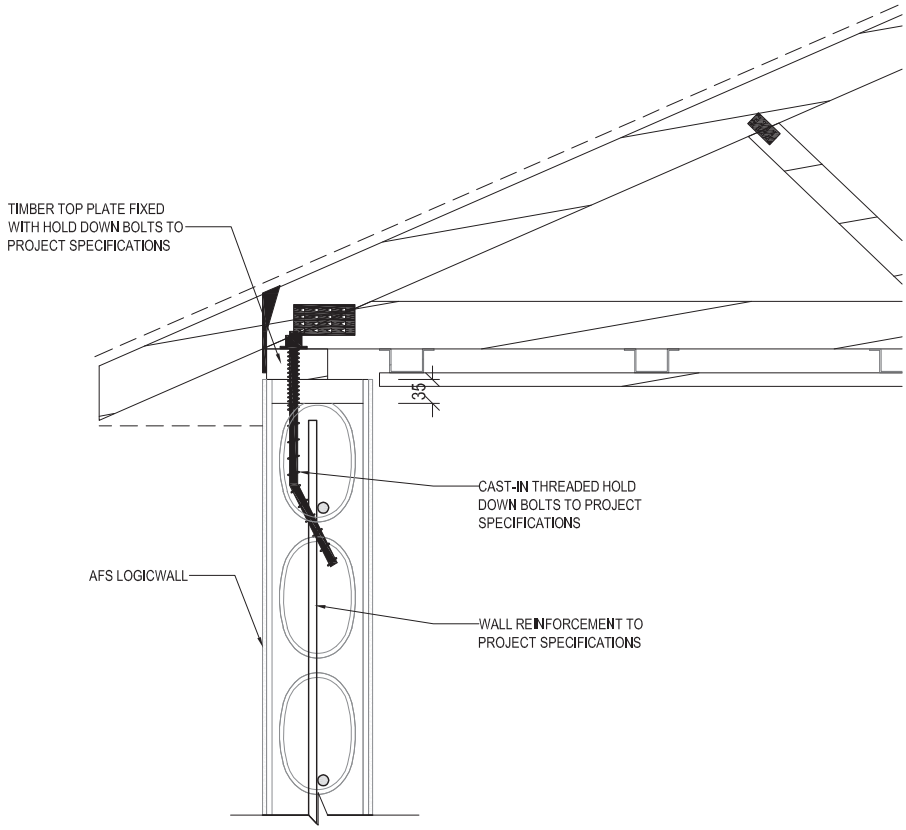
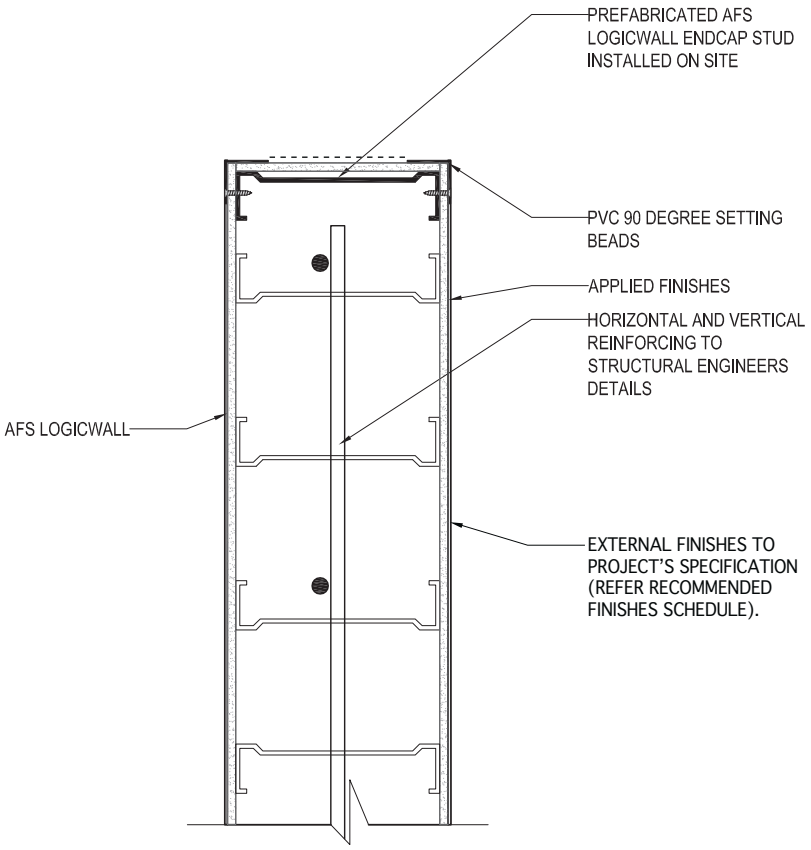


Fig I50: Timber Top Plate Connections



I11. Blade Walls

Fig I51: AFS Logicwall® Blade Wall



I12. Acoustic & Thermal Details

Fig I52: AFS Logicwall® External Wall

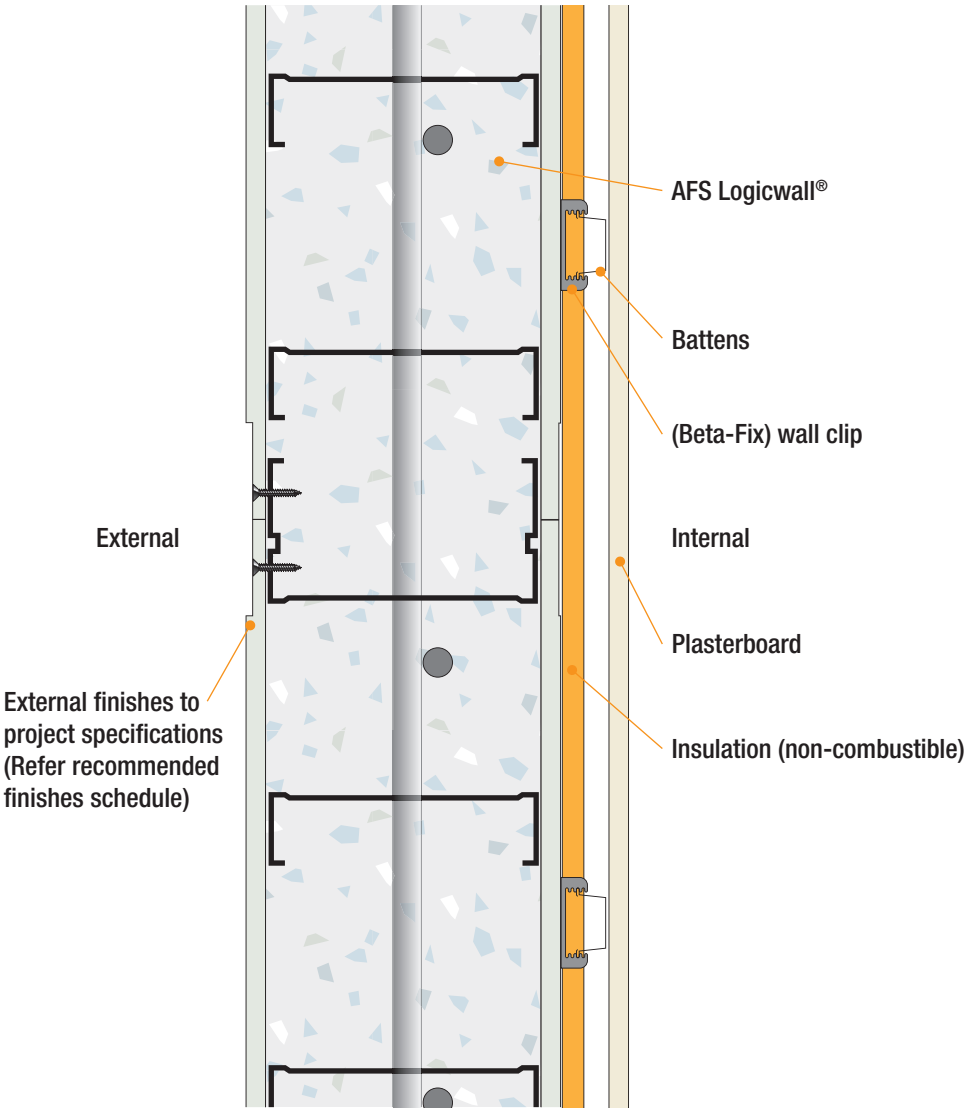
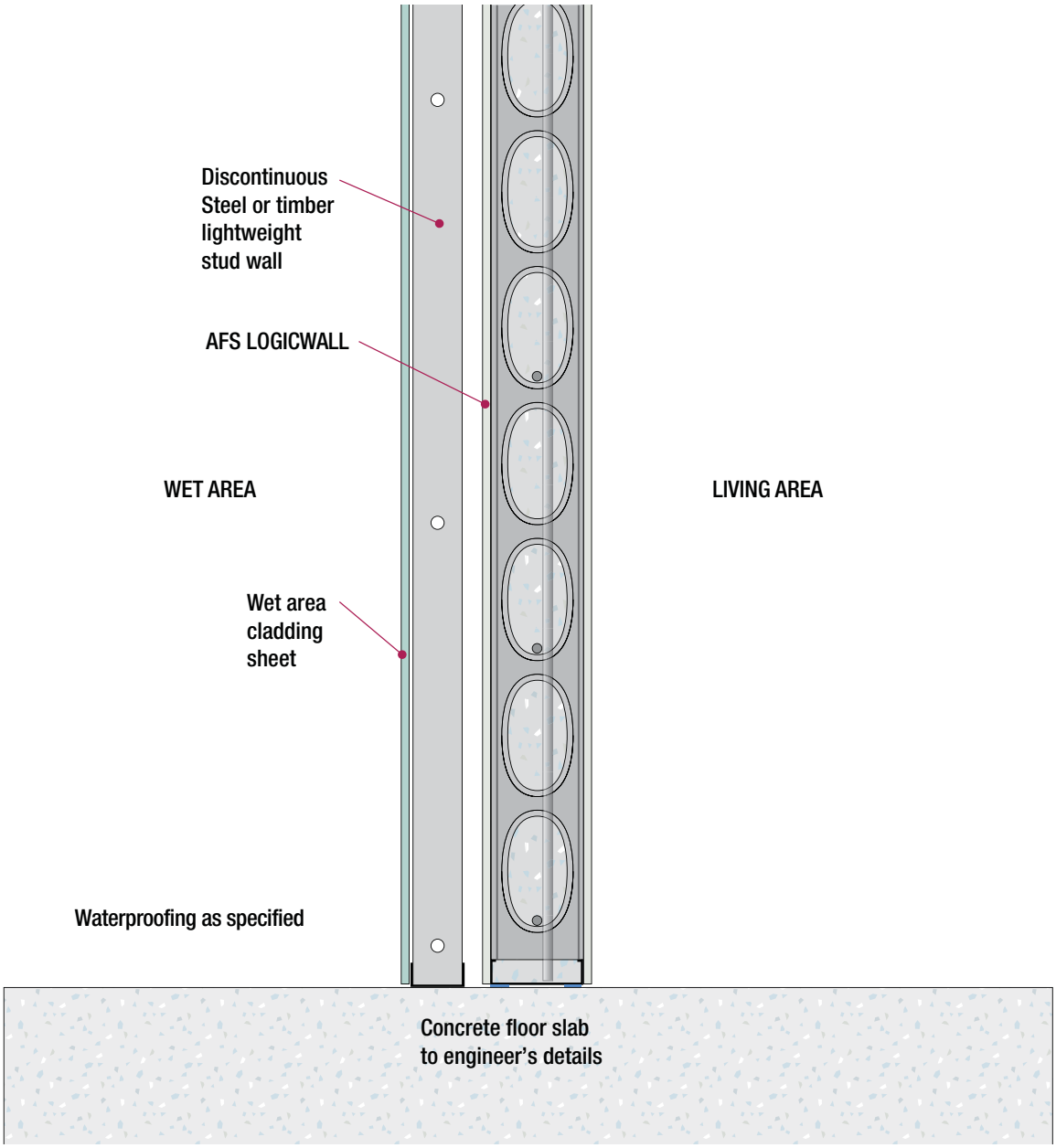


Fig I53: AFS Logicwall® Separating Wall – Wet Area/Living Area or Wet to Wet Area where plumbing services are to be installed



Architects Standard Notes

Whilst architectural requirements vary from project to project the architectural specifications may be similar.

The following afs Logicwall® architectural standard notes can be adopted and used across most projects incorporating afs Logicwall®

A NATSPEC 0310p "AFS Logicwall®" in Concrete Combined" specification is also available

ARCHITECTS STANDARD NOTES

afs logicwall

DESCRIPTION

AFS LOGICWALL comprises a steel frame made up of metal C section studs, with 6mm fibre cement sheets bonded to each side to form a sandwich panel in varying thicknesses of 120mm, 150mm, 162mm, 200mm and 262mm. The panels are erected on site, braced and core-filled with concrete to achieve load-bearing, fire and sound rated walls.

APPROVED INSTALLERS

AFS LOGICWALL is a proprietary system developed by AFS Products Group Pty Ltd. It is manufactured by AFS Products Group Pty Ltd and installed by approved Supply & Install Contractors. Contact details of approved installers are available from AFS Products Group Pty Ltd, phone 1300 727 237.

SCOPE OF INSTALLATION

Supply and install complete walling system, placement of reinforcing bars, core filling, including but not limited to:

1. All labour and materials
2. Forming and providing openings
3. Building in items provided by others
4. Making good of any damages or deformation to walls
5. Clean-up and removal of waste.

NB: Items not within scope of installer:-

1. Cranage of panels to deck
2. Set out
3. Supply of reinforcing steel
4. External setting of joints

CORNERS

AFS prefabricated 90° corner units must be used in any 90° corner location. This ensures continuity at corners and minimizes setting.

AFS corners are available in configurations as follows:

- 90° modules
- Standard plan dimensions 450mm x 450mm
- Pre-installed corner bars – in accordance with the structural engineer's details

AFS LOGICWALL Architects Standard Specification 1

Architects Standard Notes (continued)

afs logicwall

AFS LOGICWALL PANEL TYPES

The following AFS LOGICWALL panel types are available and are to be used in locations shown on architectural and structural drawings.

- AFS 120
- AFS 150
- AFS 162
- AFS 200
- AFS 262

SERVICES

Hydraulic pipes are typically not installed within AFS LOGICWALL walls but either face fixed and battened over or installed in separate leaf walls. Where plumbing and services are to be installed in LOGICWALL walls they should by poly pipes and run vertically only from the slab above.

Electrical conduits are typically installed within AFS LOGICWALL walls. Conduits are made up prior to installation with elbow at top and electrical box fitted to bottom. Conduit is lowered into wall void and box fixed to pre-cut opening. A render plate is used to hold box secure until core filling and then removed. Electrical boxes are to be separated by at least one core in wall.

Care must be taken by services contractors to maintain integrity of fire and acoustic ratings when installing services, pipes and fittings. Refer to project specifications.

SHOP DRAWINGS

Detailed shop drawings will be prepared and submitted to builder or architect for approval prior to manufacture of panels. Shop Drawings are to be by AFS nominated drafting company. Please contact AFS on 1300 727 237 for contact details.

PRE-COREFILL INSPECTION

A pre-corefill inspection must be undertaken to ensure all panels are straight and plumb, all corners are square and the required reinforcement on structural drawings is correctly installed inside the AFS LOGICWALL panels. Ensure all joints are properly secured and screw fixed at 450mm centres and all openings adequately braced.

CORE FILLING

Refer to Chapter K ' Installation Guide' of AFS LOGICWALL Designer for concrete requirements and core-filling techniques.

Architects Standard Notes (continued)

afs logicwall

CONSTRUCTION SEQUENCING

1. Form-up first slab
2. Place L bars in slab
3. Pour and cure of first slab
4. Erect AFS LOGICWALL panels, placing horizontal bars in sequence
5. Erect formwork of second slab
6. Run electrical services
7. Place vertical bars in walls using formwork as working platform
8. Core fill AFS LOGICWALL using formwork as a working platform
9. Set joints once joints are waterproofed.

NB: where a prefab floor system is used, the LOGICWALL may be core filled from a mobile scaffold prior to forming of second slab.

Sufficient notice should be given by the builder prior to core filling for inspection of AFS LOGICWALL panels, reinforcement and services. A sign-off system should be implemented by the builder to ensure any services within the walls are correctly placed prior to core filling.

TOLERANCES

All walls and openings must be square, straight and plumb and comply with drywall construction tolerances to AS2589.

REFERENCE STANDARDS

AS 4055 Wind loads for housing
AS 1170.4 Earthquake loads
AS 1650 Galvanised coatings
AS 1315 Portland cement
AS 3600 Concrete structures
AS 3700 Masonry structures
AS 2589 Plasterboard

Architects Standard Notes (continued)

BIM (Building Information Modeling) has gained acceptance in recent years and is used for the design of many buildings today. There is a range of BIM software packages now available on the market, each providing consultants and building designers flexibility and ease of design.

Whilst there have been some basic modeling programs available in the past, recent technical advancements have allowed the introduction of more advanced BIM Software programs, such as Revit and Archicad, which are more versatile and allow designers, architects and engineers to build their projects on the screen as a comprehensive 3D model. These models provide consultants with a detailed view of the scope of their projects whilst providing subcontractors, tenderers and clients a complete 3D overview of their scope of works, as they embody significant amounts of project information.

To assist with the design and documentation of AFS Logicwall® walls, AFS provides a complete package of standard details, library parts/ objects, wall families and 3D model components in the following file types.

- Revit
- DWG
- PDF (Standard Details)

afs logicwall®

December 2023

Section J
Trade Coordination

Logicwall® Trade Coordination, Concreting, Electrical/Plumbing, Internal and External Finishing, Windows and Doors, Connections of Structural Steel.

CSR

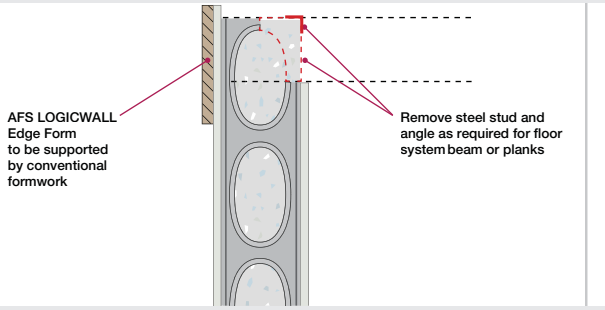
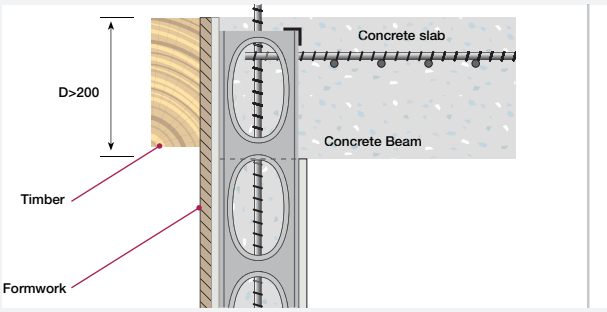
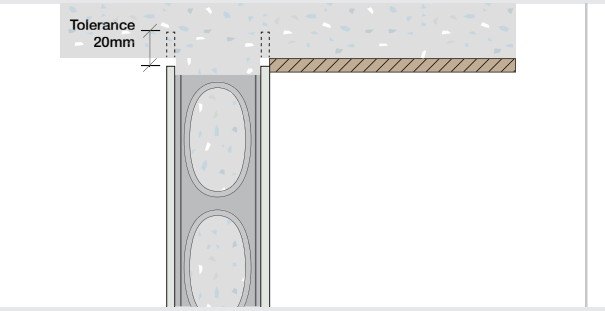
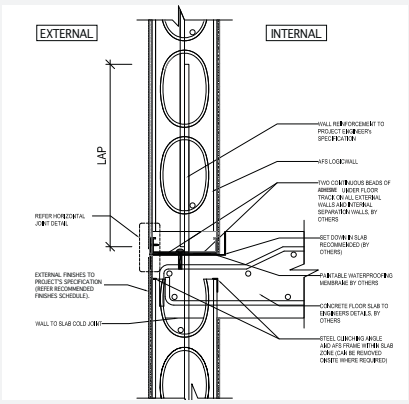
Contents

J1. Trade Coordination

Formwork/Flooring System

The interface between AFS Logicwall® and the floor deck above, whether it be conventional formwork or pre stressed beams and plank systems, requires consideration at contract stage. The following table illustrates some of the common coordination activities, but does not represent all site specific situations.

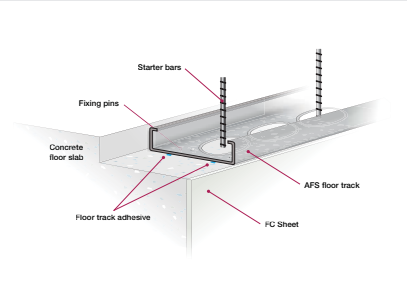
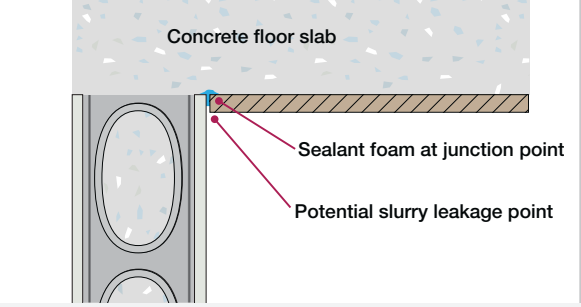
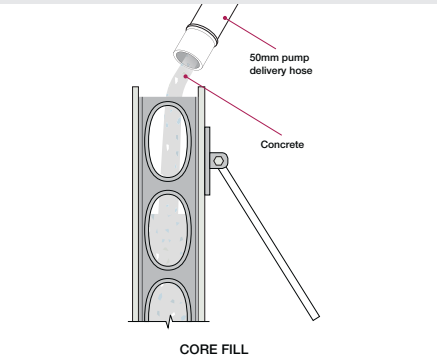
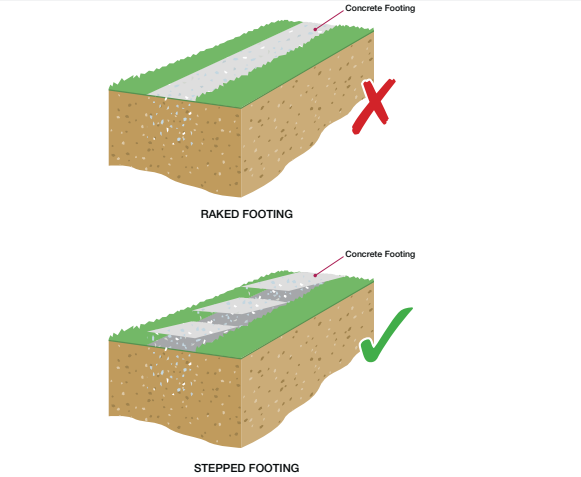
TABLE J1: Common Coordination Activities Formwork/Flooring

Coordination Activity	Diagram	Responsibility
FIG J1: Slab Zone Preparation Where the removal of the AFS Logicwall® steel stud frame may be necessary for the placement of floor beams, hollow core planks or reinforcement, the AFS Logicwall® outer sheets (Edgeform) needs to be supported by conventional formwork to prevent deflection at slab edge.		As contracted by builder.
FIG J2: Support of AFS Logicwall® Edgeform Conventional formwork is to be used to support the slab edge where the AFS Logicwall® edgeform depth is greater than 200mm to prevent deflection at slab edge.		As contracted by builder.
FIG J3: Top of Wall Tolerances AFS Logicwall® panels will follow the level of the floor slab substrate, which results in a 10-20mm tolerance in top of wall heights. Trimming at top of walls will be a contract variation. Tolerances vary depending on slab type including, Flat Plate Conventional PT, Bondek, Ultrafloor, Pre Cast Floor Panels.		As contracted by builder.
FIG J4: Slab Edge Water Proofing Options There are 3 slab details documented by AFS in this manual. This detail illustrates a rebated slab edge and 20mm expressed joint mould. Refer to chapter I for options.		As specified by builder and architect.

Concreting

The Core filling of AFS Logicwall® and the interface between AFS Logicwall® and concrete slabs needs consideration at contract stage. TABLE J2 illustrates some of the common coordination activities, but does not represent all specific situations

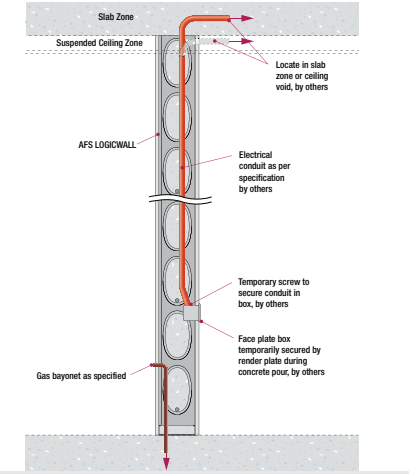
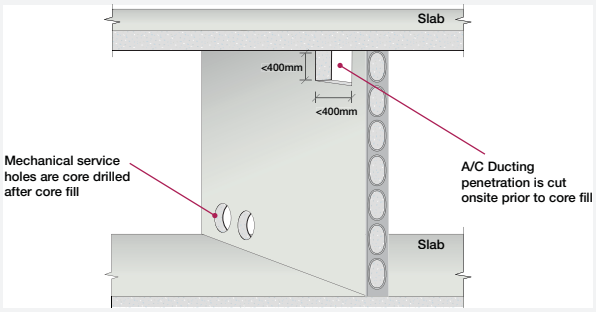
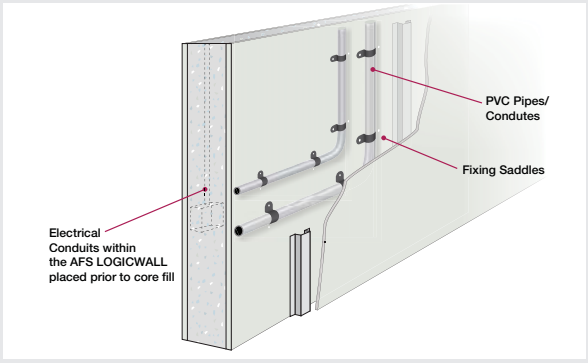
TABLE J2: Common Coordination Activities Concreting

Coordination Activity	Diagram	Responsibility
FIG J5: Concrete placement around starter bars Concrete needs to be finished neatly to allow fixing of the AFS Logicwall® track with adhesive and power pins to slab.		Concrete placement company as contracted by builder.
FIG J6: Leakage Points To prevent concrete slurry leakage, the top of AFS Logicwall® / formwork junction is sealed with sealant foam to prevent potential slurry leaks		Formwork Contractor as contracted by builder
FIG J7: Corefilling The corefilling procedure of AFS Logicwall® is detailed in chapter K and must be adhered to. Refer to Appendix for concrete design guide for AFS Logicwall®.		AFS Logicwall® installation contractor
FIG J8: Footings When walls are to be erected on footings the following points must be considered: • Footings must be stepped with level planes. Not raked. • Footings must be flush finished to allow for fixing of AFS Logicwall floor track • Starter bars to be cast in or drilled and chem-anchored.		As contracted by the builder

Electrical/Plumbing/Mechanical

The interface between AFS Logicwall® and services needs consideration at contract stage. TABLE J3 illustrates some of the common coordination activities, but does not represent all specific situations

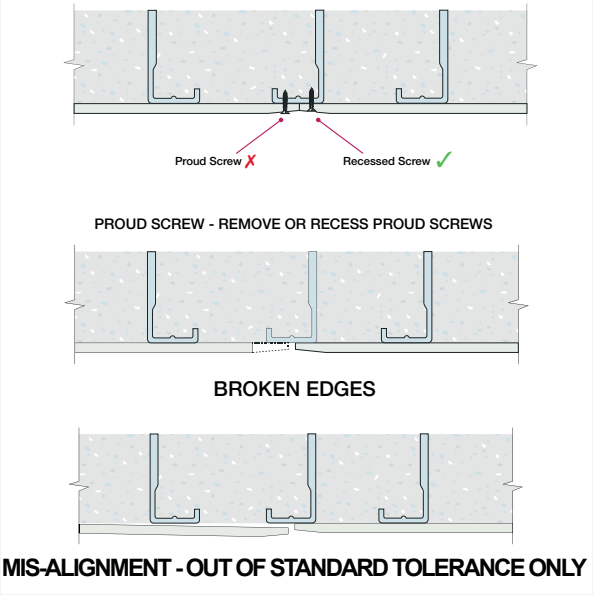
TABLE J3: Common Coordination Activities Services

Coordination Activity	Diagram	Responsibility
FIG J9: Services within Walls Placement of electrical and plumbing services within the AFS Logicwall® panel must take place between installation and concrete corefill.		Electrical contractor/ Plumbing contractor as contracted by builder.
FIG J10: Service Penetrations Penetrations for services and mechanical requirements are cut out on site where the penetration is less than 400mm x 400mm. Penetrations larger than 400x400 which are detailed in project drawings can be scheduled in the AFS Logicwall® shop drawings.		As contracted by builder.
FIG J11: Plumbing Services Plumbing for services are typically run in wall cavities or service shafts. AFS Logicwall® can be used as substrate for fixing pipes and PVC sections. In situations such as party walls between apartments, plumbing services shall be mounted within the stud frame of a discontinuous stud wall to meet BCA acoustic requirements.		Electrical contractor/ Plumbing contractor as contracted by builder.

