CONSTRUCTION CERTIFICATE NO. 210791/2

Issued under Part 6 of the Environmental Planning and Assessment Act 1979

APPLICANT

Name of person having benefit of the development consent:	**Salar Salarvand – Frasers Property Ivanhoe JV2 Pty Ltd**
Address:	**L2, 1C Homebush Bay Drive, Rhodes 2138**
Contact Details:	**Phone: 0401 909 953**

DEVELOPMENT CONSENT

Consent Authority/Local Government Area:	**Ryde City Council**
Development Consent No & Date:	**SSD 15822622 28/11/2022** **SSD 15822622 MOD 1 14/11/2023** **SSD 15822622 MOD 2 05/08/2024** **SSD-15822622-MOD-3 14/11/2024**

PROPOSAL

Address of Development:	**Building C3 - 1 Ivanhoe Estate Road, Macquarie Park NSW 2113**
Lot & DP No:	**Lot 100 & DP1262209**
Building Code of Australia (BCA) Classification:	**Class 2, 6 & 7a**
Applicable version of the BCA:	**BCA 2022**
Type of Construction:	**Type A**
Description of development:	**Stage 2 development application for the development of the Ivanhoe Estate, including:** ▪ **Excavation and earthworks** ▪ **Construction of a community facilitates building (Building C2) and two residential apartment buildings (Building C3 and Building C4) with basement car parking:** **- Building C3 with 162 dwellings, 163 car parking spaces and ground floor retail** **- Building C4 with 488 dwellings and 396 car parking spaces** ▪ **Construction of Village Green public open space** ▪ **Utilities, services infrastructures and public domain areas.**
Scope of building works covered by this Certificate:	**Stage 2 - Slab on ground with inground drainage services**
Value of Construction Certificate (Incl GST):	**$96,380,228.00 (Total cost of Building C)**
Plans and Specifications approved:	**Schedule 1**
Fire Safety Schedule:	**N/A**
Critical Stage Inspections:	**See attached Notice**
Exclusions:	**Nil**
Conditions (as per Sections 111 & 115-117 of the *Environmental Planning & Assessment (Development Certification & Fire Safety) Regulation 2021*):	**Nil**
PROJECT BUILDING SURVEYOR	Please contact **Chris Michaels** for any inquiries
CERTIFIER	**Chris Michaels** for and on behalf of **City Plan Services Pty Ltd**
REGISTRATION NUMBER	**BDC1974**

That I, Chris Michaels as the certifier:

a) certify that the work if completed in accordance with the plans and specifications identified in Schedule 1 (with such modifications verified by the certifying authority as may be shown on that documentation) will comply with the requirements of the Environmental Planning & Assessment (Development Certification & Fire Safety) Regulation 2021 as referred to in Part 6 of the Environmental Planning and Assessment Act 1979; and

b) am satisfied that, in the case where fire safety system plans and specifications have been provided, that such plans and specifications correctly identify both the performance requirements and the deemed-to-satisfy provisions of the Building Code of Australia.

DATED THIS **03** **April** **2025**

Chris Michaels
Director

NB: Prior to the commencement of work Section 6.6 of the Environment Planning and Assessment Act 1979 must be satisfied.

Suite 7.02, 80 Clarence Street, Sydney NSW 2000
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CITYPLAN.COM.AU

SCHEDULE 1
APPROVED PLANS AND SPECIFICATIONS

1. Endorsed Architectural plans

Plan Title	Prepared By	Drawing No / Ref	Revision	Date
Cover Sheet	Team 2 Architects	A-0000	3	21/03/25
Detailed Excavation Plan	Team 2 Architects	A-0021	1	21/03/25
Footings	Team 2 Architects	A-1100	1	21/03/25
Concrete Setout Plan -Basement 03	Team 2 Architects	A-1101	1	21/03/25
Waterproofing Plan -Basement 03	Team 2 Architects	A-1401	1	21/03/25
Stair & Lift A -Details	Team 2 Architects	A-6221	1	21/03/25
Stair & Lift B -Details	Team 2 Architects	A-6222	1	21/03/25
Stair & Lift B -Details 2	Team 2 Architects	A-6223	1	21/03/25
Details -Basement Sections 5	Team 2 Architects	A-7035	1	21/03/25

2. Endorsed Structural plans

Plan Title	Prepared By	Drawing No / Ref	Revision	Date
Footing Plan	TTW	S1040	1	21/03/25
Footing Sections and Details -Sheet 1	TTW	S1041	1	21/03/25
Footing Sections and Details -Sheet 2	TTW	S1042	1	21/03/25
Basement 03 Outline Plan	TTW	S5001	1	21/03/25
Typical Slab on Ground Details -Sheet 1	TTW	S6001	1	21/03/25
Basement 03 Sections -Sheet 1	TTW	S6011	1	21/03/25

3. Endorsed Hydraulic plans & Specifications

Plan Title	Prepared By	Drawing No / Ref	Revision	Date
Cover Page & Drawing Schedule	Sparks & Partners	H1101	A	21/03/25
Specification Sheet 1	Sparks & Partners	H1201	A	21/03/25
Specification Sheet 2	Sparks & Partners	H1202	A	21/03/25
Specification Sheet 3	Sparks & Partners	H1203	A	21/03/25
Gravity Services Plan -Basement 3	Sparks & Partners	H2101	A	21/03/25
Details Sheet 1	Sparks & Partners	H5101	A	21/03/25
Details Sheet 2	Sparks & Partners	H5102	A	21/03/25

4. Endorsed Specifications

Title	Prepared By	Reference	Revision	Date
Architectural Specification	Team2 Architects Pty Ltd	-	Rev 01	21/03/25
Structural Specification - Concrete	TTW (NSW) Pty Ltd	211086	Issue A	-

Title	Prepared By	Reference	Revision	Date
Hydraulic Performance Specification	DSC Consulting Engineers	8163	Rev A	04/03/22

5. Other documents relied upon

Title	Prepared By	Reference	Date
CC Application Form	Salar Salarvand - Frasers Property Ivanhoe JV2 Pty Ltd	CFT-696072	20/02/25
BCA Report	AE&D Pty Ltd	11067.3 Rev 5.0	14/03/24
LSL Receipt	Long Service Corporation	L0000133464	17/11/23
Midtown Aconex Enquiry	Parkview	001520	15/03/24
Design Compliance Declaration - Architectural DCD-001L (Load-bearing)	Team2 Architects Pty Ltd	DEP 0000170	15/03/25
Design Compliance Declaration - Architectural DCD-001W (Waterproofing)	Team2 Architects Pty Ltd	DEP 0000170	15/03/25
Design Compliance Declaration - Architectural DCD-002B (Building enclosure)	Team2 Architects Pty Ltd	DEP 0000170	15/03/25
Design Certificate - Structural	TTW (NSW) Pty Ltd	211086/SAAF	21/03/25
Design Compliance Declaration - Structural DCD-003 (Load-bearing)	TTW (NSW) Pty Ltd	DEP10001336	21/03/25
Design Compliance Declaration - Hydraulic DCD-001 (Building services)	Sparks & Partners	DEP0001273	24/03/25
Design Certificate - Hydraulic	Sparks & Partners	25023	24/03/25
Design Verification Statement - Architectural	Team2 Architects Pty Ltd	-	21/03/25
Building Plan Assessment Approval	Sydney Water	217397	28/02/25
DA Condition B41 - Excavation and Shoring Report	Douglas Partners Pty Ltd	R.006.Rev0	22/02/24
DA Condition B41 - Geotechnical Monitoring Plan	Douglas Partners Pty Ltd	R.004.Rev0	12/01/24
DA Condition 66 Email Correspondence - Contaminated Groundwater	Parkview	-	19/03/24
Construction Certificate	City Plan Services	210791/1	23/02/24
Pre CC Inspection Report	City Plan Services	210791/2	01/04/25