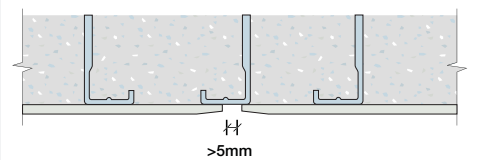
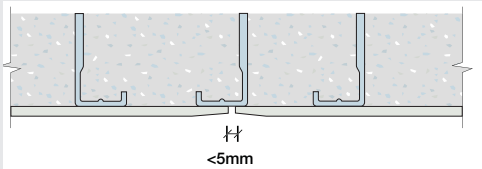
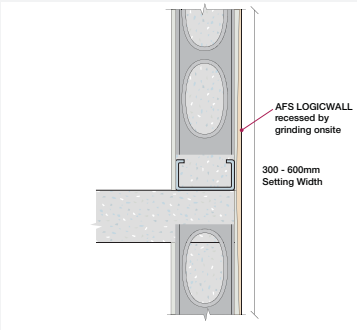
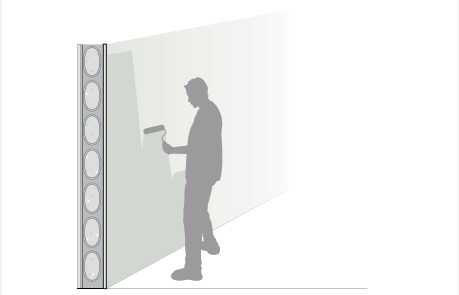
Internal Settings and Finishes

The interface between AFS Logicwall® as a finished wall face or over clad wall and the finishing trades must be given consideration at contract stage. TABLE J4 illustrates some of the common coordination activities but does not represent all site specific situations. This Section (Internal Settings and Finishes) shall be read in conjunction with Chapter E - Internal Design Considerations

TABLE J4: Common Coordination Activities Finishings

Coordination Activity	Diagram	Responsibility
FIG J12: Internal Setting Internal joint setting procedure, namely CSR wet area base coat, and topping system, must be adhered to. (Refer to the CSR Internal Joint Setting Specification in Chapter E - Internal Design Considerations). * Refer to appendix Joint Setting Specifications		Internal joint setting / plastering company as contracted by builder.
FIG J13: Wall Preparation Wall preparation work includes: • Removing screws or punching screws flush. • Patching broken FC edges • Grinding flush protruding FC board or concrete where misalignment is greater than 2mm.		AFS Logicwall® installation company.
FIG J14: Critical Light Where AFS Logicwall® walls are adjacent to external windows, vertical flush set joints will be visible and further treatment to the wall is required. (I.e. - skim coat, direct stick plasterboard or batten and sheet plasterboard).		As contracted by builder.

Internal Settings and Finishes (continued)

Coordination Activity	Diagram	Responsibility
FIG J15: Tolerance Gaps • Tolerance gaps between vertical panel joints greater than 5mm wide are to be filled with a suitable joint filler. • Tolerance gaps between vertical panel joints less than 5mm wide are to be filled with the base coat of the setting system.	 TOLERANCE GAPS GREATER THAN 5MM  TOLERANCE GAPS LESS THAN 5MM	Internal joint setting / plastering company as contracted by builder.
FIG J16: Horizontal Butt Joints Rebates are to be ground onsite with the joint to be treated as per the CSR joint setting procedure. This rebate will not reflect standard rebated joints and will require additional preparation by the internal setting contractor.		Internal joint setting / plastering company. As contracted by builder.
FIG J17: Scratches and Dents As AFS Logicwall® is a permanent formwork system which comes through the construction phase, any scratches and dents in the fibre cement panel surface are to be patched by the internal setting contractor prior to and/or following the first prep coat. **Note**: This especially applies to reinforcing bar penetrations on corner panels.		Internal joint setting / plastering company. As contracted by builder.
FIG J18: Internal Painting (Refer to Chapter E - Internal Design Considerations). Patching of scratches and dents to the fibre cement surface is to be completed between initial preparation coat and the final top coats.		Internal painting contractor as contracted by builder.

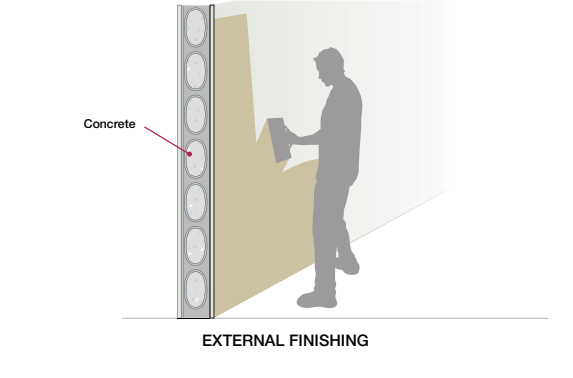
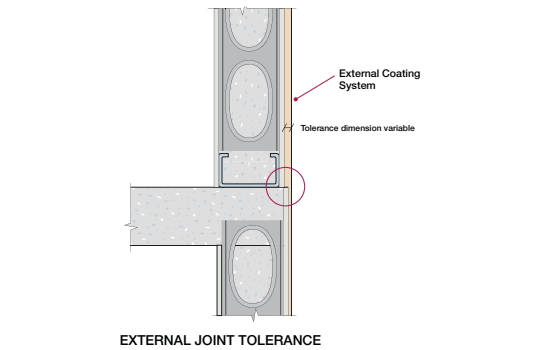
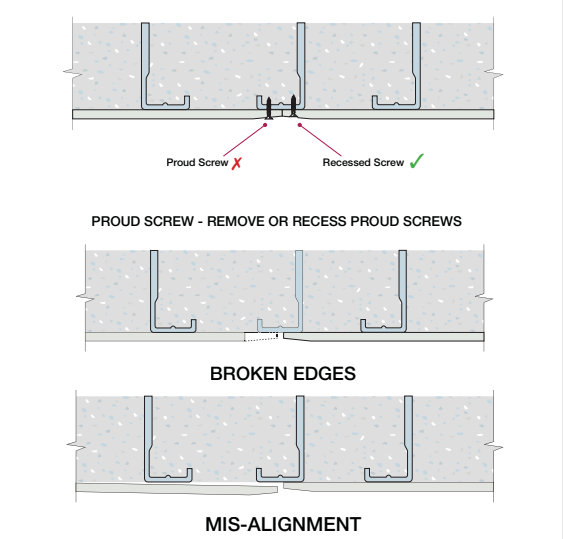
External Settings and Finishes

The interface between AFS Logicwall® and the external applied finish must be given consideration at contract stage. High quality external finishes can be achieved provided the correct finishing procedures are followed and coordinated with the associated trades.

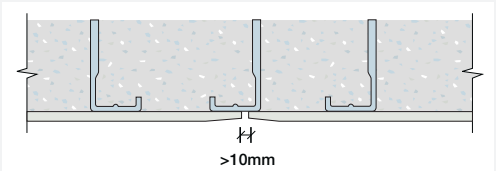
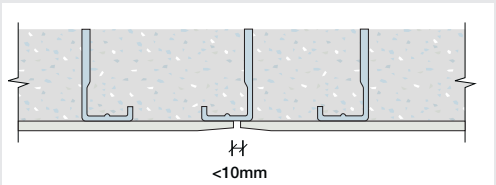
TABLE J5 illustrates some of the common coordination activities to be agreed to by the contractor but does not represent all site specific situations

This section (external Settings and Finishes) must be read in conjunction with Chapter F - External Design Considerations

TABLE J5: Common Coordination Activities External

Coordination Activity	Diagram	Responsibility
FIG J19: External Coating Systems AFS Logicwall® external walls require the application of high quality coating system. Refer to Chapter F - External Design Considerations for details		External coating system applicator as contracted by builder
FIG J20: Misalignment Tolerances When selecting an external coating system wall misalignment tolerances must be considered. These vary according to site conditions. Such misalignment tolerances can occur at the horizontal joint / slab joint junction due to set out. External coating applicator must allow for areas of extra build up to achieve an acceptable level of finish.		External coating system applicator as contracted by builder.
FIG J21: Wall Preparation Wall prep work includes: • Removing patches • Removing screws or punching screws flush. • Patching broken FC edges • Grinding flush protruding FC board or concrete.		AFS Logicwall® installation company.

External Settings and Finishes (continued)

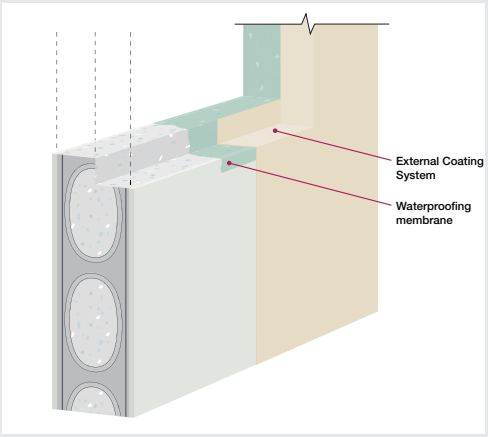
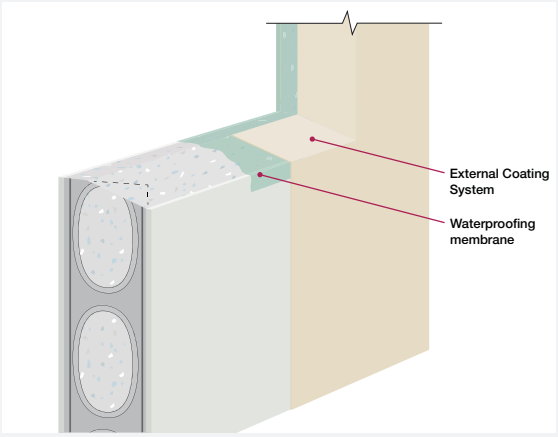
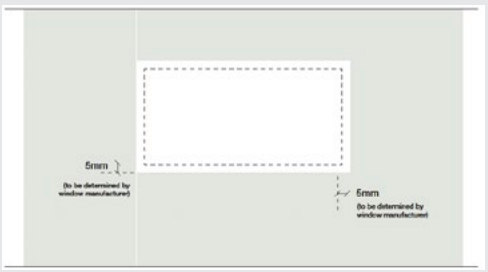
Coordination Activity	Diagram	Responsibility
FIG J22: Tolerance Gaps > 10mm Tolerance gaps between vertical panel joints greater than 10mm wide are to be filled with a suitable joint filler.	 TOLERANCE GAPS GREATER THAN 10MM	External coating applicator.
FIG J23: Tolerance Gaps < 10mm Tolerance gaps between vertical panel joints less than 10mm wide are to be filled with the base coat of the external setting system.	 TOLERANCE GAPS LESS THAN 10MM	External coating system applicator as contracted by builder.
FIG J24: External Facade Water Proofing Refer to Chapter F - External Design Considerations. 1. Adoption of horizontal slab junction details as detailed by AFS. 2. Appropriate location of flashings, especially to cap exposed parapet walls. 3. Correct application of a quality external coating system, to manufacturer's/supplier's specifications.		External coating system applicator as contracted by builder.

Windows and Doors

The interface between AFS Logicwall® and window and door units must be considered at contract stage.

Figure J7.1 illustrates some of the common coordination activities to be considered but does not represent all site specific situations.

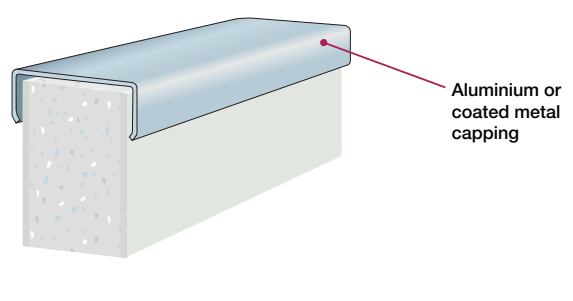
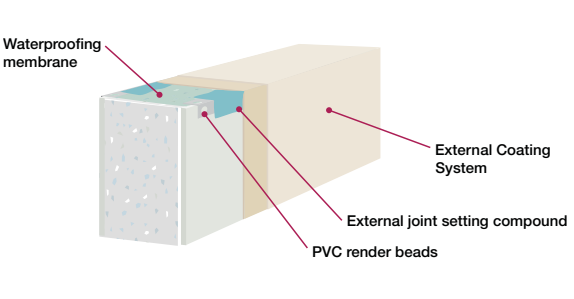
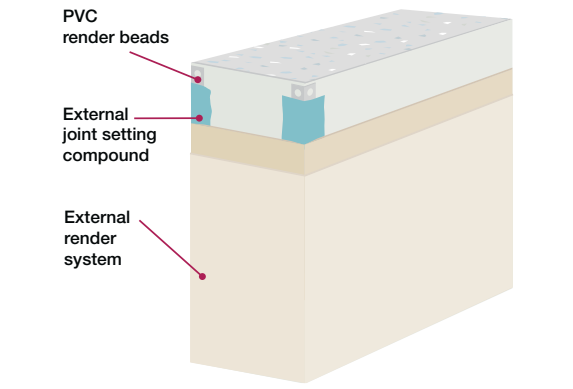
TABLE J6: Common Coordination Activities Windows and Doors

Coordination Activity	Diagram	Responsibility
FIG J25: Window Openings - Rebates • Vertical and horizontal window surrounds are to be water proofed with a compatible paintable waterproofing membrane prior to application of external coating system. • Rebated window openings are to be formed on site by AFS Logicwall® installation company. • Window sill rebates are to be water proofed with a paintable water proofing membrane prior to application of external coating system.		As contracted by builder ie. Waterproofing contractor.
FIG J26: Window Openings - Chamfer Chamfered window sills are to be formed on site by AFS Logicwall® installation company. • Vertical and horizontal window surrounds are to be water proofed with a compatible paintable waterproofing membrane prior to application of external coating system. • Window sill chamfers are to be water proofed with a paintable water proofing membrane prior to application of external coating system.		As contracted by builder ie. Waterproofing contractor.
FIG J27: Tolerances Window openings in the AFS Logicwall® panels are to suit the window manufacturer's minimum specifications. Minimum Tolerances: • 10mm on overall width • 10mm on overall height For actual tolerances, refer to window/ architectural specifications		As contracted by builder ie. Waterproofing contractor.

Parapet Cappings, Balcony Balustrades and Blade Walls

The capping of AFS Logicwall® extremities on parapets, balcony balustrades and blade walls must be considered at contract stage. TABLE J7 illustrates some of the common coordination activities to be considered but does not represent all site specific situations.

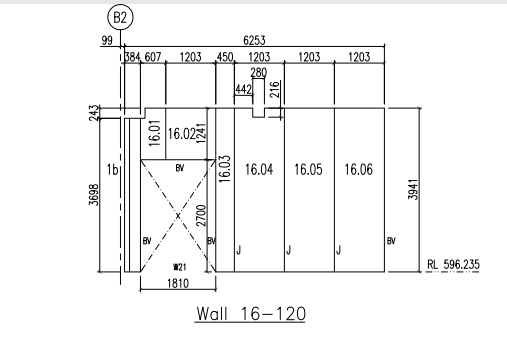
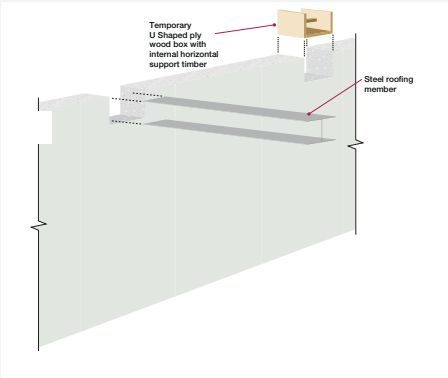
TABLE J7: Common Coordination Activities Capping

Coordination Activity	Diagram	Responsibility
FIG J28: Top of Parapet Walls Top of walls exposed in parapet applications are to be capped with an aluminium or coated metal capping by the appropriate trade		By builder
FIG J29: Balcony Balustrades Top of walls exposed in balcony balustrade applications are to be waterproofed by the appropriate trade.		External coating applicator as contracted by builder.
FIG J30: Blade Walls Blade walls are to be finished using PVC render beads or mesh tape and acrylic render to supplier's specifications. Final alignment of continuous blade walls must be performed by the external coating applicator.		External coating applicator as contracted by builder.

Connections of Structural Steel and Other Building Elements

The interface between AFS Logicwall® and other building elements, such as structural steel etc, requires consideration at contract stage. TABLE J8 illustrates some of the common coordination to be considered but does not represent all site specific situations.

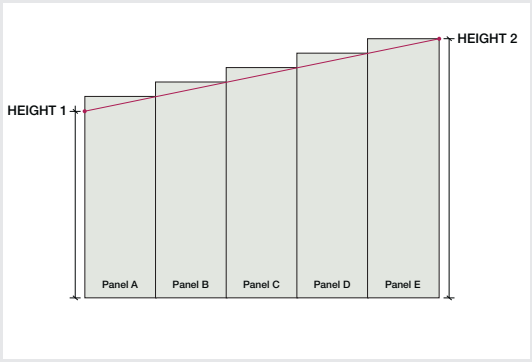
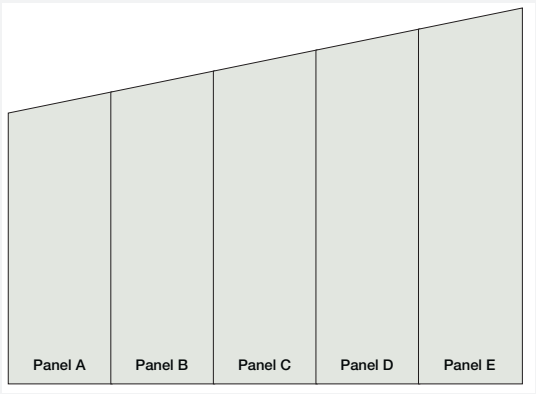
TABLE J8: Common Coordination Activities Connections

Coordination Activity	Diagram	Responsibility
FIG J31: Shop Drawings AFS Logicwall® shop drawings are coordinated with structural steel detail drawings so that wall cut-outs can be detailed for structural steel connections. Alternatively, connections can be marked out on site after installation of AFS Logicwall® panels.		Builder and AFS Shop Detailer
FIG J32: Cut Outs Where AFS Logicwall® panels are required to be cut out to allow for structural steel connections, the panel is to be cut on site and blocked out prior to corefill.		AFS Logicwall® installation company.

Raked Walls

Raking of AFS Logicwall® and the interface between raked AFS Logicwall® and other building elements, such as structural steel, roofing etc. requires consideration at contract stage. TABLE J9 illustrates the steps involved in raking AFS Logicwall® and outlines some of the coordination activities to be considered, but does not represent all site specific situations.

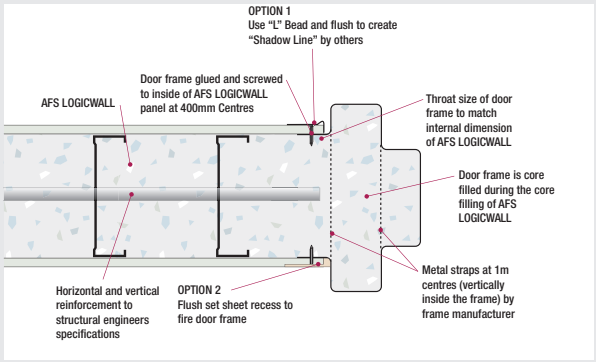
TABLE J9: Common Coordination Activities Raked walls

Coordination Activity	Diagram	Responsibility
FIG J33: Installation of Raked Walls 1. Panels supplied & installed as stepped height panels. 2. Wall heights as per drawings are marked on the wall. 3. Line of rake is marked on face of panel by appropriate method. (e.g. Chalk line.)		• AFS LOGICWAL® installation contractor • Alternatively panels can be cut on the rake prior to installation provided all measurements are detailed on the shop drawings. • Rakes to be checked on-site prior to cutting, with builder and other interfacing trades (i.e. roofing and structural steel).
FIG J34: Cutting of Raked Walls • Panels are cut at marked line using appropriate equipment prior to being filled with concrete. (eg. grinder or circular saw). Typically required to be cut from both wall faces.		• AFS Logicwall® Installation contractor • Rakes to be checked on-site prior to cutting, with builder and other interfacing trades (i.e. roofing and structural steel.)

Door Frames

The interface between AFS Logicwall® and metal door frames requires consideration at contract stage. TABLE J10 illustrates some of the common coordination activities to be considered, but does not represent all site specific situations.

TABLE J10: Common Coordination Activities Door Frames

Coordination Activity	Diagram	Responsibility
FIG J35: Fire Door Frames Fire door frames can be manufactured with a profile to be integrated with AFS Logicwall® and be installed during the AFS Logicwall® installation. For further details refer to Chapter I - Architectural Detailing and Chapter K - Installation. Contact AFS for door frame profile drawings. **Note:** Fire door frame to be braced on site to prevent movement / twisting during concrete core filling.		As contracted by builder

Appendix – Concrete Mix Specification Sheet.

FIG J36: Concrete Mix Specification Sheet.

afs logicwall®

concrete mix design guide

	standard afs pump mixes			
Location	Refer Structural Documentation			
Strength F'c (MPa)	S25	S32	S40	S50
Target Installation Slump	140±10	140±10	140±10	140±10
Design Slump (mm)	120±30	120±30	120±30	120±30
Maximum W/C Ratio	0.7	0.6	0.45	0.4
Nominal Fine to Total Aggregate Percentage (%)	65	60	55	50
Maximum Aggregate Size (mm)	10	10	10	10
Maximum 56 Day Drying Shrinkage (um)	1000	1000	1000	1000
Recommended Admixtures	WRPAPN20 (WR) ex Grace, ADVA-142 (HWR) ex Grace, or equivalent			

NOTE:

- Refer AFS Installation Manual for details and procedures for installing AFS Structural Walls.
- For high onsite temperature environments, slump at batching plant may be varied to suit conditions.
- Site water allowed to reach desired Installation Slump (at hose onsite) however, the maximum W/C ratio must not be exceeded.
- All requested property data that are not in the above table has not been determined or will vary significantly due to local raw material availability and characteristics.
- The addition of all admixtures are typically dosed at the beginning of the batch.
- Concrete mix should have a typical 'Gel' time of 30-60min in accordance with the Gel Test detailed in the Installation Manual.

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CSR

afs logicwall®

December 2023

Section K Installation

Logicwall® Installation, Panel Set out, Panel Erection, Reinforcement Installation, Core Filling of Walls, Removal of Braces, Routine QA Procedures, Safety, Tools and Accessories

CSR

Contents

K1. Installation Guide

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Introduction

AFS Logicwall® cannot be installed using traditional compaction or vibration methods as it will result in blowouts.

The contractor or installer of AFS Logicwall® (as well as any other person involved in the installation process) is responsible for:

- Proper installation of AFS Logicwall®, Achieving compaction for the concrete mix and ensuring dense and homogeneous coverage is achieved whilst avoiding blow outs,
- Avoiding over vibration of the concrete mix
- Ensuring that good building practice is followed in the installation of AFS Logicwall® and in accordance with proper safety and environmental laws and regulations as well as the requirements of the NCC.

AFS has carried out various tests and used methods which achieved compaction and the desired density and homogeneity required, whilst avoiding vibration of the concrete mix and blow outs. In this section, AFS have set out an example of a procedure for installation based on its own tests and experience in achieving desired compaction.

It is entirely at the discretion of the contractor or installer to use this guide or an equivalent procedure when installing and achieving compaction and ensuring dense and homogeneous coverage is achieved.

Delivery and Set Out

First step

Collect the AFS Logicwall® Shop Drawings and the 'as packed' paperwork from AFS. Assess the pallets and work out a loading scheme - where to put each pack on the deck to minimise handling of panels

Delivery to Site

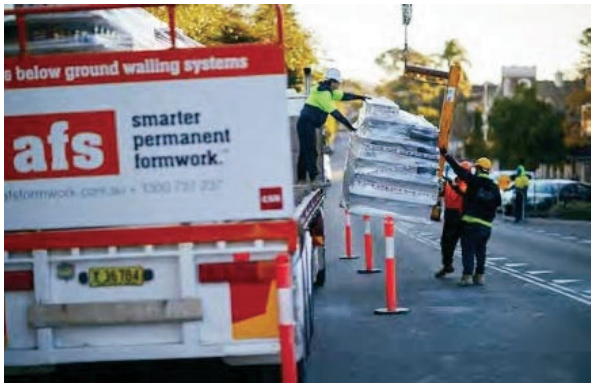
Take delivery of the AFS Logicwall®. Transport to site is arranged by AFS and lifting forks are provided with the delivery for unloading with a crane. If there is no crane a forklift will be required to unload the pallets. The crane driver and dog man are responsible for the safe and damage free unloading of the AFS Logicwall®.

It is important to have sufficient gluts available to land the pallets on. In some situations the supply of these can be negotiated with AFS.

Unloading

AFS recommend the use of an approved and certificate pallet lifter for the unloading of panels and packs on site. Pallet lifter safety guide handbook is available upon request.

Care must be taken to avoid damage to the panel edges, ends and surfaces. To ensure optimum performance, store panels under cover and keep them dry prior to erecting. If the panels become wet, allow to dry before erecting and core filling.



Delivery and Set Out (continued)

Panel Set Out

Using the pins/markings provided by the surveyor and the AFS Logicwall® Shop Drawing plan, ensure that the walls are clearly and accurately set-out. The builder should be responsible for this. At the least the builder should sign-off on the set-out.

Note: AFS Logicwall® panels can not be moved without demolition once filled with concrete. Identify each wall with the wall number as per the AFS Shop Drawings.

Floor Track Installation

Floor Track Fixing

A double bead of polyurethane adhesive (eg. Sikaflex, Bostik Seal and Flex) must be applied (in accordance with manufacturers' instructions) under the floor track on all external walls and any portion of wall that separates or adjoins wet-areas (bathrooms, kitchens, laundries). Working off the chalk-lines, using an off-cut of board as a spacer, shoot the floor track provided to the concrete slab. Ensure that the correct size (width) floor track is used for the required wall thickness.

Wall thickness may vary wall to wall, level to level

Floor track – external wall flashing requirements

Attention must be paid at this time to external walls and the detailing specified for the horizontal joint and any flashings required must be installed/fitted.

Panel Erection

Starting Point for Wall Installation

It is important to consider the wall layout and to establish the best starting point and sequence in which to proceed with installation of panels to ensure that the most working space possible is kept clear.

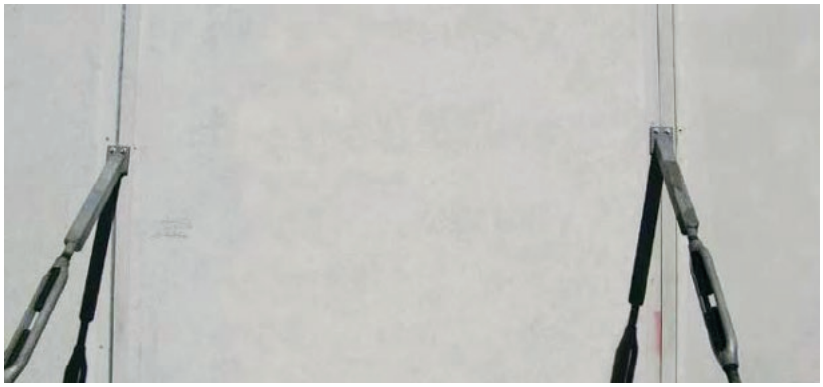
Consideration should also be given to the positioning of braces to provide the best results and also to minimise restriction of free movement by personnel around the site. If the walls are going to need to be filled off a mobile scaffold, it is preferable to run the braces in a way that leaves one face of each wall clear.

Variation in wall dimensions

When ready to start putting up panels, it is advisable to compare the wall dimension on site to the dimension on the drawing.

If necessary the panels can creep at the joint (i.e. the panels not butted tight together, to make up the wall length).

If the site dimension is noticeably shorter, identify which is going to be the easiest way to take some length out of the wall. Depending on the amount, it may be easiest to trim a few panels back or it may be necessary to take a larger cut off one panel. The effect of this on the panel and how it will impact on the joiner needs to be considered. However the golden rule is “dial” before you cut - there may be some basic discrepancy in drawings or even on rare occasions, an incorrect label.



Panel Erection (continued)

Commencement of panel installation

The panel to be placed (whether a straight panel or a prefabricated corner panel) is stood vertically beside the floor track (with the joiner at the appropriate end as per the drawings) working in a three man team and following safe manual handling procedures. Mechanical lifting should be considered for panels over 3.6m and must be used for panels over 4.2m.

The panel is then lifted clear of the starter bars, aligned with the track and then lowered into position, dropping down over the floor track. The track may occasionally be belled out a little and the panel rest on top of the track. It is important to tap the track inwards and ensure the panel has dropped down and is sitting on the slab.

Should any of the starter bars foul on the studs within the panel, the bars can normally be pushed/pulled clear of the stud and the panel successfully lowered as normal. Occasionally it may be necessary to lift the panel completely clear and actually bend the starter bar/s that are fouling to re-align them sufficiently for the panel to easily be lowered into position.

Application of adhesive to floor track edge

It is not normally necessary to apply any adhesive to the edge of the floor track however it is standard procedure to do so in certain situations (ie. basement/ retaining walls, external walls and even the first and last panels on each run of wall).

Panel Erection (continued)

Placement and positioning of braces

When the first panel of a wall is stood, it is essential to ensure that the panel is square, straight, plumb and true before further panels are installed.

Additional braces may be used and fitted in varying positions to push/pull the panel into alignment. AFS Logicwall® needs to be installed to achieve a tolerance of +/- 4mm over any 1800mm plane. In the case of corners it is not uncommon to use 3 or 4 braces.

Fixing of braces

Braces are screwed to the panel using 2-3 off tek-screws per brace, ensuring that the screws engage into a metal stud/ joiner within the panel. It is not acceptable to only screw into the board. The base of the brace is fixed to the slab using an 'Excalibur' style screw bolt.

The panel is plumbed with a spirit level before the brace is fixed. Refer to Section L for the standard bracing design certification.

Bracing considerations - high panels, high wind

The standard braces used by installers of AFS Logicwall® are engineer certified and are more then adequate for normal applications. In situations where panels higher then 3.6m are bing installed or onsite in ares known to be subject to wild or squally weather it is the responsibility of the builder and the installers to ensure that AFS Logicwall® panels are suitably/safely braced to maintain their integrity whilst filling with concrete.

If in doubt check with project structural engineer

Panel Erection (continued)

Panels screwed at floor track

Once the first panel is securely in place and plumbed, screw along the floor track at 400mm centres.

Panel installation

The next panel is now brought alongside the floor track, and then lifted clear of the starter bars and the joiner engaged in the first panel. This is done by lifting the leading end of the panel higher and getting the bottom of the joiner into the first panel. The trailing end of the panel is now lifted, bringing the base of the panel parallel with the slab and at the same time feeding the joiner into the first panel.

The panel is then lowered into position, plumbed and the joint and floor track screwed at 400mm centres. Do not screw within 10mm of the edge of the board.

A brace is fitted at the joint and the next panel in positioned using the same technique.

As each panel is about to be placed, visually check whether there is any build up of excess adhesive on the joiner. If there is, scrape it off with a chisel prior to placing the panel.

1.

2.

3.

4.

5.

Panel Erection (continued)

Fixing of panel at bottom and joiner

It is advisable to glue and screw the bottom of the panel edges of the floor track and the joiner of every panel of any wall run.

Repeat of process

The process is repeated for the length of the wall.

Panel Erection (continued)

Location of openings - doors and windows

Where there is a scheduled opening (typically a door or window, occasionally a large mechanical opening) the surveyor should have provided marks or pins either side of the opening to ensure it is the right spot. Do not proceed without confirmation of opening location.

Creation and capping of openings

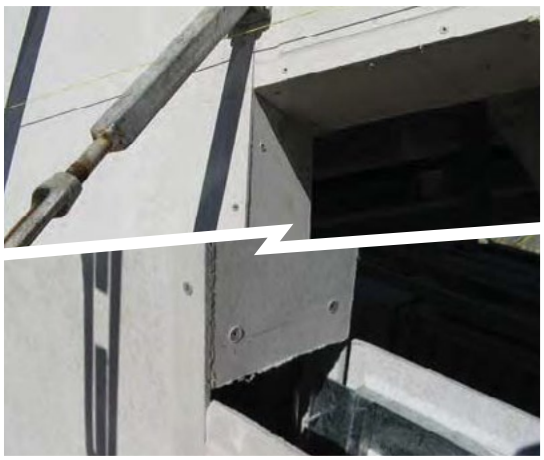
If the opening is a window, the sill is installed as per normal panel installation. The lintel is then sat on the top of the sill (on gluts) and the next full height panel installed.

Once this next panel is in place or at a convenient time thereafter the lintel is then raised to its correct height to provide the correct size opening. Use timber struts to maintain its position.

It is occasionally necessary, particularly if the lintels are a large span, to temporarily strap across the lintel and onto the wall panels on either side using a structural top-hat/strong-back to ensure the lintel is held straight and to maintain the true alignment of the overall wall.

The vertical sides of the opening and the window head are capped using the capping provided. The capping provided is cut to the appropriate lengths and is fitted into the panels using adhesive and screws. As the capping creates the reveal, care must be taken to ensure that it is fixed neatly, square and flush and creating an opening that is within tolerance of the specified opening size.

Capped ends may need to be temporarily strapped during pour in some situations, for example, blade wall ends.



Panel Erection (continued)

Large span lintels will need temporary propping during and after pour until adequate cure time has been reached. Refer to project structural engineer for advice.

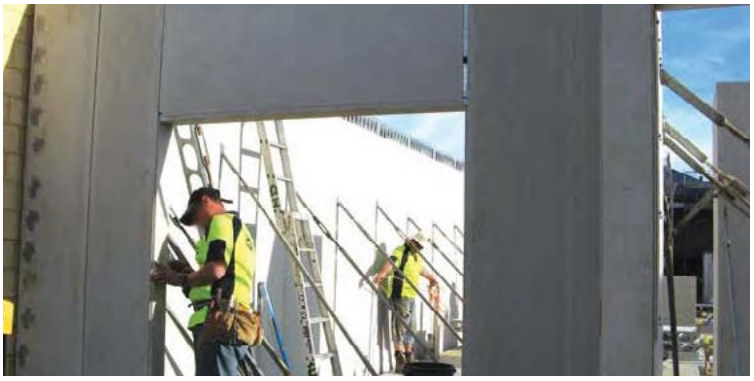
Doorway openings

Where the opening is a doorway, if a metal door frame is to be fitted, the frame is slid into position with the throat of the frame over or into the last panel. The next full size panel is then placed in position having been engaged into the throat of the door frame.

A piece of AFS Logicwall® track is flush fitted into the end of the AFS Logicwall® panels to provide a solid element to fix the frame to.

Alternatively the panels either side are fixed into position and plumbed (ensuring the opening between them is accurate for the frame). The frame can then be lowered between the panels. The lintel panel is lowered into position, engaging into the panels on both sides and dropping down into the head of the door frame.

A door opening that is going to have a retro-fitted door frame is created and capped in the same way as a window opening, without out the sill panel.



Panel Erection (continued)

Set-up of metal door frames

Built in metal door frames must be set up accurately and squared/plumbed correctly.

They also require sufficient bracing to prevent distortion during filling, which can be achieved by timber separators or timber bracing.

Purpose-made metal clips can also be manufactured which fix over the frame to prevent distortion.

Window and door openings - additional reinforcing

All window and door openings require additional local horizontal reinforcement for crack control. It is essential that this is placed in accordance with the structural drawings/ reinforcing specifications.

Creation of 'T'-junction

Where a T-junction is required, the 'through' wall is erected first. This wall must be fully braced, straight, squared plumbed and true prior to the 'T' wall being connected.

Straightening of AFS Logicwall® panels

Walls are straightened by fixing a piece of conduit (normally 20-25mm diameter and approximately 100mm long) at either end of the wall. Then using a piece of the same conduit as a gauge, start at one end of the wall and at each panel joint beside the recess (but not in the recess) check the distance between the stringline and the face of the panel. Using the turn-buckle in the brace, adjust as necessary.

Panel Erection (continued)

Erection of 'T' wall

When the through wall is ready, the location of the 'T' wall is established and accurately marked on the through wall.

A piece of AFS Logicwall® track is then cut to the appropriate length and fixed to the face of the through wall.

Using a hammer, break out the fibre cement board of the through wall within each hole in the AFS Logicwall® track. (This ensures concrete flow between the two walls). Remove the broken out board from inside the panel via the bottom hole.

Ensure there is enough clearance to achieve the required concrete cover around the reinforcement bars that are to be installed through the created hole

The 'T' wall is then erected as normal.

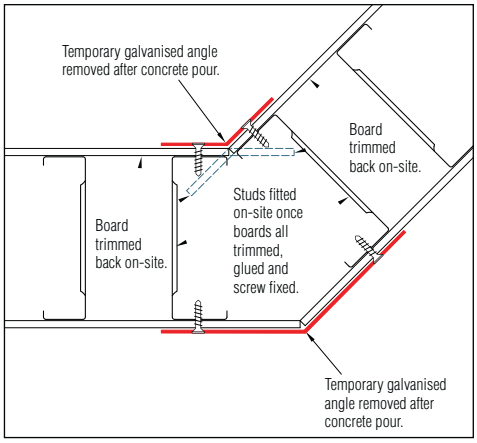
The initial joint connecting the 'T' wall to the AFS Logicwall® track on the through wall should be glued and screwed. Refer to Section I Architectural detailing for end cap details.

Where the 'T' wall takes off from the through wall at an angle other than 90º, AFS provide custom folded metal profiles to take the place of the AFS Logicwall® track. Prior to fitting this profile to the through wall, using a piece of AFS Logicwall® track as a template, cut holes in the web that basically match the holes in AFS Logicwall® track. The pressing is then installed as outlined for the AFS Logicwall® track section above.

Change of wall direction

Where a wall changes direction at any angle other than 90º, the surveyor should clearly mark/pin the location of the 'corner.' When fixing the floor track, mitre cut it to suit. Build the wall, working up the 'corner.'

The two panels that form the corner (one either side) are made with the frame stopped back inside the panel and both boards long enough to run past the inside and outside edge of the corner. The AFS Logicwall® Shop Drawings provide the dimensions that the boards on the panel should be trimmed by to finish at the corner. Confirm the dimension on site and trim the boards. A piece of AFS Logicwall® track (supplied loose) is then fitted inside each panel using adhesive and screws. These are fitted close enough to the edge of the panel to ensure that when the metal profiles provided are screwed into the inside and onto the outside of the corner, the screws go through the profiles, through the board and engage into the AFS Logicwall® track, locking the corner for pour. After the concrete pour, the metal pressings are removed and later the joint is taped and set.



Panel Erection and Reinforcement Installation (continued)

Connection to Pre-Cast / In-Situ Concrete - Structural and Non-Structural

Where AFS Logicwall® connects to pre-cast or in-situ concrete panels or columns, the connection can be done two ways - structural and non-structural.

A STRUCTURAL CONNECTION

For a structural connection the pre-cast or in-situ element must be in position prior to installation of AFS Logicwall®. Once the alignment of the AFS Logicwall® is confirmed, a piece of AFS Logicwall® track is fitted to the pre-cast/in-situ elements. If ferrules have been placed in position, located over the stater bars/floor track and into the AFS Logicwall® track on the pre-cast/on-situ elements

When the panel is in position, reaching through the holes in the AFS Logicwall® frame, screw the dowel bars (provided by builder) into the ferrules in the pre-cast/in-situ elements.

i. If ferrules have not been cast in, once the alignment is confirmed, fit the AFS track to the pre-cast/in-situ element and drill appropriate sized holes into the precast/ in-situ elements. Place the first panel. It is preferable if this detail is going to be used, to coordinate with the AFS Shop Drawing team and ensure that this first panel is approximately 600mm long, not a full size panel. Then working through the holes in the frame (this is difficult and care needs to be taken to ensure no injuries) fill the holes with chemical adhesive and insert dowell bars. This must be done strictly in accordance with the manufacturer's and structural engineer's instructions.

B NON- STRUCTURAL CONNECTION

i. For non-structural connection between AFS Logicwall® and pre-cast or in-situ elements, it doesn't matter whether the AFS Logicwall® is installed before or after the pre-cast or in-situ element. The AFS Logicwall® is simply installed as normal, the panel abutting the pre-cast/in-situ element "capped" at the end (in accordance with normal "capping procedure") and a gap of 10-25mm. as specified, left between the AFS Logicwall® and the pre-cast/insitu element. At the appropriate time this joint is treated like a normal pre-cast panel joint, (i.e. backing rods and fitted into the joint and the joint is filled using a suitable jointing product in accordance with good trade practice and manufactures instructions.

Raking walls

Raking walls are supplied to site as "stepped height" panels. Once these panels are installed the raking angle is established on-site and marked with a chalk line (or other appropriate ways). The rake is then cut on-site, prior to the panels being reinforced and filled with concrete. After the pour the rake is trowelled smooth.

The builder must provide adequate and safe access for this procedure.

Panel Erection (continued)

Cast in items

Cast-in items are sometimes required to be fitted into AFS Logicwall® eg. brackets for lift rails in lift shafts. The position of such items needs to be clearly established and the panel cut out as required.

The items to be cast-in need to be securely fitted to a piece of form-ply significantly larger than the cast-in item. The item is then located in the cut out in the panel gap and the form-ply securely screwed to the face of the panel, ensuring that the screws have engaged in the studs within the panel. After pour, the form-ply is removed and if required at some later point the screw holes can be patched/flushed.

Temporary patching of minor damage to panels

When the installation of panels is complete and all capping has been fitted, the walls need to be checked over and any areas of minor damage, as inevitably happens (eg. a corner of a panel gets broken away, a panel gets a hole punched in the face by some mishap), need to be temporarily patched to ensure that these spots don't become weak points and let go during the concrete pour. This is done using appropriate sized pieces of form-ply tek-screwed over the area, ensuring the screws engage in the studs within the panel.

After pour these patches are simply removed by reversing out the tek-screws. Such areas are patched and flushed at the time when the joints are taped and set.

Reinforcement Installation

Installation of Straight horizontal reinforcing bars

Horizontal reinforcing shall be installed as the panels are erected, in strict accordance with the project engineers design.

Once the Logicwall® profiles are fixed in place, slide the horizontal reinforcement bars through the holes. The shape of the cut hole will help hold the bars in the correct position.

Typically 5 panels are erected and 6m lengths of reinforcement bars are placed at the centres as specified. Another 4 panels are erected and 6m long bars are placed to provide lap as specified.

Reinforcing placement in short run lengths of wall

In short run lengths of wall, the reinforcement needs to be cut to the appropriate length and, in the case of a blade wall, placed prior to the end of the wall being capped. In a situation (typically lift shafts and stairwells) where there are short runs of wall, closed at each end with a pre-fabricated corner panel; the wall section is erected and the corners fitted into position.

Reinforcement bars as specified is cut to the appropriate length, the required centres are marked on the outside face of one of the corners and using piece of bar as a punch, neat holes are made in the board, through which the pre-cut lengths of reinforcement are inserted.

These holes are covered with a temporary patch (duct tape is often sufficient) until after pour. Later when the corners have a bead fitted and are flushed, these holes are patched and flush set.

Installation of Vertical Reinforcement Bars

Use of Alignment Bars

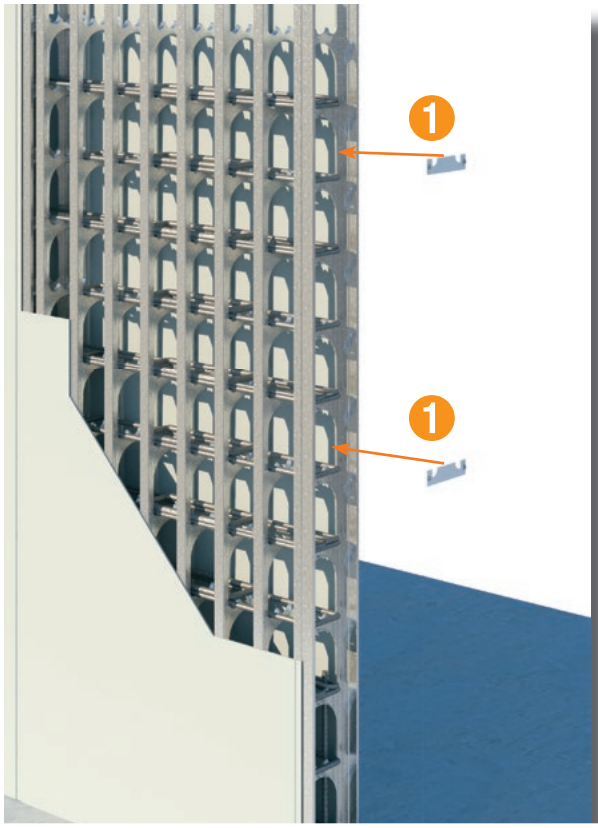
R10 alignment bars can be used to assist with location and installation of the vertical reinforcement bars. These alignment bars shall be installed horizontally on both sides of the wall generally at one third the wall height and are installed progressively as the wall is built.

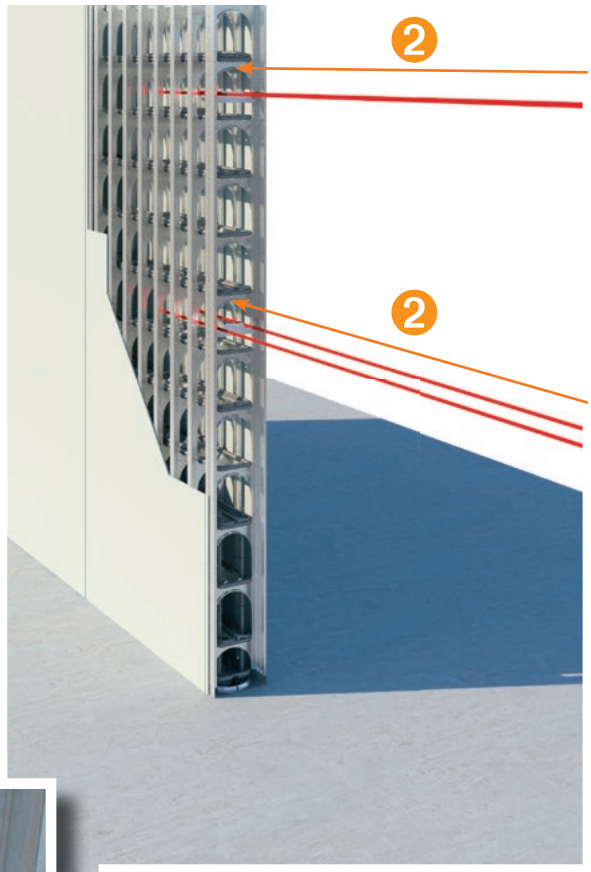
A precut locater can be used to ensure consistent spacing/location of the guide bar.

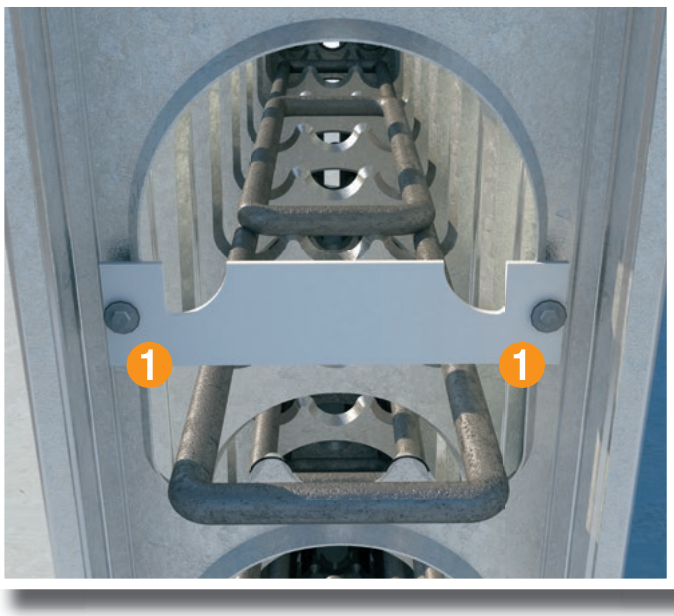
1. Fix the locater to the Logicwall® stud face at the desired locations of the alignment bars.

2. Slide the alignment bar through the locater. Guide locators should be placed at approximately 2200mm centres (every second panel) horizontally.

Note: These guide bars are **NOT** to be considered as part of the wall structural reinforcement**.**







Reinforcement Installation (continued)

Installation of Vertical Reinforcing Bars

If a normal formwork deck is being erected, once the deck is in and it is safe to do so, the vertical reinforcing bars are lifted onto the deck.

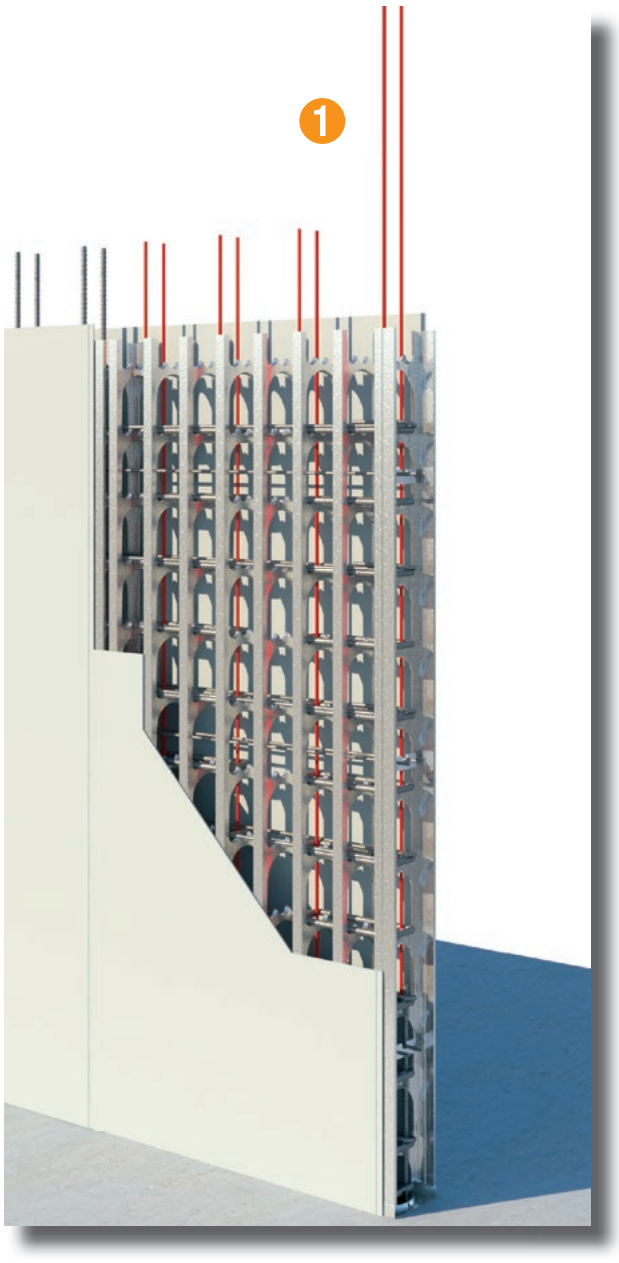
1. The vertical reinforcement bars are then lowered into the Logicwall® panel at the correct locations.

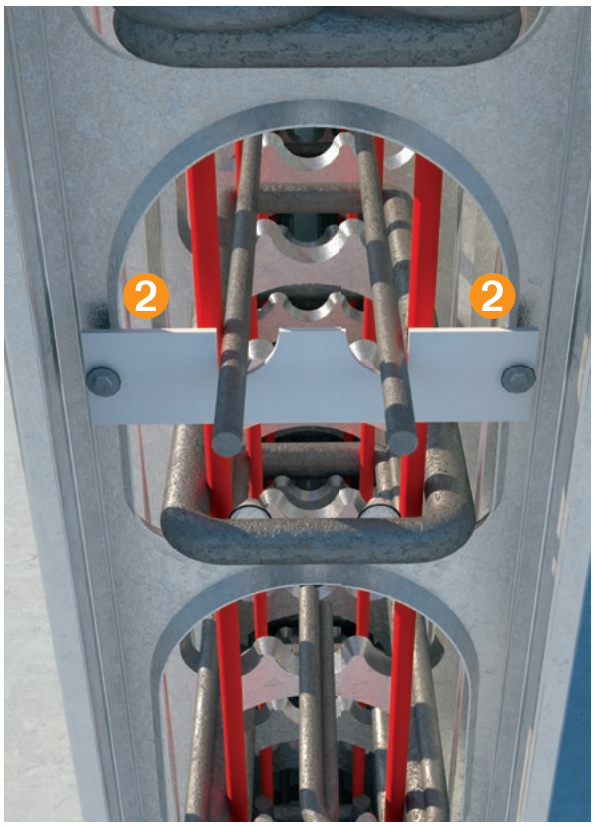
2. Ensure that the vertical bars are on the internal side of ligatures and horizontal bars, and on the outer side of the alignment bars.

An extra joggle bar with small 20mm bend at the base can assist in installing vertical bars.

The offset makes it easy when lowering the vertical reinforcing bars into the wall to weave it in between the locater bars and the outer horizontal reinforcing bars.

A mark on the vertical joggle bars can facilitate locating the alignment bars so that the joggle bars can be paused just above the horizontal locater bar can speed up reinforcement installation.



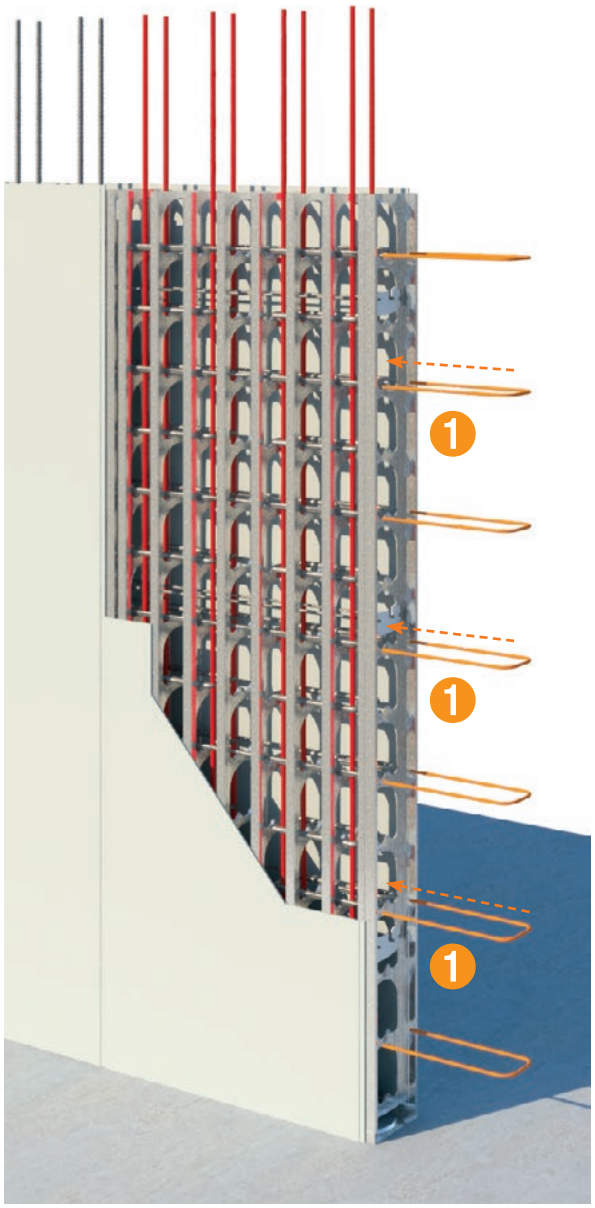


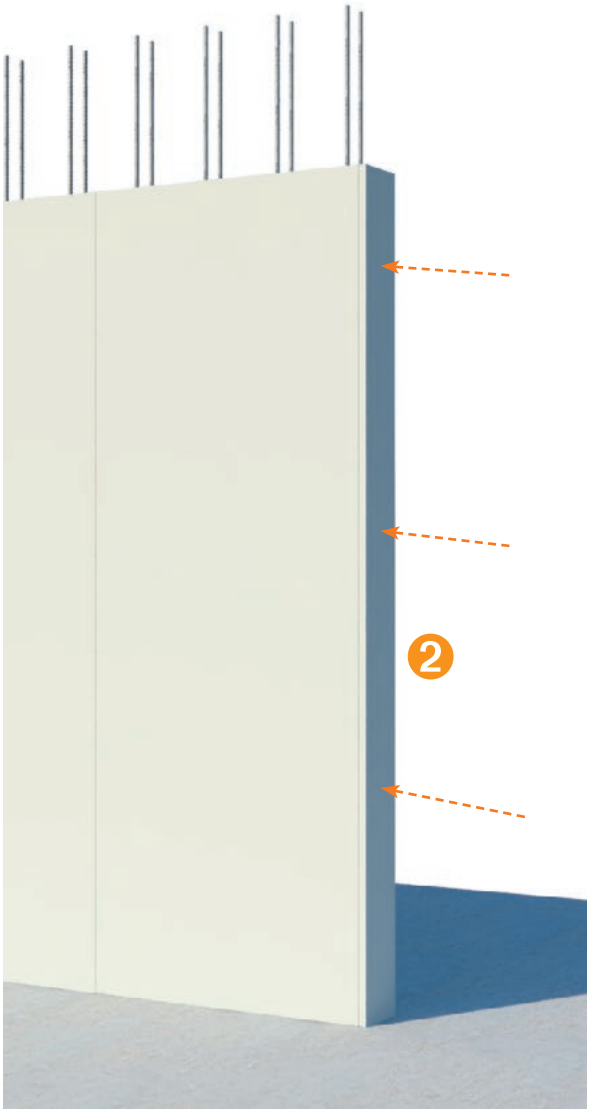
Reinforcement Installation (continued)

U bar Reinforcement Installation

1. Install U bars as per the project specification.

2. End caps must be fitted using adhesive and counter sink or self drilling screws at 400mm centres typical.





Reinforcement Installation (continued)

Vertical Reinforcement Tie Off

1 When the vertical bars have been placed in position, tie the top of each vertical bar to the top horizontal reinforcement as required to ensure bars remain in correct position during concrete pour

2 The top of the vertical bars can also be spaced and locked in correct position by using an LVL timber or similar.

3 Where the walls are going to continue through on the next level, the vertical bars are left longer by the amount required to clear the slab and act as the starter bar for the wall over. Ensure that the bar will maintain the correct overlap with the previous and subsequent bars where applicable. Refer to the Project Engineer's specifications for correct overlap and spacing of reinforcing bars. On projects where a pre-cast slab system such as Ultra-floor is being used, and it is necessary to pour the AFS Logicwall® prior to the 'deck' going in, it is necessary to place the vertical reinforcement from either a mobile or temporary scaffold.