REGULATED DESIGN RECORD

Project Address: 1 Ivanhoe Place, Macquarie Park NSW

Project Title: C3 Midtown Treehouse

Consent No: SSD-15822622-Mod-1 | Body Corporate Reg No: DEP0000612

Drawing Title: Cover Sheet | Drawing No: A-0000

Rev	Date	Description	DP Full Name - Reg No
1	14.02.24	CC1 IFC	THOMAS MAGUER DEP 0000170
2	19.03.24	CC1 IFC	THOMAS MAGUER DEP 0000170
3	21.03.2025	CC2 SUBMISSION	THOMAS MAGUER DEP 0000170

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DRAWING STATUS:

CONSTRUCTION CERTIFICATE

Rev	Revision Description	Date
	INTERNAL CHECK	N/A
A	GRIDS SETOUT	19.12.23
B	CC1 PRELIMINARY	22.01.24
C	CC1 DRAF FOR REVIEW	30.01.24
D	CC1 ISSUE FOR APPROVAL	07.02.24
1	CC1 IFC	14.02.24
2	CC1 IFC	19.03.24
E	CC2 SUBMISSION PRE DECLARE	20.03.2025
3	CC2 SUBMISSION	21.03.2025

City Plan Services Pty Ltd
BPB 0010791/2
21/03/2025
Construction Certificate
Thomas Maguer
Director
BDC1974

Client
FRASERS PROPERTY
1 Homebush Bay Drive
Rhodes NSW, 2138

Builder
RICHARD CROOKES
Level 14, 558 Pacific Highway
St Leonards NSW 2065

Title:
Cover Sheet

Project #:	Scale:	Drwn:	Chkd:
1199	@A1	CH	ML

Drawing #: A-0000 | Rev: 3

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Reg Vic: 19340

Project:
C3 Midtown Treehouse
1 Ivanhoe Place, Macquarie Park NSW

C3 MIDTOWN TREEHOUSE MACQUARIE PARK

CC2 ARCHITECTURAL PARCKAGE

SHEETS LIST CC2

SHEETS		REVISIONS	
NUMBER	NAME	NUMBER	DATE
CC2			
A-0000	Cover Sheet	3	21.03.2025
A-0021	Detailed Excavation Plan	1	21.03.2025
A-1100	Footings	1	21.03.2025
A-1101	Concrete Setout Plan - Basement 03	1	21.03.2025
A-1401	Waterproofing Plan - Basement 03	1	21.03.2025
A-6221	Stair & Lift A - Details	1	21.03.2025
A-6222	Stair & Lift B - Details	1	21.03.2025
A-6223	Stair & Lift B - Details 2	1	21.03.2025
A-7035	Details - Basement Sections 5	1	21.03.2025

GENERAL ARCHITECTURAL NOTES

GENERAL:
THESE ARCHITECTURAL DRAWINGS TOGETHER WITH THE ARCHITECTURAL SPECIFICATION AND SCHEDULES SHOW THE INTENT, SCOPE AND PERFORMANCE REQUIREMENTS FOR THE PROJECT. REFER ALSO TO THE STRUCTURAL, CIVIL, MECHANICAL, ELECTRICAL, HYDRAULIC, LANDSCAPE AND OTHER SPECIALIST CONSULTANTS' DRAWINGS, SPECIFICATIONS, SCHEDULES AND REPORTS FOR THE INTENT, SCOPE AND PERFORMANCE REQUIREMENTS OF THESE RESPECTIVE DISCIPLINES.
THE HEAD CONTRACTOR AND ALL SUB-CONTRACTORS ARE TO ALLOW FOR AND PROVIDE ALL MATERIALS, LABOUR AND ACCESSORIES NECESSARY TO COMPLETE THE WORKS TO THE INTENT, SCOPE AND PERFORMANCE SHOWN AND SPECIFIED FOR THE PROJECT. NO VARIATIONS WILL BE CONSIDERED FOR THE PROJECT UNLESS IT IS A CLEAR CHANGE TO THE INTENT AND SCOPE OF THE WORKS INITIATED IN WRITING BY THE SUPERINTENDENT.

DOCUMENTS:
THE ARCHITECTURAL DRAWINGS AND SPECIFICATIONS ARE TO BE READ IN CONJUNCTION WITH ALL THE CONTRACT DOCUMENTS. SEEK CLARIFICATION FROM THE SUPERINTENDENT BEFORE PROCEEDING WITH THE WORK SHOULD ANY DISCREPANCY OR AMBIGUITY BE FOUND IN THE CONTRACT DOCUMENTS
THESE DOCUMENTS HAVE NOT BEEN PRODUCED FOR THE INTENTION OF LETTING OF TRADE PACKAGES AND MUST BE READ AS A COHESIVE SET.

AUTHORITIES:
ALL NEW BUILDING WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH THE PROVISIONS OF THE BUILDING CODE OF AUSTRALIA (BCA) AND IN ACCORDANCE WITH CLAUSE 98 OF THE ENVIRONMENTAL PLANNING & ASSESSMENT REGULATION 2000.

TERMITE PROTECTION:
THE BUILDING IS TO BE PROTECTED IN ACCORDANCE WITH BCA PART B1.4(i) AND AS 3660: TERMITE MANAGEMENT.

SETTING OUT:
ALL SET OUT DIMENSIONS & LEVELS ARE TO BE CHECKED BY A LICENSED SURVEYOR ON SITE AND ALL OVERALL AND CRITICAL DIMENSIONS ARE TO BE SET OUT FOR SUPERINTENDENT APPROVAL PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION OR EXCAVATION.
THE CONTRACTOR IS TO CHECK AND VERIFY ALL SETOUT, DIMENSIONS & LEVELS ON SITE PRIOR TO THE COMMENCEMENT OF ANY RELEVANT PART OF THE WORKS.
THE LICENSED SURVEYOR IS TO ESTABLISH THE EXACT POSITION OF ALL SET BACKS AND PROPERTY BOUNDARIES PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION OR EXCAVATION.
BUILDING SETBACKS ARE TO BE SET OUT FROM THE BOUNDARY TO THE FINISHED EXTERNAL FACE OF EXTERNAL WALLS.
NO PART OF THE BUILDING IS TO BE BUILT OVER A SPECIFIED SET-BACK LINE, EASEMENT OR PROPERTY BOUNDARY EXCEPT WHERE SPECIFICALLY SHOWN ON THE DRAWINGS.
REPORT ANY DISCREPANCIES IN THE BUILDING SETOUT TO THE SUPERINTENDENT IMMEDIATELY.
THE RL'S OF PROPOSED PAVING AND OTHER GROUND FINISHES ARE INDICATIVE ONLY. REFER TO THE CIVIL/STRUCTURAL/HYDRAULIC-ENGINEER/LANDSCAPE ARCHITECT'S DRAWINGS FOR ALL PAVING, HARDSTAND & LANDSCAPE RLS, GRADIENTS AND FALLS.

REFERENCE LEVELS:
ALL LEVELS AND RLS INDICATED RELATE TO THE AUSTRALIAN HEIGHT DATUM (AHD).
A BENCHMARK IS TO BE ESTABLISHED ADJACENT TO THE SITE TO AUSTRALIAN HEIGHT DATUM TO ENABLE COMPARISON TO THE FLOOD STANDARD.
ALL LEVELS ARE TO BE CERTIFIED BY A REGISTERED SURVEYOR PRIOR TO POURING OF FLOOR SLABS OR INSTALLATION OF FLOORING.

ABORIGINAL:
SHOULD ANY ABORIGINAL ARTEFACTS (RELICS) BE UNCOVERED DURING EARTHWORKS, WORKS SHOULD CEASE AND THE NSW OFFICE OF ENVIRONMENT AND HERITAGE (OEH) AND THE METROPOLITAN LOCAL ABORIGINAL LAND COUNCIL SHALL BE CONTACTED.

CERTIFICATES & WARRANTIES:
PRIOR TO PRACTICAL COMPLETION THE RELEVANT SUBCONTRACTOR MUST PROVIDE CERTIFICATION THAT THE WORKS HAVE BEEN DESIGNED, SELECTED AND INSTALLED IN ACCORDANCE WITH THE BCA, RELEVANT AUSTRALIAN STANDARDS AND ANY MANUFACTURER'S RECOMMENDATIONS.
PRIOR TO PRACTICAL COMPLETION THE RELEVANT SUBCONTRACTOR MUST PROVIDE COPIES OF ALL

GRIDS NOTES

GRIDS SET IN RELATION TO SITE BOUNDARIES, AS PER SURVEY "220337.9054.C2 PLOT DETAIL" RECEIVED 14/11/2023 AND "MACQUARIE PARK IVANHOE C3 - EXTRA LEVELS" RECEIVED 01/02/2024

DEMOLITION NOTES
1. ALL EXISTING LEVELS TO BE CONFIRMED ON SITE PRIOR TO COMMENCEMENT OF WORKS.
2. ALL WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH THE NOMINATED OR APPLICABLE COUNCIL SPECIFICATION. WHERE A SPECIFICATION HAS NOT BEEN NOMINATED THEN THE CURRENT NSW DEPARTMENT OF HOUSING CONSTRUCTION SPECIFICATION IS TO BE USED. THE NOMINATED SPECIFICATION SHALL TAKE PRECEDENCE TO THESE NOTES.
3. ALL DRAWINGS SHALL BE READ WITH THE RELEVANT ARCHITECTURAL DRAWINGS AND DRAWINGS FROM OTHER CONSULTANTS.
4. THE CONTRACTOR SHOULD REPORT ANY DISCREPANCIES ON THE DRAWINGS TO THE ENGINEER RESPONSIBLE FOR THE DESIGN.
5. THE CONTRACTOR SHOULD LOCATE AND LEVEL ALL EXISTING SERVICES PRIOR TO COMMENCING CONSTRUCTION AND PROJECT, AND MAKE ARRANGEMENT WITH THE RELEVANT AUTHORITIES TO RELOCATE AND/OR ADJUST IF NECESSARY. INFORMATION GIVEN ON THE DRAWINGS IN RESPECT TO SERVICES IS FOR GUIDANCE ONLY.
6. THE CONTRACTOR IS NOT TO ENTER UPON NOR DO ANY WORK WITHIN ADJACENT LANDS WITHOUT THE PERMISSION OF THE OWNER.
7. SURPLUS EXCAVATED MATERIAL SHALL BE PLACED WHERE DIRECTED OR REMOVED FROM SITE.
8. ALL NEW WORKS SHALL MAKE A SMOOTH JUNCTION WITH EXISTING.
9. ALL DRAINAGE LINES THROUGH ADJACENT LOTS SHALL BE CONTAINED WITHIN EASEMENTS CONFIRMING TO COUNCIL'S STANDARDS.
10. THE CONTRACTOR SHALL CLEAR THE SITE BY REMOVING ALL RUBBISH, FENCES AND DEBRIS ETC. TO THE EXTENT SPECIFIED
11. PRIOR TO THE COMMENCEMENT OF WORK, THE CONTRACTOR SHALL PROVIDE A TRAFFIC MANAGEMENT PLAN PREPARED BY AN ACCREDITED PERSON IN ACCORDANCE WITH RMS REQUIREMENT, FOR ANY WORK ON OR ADJACENT TO PUBLIC ROADS, PLAN TO BE SUBMITTED TO COUNCIL & RMS
12. ASBESTOS - CONTRACTOR TO ALLOW FOR COMPLETE DEMOLITION & REMOVAL OF ALL ASBESTOS PRODUCTS. ALL ASBESTOS PRODUCTS TO BE REMOVED & HANDLED AS PER RELEVANT AUSTRALIAN STANDARDS.
13. NOISE SHALL BE MINIMISED AS FAR AS PRACTICABLE, BY THE SELECTION OF APPROPRIATE METHODS AND EQUIPMENT, AND BY THE USE OF SILENCING DEVICES WHEREVER PRACTICABLE TO EPA/CODE REQUIREMENTS.

EXCAVATION NOTES

1. DRAWINGS ARE TO BE READ IN CONJUNCTION WITH OTHER RELEVANT CONSULTANTS' DOCUMENTATION IN LATEST REVISION

2. DIMENSIONS SHOWN TO EDGES OF EXCAVATION OR INTERNAL FACE OF SHORING WALLS UNLESS STATED OTHERWISE

ABBREVIATIONS

BEL	BULK EXCAVATION LEVEL
CL	CENTRELINE
EXI	EXISTING CONDITION, TO BE VERIFIED ON SITE
RL	REDUCED LEVEL
SP	SETOUT POINT
SSL	STRUCTURE SLAB LEVEL
TBC	TO BE CONFIRMED
NGL	NATURAL GROUND LEVEL
TOW	TOP OF WALL

REGULATED DESIGN RECORD

Project Address:	1 Ivanhoe Place, Macquarie Park NSW
Project Title:	C3 Midtown Treehouse
Consent No:	SSD-15822622-Mod-1
Body Corporate Reg No:	DEP0000612
Drawing Title:	Detailed Excavation Plan
Drawing No:	A-0021

Rev	Date	Description	DP Full Name - Reg No
1	21.03.2025	CC2 SUBMISSION	THOMAS MAGUER DEP 0000170

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5. Clouds reflect changes since previous revision; reversed clouds reflect area or item on hold/pending input or confirmation.

DRAWING STATUS:

CONSTRUCTION CERTIFICATE

Rev	Revision Description	Date
	INTERNAL CHECK	N/A
A	FOR COORDINATION	11.12.24
B	FOR COORDINATION	16.01.25
C	FOR COORDINATION	03.03.2025
D	FOR COORDINATION	12.03.2025
E	DRAFT CC2	18.03.2025
F	CC2 SUBMISSION PRE DECLARE	20.03.2025
1	CC2 SUBMISSION	21.03.2025

Fraser Property Services Pty Ltd
Accredited Certifier
BDC1974
Chris Michaels
Director
BDC1974