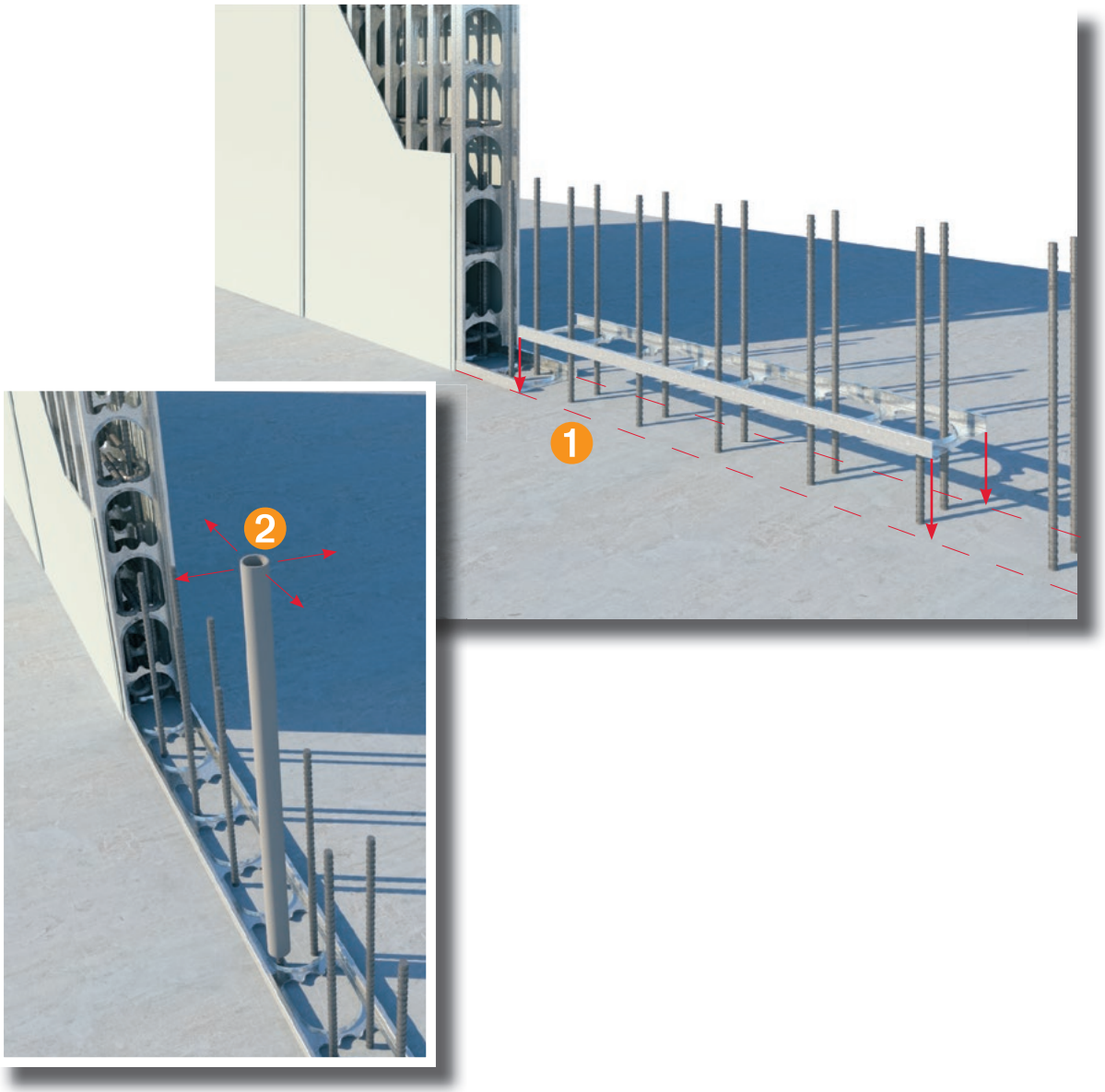
Installation of Horizontal Hooked Bars and Ligatures in Logicwall® Panels

The following procedures outlines the installation of horizontal hooked bars, ligatures in AFS Logicwall® panels.

1 Mark the location of the wall and carefully position the floor track over the starter bars and fix it to the floor.

2 Confirm the location of all starter bars and adjust their vertical alignment so that the required ligature reinforcement can be placed easily over the starter bars.

A steel tube can be used to adjust the alignment of the starter bars where required.

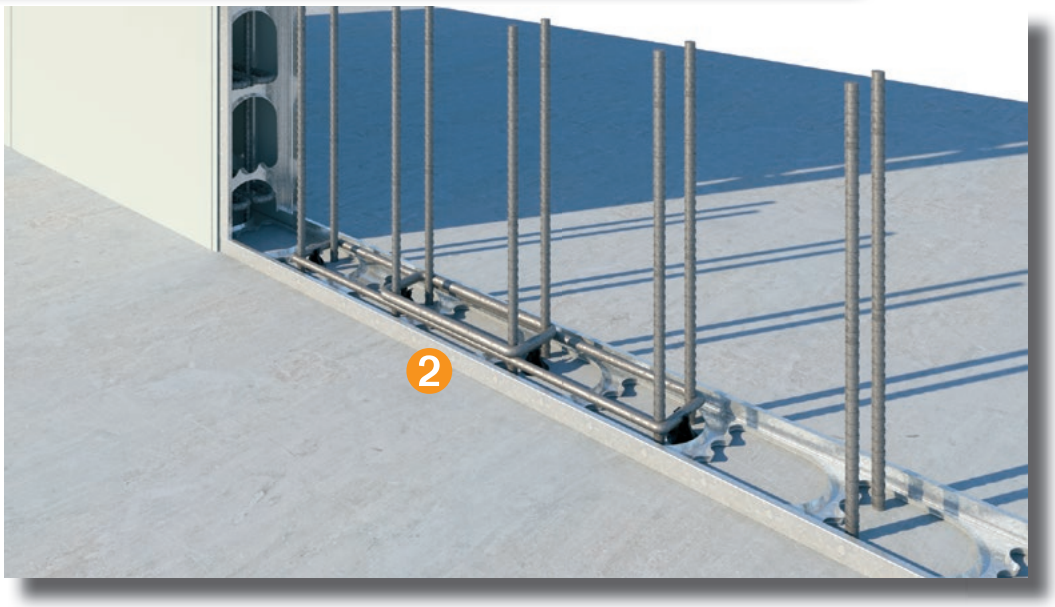


Installation of Lowest Ligatures Over Starter Bars

Consult the project engineer drawings regarding the correct location of ligatures.

1. Carefully position and lower the ligatures around the starter bars.

2. Install the lowest ligatures over the starter bars and place them on the bar chairs. The lowest ligatures should be placed/chaired to a maximum of 50mm above the slab top surface.

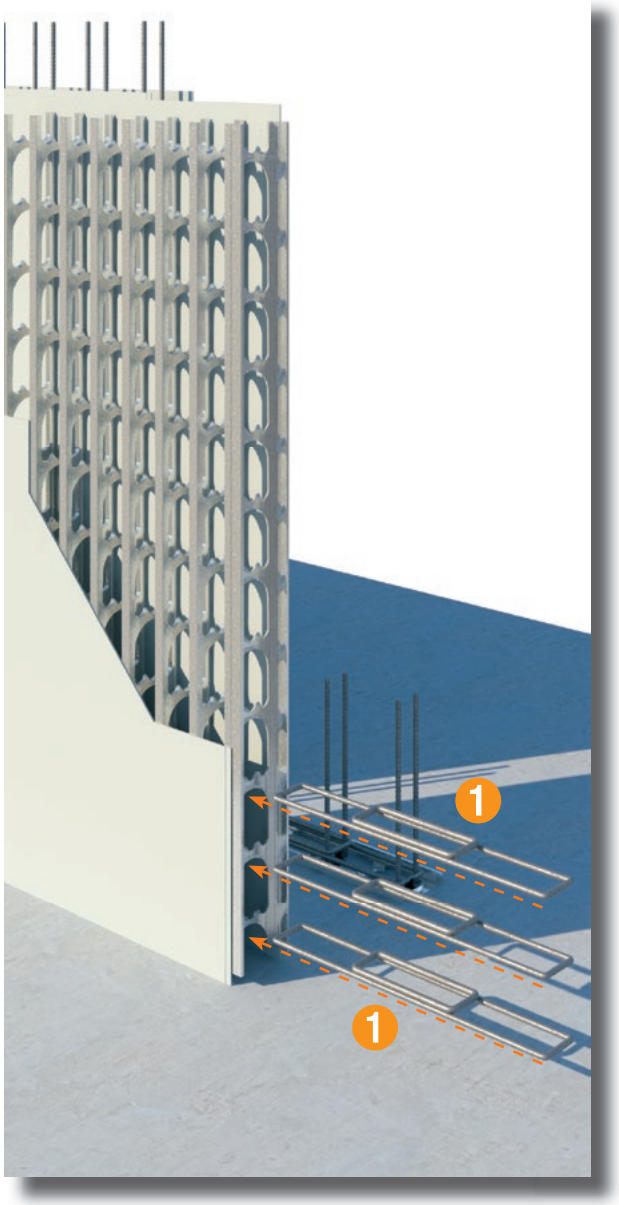


Installation of Subsequent Ligatures in the AFS Logicwall® Over Starter Bars

Consult with the project engineers drawings regarding the required locations of the reinforcement ligatures.

Ligatures required over starter bars are to be positioned into the AFS Logicwall® panels in their correct locations prior to the installation of panels over starter bars.

1 Ensure that the Logicwall® panel widths suit the ligature sizes. Where required, ligatures can be tied in groups to avoid reaching into the Logicwall® for installation. Shop drawn panel widths should be coordinated with ligature placement. Slide the ligature assembly into the panel to the correct location.



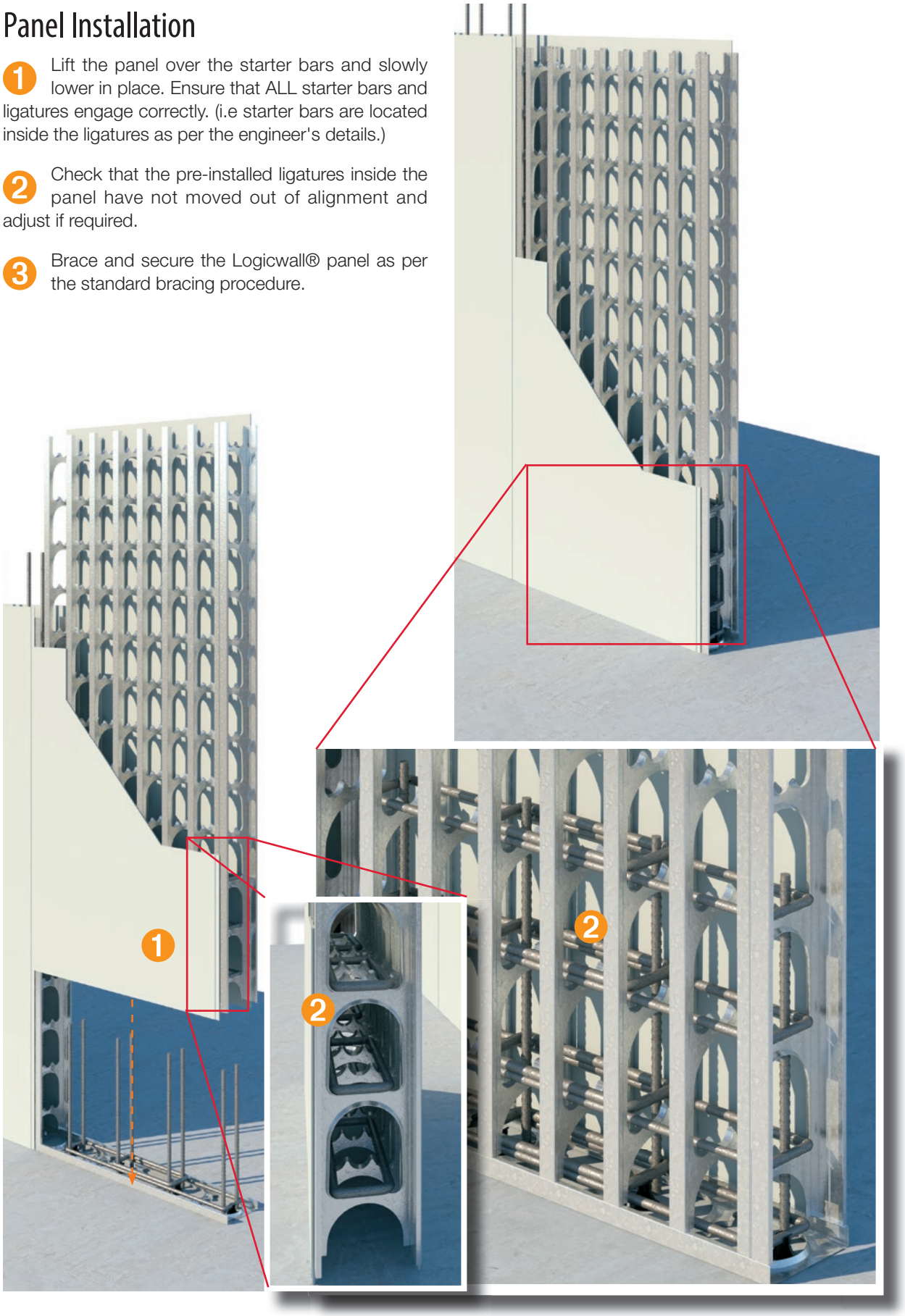
Reinforcement Installation (continued)

Panel Installation

1. Lift the panel over the starter bars and slowly lower in place. Ensure that ALL starter bars and ligatures engage correctly. (i.e starter bars are located inside the ligatures as per the engineer's details.)

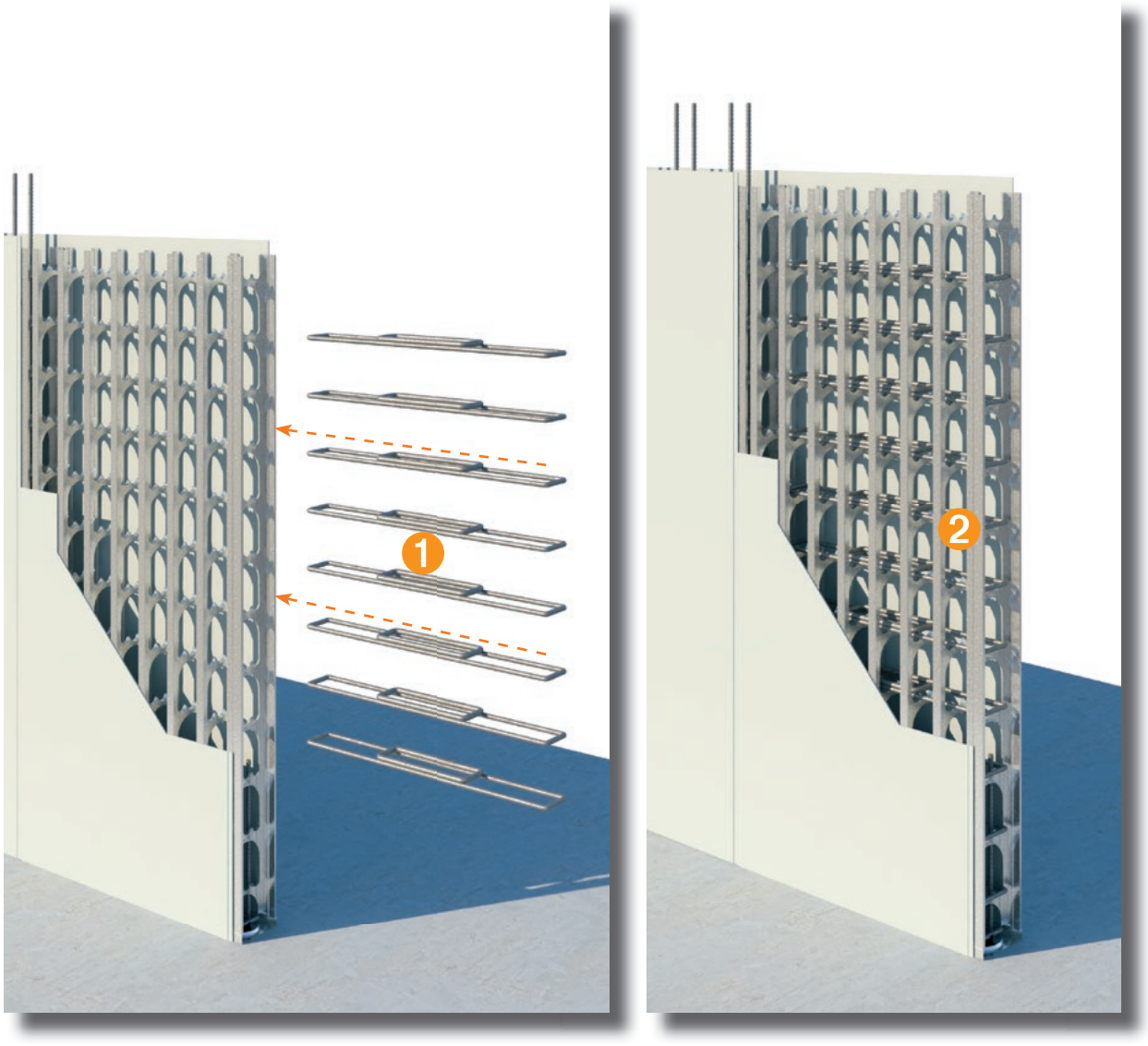
2. Check that the pre-installed ligatures inside the panel have not moved out of alignment and adjust if required.

3. Brace and secure the Logicwall® panel as per the standard bracing procedure.



Installation of Subsequent Ligatures in Panels Above Starter Bars

1. Install subsequent ligatures for the remainder of the panel as per the project engineering drawings.
2. Ensure that all ligatures are correctly located to allow vertical bars installation.



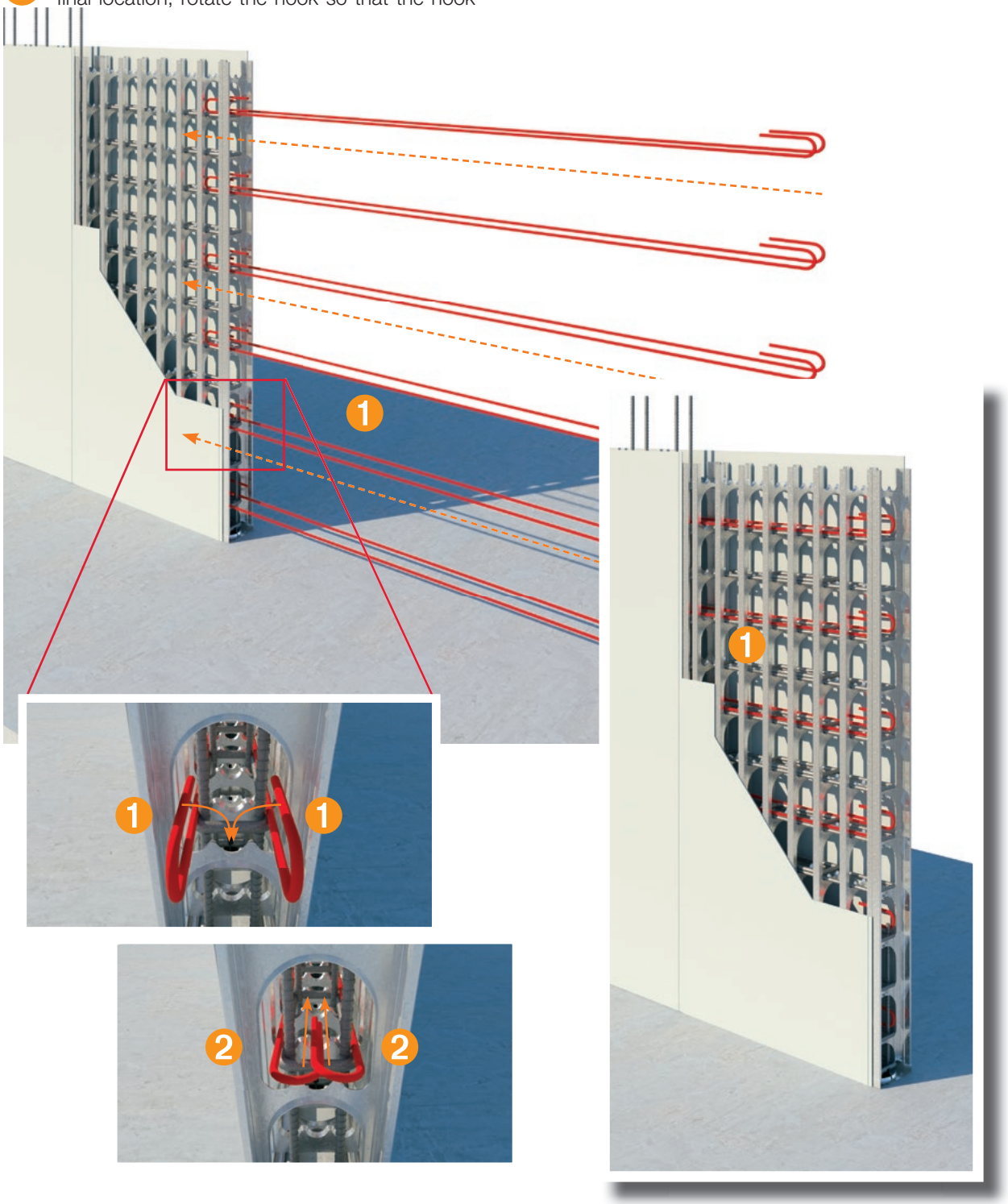
Installation of Horizontal Reinforcement with Hooks

1. Slide the horizontal reinforcement bar into the Logicwall® panel ensuring that the hook bar face is in a vertical position and is placed on the outside of all the starter bars.

2. When the horizontal bars are slid in their correct final location, rotate the hook so that the hook rests horizontally on the studs.

Repeat for both sides of the wall, turning the hook inwards and resting on the stud.

Install horizontal hook bars progressively above the starter bars as the wall is built. Note that horizontal hook bars shall be lapped as per the project engineer's details



Reinforcement Installation (continued)

Installation of Standard Hook Bars with Open Corner Capping

The installation procedure is as follows:

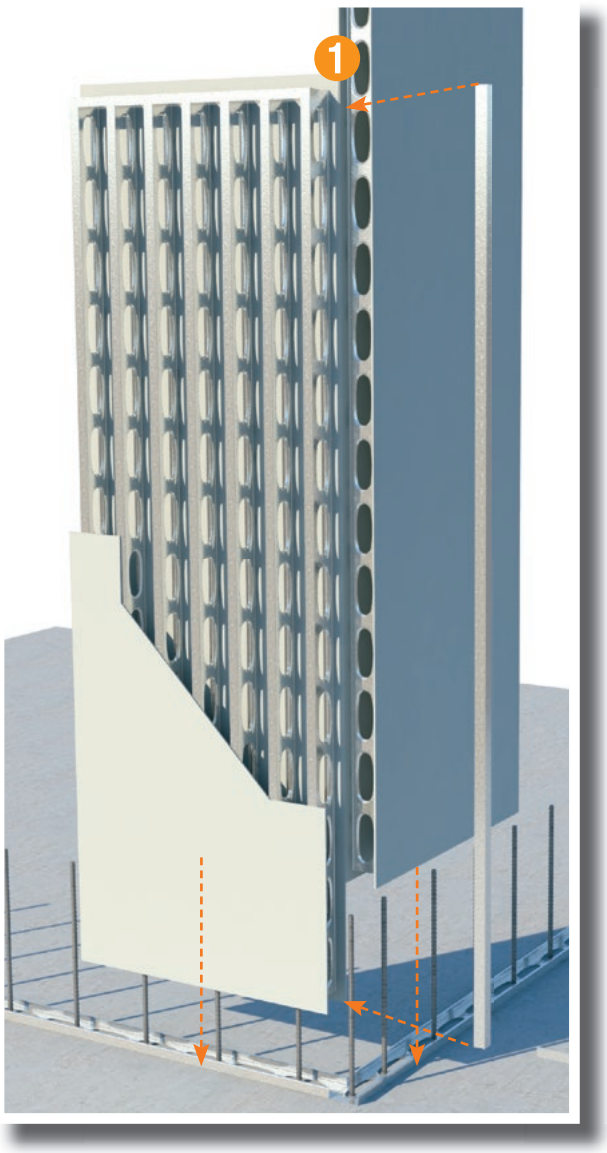
1. Install corner panel 1 to the internal edge of the corner panel 2. Glue and Screw fix (typically 300mm centres) internal corner angle to the FC sheet on the internal side of the wall corner.

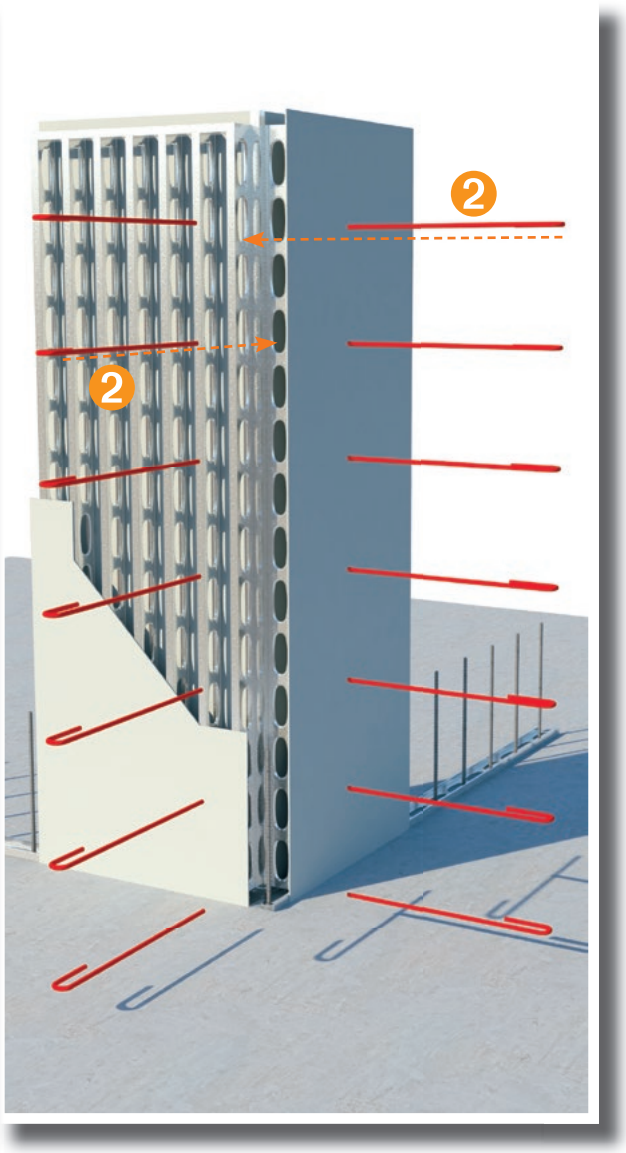
2. Align the 'hook' on each hook bar in the corner and insert the vertical 'dropper bar' from the top of the corner panel and through the loops formed by the hook bars.