Client
FRASERS PROPERTY
1 Homebush Bay Drive
Rhodes NSW, 2138

Builder
RICHARD CROOKES
Level 14, 558 Pacific Highway
St Leonards NSW 2065

SCALE 1:100

Title:
Detailed Excavation Plan

Project #:	Scale:	Drwn:	Chkd:
1199	1 : 100 @A1	CH	ML

Drawing #: A-0021 Rev: 1

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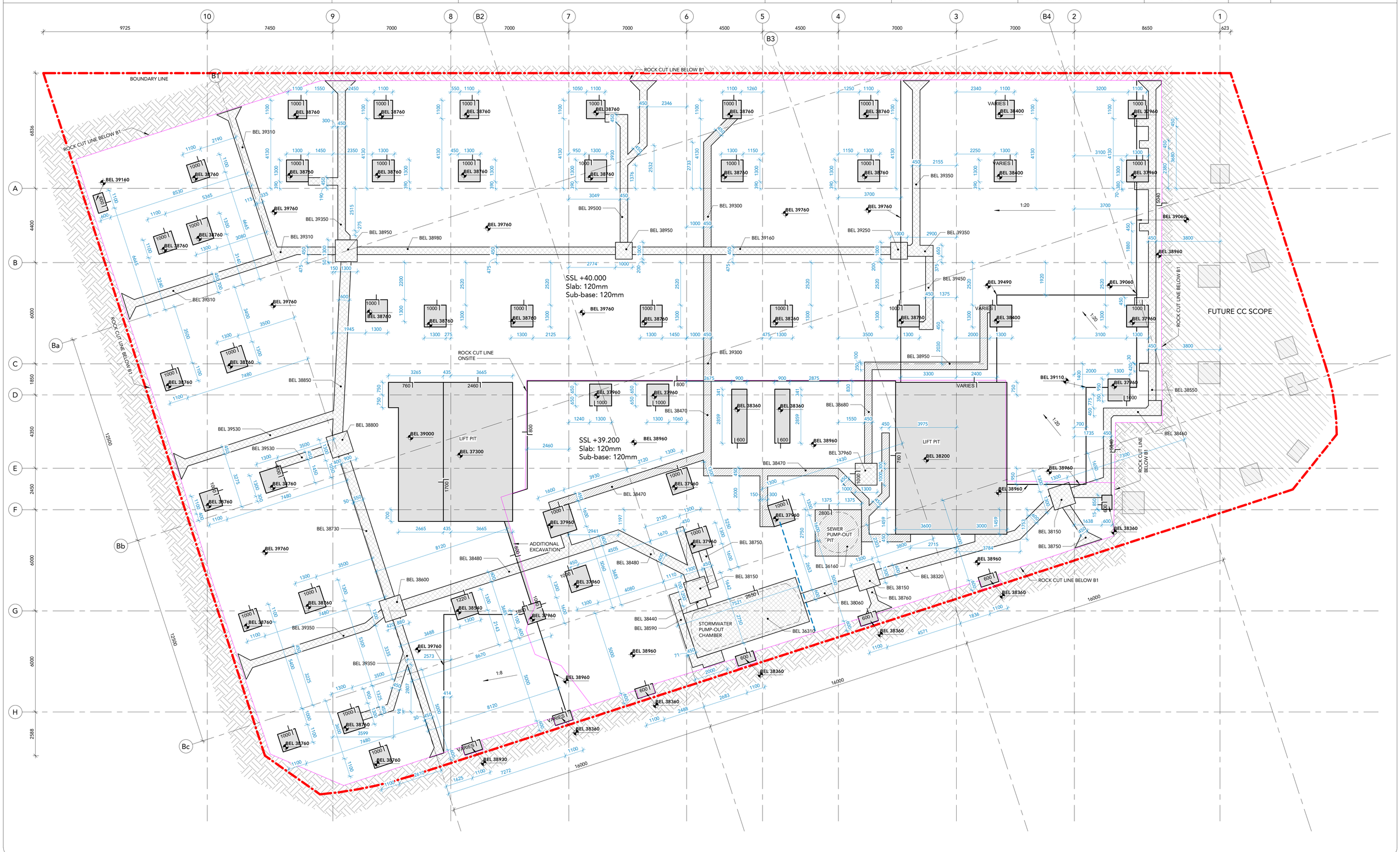
Reg Vic: 19340

Project:
C3 Midtown Treehouse
1 Ivanhoe Place, Macquarie Park
NSW



REGULATED DESIGN RECORD

Project Address:	1 Ivanhoe Place, Macquarie Park NSW
Project Title:	C3 Midtown Treehouse
Consent No:	SSD-15822622-Mod-1
Body Corporate Reg No:	DEP0000612
Drawing Title:	Footings
Drawing No:	A-1100

Rev	Date	Description	DP Full Name - Reg No
1	21.03.2025	CC2 SUBMISSION	THOMAS MAGUER DEP 0000170

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DRAWING STATUS:

CONSTRUCTION CERTIFICATE

Rev	Revision Description	Date
	INTERNAL CHECK	N/A
A	DRAWING SET	23.04.24
B	FOR COORDINATION	16.01.25
C	FOR COORDINATION	03.03.2025
D	FOR COORDINATION	05.03.2025
E	FOR COORDINATION	12.03.2025
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Fraser Property Australia Services Pty Ltd
Accredited Certifier - 110791/2
Date: 21/03/2025
Certified: Chris Michaels
Director
BDC1974

Client
FRASERS PROPERTY
1 Homebush Bay Drive
Rhodes NSW, 2138

Builder
RICHARD CROOKES
Level 14, 558 Pacific Highway
St Leonards NSW 2065

SCALE 1:100

Title: Footings

Project #:	Scale:	Drwr:	Chkd:
1199	1 : 100 @A1	CH	ML

Drawing #: A-1100 Rev: 1

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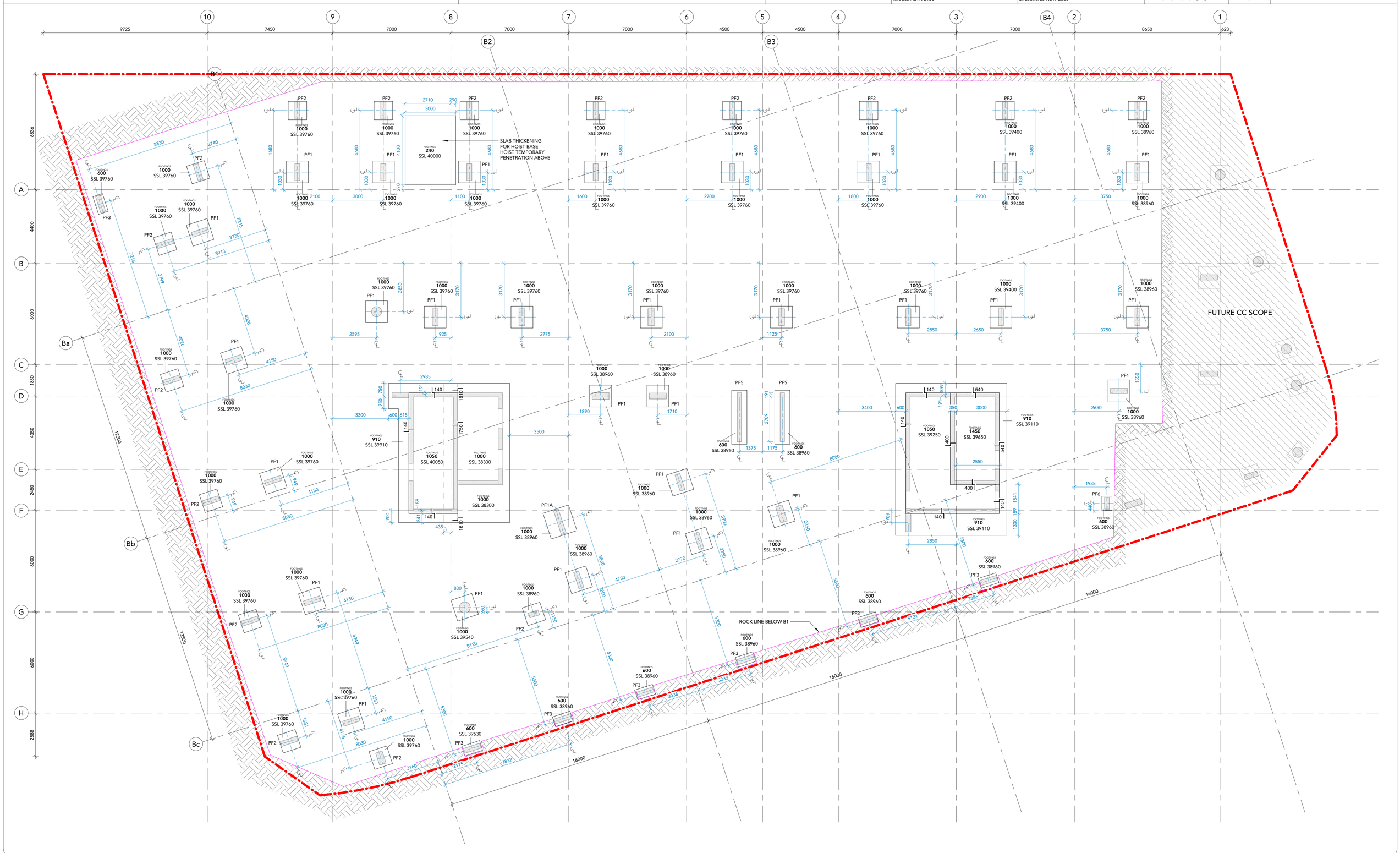
T: +61 3 8849 9137
Reg Vic: 19340

Project:
C3 Midtown Treehouse
1 Ivanhoe Place, Macquarie Park NSW



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Project Title:	C3 Midtown Treehouse
Consent No:	SSD-15822622-Mod-1
Body Corporate Reg No:	DEP0000612
Drawing Title:	Concrete Setout Plan - Basement 03
Drawing No:	A-1101

Rev	Date	Description	DP Full Name - Reg No
1	21.03.2025	CC2 SUBMISSION	THOMAS MAGUER DEP 0000170

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CONSTRUCTION CERTIFICATE

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	INTERNAL CHECK	N/A
A	CSO BASEMENT FOR INFORMATION	20.02.24
B	DRAWING SET	23.04.24
C	FOR COORDINATION	13.12.24
D	FOR COORDINATION	16.01.25
E	FOR COORDINATION	04.02.2025
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G	FOR COORDINATION	12.03.2025
H	DRAFT CC2	18.03.2025
I	CC2 SUBMISSION PRE DECLARE	20.03.2025
1	CC2 SUBMISSION	21.03.2025

City Plan Services Pty Ltd
Accredited Certifier
BPB 0374

FRASERS PROPERTY

Client
FRASERS PROPERTY
1 Homebush Bay Drive
Rhodes NSW, 2138

RICHARD CROOKES CONSTRUCTIONS

Builder
RICHARD CROOKES
Level 14, 558 Pacific Highway
St Leonards NSW 2065

SCALE 1:100

Title:
Concrete Setout Plan - Basement 03

Project #:	Scale:	Drwn:	Chkd:
1199	1 : 100 @A1	CH	ML

Drawing #: A-1101 Rev: 1

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Reg NSW: 9940

MELBOURNE
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Reg Vic: 19340

Project:
C3 Midtown Treehouse
1 Ivanhoe Place, Macquarie Park NSW

REGULATED DESIGN RECORD

Project Address:	1 Ivanhoe Place, Macquarie Park NSW
Project Title:	C3 Midtown Treehouse
Consent No:	SSD-15822622-Mod-1
Body Corporate Reg No:	DEP0000612
Drawing Title:	Waterproofing Plan - Basement 03
Drawing No:	A-1401

Rev	Date	Description	DP Full Name - Reg No
1	21.03.2025	CC2 SUBMISSION	THOMAS MAGUER DEP 0000170

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DRAWING STATUS:

CONSTRUCTION CERTIFICATE

Rev	Revision Description	Date
	INTERNAL CHECK	N/A
A	DRAFT CC2	18.03.2025
B	CC2 SUBMISSION PRE DECLARE	20.03.2025
1	CC2 SUBMISSION	21.03.2025

Certification Services Pty Ltd
Reference: 210791/2
Date: 03/04/2025
Construction Certificate
Chris Michaels
Director
BDC1974

Client
FRASERS PROPERTY
1 Homebush Bay Drive
Rhodes NSW, 2138

FRASERS PROPERTY

Builder
RICHARD CROOKES
Level 14, 558 Pacific Highway
St Leonards NSW 2065

RICHARD CROOKES CONSTRUCTIONS

0 1 2 3 4 5
SCALE 1:100

Title:
Waterproofing Plan - Basement 03

Project #:	Scale:	Drw:	Chd:
1199	1 : 100 @A1	CH	ML

Drawing #: A-1401 Rev: 1

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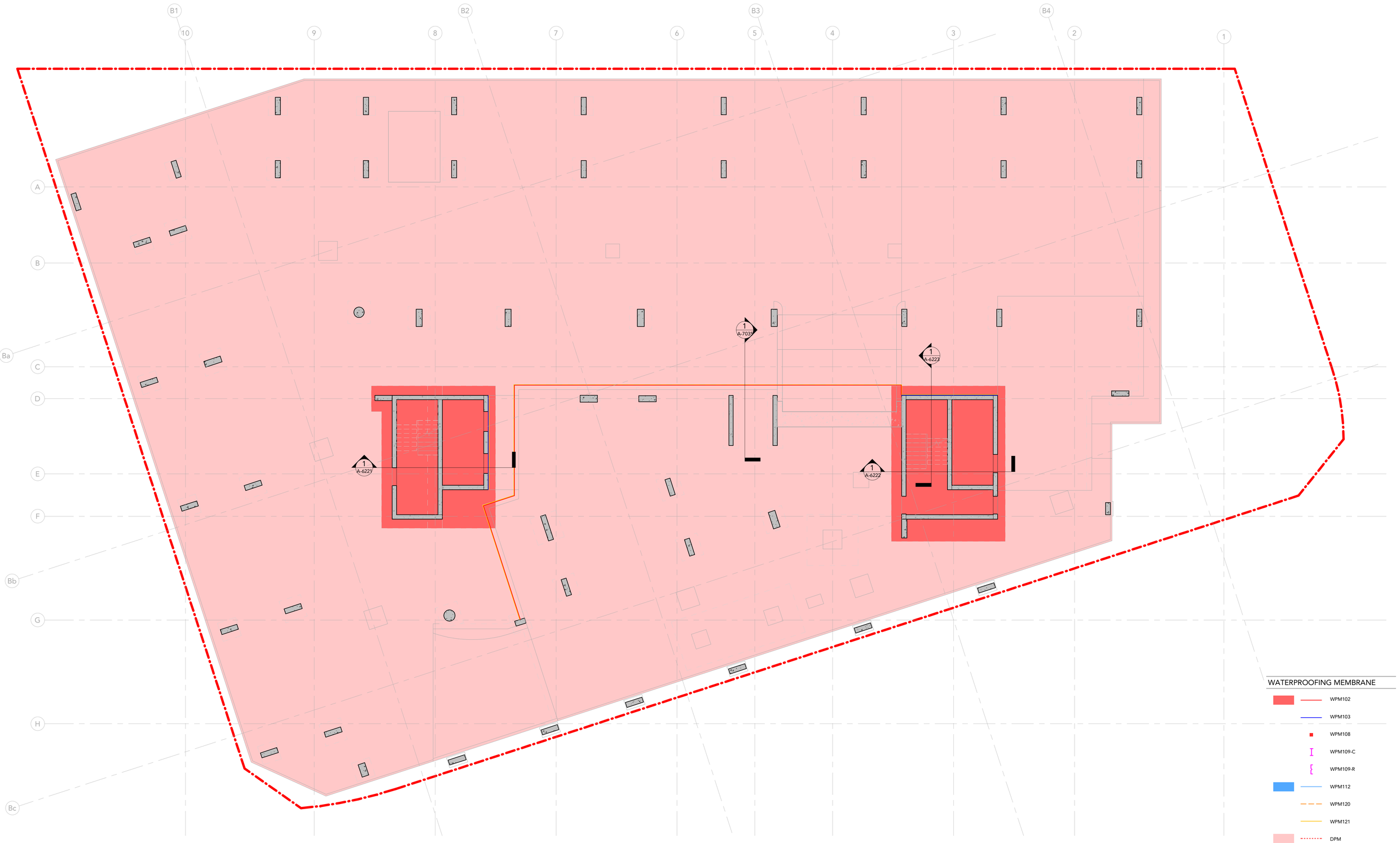
South Yarra VIC 3141
T: +61 3 8849 9137
Reg Vic: 19340