NOTE: Hook returns should be a minimum of 150mm to prevent the hook twisting in the cavity. (Panel bracing not shown for clarity)

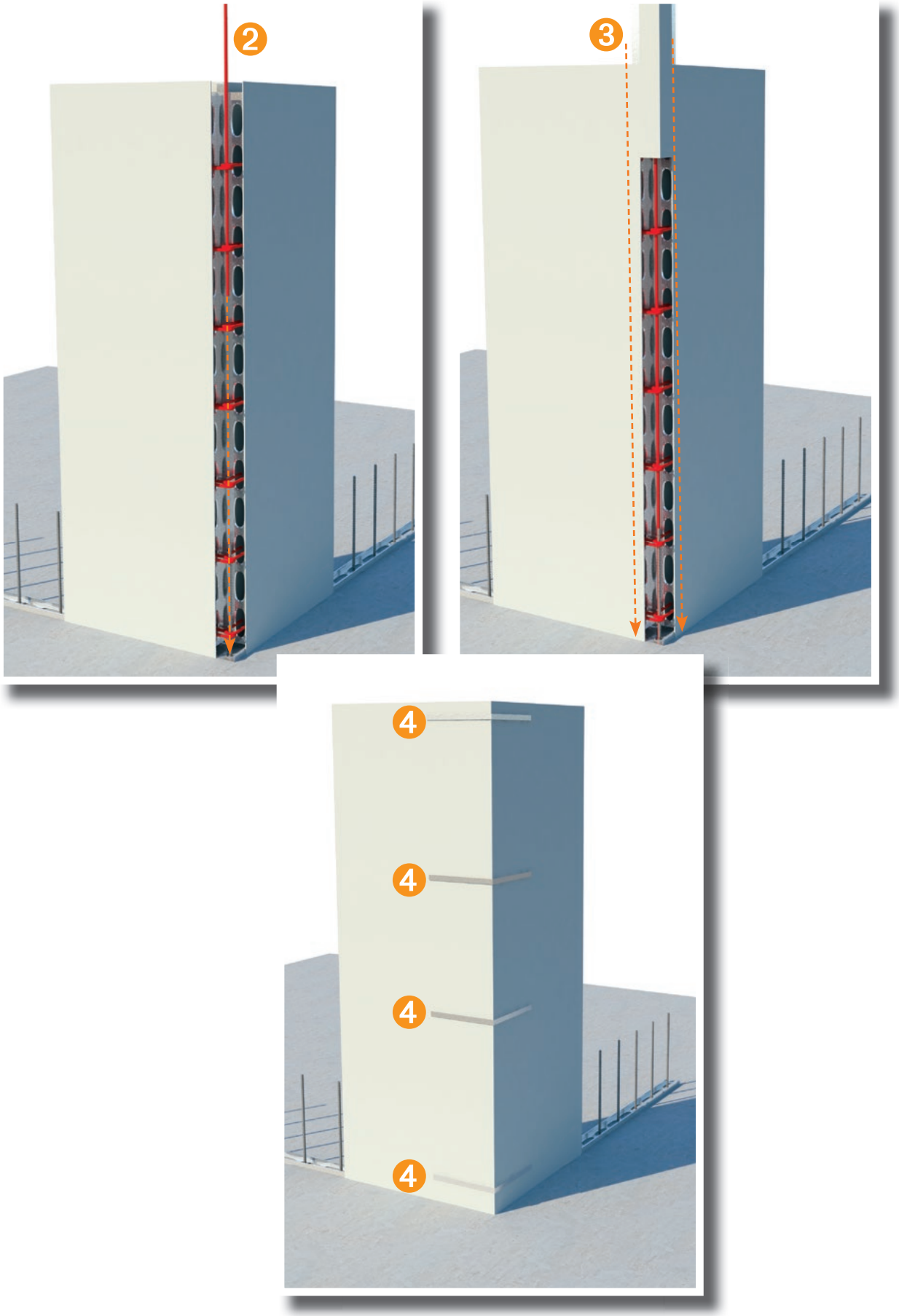
3. Install steel corner cap by sliding the cap down from the top. Glue and screw fix in place typically at 300mm centres

4. Install steel corner brackets on the external side of the corner panels. The brackets are to be screw fixed with hex head screws. The brackets should be located typically at 1000mm centres along the wall height on the external side of wall corners.





Reinforcement Installation (continued)



Site Installation of closed Ligatures or Hooked U Bars in Logicwall® Panels with Open Corner Capping

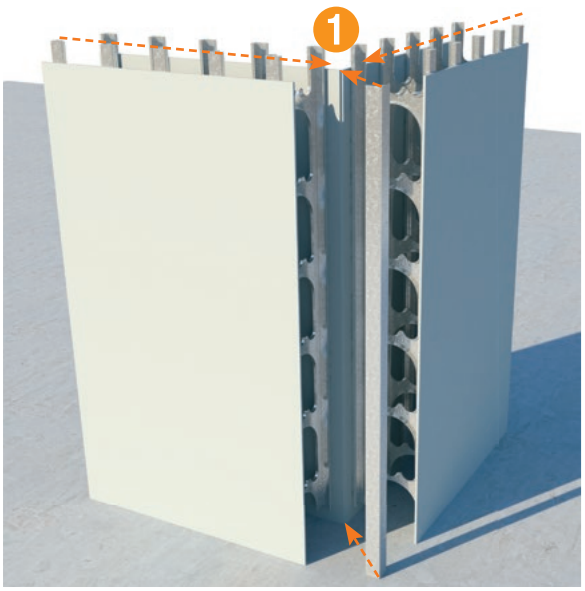
Logicwall® panels with open corner capping shall be used where closed ligatures or U bars with hooks are required to be installed in the wall corners.

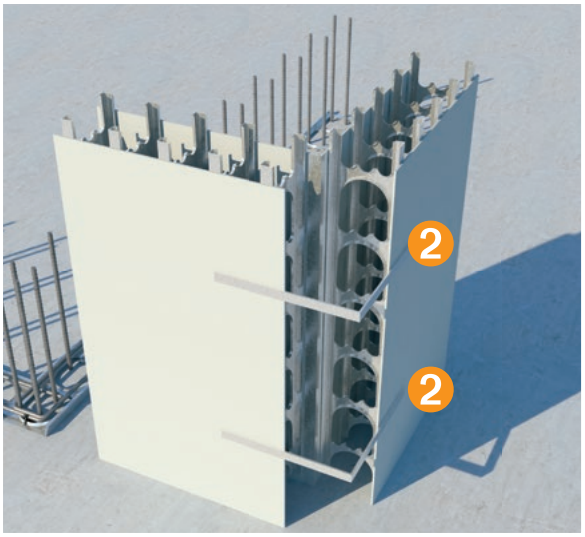
The corner panel shall be installed in two stages along the wall height as follows;

1 – Placement of lower corner panel assembly over the height of starter bars and

2 – Placement of upper corner panels on

The lower corner panels are 1200mm in height and will have steel stud frame extensions to facilitate installation, joining and alignment of upper corner panels.





The installation procedure is as follows:

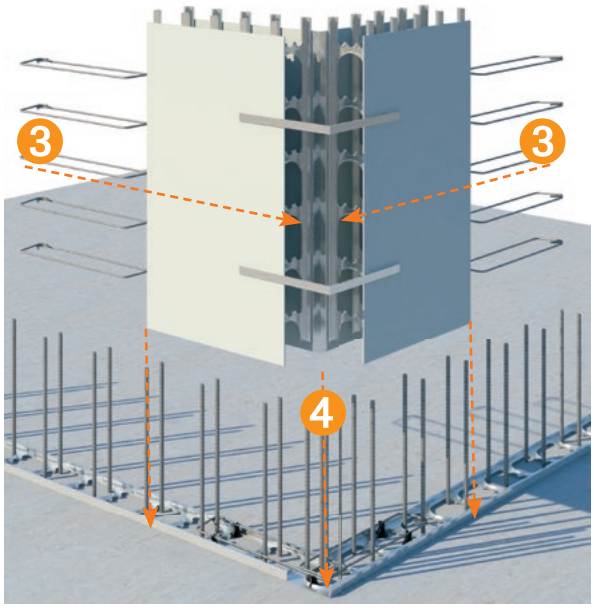
1 Stand lower corner panel 1 to the internal edge of the lower corner panel 2. Each panel is 1200mm in height.

Cut internal steel corner angle to the height of lower corner panels. Glue and Screw fix (typically 300mm centres) internal corner angle to the FC sheet on the internal side of the wall corner. Plumb panel 2, then glue and screw.

2 Install steel corner brackets on the internal and external side of the corner panels. The brackets are to be screw fixed with hex head screws. The brackets should be located at the top and typically 300mm below the top on the internal side and at top and bottom on the external side of wall corner assembly. Ensure that brackets are clear of the location of the ligatures or U bars.

3 Install closed ligatures or U bars with hooks in both corner panels over the height of starter bars. Follow the installation procedure described earlier in the section "Installation of Subsequent Ligatures in the AFS Logicwall® over starter bar".

4 Once corner steel reinforcement has been installed, lift the steel bracketed Logicwall® corner panel assembly by hand or crane. Lower it slowly and carefully over the starter bars ensuring that the starter bars are on the inside of closed ligatures or hooked U bars.



Reinforcement Installation (continued)

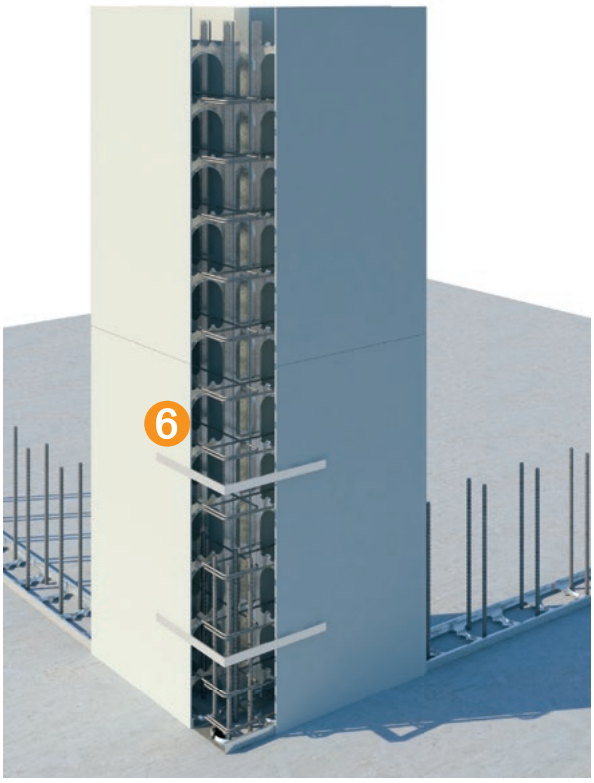
5 Install upper corner panels on top of lower corner panels. The panels can be installed manually or using crane depending on the panels size. Fix internal corner angle to the first upper panel to be installed as per step 2. Then plumb and brace lower panel 1 and upper panel 1 as per the standard procedure.

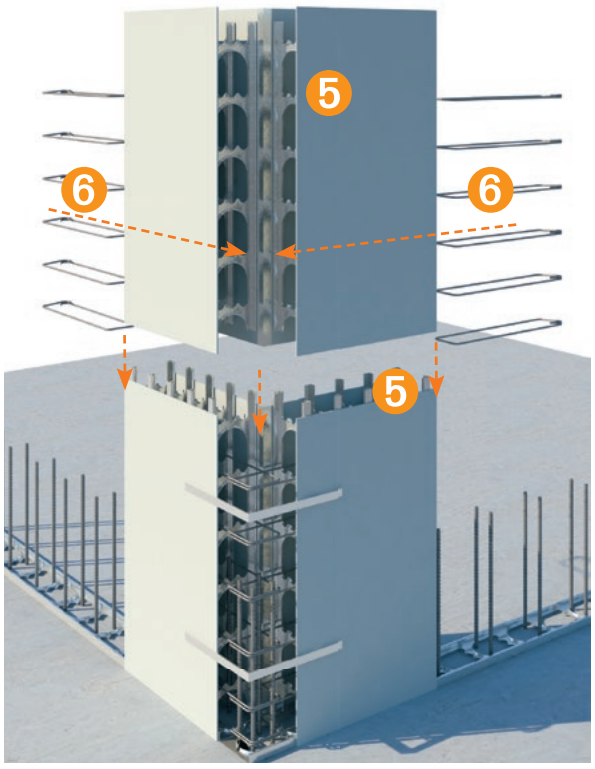
Fix the upper panel 2, glue and screw the internal corner angle. Then plumb and brace lower panel 2 and upper panel 2.

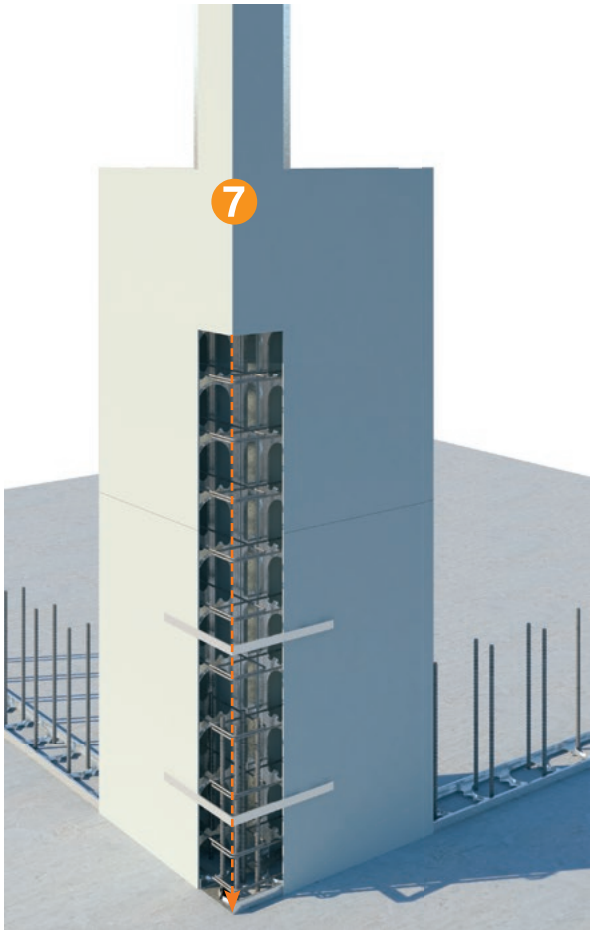
6 Install closed ligatures or U bars with hooks in the upper corner panels.

Note: Slide and install horizontal bars with hooks and Install vertical reinforcement bar using guide horizontal locater bars as required before closing the corner.

7 Remove brackets and install steel corner cap by sliding the cap down from the top. Glue and screw fix in place typically at 300mm centres. Bracket and brace corner caps.







Final Check Before Concrete Pour

Prior to filling AFS Logicwall® the Builder, Engineer and the installer should perform a check that all walls are straight, square, plumb and true, that all reinforcement, both horizontal and vertical has been placed according to the structural drawings/specification.

Make sure all the opening are the correct size and in the correct location and capped; that all electrical/data conduits and boxes are in and according to plan. This procedure should be documented.

Power/data connection boxes need a "face plate" fitted to hold them square and prevent them from dislodging during concrete pour. Also, it is advisable to put a screw through the end of the conduit, inside the box to prevent the conduit "floating" out during pour.

Core Filling of Walls

Introduction

The contractor or installer is responsible for achieving compaction and dense and homogeneous coverage of the concrete mix in AFS Logicwall®.

AFS Logicwall® cannot be installed using traditional methods of compaction or vibration.

AFS has carried out tests which achieved desired compaction or dense and homogeneous coverage of AFS Logicwall®

This guide sets out the methods used by AFS to achieve compaction.

Use of this guide or an equivalent procedure to achieve compaction of AFS Logicwall® is entirely at the discretion of the contractor or installer.

AFS is not responsible for achieving compaction of the concrete in AFS Logicwall® or core filling of walls.

Concrete Pour Limitations

When panel installation is complete with all appropriate checks ticked off, the walls can be filled with concrete.

Quantity of concrete that can be poured in a day must be assessed and determined in consideration of the following factors:

- Ease of access
- Number of passes that are required
- Concrete gelling time between passes
- Consideration of wet weather

For wet weather conditions, the panels need to be assessed and the concrete pour either be delayed or be undertaken with extreme caution, applying measures to suit the given conditions.

Core Filling of Walls (continued)

Additional equipment required for concrete pour

Prior to commencing a pour, ensure that a concrete vibrator (40mm diameter maximum), at least one wheelbarrow and multiple shovels, trowels, screw guns and screws and some sheets of form-ply are readily available.

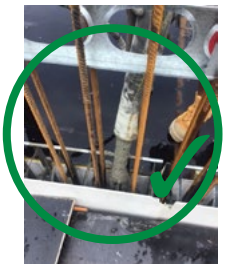
Number of concrete passes required per panel

Walls up to 3 metres high can be filled in 2 passes with the first pass being to a maximum height of 1.5m. Walls from 3-4.2m should be filled in 3-4 passes with the 1st & 2nd pass being to a maximum height of 1m each. Allow at least 30 minutes or more between passes for concrete to gel.

Higher MPa mixes will gel faster than low strength mix designs. These guidelines will vary according to site conditions, with the requirement of extra passes and extra gelling time in wet/ cold weather. In cases of extreme weather the concrete pour should be postponed.

Concrete pour

The concrete mix and concrete placement technique is critical to the successful outcome of filling AFS Logicwall®.



Concrete mix design

The concrete supplier is responsible to provide a mix design that is suitable for filling AFS Logicwall®.

The concrete core fill mix must be designed with enhanced flow characteristics. Such concrete is available from most of the major concrete suppliers. Refer to Section J for concrete mix design guide.

Core Filling of Walls (continued)

Concrete delivery and placement

The concrete must be placed using a suitable boom pump via a 50mm delivery hose wiith continuous flow. Never fill AFS Logicwall® using a kibble. AFS Logicwall® cannot be core filled using traditional core filling and vibrating methods.

Concrete 'Gel' Test

The concrete core filling in AFS Logic wall is undertaken in passes with concrete pours limited to 1500mm high per pass. A simple reinforcement test shall be undertaken to check that concrete in each pass has 'gelled' sufficiently before the subsequent pass (Typically 30 minutes or more). The test steps are as follows:

a) After the first pass of the concrete pour, lower an N12 or N16 reinforcement bar into the Logicwall® cavity till the reinforcement contacts the wet concrete.

b) Let the reinforcement bar fall under its own weight. If the reinforcement bar sinks 75 - 125 mm into concrete and stops, it indicates that the concrete has 'gelled' sufficiently for the 2nd pass of the concrete pour to commence.

c) If the reinforcement bar does not stop and continues to go down into the wet concrete, the concrete is still too wet for commencement of the second pass of the concrete pour. Allow suitable time for the concrete to 'gel'. Then, conduct the test again to check and ensure that it meets the bar sink criteria as noted in Step 'b' before proceeding to the next pass of the concrete pour.

d) Depending on wall height, the gel test shall be carried out for all subsequent passes of the concrete pour.

- Concrete is vibrated with a 40mm diameter needle vibrator by placing the vibrator in the upper 300mm of the wall panel and rattling the steel stud framework.

Note: Over-vibrating can result in bulges and/or blowouts. Do not touch the fiber cement sheets with the vibrator. Keep vibration to a minimum. If any bulges occur, carry out the repair works as per the routine QA procedures explained in subsequent section.

The average pump rate for core filling AFS Logicwall® is 10m^3 per hour. It is important to advise the concrete supply company of the required delivery turn around time. (e.g. 1x5m^3 load every half hour).

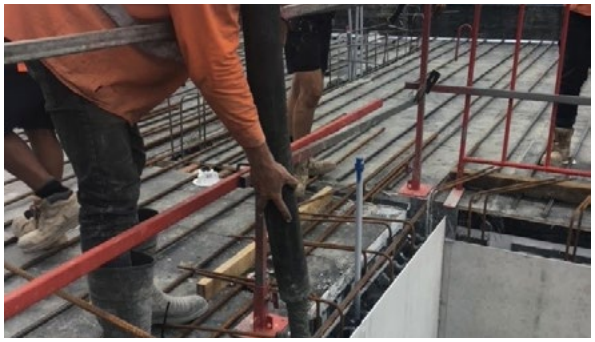
Core Filling of Walls (continued)

Concrete pour procedure

Starting from an appropriate point commence filling the walls, holding the hose directly over each 'cell' (space between studs) move from cell to cell counting to 10 to 20 as required to achieve a maximum 1500mm high lift.

When moving around the walls filling them, remember that the shorter/thinner a section of wall the faster it will fill. Consequently vary the time the hose is held over each cell to ensure that any given area is only filled approximately maximum 1500mm per pass.

There should be at least one person either side of the wall at the base of the wall, confirming by tapping with a hammer that the correct height lift is being achieved. Keep a keen eye on the panels for any sign of bulging or movement. Should this occur, immediately move the hose to another area and continue pumping.



Securing of temporary patches/bracing if area bulges/blows out

If panel bulging or blow outs occur, call across other team members to screw form-ply over the affected area, ensuring that they get the screws into the studs within the panel.

Clean up any concrete that may have become misplaced straight away.

Once form-ply has been securely screwed to the face of the panel and any other temporary propping or bracing thought necessary applied, bring the hose back and fill the area.

Filling of sills

At openings such as windows or large mechanical penetrations, lower the hose and ensure all sills are uncapped and adequately filled.

Core Filling of Walls (continued)

Filling of horizontal panels

Special attention needs to be given to the filling of "horizontal" panels (i.e. studs run horizontally) as the concrete can tend to 'bridge' on the stud leaving pockets empty below. If this is happening it is necessary to use a needle vibrator, 38mm diameter maximum, to ensure that these panels are properly filled.

Note: Over-vibrating could result in bulges and/or blow-outs.

Use of the concrete vibrator in AFS Logicwall®

Concrete is to be vibrated with a 38mm diameter needle vibrator, by placing the vibrator within the upper 300mm of the wall panel and rattling the steel stud framework for 3 seconds at a time.

The vibrator must not be dropped or lowered to the bottom of the panel (as done traditionally) or held against the fibre cement board as this may result in panel failure.

Finishing of sills/top of wall

When the sills and tops of walls have been filled, they should be neatly trowel finished. The top of the sill/wall is either:

a) left set down slightly if a slab is to be poured over the top;

OR

b) trowelled off smooth if it is the finished top of a wall or if it is to be the bearing edge for Delta-core or Ultra-floor to sit on.

Core Filling of Walls (continued)

Placing of 'L' bars at the top of the AFS Logicwall®

It is at this point that 'L' bars may be required to be placed in the wet concrete at the top of the AFS Logicwall® wall to tie the wall and slab over together.

This needs to be done by the responsible person / party. The bars need to have been ordered and be readily available.

Concrete clean-up

During pour, it is inevitable that some concrete gets splattered onto the slab below and down the face of the AFS Logicwall® panels.

This must be cleaned on the pour day, straight after the pour.

During a large pour, persons should follow around, scrapping all splattered concrete off the slab and walls and where necessary, wipe the walls down. Otherwise the concrete will set hard creating extra work to scrape off.

Removal of braces

Early removal of braces

The braces are normally removed once the slab over is poured or the roof is attached. However if due to site conditions or for any other circumstance, it is desirable to remove the braces earlier, approval must be obtained from the project engineer, especially in situations where the AFS Logicwall® is to become retaining wall and will be back-filled against, or is to be loaded with a pre-cast slab system.

Routine QA Procedures

Removal of temporary patches

The day after pour any temporary patches are to be removed. In the event of a bulge or blowout that had to be ply-ed up during the pour, that ply should be removed and the area assessed. If the ply has pulled the board tight back against the studs within the panel, no further work is necessary.

Repair of panels if concrete has bulged/panel blown out

If the board has come away from the studs and is distorted beyond the allowable tolerance, make a cut through the board at a point where it lies flat against the studs and remove that section of the board.

If the concrete has bulged beyond the stud, scrape it back to the face of the stud while the concrete is still green. Subsequently, a new piece of board can new piece of board can now be glued onto the stud or the area can be patched using a suitable acrylic modified render (i.e. Macrender) and flushed over when the joints are set.

Repair of voids in panels

After AFS Logicwall® walls have been corefilled the walls should be tapped using hammers on both sides to check compaction. should a hollow in the wall be identified, the location should be marked. a high strength grout should then be injected into the panel to fill the hollow. This process should be done in conjunction with the specifications from the grout supplier and the methodology be approved by the project engineer.

Cleaning and tidy up

When all necessary cleaning, tidy up and patching has been done, the installer should hand the completed area over to the builder until it is ready for the installer to come back in and tape and set the joints. Some areas will require extra work in preparation for joint setting.

The horizontal joint that occurs in stairwells (also the external horizontal joints, depending on the specified finish) will inevitably require some grinding back and/or patching to ‘feather-out’ any misalignment which has occurred during installation.

Workplace Health Safety and the Environment

AFS logicwall® has been designed with workplace health safety and the environment in mind. Issues regarding installation have been considered so that the risk of harm to those who build, use and maintain the structure is minimised.

A vital consideration when planning installation, is to have appropriate safe systems of work to identify hazards, assess risks, control exposures and to ensure a process is in place to review control measures.

Assessing the hazards associated with the installation methods, equipment, tools, dust, noise, chemicals, other trades and work environment is the responsibility of both the builder and installer.

Appropriate assessment of risk, adequate resources, communication methods and training provided to workers is to be considered and documented for each site location.

Personal Protective Equipment

The Personal Protective Equipment (PPE) required may vary from site to site and from time to time, and it is the responsibility of every individual to ensure that they use the appropriate equipment to safeguard themselves and those around them.

Logicwall® panels and concrete contain silicas that are harmful if inhaled. Appropriate protective clothing and breathing equipment must be worn when cutting logicwall®.

When cutting, drilling, screwing or grinding panels using power tools, an attached LEV and a M or H Class HEPA filter industrial vacuum must be used.

Always ensure the work area is properly ventilated. An approved P2 half face mask and safety glasses must be worn. AFS recommends that hearing protection be worn if equipment used exceeds noise standards.

Recommended Safe Working Practices

Cutting Outdoors

- Position cutting station so wind will blow dust away from the user or others in the working area.
- Use a dust reducing plunge saw equipped with a dust extract ion system . (LEV and a M or H Class HEPA filter)

Sanding/Drilling/Screwing/Other Machining

- When sanding, drilling, screwing or machining, you should always wear a P2 half face mask. **(provides 10 x protection from dust inhalation)**
- Fit check and fit test your respirators to get full protection.
- Replace your mask (or filter components) more often if heavy dust.
- Warn others in the immediate area to move away or wear suitable PPE.

Important Reminders

NEVER use a power saw indoors without adequate ventilation and PPE.

NEVER use a saw blade that is not purpose-made for cutting fibre cement, concrete and steel products.

AVOID dust generation by either vacuuming or wet sweeping.

AVOID dry sweeping - only with adequate ventilation and PPE.

ALWAYS wear recommended PPE.

ALWAYS follow tool manufacturers' safety recommendations.

ALWAYS be aware of others in your working location.

These control measures are consistent with industry recommendations for safe work practices. Assessments have proven, this combination will reduce the airborne concentration of RCS to levels below the exposure standard for workers .

AFS has documented sample safe work methods that can be accessed upon request as REFERENCE MATERIAL ONLY. This can be provided as an aid to builders and installers when risk assessing the work, and when developing their own documentation.

Consultation and training of workers in agreed safe methods will always be the builders and installers responsibility.

Safety Data Sheets are available upon request at www.afsformwork.com.au

For further information please visit SafeWork Australia https://www.safeworkaustralia.gov.au/risk

Tools and Accessories

Hand Tools

To safely and efficiently complete any task, it is essential to have the necessary tools available and to use the right tool for the right task.

A typical range of hand tools would include, but not be limited to the following:

- A set of tin snips
- Cutting knife
- Chisels
- Hammers - 'claw' and 'gympie'
- Pencils, marking pens, chalk
- Variety of pliers
- A range of squares
- Tool bag/belts are essential
- String and chalk lines
- Tape Measures - eg. 8m and 3m
- Spirit levels - range of lengths eg. 600mm and 2000mm
- Plumb Bob
- Laser leveling equipment

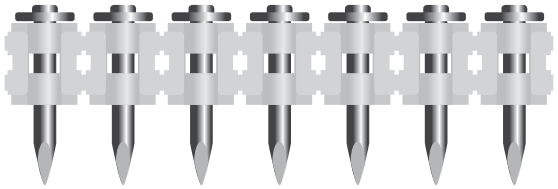
Tools and Accessories (continued)

Power Tools

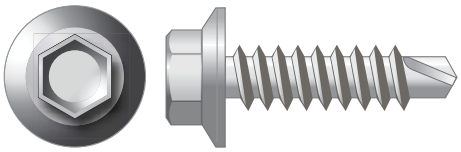
There are a range of power tools required during installation of AFS Logicwall®. Wherever possible preference should be given to cordless tools.

Note: The following images of power tools are only diagamatic and do not represent the specific brand or model to be used. All power tools require tagging as per site requirements.

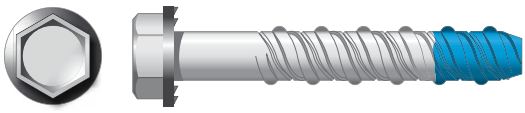
Note: Refer to the Personal Protective Equipment (PPE) part of this manual section for suitable PPE provisions for safe operations.



The floor track is shot down using 'charge' guns, with appropriate fixings.



The braces are fixed to the panel using tek-screws.
These are driven in using cordless impact driver with hexhead bit fitted.

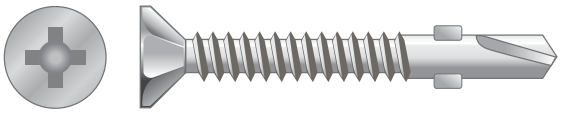


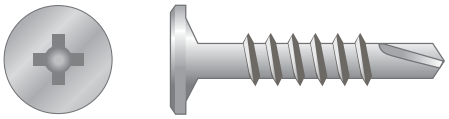
The braces are fixed to the concrete slab using 'Excalibur' style screw bolts. The screw bolts are driven into a hole that has been pre-drilled (using cordless rotary drill with appropriate sized masonry bit) using cordless impact wrench with appropriate sized impact socket.