Project:
C3 Midtown Treehouse
1 Ivanhoe Place, Macquarie Park
NSW



WATERPROOFING MEMBRANE

- WPM102
- WPM103
- WPM108
- WPM109-C
- WPM109-R
- WPM112
- WPM120
- WPM121
- DPM

REGULATED DESIGN RECORD

Project Address: 1 Ivanhoe Place, Macquarie Park NSW
Project Title: C3 Midtown Treehouse
Consent No: SSD-15822622-Mod-1 | Body Corporate Reg No: DEP0000612
Drawing Title: Stair & Lift A - Details | Drawing No: A-6221

Rev	Date	Description	DP Full Name - Reg No
1	21.03.2025	CC2 SUBMISSION	THOMAS MAGUER DEP 0000170

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5. Clouds reflect changes since previous revision; reversed clouds reflect area or item on hold/pending input or confirmation.

DRAWING STATUS:
CONSTRUCTION CERTIFICATE

Rev	Revision Description	Date
	INTERNAL CHECK	N/A
A	LIFT DETAIL SECTION	07.03.24
B	DRAWING SET	23.04.24
C	FOR COORDINATION	20.01.25
D	FOR COORDINATION	04.02.2025
E	FOR COORDINATION	11.03.2025
F	DRAFT CC2	18.03.2025
G	CC2 SUBMISSION PRE DECLARE	20.03.2025
1	CC2 SUBMISSION	21.03.2025

City Plan Services Pty Ltd
BPB 0110791/2
Dated 21/3/2025
Construction Certificate
Thomas Maguer
Director
BDC1974

Client
FRASERS PROPERTY
1 Homebush Bay Drive
Rhodes NSW, 2138

Builder
RICHARD CROOKES
Level 14, 558 Pacific Highway
St Leonards NSW 2065

SCALE 1:20

Title:
Stair & Lift A - Details

Project #:	Scale:	Drw:	Chd:
1199	1 : 20 @A1	CH	TM

Drawing #: A-6221 | Rev: 1

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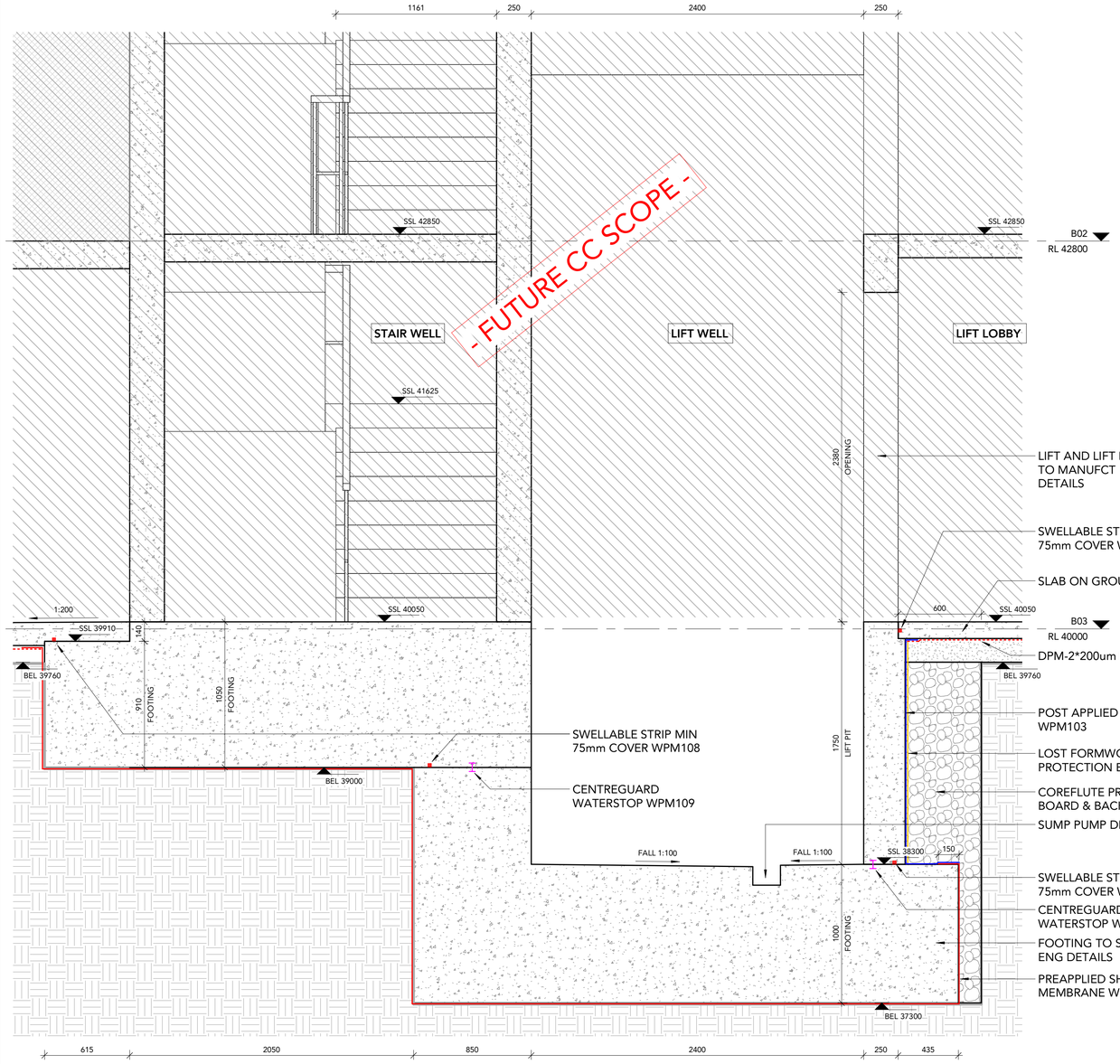
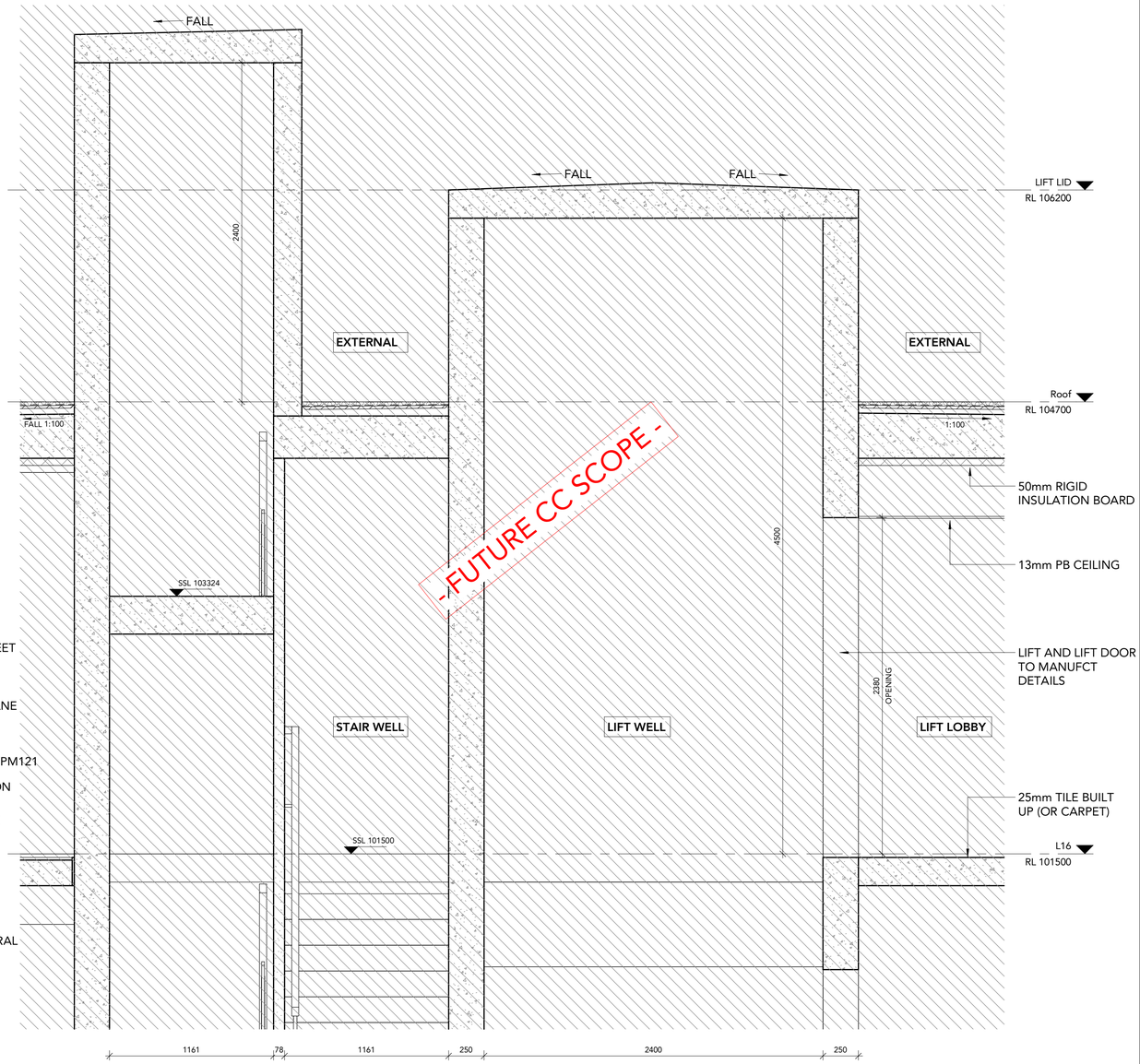
T: +61 3 8849 9137
Reg Vic: 19340

Project:
C3 Midtown Treehouse
1 Ivanhoe Place, Macquarie Park
NSW



1 Lift A - Pit Section
Scale: 1 : 20



2 Lift A - Overrun Section
Scale: 1 : 20

REGULATED DESIGN RECORD

Project Address:	1 Ivanhoe Place, Macquarie Park NSW
Project Title:	C3 Midtown Treehouse
Consent No:	SSD-15822622-Mod-1
Body Corporate Reg No:	DEP0000612
Drawing Title:	Stair & Lift B - Details
Drawing No:	A-6222

Rev	Date	Description	DP Full Name - Reg No
1	21.03.2025	CC2 SUBMISSION	THOMAS MAGUER DEP 0000170

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DRAWING STATUS:

CONSTRUCTION CERTIFICATE

Rev	Revision Description	Date
	INTERNAL CHECK	N/A
A	FOR COORDINATION	20.01.25
B	FOR COORDINATION	04.02.2025
C	FOR COORDINATION	03.03.2025
D	FOR COORDINATION	11.03.2025
E	DRAFT CC2	18.03.2025
F	CC2 SUBMISSION PRE DECLARE	20.03.2025
1	CC2 SUBMISSION	21.03.2025

Fraser Property Australia Services Pty Ltd
Accredited Certifier - 110791/2
Date of Issue: 21/03/2025
Construction Certificate
Chris Michaels
Director
BDC1974

Client
FRASERS PROPERTY
1 Homebush Bay Drive
Rhodes NSW, 2138

Builder
RICHARD CROOKES
Level 14, 558 Pacific Highway
St Leonards NSW 2065

SCALE 1:20 (0, 0.5, 1)