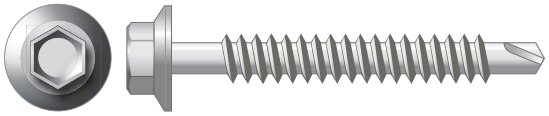
Tools and Accessories (continued)

The panels are screwed off to the floor track and at each joint and end caps are fitted using counter sink, self drilling screws - there are a range of these available with Philips Head or Square Drive, in a range of styles.

These **must** be minimum Class 3 Galvanised. On some projects architects/ builders have specified stainless steel in external areas. These screws are driven in using cordless impact driver fitted with the appropriate driver bits.







A range of other screws can/are used in varying applications eg. the fitting of temporary patches.

The trimming of the panels and fitting of power boxes involves the use of 100mm, 125mm and 225mm grinders and circular saws with an appropriate range of cutting discs eg. metal cutting and diamond dry cutting discs.

Tools and Accessories (continued)

Adhesive/Sealant

The floor track at external walls and between wet areas, requires 2 beads of adhesive (one each side of the track). End caps must be fitted using adhesive and screws. In some situations it is prudent to use adhesive and screws on the panel joints.

The adhesives that are normally used are polyutherane based products such as Sikaflex or Bostik Seal'n'Flex. These products are supplied in sausages and applied using appropriate sausage guns The adhesives must be used strictly in accordance with manufacturers recommendations.

Access tools

All scaffolding and safe access provisions are the responsibility of the builder and installers and are governed by the individual site conditions. It is essential that safe work practices and all associated standards are met/complied with. Installers would normally provide a range of ladders and/or platforms for personal access to the top of wall

Concrete pour tools

In addition to all the normal equipment including screwguns and an assortment of screws and formply, the following is an indicative guide to the extra equipment required during concrete pours.

- At least one wheelbarrow, multiple shovels and a range of trowels.
- Concrete vibrator: 38mm diameter maximum.

afs logicwall®

December 2023

Section L Certification

Logicwall® Certification, Load resistance, FRL Certification, CSIRO Assessment, Acoustic Performance, Thermal Performance, Compaction Test, Bracing Design.

CSR

Contents

L1. Certification

Disclaimer: The products referred to in this document have been manufactured by or on behalf of CSR Building Products Limited ("CSR") to comply with the relevant sections of the National Construction Code (NCC) and any relevant Australian Standards. While any design or usage guidelines set out in this document have been prepared in good faith by CSR, they are of a general nature only and are intended to be used in conjunction with project specific design and engineering advice.

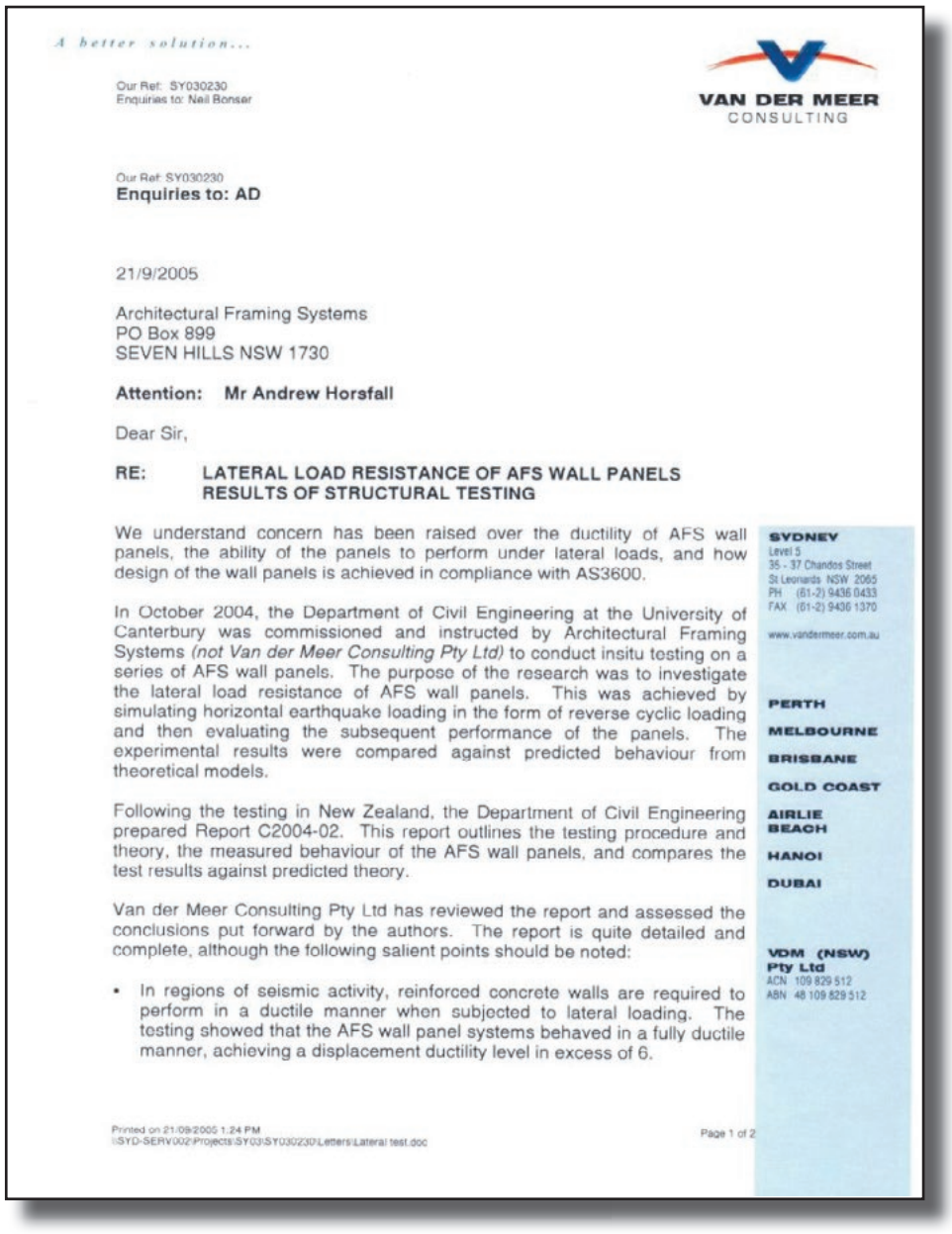
It is the responsibility of the customer to ensure that CSR's products are suitable for their chosen application, including in respect of project-specific matters such as, but not limited structural adequacy, acoustic, fire resistance/combustibility, thermal, and weatherproofing requirements. All information relating to design/installation/application of these products is offered without warranty and no responsibility can be accepted by CSR for errors and omissions, or for any use of the relevant products not in accordance with CSR's technical literature or any other relevant industry standards. For current technical and warranty documentation relating to CSR's products, visit the AFS website at www.afsformwork.com.au

Structure

In October 2004 Logicwall® was subjected to a lateral load resistance test by the University of Canterbury in New Zealand.

The following letter (Fig L1)from Van Der Meer Consulting Engineers is a summary of the test and its results.

Fig L1: Van Der Meer Consulting Letter



A better solution...

VAN DER MEER
CONSULTING

Our Ref: SY030230
Enquiries to: Neil Bonser

Our Ref: SY030230
Enquiries to: AD

21/9/2005

Architectural Framing Systems
PO Box 899
SEVEN HILLS NSW 1730

Attention: Mr Andrew Horsfall

Dear Sir,

RE: LATERAL LOAD RESISTANCE OF AFS WALL PANELS
RESULTS OF STRUCTURAL TESTING

We understand concern has been raised over the ductility of AFS wall panels, the ability of the panels to perform under lateral loads, and how design of the wall panels is achieved in compliance with AS3600.

In October 2004, the Department of Civil Engineering at the University of Canterbury was commissioned and instructed by Architectural Framing Systems *(not Van der Meer Consulting Pty Ltd)* to conduct insitu testing on a series of AFS wall panels. The purpose of the research was to investigate the lateral load resistance of AFS wall panels. This was achieved by simulating horizontal earthquake loading in the form of reverse cyclic loading and then evaluating the subsequent performance of the panels. The experimental results were compared against predicted behaviour from theoretical models.

Following the testing in New Zealand, the Department of Civil Engineering prepared Report C2004-02. This report outlines the testing procedure and theory, the measured behaviour of the AFS wall panels, and compares the test results against predicted theory.

Van der Meer Consulting Pty Ltd has reviewed the report and assessed the conclusions put forward by the authors. The report is quite detailed and complete, although the following salient points should be noted:

- In regions of seismic activity, reinforced concrete walls are required to perform in a ductile manner when subjected to lateral loading. The testing showed that the AFS wall panel systems behaved in a fully ductile manner, achieving a displacement ductility level in excess of 6.

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MELBOURNE
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GOLD COAST
AIRLIE BEACH
HANOI
DUBAI

VDM (NSW) Pty Ltd
ACN 109 829 512
ABN 48 109 829 512

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\\SYD-SERV002\Projects\SY03\SY030230\Letters\Lateral test.doc

Page 1 of 2

Van Der Meer Consulting Letter

A better solution...

- The flexural response of the AFS wall panels was adequately predicted using conventional reinforced concrete theory and analysis techniques. In fact, testing showed that the actual lateral load resisting capacity of the wall panels exceeded the theoretical value by as much as 38%.

- The vertical steel stud members in the AFS wall panels act as flexural reinforcement in the wall panels, effectively limiting the length of the plastic hinge zone to the junction between the wall and foundation members. This did not adversely affect the performance of the walls in the experimental testing.

- We are aware concern has been raised in the past regarding the slip shear interface between the concrete and the vertical steel studs in the wall panels. The testing has shown that the shear reinforcement requirements for the AFS wall panel systems are adequately predicted using the AFS design method (as outlined in the AFS Technical Manual). The authors recommend that the conservative estimates of β_4 & β_5 developed by AFS be adopted.

- No shear deformations were found to occur within the AFS wall panels during the testing. This finding was the case for all test specimens and was independent on the amount of shear reinforcement.

- Testing confirms AFS' recommendations that the height-to-length ratio of the wall panels should not exceed 1.0 when being relied upon as shear walls.

Based on the testing and the conclusions of the authors, we advise that the behaviour and design of AFS wall panels for lateral loads can satisfactorily be undertaken in accordance with AS3600, modified as noted in the AFS Technical Manual.

Yours faithfully,
Van der Meer Consulting Pty Ltd

Neil Bonser
Managing Director

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Fig L2: Lateral Load Resistance of AFS Wall Panels.

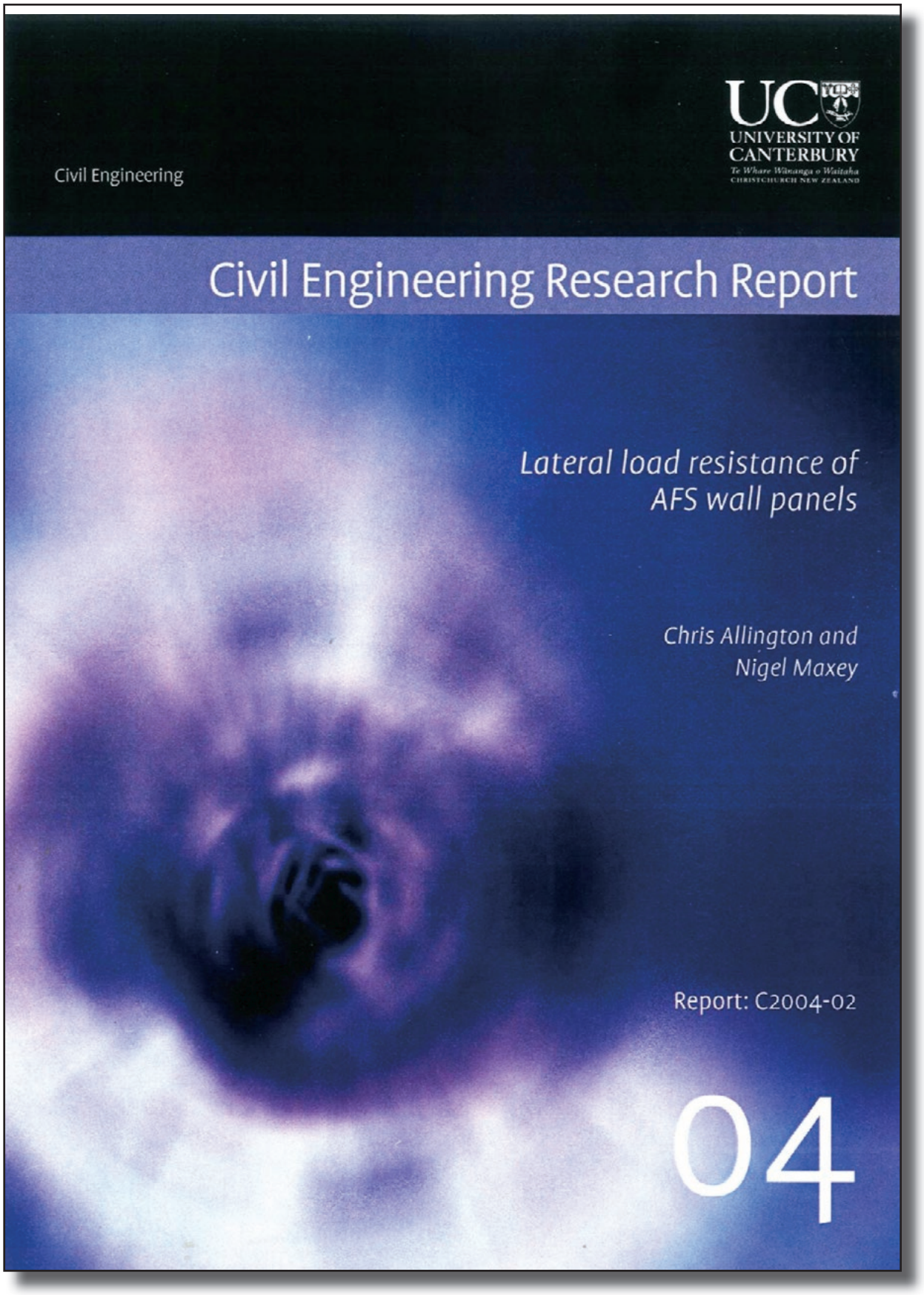


Fig L3: Durability Compliance

MAHAFFEY ASSOCIATES PTY LTD (ABN 90 001 629 036)
Incorporating BEMAC Laboratories
Unit 9/108-110 Percival Rd (PO Box 2162) Smithfield NSW 2164
Ph (02) 9756 4003 Fax (02) 9757 4228 Email mahaffey@mahaffey.com.au

DRM/L01/10655

3 November 2014

AFS Systems Pty Ltd
39 Delhi Rd
NORTH RYDE NSW 2113

Attention : Mr S. Darwell

Dear Sir,

Re : AFS LOGICWALL – AS3600 Durability Compliance Review

1. Introduction

Mahaffey Associates has carried out a review of the AFS LOGICWALL system to assess whether a wall constructed using this system complies with the durability requirements of AS3600, "Concrete Structures".

The LOGICWALL system is designed for the construction of reinforced or non-reinforced concrete walls. Once constructed, the formwork does not contribute to the structural capacity of the wall which acts as a normal reinforced concrete structure.

2. Discussion

The concrete and reinforcement are encapsulated within the fibre cement shell and coating which together act as a protective barrier. When used in the construction of walls in interior and exterior environments, the presence of the protective barrier enhances the protection against the effects of the prevailing environment.

LOGICWALL walls designed in accordance with AS 3600 will be subjected to environments consistent with a B2 exposure classification. AS3600 states that protective coatings can be taken into account when assigning exposure classification. Accordingly, the coating system plays a significant role in the design of the system in compliance with AS3600. In a typical

environment, the main agent of deterioration is carbonation. Therefore, the coated external skin in combination with concrete cover to the reinforcement, meets the durability and service life requirement of the standard.

The galvanised steel stud framework becomes embedded in concrete. Field evidence has shown that galvanised steel is durable in concrete in the harshest marine environment. In carbonated concrete, galvanized steel is even more resistant to corrosion.

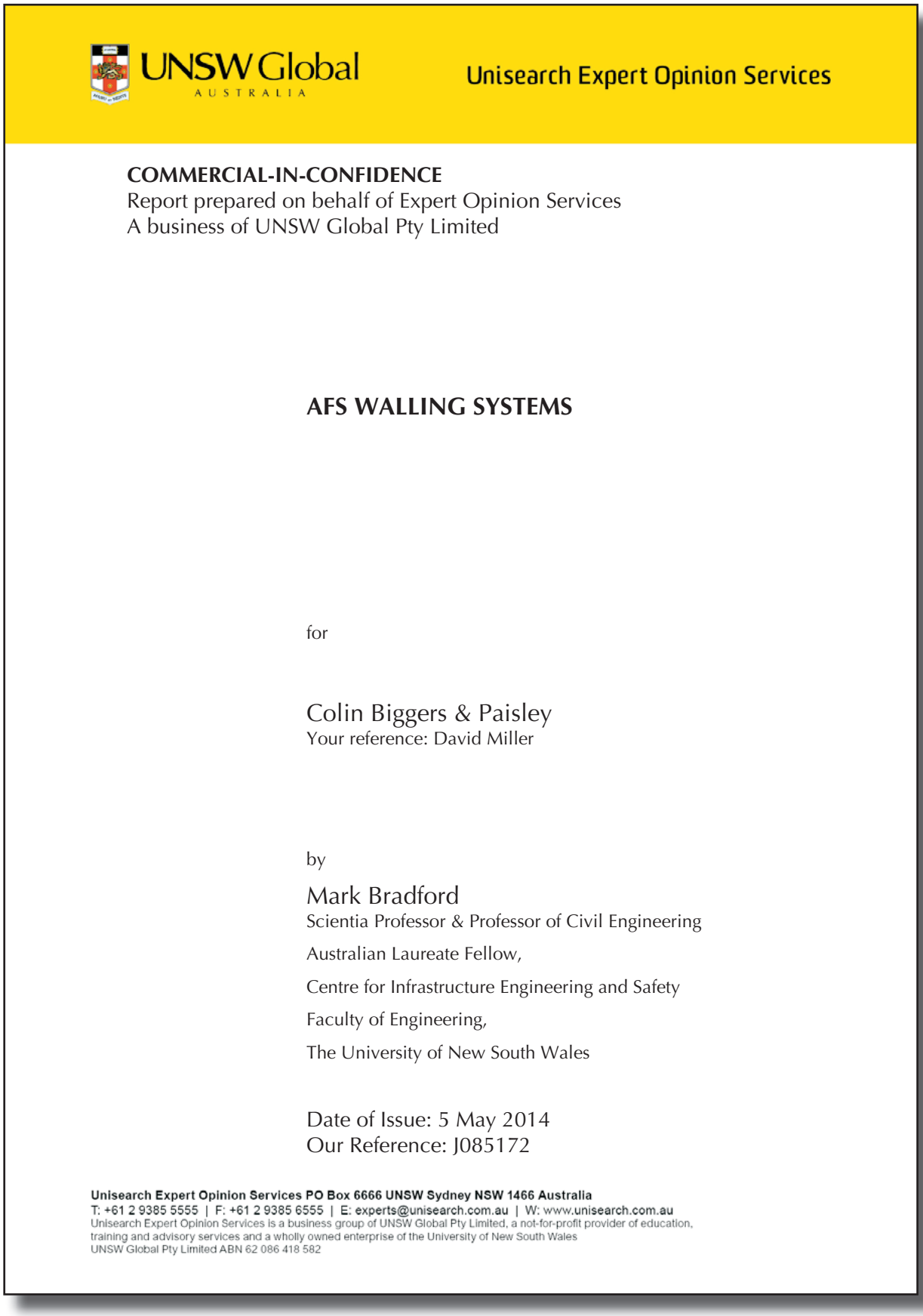
3. Conclusion

Walls constructed using the LOGICWALL system comply with AS3600 provided that the concrete strength and cover meet the requirements of the standard for exposure classifications up to and including B2. Additional protection is provided to the concrete and reinforcement as well as to the components of the LOGICWALL system by the specified protective coating.

Yours faithfully,
Mahaffey Associates Pty Ltd

D. R. Mahaffey

Fig L4: AFS Unisearch Report



UNSW Global AUSTRALIA

Unisearch Expert Opinion Services

COMMERCIAL-IN-CONFIDENCE
Report prepared on behalf of Expert Opinion Services
A business of UNSW Global Pty Limited

AFS WALLING SYSTEMS

for

Colin Biggers & Paisley
Your reference: David Miller

by

Mark Bradford
Scientia Professor & Professor of Civil Engineering
Australian Laureate Fellow,
Centre for Infrastructure Engineering and Safety
Faculty of Engineering,
The University of New South Wales

Date of Issue: 5 May 2014
Our Reference: J085172

Unisearch Expert Opinion Services PO Box 6666 UNSW Sydney NSW 1466 Australia
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Fig L5: FRL Certificate for LW150 Logicwall®

Certificate of Test

No. 1745

This is to certify that the element of construction described below was tested by the CSIRO Division of Manufacturing and Infrastructure Technology in accordance with Australian Standard 1530, Methods for fire tests on building materials, components and structures, Part 4-1997 on behalf of:

Architectural Framing Systems Pty Ltd
29 Prime Drive
SEVEN HILLS NSW

A full description of the test specimen and the complete test results are detailed in the Division's sponsored investigation report numbered FSV 1038.

Product Name: Permanent formwork, load-bearing, reinforced concrete wall system

Description: The specimen comprised a reinforced concrete wall system of dimensions 2980-mm high x 3000-mm wide x 150-mm thick made up of 3 pre-fabricated permanent formwork panels filled with insitu concrete after assembly.
The formwork panels were fabricated from two 2980-mm high x 1200-mm wide x 6-mm thick fibre cement sheets bonded to 10 galvanised C-section metal studs of dimensions 136-mm x 35-mm x 0.6-mm using "AV Syntec" general purpose building glue. The studs were spaced at 100-mm centres and fixed together in a rigid frame. The studs had 90-mm diameter round holes spaced at 150-mm centres for a provision of horizontal reinforcing bars. The panels were fixed to a floor track (galvanised steel C-section) with provision for reinforcing starter bars from a completed floor slab. Succeeding panels were fitted together in a tongue and groove arrangement, and fixed with 9-18 x 20-mm fibretecs csk rib head screws at 500-mm centres. The wall was reinforced with N12 reinforcing bars at 450-mm centres, horizontally and vertically. Electrical services were installed in the cavity of the wall, that included two general power outlets and associated PVC conduits at 1200-mm centres. The panels were appropriately braced and 32 Mpa concrete 32-10-120 was pumped in through the top openings in 1500-mm layers and trowelled-off when completely filled. The specimen was subjected to an evenly distributed total load of 600 kN.
Details of panel construction are shown in drawing numbered 146-01 Issue B, dated 17 December 2003, by LGDS.

The element of construction described above satisfied the following criteria for fire-resistance for the period stated.

Structural Adequacy	-	no failure at 240 applicable
Integrity	-	no failure at 240 applicable
Insulation	-	236 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of 240/240/180. The FRL is applicable for exposure to fire from either direction.

Testing Officer: Chris Wojcik Date of Test: 25 February 2004
Issued on the 12th day of March 2004 without alterations or additions.

Garry E Collins
Manager, Fire Testing and Assessments

This laboratory is accredited (Accreditation No. 3632) by the National Association of Testing Authorities, Australia. The tests reported herein have been performed in accordance with its terms of accreditation.

CSIRO

CSIRO Manufacturing & Infrastructure Technology
14 Julius Avenue, Riverside Corporate Park, North Ryde NSW 2113 AUSTRALIA
Telephone: 61 2 9490 5444 Facsimile: 61 2 9490 5555

Fig L6: FRL Certificate for LW120 Logicwall®

Certificate of Test

No. 2347

This is to certify that the element of construction described below was tested by the CSIRO Division of Manufacturing and Infrastructure Technology in accordance with Australian Standard 1530, Methods for fire tests on building materials, components and structures, Part 4-2005, Fire-resistance test of elements of construction on behalf of:

AFS Products Group Pty Ltd
22-24 Sommerville Circuit
EMU PLAINS NSW

A full description of the test specimen and the complete test results are detailed in the Division's sponsored investigation report numbered FSV 1513A.

PRODUCT NAME 120-mm thick, load-bearing AFS structural wall system.

DESCRIPTION: The specimen comprised a reinforced concrete wall system 3000-mm high x 3000-mm wide x 120-mm thick made up of three pre-fabricated permanent formwork panels core-filled with concrete after assembly.
The pre-fabricated permanent formwork panels, 1200-mm wide x 3000-mm high, comprised two 6-mm thick fibre cement sheets (CSR Waterblock Technology) bonded to the perforated steel stud assembly using AFS Structural Adhesive. The studs, nominally 2900-mm long x 108-mm wide x 35-mm high, with perforations shown in drawing numbered AFS-CSIR-23-11-11, dated 23 November 2011, by Peter Ellsmore & Associates Pty Ltd., were equally spaced over the width of the panel at nominally 140-mm centres. The wall was reinforced with N12 reinforcing bars at 400-mm centres vertically and 600-mm centres horizontally.
The panels were appropriately braced and 32 Mpa 120-mm slump concrete was pumped in through the top openings in 1500-mm high layers, and trowelled off when completely filled.
A total load of 700 kN was applied to the specimen for the duration of the test.

The element of construction described above satisfied the following criteria for fire-resistance for the period stated

Structural adequacy	-	no failure at 241 minutes
Integrity	-	no failure at 241 minutes
Insulation	-	190 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of 240/240/180. The FRL is applicable for exposure to fire from either direction.

This certificate is provided for general information only and does not comply with the regulatory requirements for evidence of compliance.

Testing Officer: Chris Wojcik Date of Test: 23 November 2011
Issued on the 16th day of December 2011 without alterations or additions.

Garry E Collins
Manager, Fire Testing and Assessments

CSIRO

CSIRO Materials Science and Engineering
14 Julius Avenue, Riverside Corporate Park, North Ryde NSW 2113 AUSTRALIA
Telephone: 61 2 9490 5444 Facsimile:61 2 9490 5555

NATA

This document is issued in accordance with NATA's accreditation requirements

Fig L7: FRL Assessment

STEPHEN GRUBITS & ASSOCIATES

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T: +61 2 9247 1444 E: sydney@grubits.com.au W: www.grubits.com.au

Logicwall® Fire-Resistance-Level Assessment

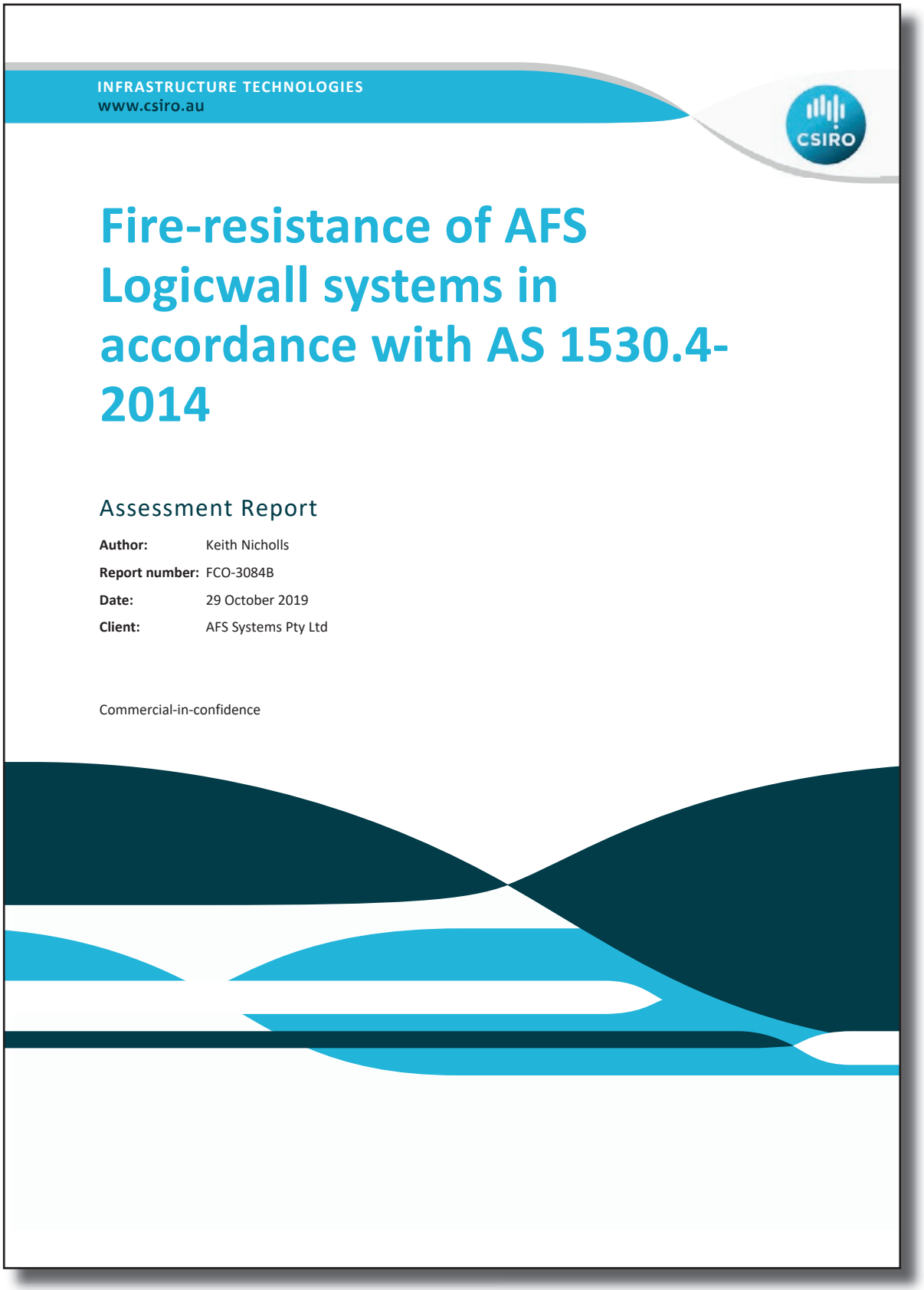
ARCHITECTURAL FRAMING SYSTEMS PTY LTD

FIRE ENGINEERING REPORT

REPORT 2013/277.81 R1.0

· FIRE SAFETY ENGINEERS ·

Fig L8: CSIRO Assessment Report



INFRASTRUCTURE TECHNOLOGIES
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CSIRO

Fire-resistance of AFS Logicwall systems in accordance with AS 1530.4-2014

Assessment Report

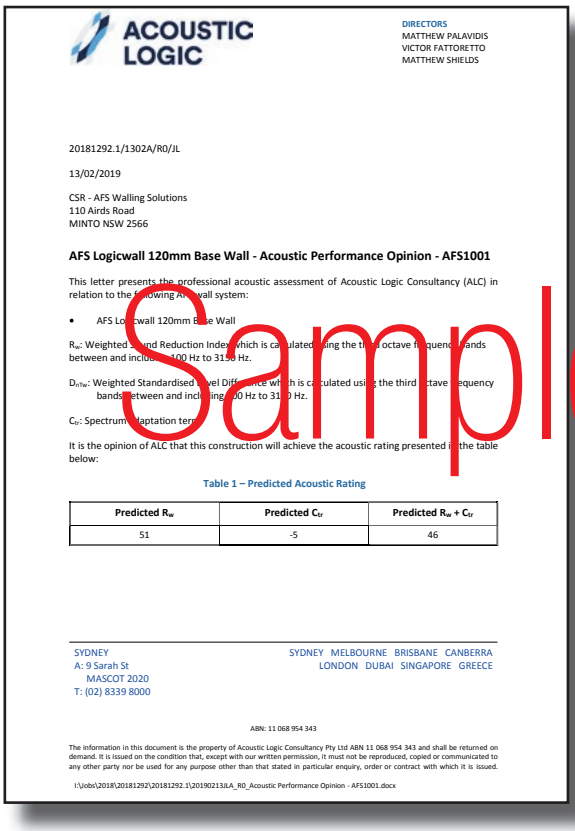
Author: Keith Nicholls
Report number: FCO-3084B
Date: 29 October 2019
Client: AFS Systems Pty Ltd

Commercial-in-confidence

Fig L9: Acoustic Performance Assessment

Acoustic test reports available on request:

AFS Logicwall 120mm Base Wall - Acoustic Performance Opinion - AFS1001. ref - 20181292.1/1302A/R0/JL
AFS Logicwall 150mm Base Wall - Acoustic Performance Opinion - AFS2001 ref - 20181292.1/1502A/R0/JL
AFS Logicwall 162mm Base Wall - Acoustic Performance Opinion - AFS3001 ref - 20181292.1/2502A/R0/JL
AFS Logicwall 200mm Base Wall - Acoustic Performance Opinion - AFS4001 ref - 20181292.1/2502A/R0/JL
262MM THICK AFS LOGICWALL - ACOUSTIC ASSESSMENT. ref - 20181292.6/1606A/R1/GW
AFS Logicwall 120mm Wall System - Acoustic Performance Opinion - AFS1101. ref - 20181292.1/1302A/R0/JL
AFS Logicwall 120mm Wall System - Acoustic Performance Opinion - AFS1102. ref - 20181292.1/1302A/R0/JL
AFS Logicwall 120mm Wall System - Acoustic Performance Opinion - AFS1103. ref - 20181292.1/1302A/R0/JL
AFS Logicwall 120mm Wall System - Acoustic Performance Opinion - AFS1301. ref - 20181292.1/1302A/R0/JL
AFS Logicwall 120mm Wall System - Acoustic Performance Opinion - AFS1302. ref - 20181292.1/1502A/R0/JL
AFS Logicwall 120mm Wall System - Acoustic Performance Opinion - AFS1401. ref - 20181292.1/1502A/R0/JL
AFS Logicwall 120mm Wall System - Acoustic Performance Opinion - AFS1402. ref - 20181292.1/1502A/R0/JL
AFS Logicwall 120mm Wall System - Acoustic Performance Opinion - AFS1501. ref - 20181292.1/1502A/R0/JL
AFS Logicwall 120mm Wall System - Acoustic Performance Opinion - AFS1502. ref - 0181292.1/1502A/R0/JL
AFS Logicwall 120mm Wall System - Acoustic Performance Opinion - AFS1503. ref - 20181292.1/1502A/R0/JL
AFS Logicwall 120mm Wall System - Acoustic Performance Opinion - AFS1504. ref - 20181292.1/1502A/R0/JL
AFS Logicwall 150mm Base Wall - Acoustic Performance Opinion - AFS2001. ref - 20181292.1/1502A/R0/JL
AFS Logicwall 150mm Wall System - Acoustic Performance Opinion - AFS2101. ref - 20181292.1/1502A/R0/JL
AFS Logicwall 150mm Wall System - Acoustic Performance Opinion - AFS2102. ref - 20181292.1/1502A/R0/JL
AFS Logicwall 150mm Wall System - Acoustic Performance Opinion - AFS2103. ref - 20181292.1/1502A/R0/JL
AFS Logicwall 150mm Wall System - Acoustic Performance Opinion - AFS2301. ref - 20181292.1/1502A/R0/JL
AFS Logicwall 150mm Wall System - Acoustic Performance Opinion - AFS2302. ref - 20181292.1/1502A/R0/JL
AFS Logicwall 150mm Wall System - Acoustic Performance Opinion - AFS2401. ref - 20181292.1/1502A/R0/JL
AFS Logicwall 150mm Wall System - Acoustic Performance Opinion - AFS2402. ref - 20181292.1/1502A/R0/JL
AFS Logicwall 150mm Wall System - Acoustic Performance Opinion - AFS2501. ref - 20181292.1/1502A/R0/JL
AFS Logicwall 150mm Wall System - Acoustic Performance Opinion - AFS2502. ref - 20181292.1/1502A/R0/JL
AFS Logicwall 150mm Wall System - Acoustic Performance Opinion - AFS2503. ref - 20181292.1/1502A/R0/JL
AFS Logicwall 150mm Wall System - Acoustic Performance Opinion - AFS2504. ref - 20181292.1/1502A/R0/JL



ACOUSTIC LOGIC

DIRECTORS
MATTHEW PALAVIDIS
VICTOR FATTORETTO
MATTHEW SHIELDS

20181292.1/1302A/R0/JL

13/02/2019

CSR - AFS Walling Solutions
110 Airds Road
MINTO NSW 2566

AFS Logicwall 120mm Base Wall - Acoustic Performance Opinion - AFS1001

This letter presents the professional acoustic assessment of Acoustic Logic Consultancy (ALC) in relation to the following AFS wall system:

- AFS Logicwall 120mm Base Wall

R_w: Weighted Sound Reduction Index which is calculated using the third octave frequency bands between and including 100 Hz to 3150 Hz.

D_{nTw}: Weighted Standardised Level Difference which is calculated using the third octave frequency bands between and including 100 Hz to 3150 Hz.

C_{tr}: Spectrum adaptation term

It is the opinion of ALC that this construction will achieve the acoustic rating presented in the table below:

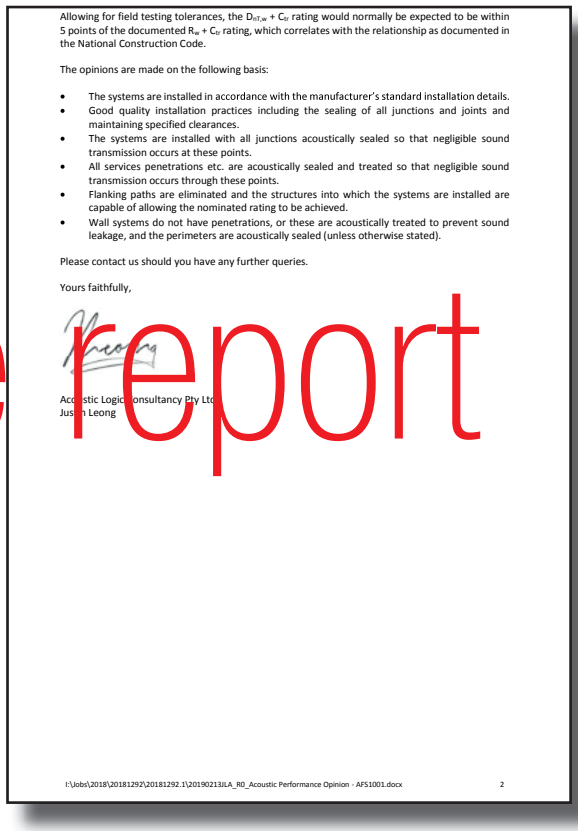
Table 1 – Predicted Acoustic Rating

Predicted R_w	Predicted C_{tr}	Predicted $R_w + C_{tr}$
51	-5	46

SYDNEY
A: 9 Sarah St
MASCOT 2020
T: (02) 8339 8000

SYDNEY MELBOURNE BRISBANE CANBERRA
LONDON DUBAI SINGAPORE GREECE

ABN: 11 068 954 343



Allowing for field testing tolerances, the $D_{nT,w} + C_{tr}$ rating would normally be expected to be within 5 points of the documented $R_w + C_{tr}$ rating, which correlates with the relationship as documented in the National Construction Code.

The opinions are made on the following basis:

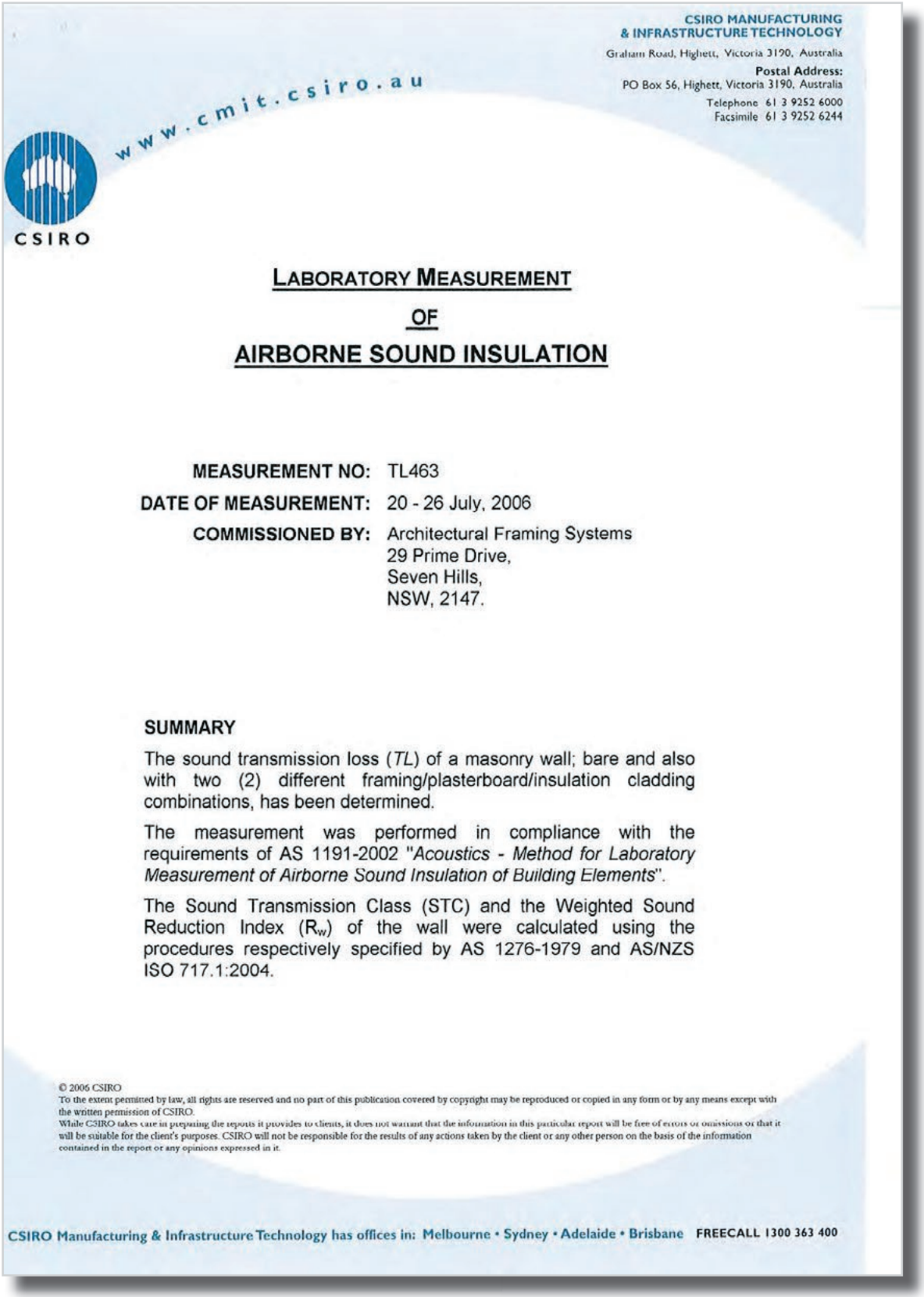
- The systems are installed in accordance with the manufacturer's standard installation details.
- Good quality installation practices including the sealing of all junctions and joints and maintaining specified clearances.
- The systems are installed with all junctions acoustically sealed so that negligible sound transmission occurs at these points.
- All services penetrations etc. are acoustically sealed and treated so that negligible sound transmission occurs through these points.
- Flanking paths are eliminated and the structures into which the systems are installed are capable of allowing the nominated rating to be achieved.
- Wall systems do not have penetrations, or these are acoustically treated to prevent sound leakage, and the perimeters are acoustically sealed (unless otherwise stated).

Please contact us should you have any further queries.

Yours faithfully,

Acoustic Logic Consultancy Pty Ltd
Justin Leong

Fig L10: CSIRO Laboratory Measurement of Airborne Sound Insulation



CSIRO MANUFACTURING
& INFRASTRUCTURE TECHNOLOGY
Graham Road, Highett, Victoria 3190, Australia
Postal Address:
PO Box 56, Highett, Victoria 3190, Australia
Telephone 61 3 9252 6000
Facsimile 61 3 9252 6244

www.cmit.csiro.au

CSIRO

LABORATORY MEASUREMENT OF AIRBORNE SOUND INSULATION

MEASUREMENT NO: TL463

DATE OF MEASUREMENT: 20 - 26 July, 2006

COMMISSIONED BY: Architectural Framing Systems
29 Prime Drive,
Seven Hills,
NSW, 2147.

SUMMARY

The sound transmission loss (*TL*) of a masonry wall; bare and also with two (2) different framing/plasterboard/insulation cladding combinations, has been determined.

The measurement was performed in compliance with the requirements of AS 1191-2002 "*Acoustics - Method for Laboratory Measurement of Airborne Sound Insulation of Building Elements*".

The Sound Transmission Class (STC) and the Weighted Sound Reduction Index (R_w) of the wall were calculated using the procedures respectively specified by AS 1276-1979 and AS/NZS ISO 717.1:2004.

Fig L11: Thermal Performance (updated 2023)

TOTAL R FOR INSULATION PATH ONLY
THERMAL PERFORMANCE CALCULATIONS
TO AS/NZS 4859 Parts 1 & 2:2018

The following calculations by James M Fricker Pty Ltd are based upon:

a) AS/NZS 4859.1:2018 “Thermal insulation materials for buildings. Part 1: General criteria and technical provisions”,

b) AS/NZS 4859.2:2018 “Thermal insulation materials for buildings. Part 2: Design”,

c)t he Australian Institute of Refrigeration Air-conditioning & Heating (AIRAH) Handbook (Edition 6, 2021), and (if necessary) the ASHRAE Fundamentals Handbook.

Total R values are reported for the insulation path only. These Total R-values include surface film resistances but not thermal bridging.

Total R-values are based on product in-service conditions in accordance with AS/NZS 4859.2:2018 including the alteration of insulation Material R for temperature, and Air Space R for temperature and infrared emittance.

Each calculation result is subject to any specific notes and assumptions listed on the calculation.

If a construction differs from the described system, the thermal resistance may be different.

All calculations were done by James M Fricker, F.AIRAH F.IEAust CPEng NER APEC Engineer IntPE(Aus)

ENGINEERS
AUSTRALIA
Chartered Professional Engineer
MEMBER 1179647

JAMES M FRICKER PTY LTD
54 Felix Crescent
Ringwood North VIC 3134 Australia
Mobile: 0414 804 097
Phone: (03) 9879 5744
fricker@optusnet.com.au
http://fricker.net.au

Fig L12: Corefill Compaction Test

afs logicwall®

Corefill Compaction Test

Conducted on 16/11/2009

afs smarter permanent formwork.™

1300 727 237

afsformwork.com.au

Corefill Compaction Test (continued)

AFS LOGICWALL CONCRETE COMPACTION TEST

MONDAY 16/11/09

LOCATION: 29 Prime Drive, Seven Hills NSW

PRESENT:
Harold Roper / Materials Professor
Robert Herbertson / Wellstructured Structural Engineers
Nick Crennan / Colin Biggers & Paisley Lawyers
Peter Saddington / Coffey International
Steven Nash / PDR Smart Structures
AFS (Directors)
Clyde Daish / HD Projects
Andrew Bonnette / Bonnette Marketing
Lenny Casella / Hanson Concrete
Willy Reinhardt / ANF Concrete Pumping

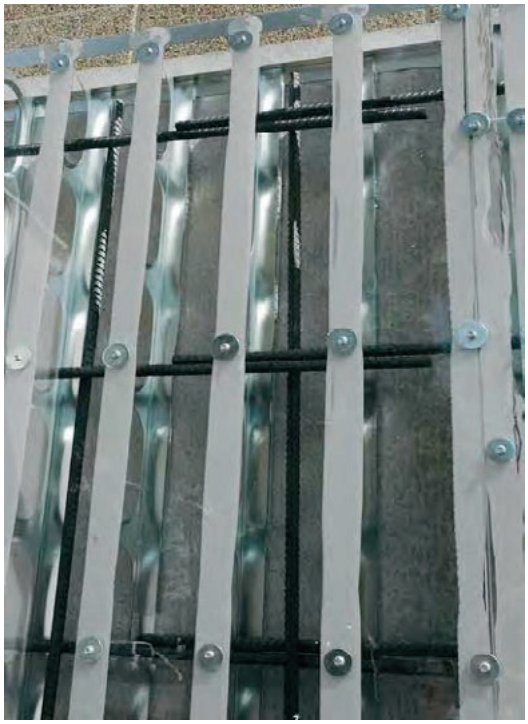
RECORD OF EVENTS:

MONDAY 16/11/09	
11.05am	Concrete arrives (refer docket 50410305). Mixed on site for 1 ½ minutes.
11.10am	Commenced slump test – result 130mm. Added 10 litres water to mix.
11.17am	Another slump test – result 140mm
11.20am	Commenced core filling wall
11.24am	Finish first lift (1600mm) Temperature at 11:30am - 32°C. WAIT BETWEEN LIFTS
11.55am	Another slump test – result 85mm Added 30 litres water & mixed for 5 minutes.
12:04pm	Retest slump – result 110mm Added another 20 litres water & mixed for 4 minutes
12:12pm	Retest slump – result 135mm
12:13pm	Commenced core-filling
12:18pm	Finished second lift.
2:00pm	Commenced stripping the Perspex panels & strips from one of the fibre cement panels
3:30pm	Commenced filming the stripping procedure & the compacted walls
4:15pm	Finish filming stripping procedure & compacted walls
TUESDAY 17/11/09	
4.00-5:30pm	Coffey International core-drilled 6 samples from unstripped wall, at base, middle & top of wall.

Corefill Compaction Test (continued)

SLUMP TEST – 140mm

UNFILLED PERSPEX CLAD PANELS



Corefill Compaction Test (continued)

CORE FILLING

STRIPPED PANELS

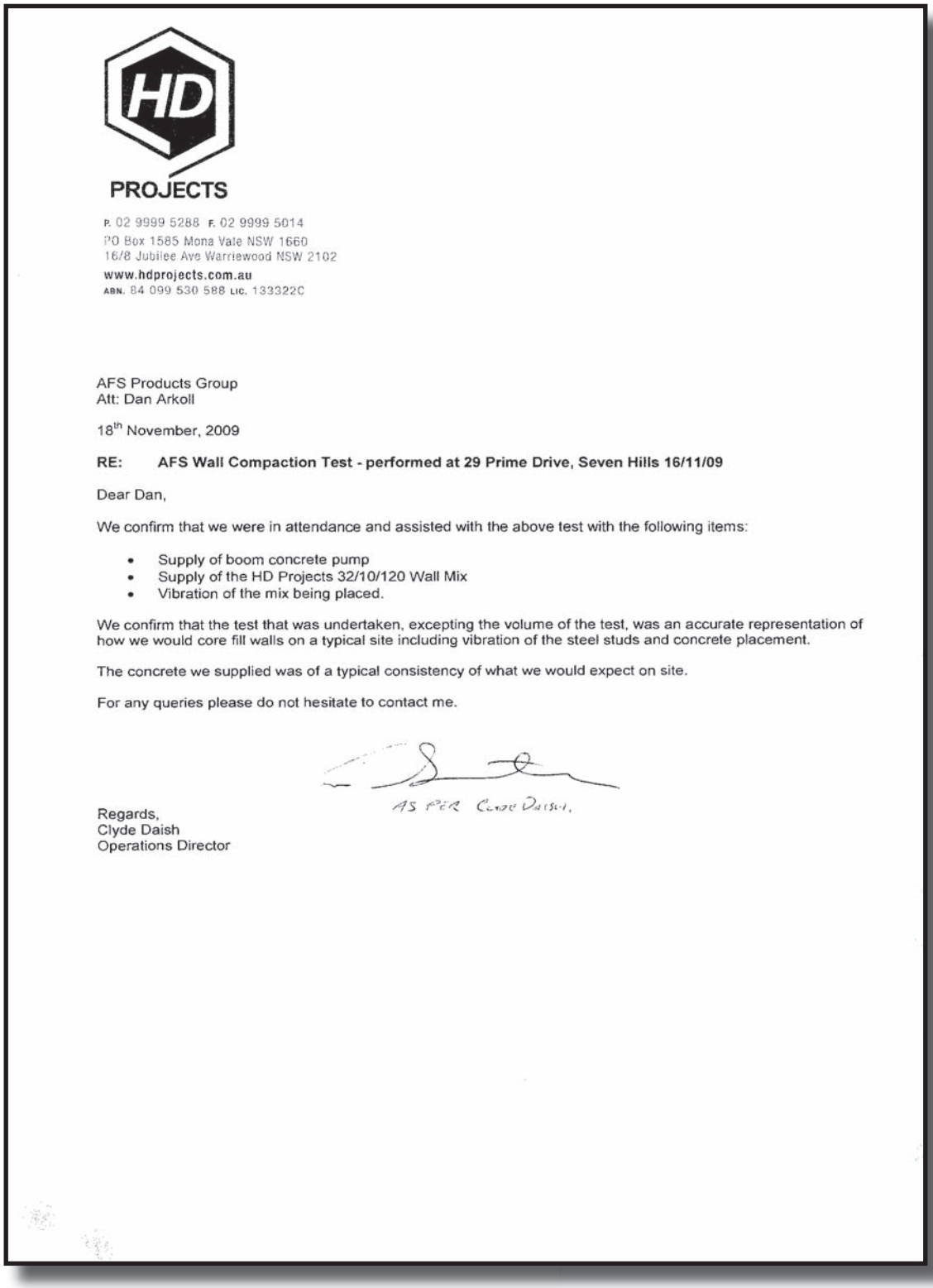
Corefill Compaction Test (continued)

CORE DRILL TEST PANEL

CORE DRILL SAMPLES

(L–R) Base, Middle & Top of Wall

Corefill Compaction Test (continued)



HD PROJECTS

P. 02 9999 5288 F. 02 9999 5014
PO Box 1585 Mona Vale NSW 1660
16/8 Jubilee Ave Warriewood NSW 2102
www.hdprojects.com.au
ABN. 84 099 530 588 Lic. 133322C

AFS Products Group
Att: Dan Arkoll

18th November, 2009

RE: AFS Wall Compaction Test - performed at 29 Prime Drive, Seven Hills 16/11/09

Dear Dan,

We confirm that we were in attendance and assisted with the above test with the following items:

- Supply of boom concrete pump
- Supply of the HD Projects 32/10/120 Wall Mix
- Vibration of the mix being placed.

We confirm that the test that was undertaken, excepting the volume of the test, was an accurate representation of how we would core fill walls on a typical site including vibration of the steel studs and concrete placement.

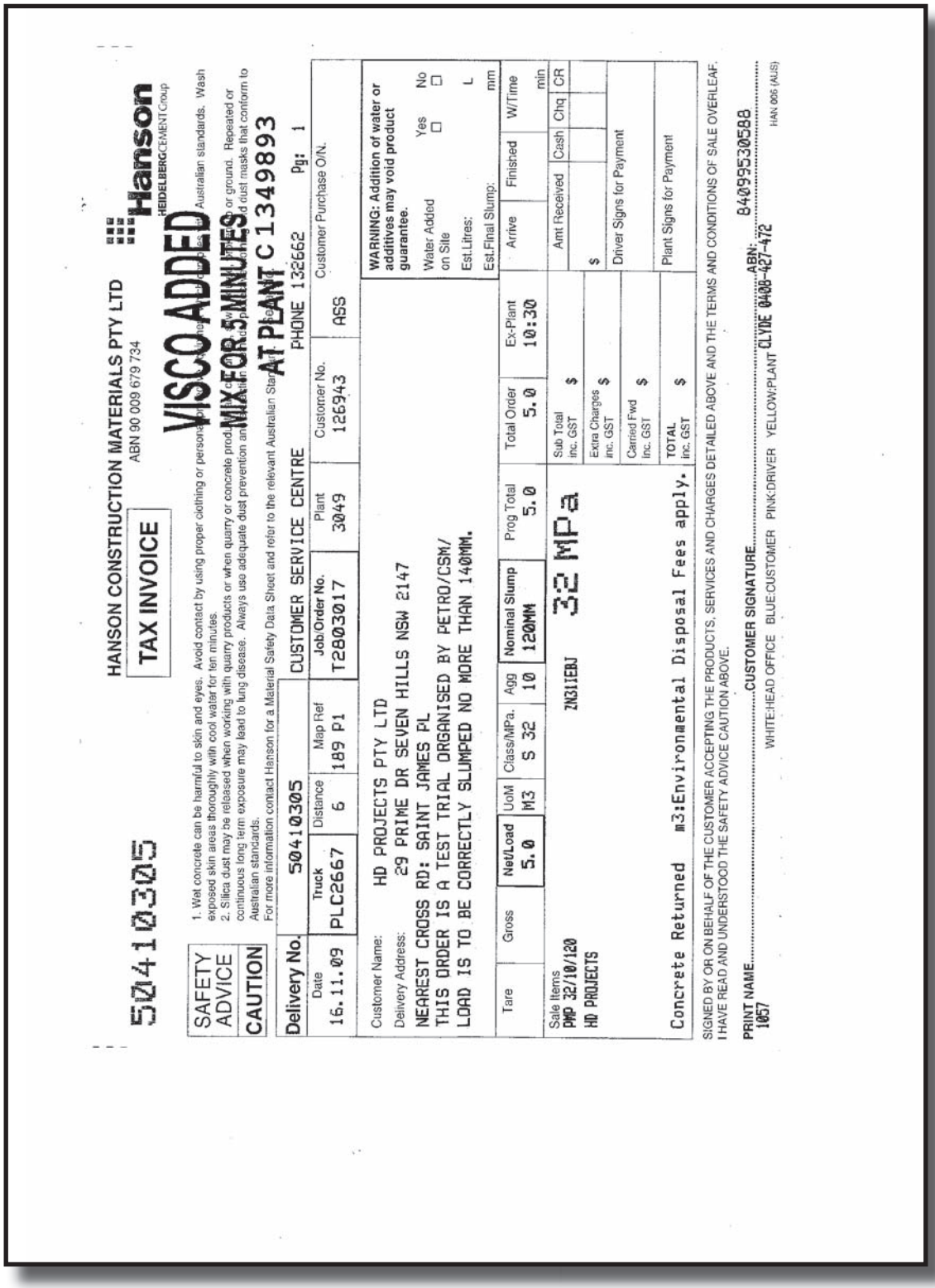
The concrete we supplied was of a typical consistency of what we would expect on site.

For any queries please do not hesitate to contact me.

AS PER Clyde Daish.

Regards,
Clyde Daish
Operations Director

Corefill Compaction Test (continued)



HANSON CONSTRUCTION MATERIALS PTY LTD
ABN 90 009 679 734

Hanson
HEIDELBERGCEMENT Group

TAX INVOICE

VISCO ADDED

5041103105

MIX FOR 5 MINUTES AT PLANT C 1349893

SAFETY ADVICE
CAUTION

1. Wet concrete can be harmful to skin and eyes. Avoid contact by using proper clothing or personal [illegible] Australian standards. Wash exposed skin areas thoroughly with cool water for ten minutes.
2. Silica dust may be released when working with quarry products or when quarry or concrete products are cut, ground or [illegible] or ground. Repeated or continuous long term exposure may lead to lung disease. Always use adequate dust prevention and [illegible] d dust masks that conform to Australian standards.
For more information contact Hanson for a Material Safety Data Sheet and refer to the relevant Australian Standard.

Delivery No.	50410305	CUSTOMER SERVICE CENTRE	PHONE 132662	Pg: 1

Date	Truck	Distance	Map Ref	Job/Order No.	Plant	Customer No.	Customer Purchase O/N.
16.11.09	PLC2667	6	189 P1	T28003017	3049	126943	ASS

Customer Name: HD PROJECTS PTY LTD
Delivery Address: 29 PRIME DR SEVEN HILLS NSW 2147
NEAREST CROSS RD: SAINT JAMES PL
THIS ORDER IS A TEST TRIAL ORGANISED BY PETRO/CSM/
LOAD IS TO BE CORRECTLY SLUMPED NO MORE THAN 140MM.

WARNING: Addition of water or additives may void product guarantee.
Water Added on Site Yes ☐ No ☐
Est.Litres: L
Est.Final Slump: mm

Tare	Gross	Net/Load	UoM	Class/MPa.	Agg	Nominal Slump	Prog Total	Total Order	Ex-Plant	Arrive	Finished	W/Time
		5.0	M3	S 32	10	120MM	5.0	5.0	10:30			min

Sale Items
PMP 32/10/120
HD PROJECTS

ZN31EBJ 32 MPa

Sub Total inc. GST	$	Amt Received	Cash	Chq	CR
Extra Charges inc. GST	$	$			
Carried Fwd inc. GST	$	Driver Signs for Payment			
TOTAL inc. GST	$	Plant Signs for Payment			

Concrete Returned m3:Environmental Disposal Fees apply.

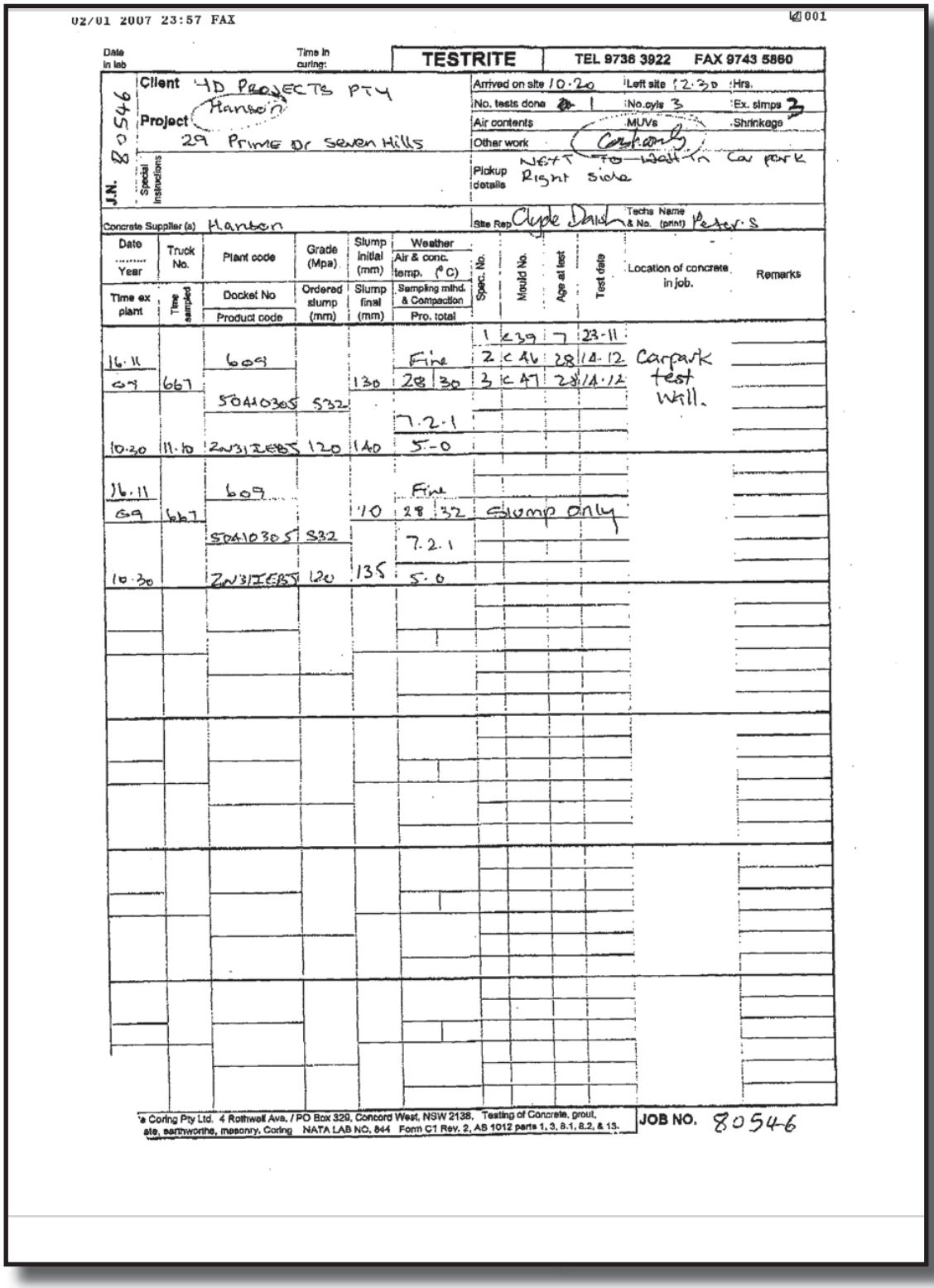
SIGNED BY OR ON BEHALF OF THE CUSTOMER ACCEPTING THE PRODUCTS, SERVICES AND CHARGES DETAILED ABOVE AND THE TERMS AND CONDITIONS OF SALE OVERLEAF.
I HAVE READ AND UNDERSTOOD THE SAFETY ADVICE CAUTION ABOVE.

PRINT NAME..... CUSTOMER SIGNATURE..... ABN: 84099530588
1057

WHITE:HEAD OFFICE BLUE:CUSTOMER PINK:DRIVER YELLOW:PLANT CLYDE 0408-427-472

HAN 006 (AUS)

Corefill Compaction Test (continued)



02/01 2007 23:57 FAX 001

Date in lab | Time in curing: | **TESTRITE** | TEL 9738 3922 FAX 9743 5860

J.N. 80546

Client 4D PROJECTS PTY

Project Hanson 29 PRIME Dr SEVEN HILLS

Special instructions

Arrived on site 10.20 | Left site 12.30 | Hrs.

No. tests done 3 | No. cyls 3 | Ex. slmps 3

Air contents | MUVs | Shrinkage

Other work Carparks

Pickup details NEXT TO Main Car park Right side

Concrete Supplier (a) Hanson | Site Rep Clyde Dash | Techs Name & No. (print) Peter. S

Date ..... Year / Time ex plant	Truck No. / Time sampled	Plant code / Docket No / Product code	Grade (Mpa) / Ordered slump (mm)	Slump initial (mm) / Slump final (mm)	Weather Air & conc. temp. (°C) / Sampling mthd. & Compaction / Pro. total	Spec. No.	Mould No.	Age at test	Test date	Location of concrete in job.	Remarks
16.11		609			Fine	1	C39	7	23-11		
09	667			130	28 30	2	C46	28	14-12	Carpark test Wall.	
		5041030S	532		7.2.1	3	C47	28	14-12		
10.30	11.10	ZW3IEBS	120	140	5-0						
16.11		609			Fine						
09	667			110	28 32	Slump only					
		5041030S	532		7.2.1						
10.30		ZW3IEBS	120	135	5.0						

'a Coring Pty Ltd. 4 Rothwell Ave. / PO Box 329, Concord West, NSW 2138. Testing of Concrete, grout, ete, earthworthe, masonry, Coring NATA LAB NO. 844 Form C1 Rev. 2, AS 1012 parts 1, 3, 8.1, 8.2, & 13. JOB NO. 80546

Corefill Compaction Test (continued)

TESTRITE
ABN 921114 364046
PH 9736 3922 FAX 9743 5860

TESTRITE

4 ROTHWELL AVENUE,
PO BOX 329 CONCORD WEST
NSW 2138

REPORT ON COMPRESSIVE STRENGTH OF CONCRETE CORES (AS1O12.14)

REPORT FOR CORES DRILLED & TESTED BY LABORATORY

REPORT NO : 81025
PAGE NO : 1 OF 1
TOTAL NO. CORES: 3
DATE DRILLED : 10.12.09

CLIENT : AFS Product
ADDRESS : P.O. BOX 899
SEVEN HILLS NSW 1730

PROJECT : Prime Drive, Seven Hills

NATA — ACCREDITED FOR TECHNICAL COMPETENCE

This document is issued in accordance with NATA's accreditation requirements.

LABORATORY SPECIMEN NO.	LOCATION OF CORE IN STRUCTURE AND OTHER IDENTIFICATION DATA	CONCRETE AGE (days) [if known]	DATE TESTED	PRECONDITIONING (See notes below)	DIMENSIONS : AVE. DIAM. (mm)	DIMENSIONS : LENGTH (mm)	MASS PER UNIT VOLUME (kg/m3): RAPID METHOD A.S. 1012.12 Section 1	MASS PER UNIT VOLUME (kg/m3): WATER DISPL'MNT METHOD A.S.1012.12 Section 2	COMPRESSIVE STRENGTH (MPa): CORE STRENGTH (See notes)	COMPRESSIVE STRENGTH (MPa): CORRECTED STRENGTH (See notes)	LENGTH AS DRILLED (mm)
1	Top. Test Wall.	28	14.12.09	WET/3 (w)	76.2	131	NR	N/R	**45.5**	**44.5**	
2	Middle. Test Wall.	28	14.12.09	WET/3 (w)	76.4	130	NR	N/R	**48.0**	**47.0**	
3	Base. Test Wall.	28	14.12.09	WET/3 (w)	76.4	132	NR	N/R	**47.5**	**46.5**	
-		-	-	-	-	-	-	-	-	-	
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SYMBOLS USED ABOVE FOR A.S 1012.14 STANDARD PRECONDITIONING METHODS
DRY: 7 days in air at 18 to 28 deg.C, and 40 to 60 % Relative Humidity. WET/3 : 3 days in H2O @ 18-28 deg.C. WET/V : 3 hrs vacuum saturation
NOTE: if these symbols appended with (w), corresponding cores stored in water at 21 - 25 deg C from receipt until the start of the preconditioning period

SYMBOLS USED WITH CORE DIMENSIONS (L): MAX.LENGTH AVAILABLE GAVE L:DIAM RATIO LESS THAN THE ALLOWABLE MINIMUM OF 1:1
(D): CLIENT NOMINATED DEPARTURE FROM AS 1012.14, WHEREIN THE CORE DIAM. WAS LESS THAN THE MIN.OF 75mm ALLOWABLE BY AS 1012.14.

MASS PER UNIT VOLUME - SYMBOLS & NOTES RAPID METHOD: VOL. BY DIMENSIONS, H2O DISPLACEMENT METHOD : VOLUME BY IMMERSED MASS
X: INVALID TEST DUE DEFECT. NR: TEST NOT REQUIRED

COMPRESSIVE STRENGTH - SYMBOLS & TERMS *N/C* : NO CORRECTION REQ'D FOR L : D RATIO. N/A: NO CORR. AVAILABLE FOR THIS L: D RATIO.
CORE STRENGTH : NO ADJUSTMENT MADE FOR LENGTH TO DIAMETER RATIO. *F/D* : TO BE TESTED AT A FUTURE DATE.
CORRECTED STRENGTH : ADJUSTMENT WHEN LENGTH : DIAM. RATIO IS OTHER THAN 2 : 1. CAPPING METHOD: FILLED SULPHUR MIXTURE.

SYMBOLS FOR DEFECTS NOTED BEFORE OR AFTER TEST H: HONEYCOMBED, VS: VOIDS AROUND STEEL, S: SEGREGATION, N: NUMEROUS VOIDS,
V: VOID, C(x): CRACK & ITS LENGTH, D: DRY JOINT / SEPARATION, F: FOREIGN MATTER B: CORE DIAMETER LESS HAN 3 TIMES NOMINAL SIZE OF AGGREGATE
E: EROSION OF MATRIX FROM DRILLING, R: RIDGES ,STEPS,GROOVES, G: GOUGES OR SCORES, A: VARIATION OF CONCRETE APPEARANCE IN CORE

NATA ACCREDITATION NO: 844 NAME OF APPROVED SIGNATORY: J.HEWLING

REMARKS:

Corefill Compaction Test (continued)

25 Nov 2009 13:40 Hanson 0298971425 p.1

Hanson
HEIDELBERG

Hanson Construction Materials Pty Ltd
ABN 90 009 679 734
Technical Services Centre
1/29 Crescent Street
Granville
NSW 2142
Tel (02) 8868 1900
Fax (02) 9897 2981
www.hanson.biz

Fax message

Date 25/11/09

To Clyde
Company HD Projects P/L
Project Prime Dr, Seven Hills
Fax 9999 5014

From Hanson Lab

Subject Test Results
Pages 1 including this one

Field Sheet	Specimen	Date Cast	Product Description	Age	Strength MPa
80546	A	16/11/09	ZN31IEBJ	7	39.0

Fig L13: Weatherproofing

Fig L14: Lifting Bar Certification

myd CONSULTING ENGINEERS
ABN: 36 102 975 600
Level 2 Suite 201C 19 Harris St, Pyrmont, NSW 2009
Tel: 02 9817 2611
Email: info@mydconsulting.com

28th November 2018

Certificate of Structural Design

Client: AFS Systems Pty Ltd

Elements: AFS Lifting Bar

We MYD Consulting Engineers, being professional Engineers in accordance with the Building Code of Australia, certify that the structural details as shown in the structural drawing Nos.

- P2445 S-01/Rev 01 Logicwall Lifting Bar Details,

was prepared by a professional Structural Engineer certified under NER, in accordance with the relevant structural requirements of the BCA, and Australian Standards in particular:

- AS 4100 (1998) - Steel Structures Codes.
- AS 1170 (2011) - Parts 1 Loading Codes.
- AS3610 (1995,2010)-Formwork Design Code.

The AFS report titled – Lifting Bar Test Rev B June 18 was used as a reference document for the verification of the lifting bar capacity

The use of the lifting bar as detailed in the drawings above shall be limited to the following conditions:

- Wind speeds not greater than 15m/s
- Maximum lifting weight 150kg
- Lifting strap located at centroid of load and to be checked to be in satisfactory condition prior to lifting
- Lifting bar undamaged (not bent or kinked)
- EHS practices followed by users of lifting bar
- Ensure the bar has engaged satisfactorily prior to lifting

Lifting Bar Certification (continued)

Exclusions:

- Adequacy and certification of Lifting strap used around lifting bar

Any scenarios outside these conditions, MYD consulting shall be consulted for further advice.

This certificate shall not be construed as relieving any other party of their responsibilities.

Peter Marzullo B.Sc, B.E., MIE Aust, CP Eng
For and behalf of
MYD Consulting Engineers.

Lifting Bar Certification (continued)

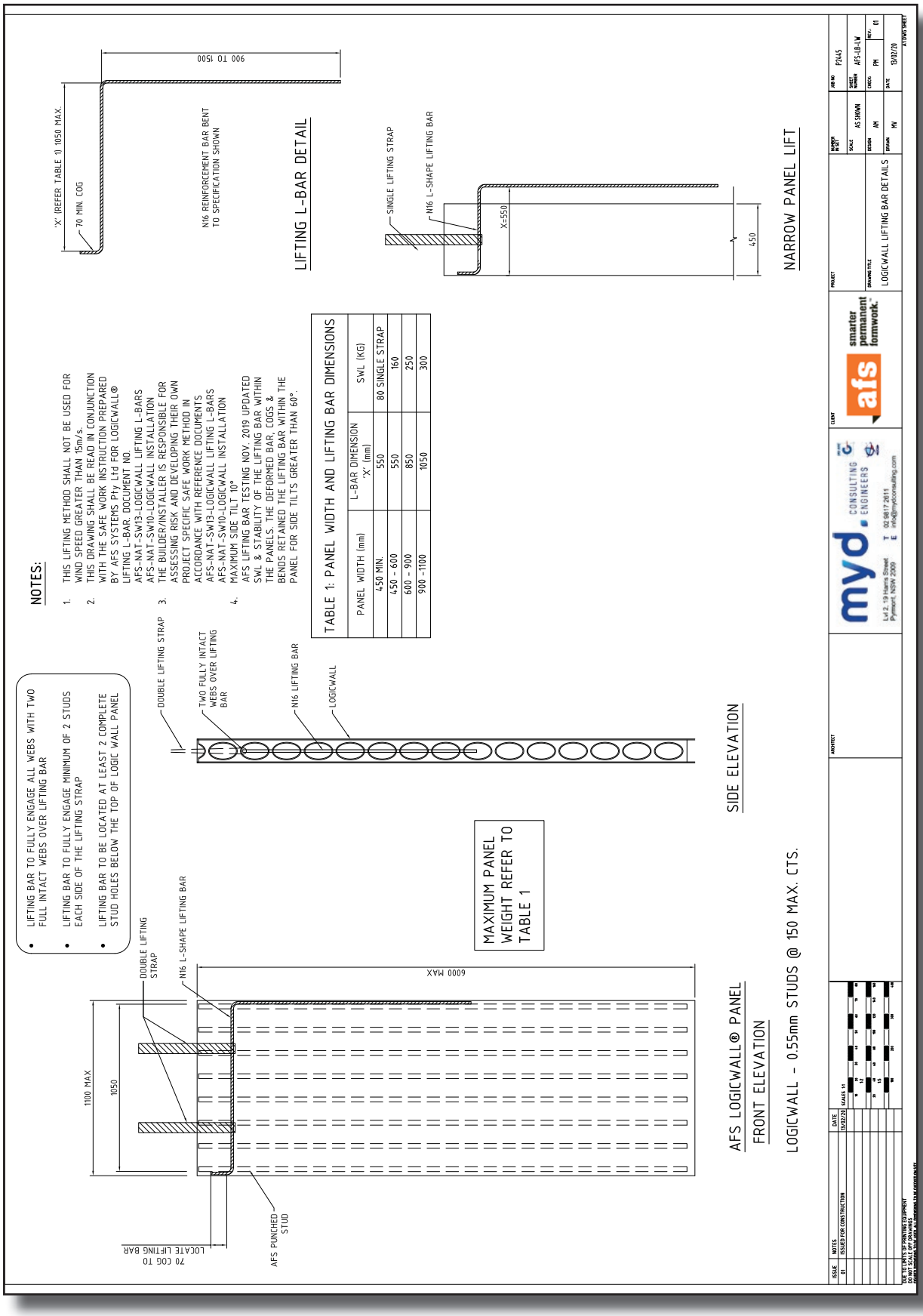


Fig L15: Bracing Design Certification

myd CONSULTING ENGINEERS
ABN: 36 102 975 600
Level 2 Suite 201C 19 Harris St, Pyrmont, NSW 2009
Tel: 02 9817 2611
Email: info@mydconsulting.com

11th December 2018

Certificate of Structural Design

Client: AFS Systems Pty Ltd

Elements: AFS Logicwall® Standard Propping Details

We MYD Consulting Engineers, being professional Engineers in accordance with the Building Code of Australia, certify that the structural details as shown in the structural drawing Nos.

- P2351 S-01/Rev D AFS Brace Arrangement Type L1,
- P2351 S-02/Rev D AFS Brace Details Type L1,
- P2351 S-03/Rev D AFS Brace Arrangement Type S1,
- P2351 S-04/Rev D AFS Brace Details Type S1,

Were prepared by a professional Structural Engineer certified under NER, in accordance with the relevant structural requirements of the BCA, and Australian Standards in particular:

- AS 4100 (1998) - Steel Structures Codes.
- AS 1170 (2011) - Parts 1 and 2 Loading Codes.
- AS3610 (1995,2010)-Formwork Design Code.
- AS 2269 (2004)-Structural Plywood Code.
- AS 1720 (2010) - Timber Structures.
- AS 3600(2009) - Concrete design Code.

The use of the propping as detailed in the drawings above shall be limited to the following conditions:

- Region A (non cyclonic)
- Category 3
- Height limited to 8 storeys above surrounding ground level
- The props are to temporarily support the Logicwall formwork only. Based on maximum brace installation period of 4 days.
- All fixings to concrete slab based on the slab having a minimum thickness of 130mm

Bracing Design Certification (continued)

Exclusions:

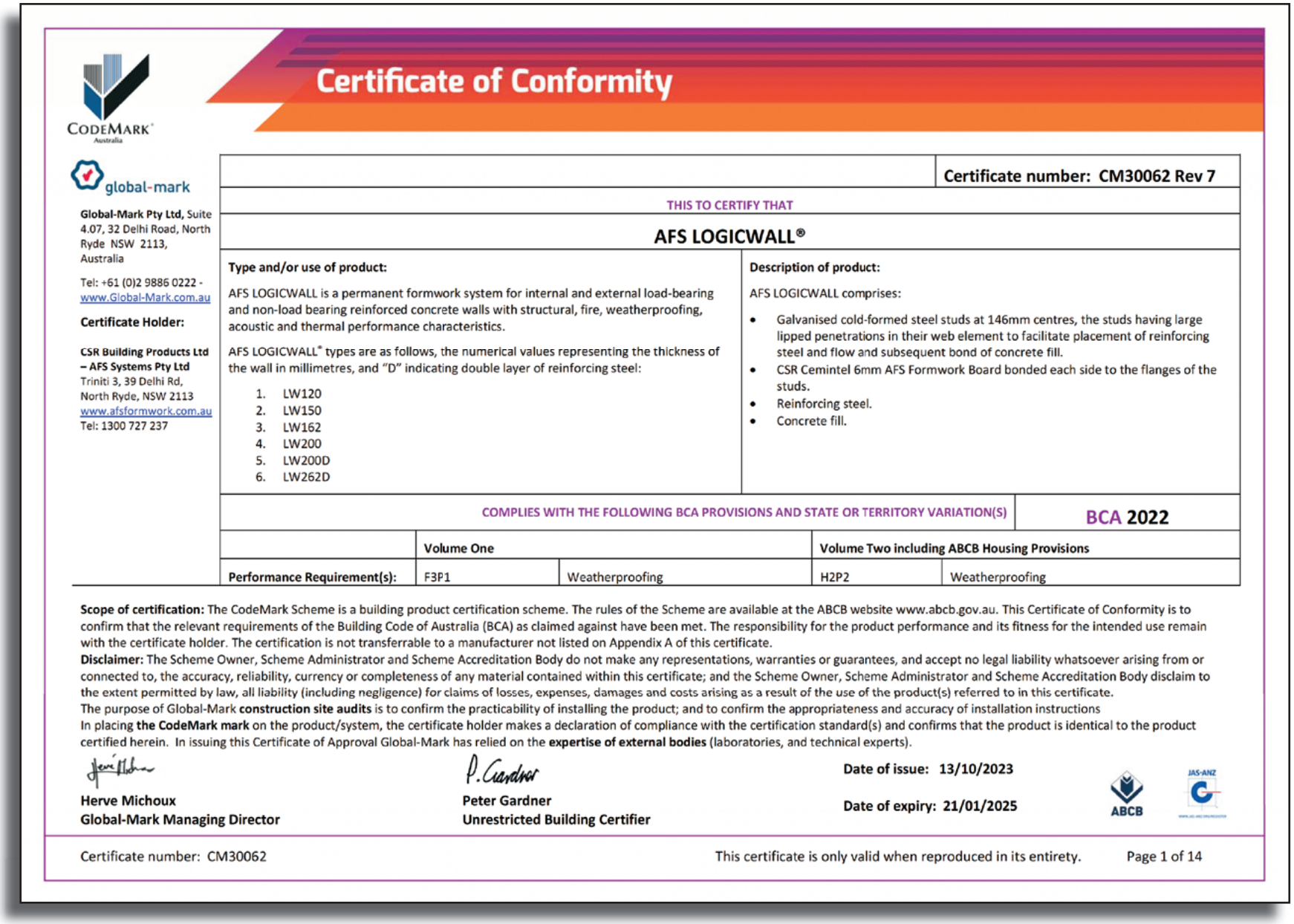
- The prop shall not support backfill behind the wall.
- The structural design and certification of the slabs is by the project engineer
- The structural requirements of the Logic wall to support the structure shall be verified and certified by the project engineer

Any scenarios outside these conditions, MYD consulting shall be consulted for further advice.

This certificate shall not be construed as relieving any other party of their responsibilities.

P. Marzullo

Peter Marzullo B.Sc, B.E., MIE Aust, CP Eng
For and behalf of
MYD Consulting Engineers.



Certificate of Conformity

CODEMARK Australia

global-mark

Global-Mark Pty Ltd, Suite 4.07, 32 Delhi Road, North Ryde NSW 2113, Australia

Tel: +61 (0)2 9886 0222 - www.Global-Mark.com.au

Certificate Holder:

CSR Building Products Ltd – AFS Systems Pty Ltd
Triniti 3, 39 Delhi Rd,
North Ryde, NSW 2113
www.afsformwork.com.au
Tel: 1300 727 237

Certificate number: CM30062 Rev 7

THIS TO CERTIFY THAT

AFS LOGICWALL®

Type and/or use of product:

AFS LOGICWALL is a permanent formwork system for internal and external load-bearing and non-load bearing reinforced concrete walls with structural, fire, weatherproofing, acoustic and thermal performance characteristics.

AFS LOGICWALL® types are as follows, the numerical values representing the thickness of the wall in millimetres, and "D" indicating double layer of reinforcing steel:

1. LW120
2. LW150
3. LW162
4. LW200
5. LW200D
6. LW262D

Description of product:

AFS LOGICWALL comprises:

- Galvanised cold-formed steel studs at 146mm centres, the studs having large lipped penetrations in their web element to facilitate placement of reinforcing steel and flow and subsequent bond of concrete fill.
- CSR Cemintel 6mm AFS Formwork Board bonded each side to the flanges of the studs.
- Reinforcing steel.
- Concrete fill.

COMPLIES WITH THE FOLLOWING BCA PROVISIONS AND STATE OR TERRITORY VARIATION(S) **BCA 2022**

	Volume One		Volume Two including ABCB Housing Provisions	
Performance Requirement(s):	F3P1	Weatherproofing	H2P2	Weatherproofing

Scope of certification: The CodeMark Scheme is a building product certification scheme. The rules of the Scheme are available at the ABCB website www.abcb.gov.au. This Certificate of Conformity is to confirm that the relevant requirements of the Building Code of Australia (BCA) as claimed against have been met. The responsibility for the product performance and its fitness for the intended use remain with the certificate holder. The certification is not transferrable to a manufacturer not listed on Appendix A of this certificate.
Disclaimer: The Scheme Owner, Scheme Administrator and Scheme Accreditation Body do not make any representations, warranties or guarantees, and accept no legal liability whatsoever arising from or connected to, the accuracy, reliability, currency or completeness of any material contained within this certificate; and the Scheme Owner, Scheme Administrator and Scheme Accreditation Body disclaim to the extent permitted by law, all liability (including negligence) for claims of losses, expenses, damages and costs arising as a result of the use of the product(s) referred to in this certificate.
The purpose of Global-Mark **construction site audits** is to confirm the practicability of installing the product; and to confirm the appropriateness and accuracy of installation instructions
In placing **the CodeMark mark** on the product/system, the certificate holder makes a declaration of compliance with the certification standard(s) and confirms that the product is identical to the product certified herein. In issuing this Certificate of Approval Global-Mark has relied on the **expertise of external bodies** (laboratories, and technical experts).

Herve Michoux
Global-Mark Managing Director

Peter Gardner
Unrestricted Building Certifier

Date of issue: 13/10/2023

Date of expiry: 21/01/2025

ABCB JAS-ANZ

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Fig L16: CodeMark Certificate of Conformity

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