Title:
Stair & Lift B - Details

Project #:	Scale:	Drw:	Chk:
1199	1 : 20 @A1	CH	TM

Drawing #: A-6222 Rev: 1

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Reg Vic: 19340

Project:
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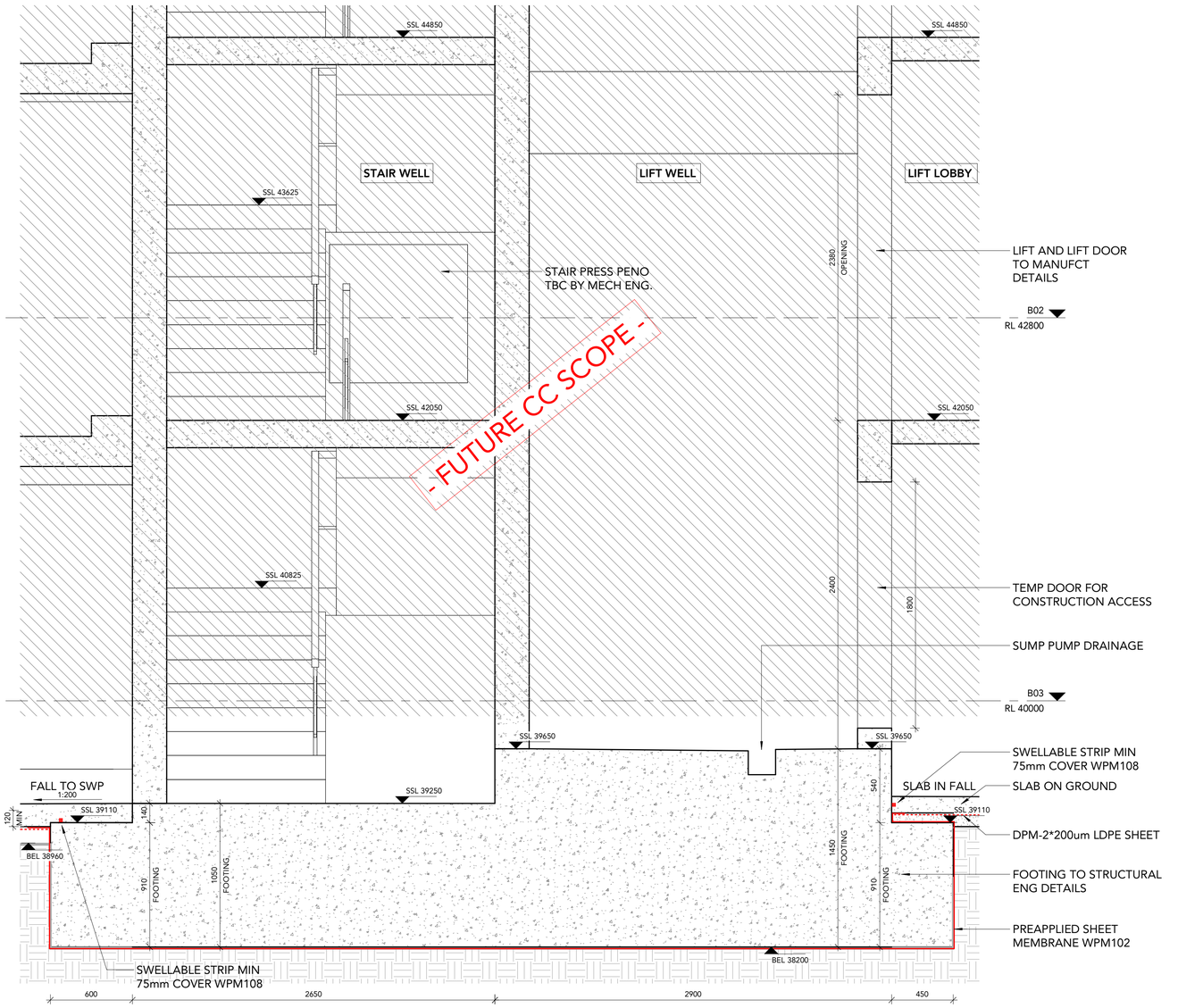
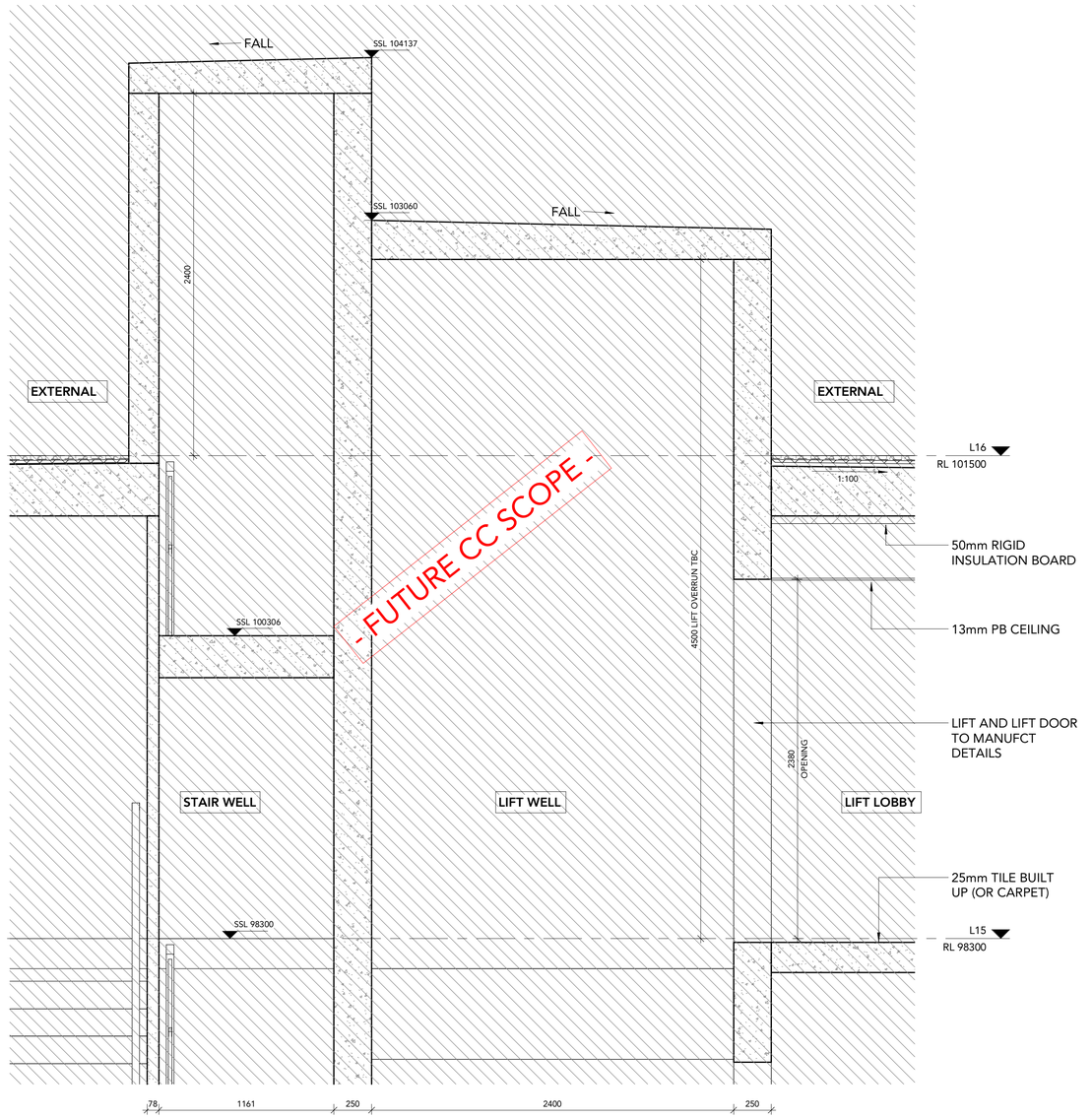
1 Ivanhoe Place, Macquarie Park NSW



1 Lift B - Pit Section
Scale: 1 : 20



2 Lift B - Overrun Section
Scale: 1 : 20

REGULATED DESIGN RECORD

Project Address:	1 Ivanhoe Place, Macquarie Park NSW
Project Title:	C3 Midtown Treehouse
Consent No:	SSD-15822622-Mod-1
Body Corporate Reg No:	DEP0000612
Drawing Title:	Stair & Lift B - Details 2
Drawing No:	A-6223

Rev	Date	Description	DP Full Name - Reg No
1	21.03.2025	CC2 SUBMISSION	THOMAS MAGUER DEP 0000170

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DRAWING STATUS:

CONSTRUCTION CERTIFICATE

Rev	Revision Description	Date
	INTERNAL CHECK	N/A
A	FOR COORDINATION	05.03.2025
B	FOR COORDINATION	11.03.2025
C	DRAFT CC2	18.03.2025
D	CC2 SUBMISSION PRE DECLARE	20.03.2025
1	CC2 SUBMISSION	21.03.2025

Certificate No: CC10791/2
Date: 07/4/2025
Construction Certificate
Chris Michaels
Director
BDC1974

Client
FRASERS PROPERTY
1 Homebush Bay Drive
Rhodes NSW, 2138

Builder
RICHARD CROOKES
Level 14, 558 Pacific Highway
St Leonards NSW 2065

0 0.5 1
SCALE 1:20

Title:
Stair & Lift B - Details 2

Project #:	Scale:	Drw:	Chk:
1199	1 : 20 @A1	CH	TM

Drawing #: A-6223 Rev: 1

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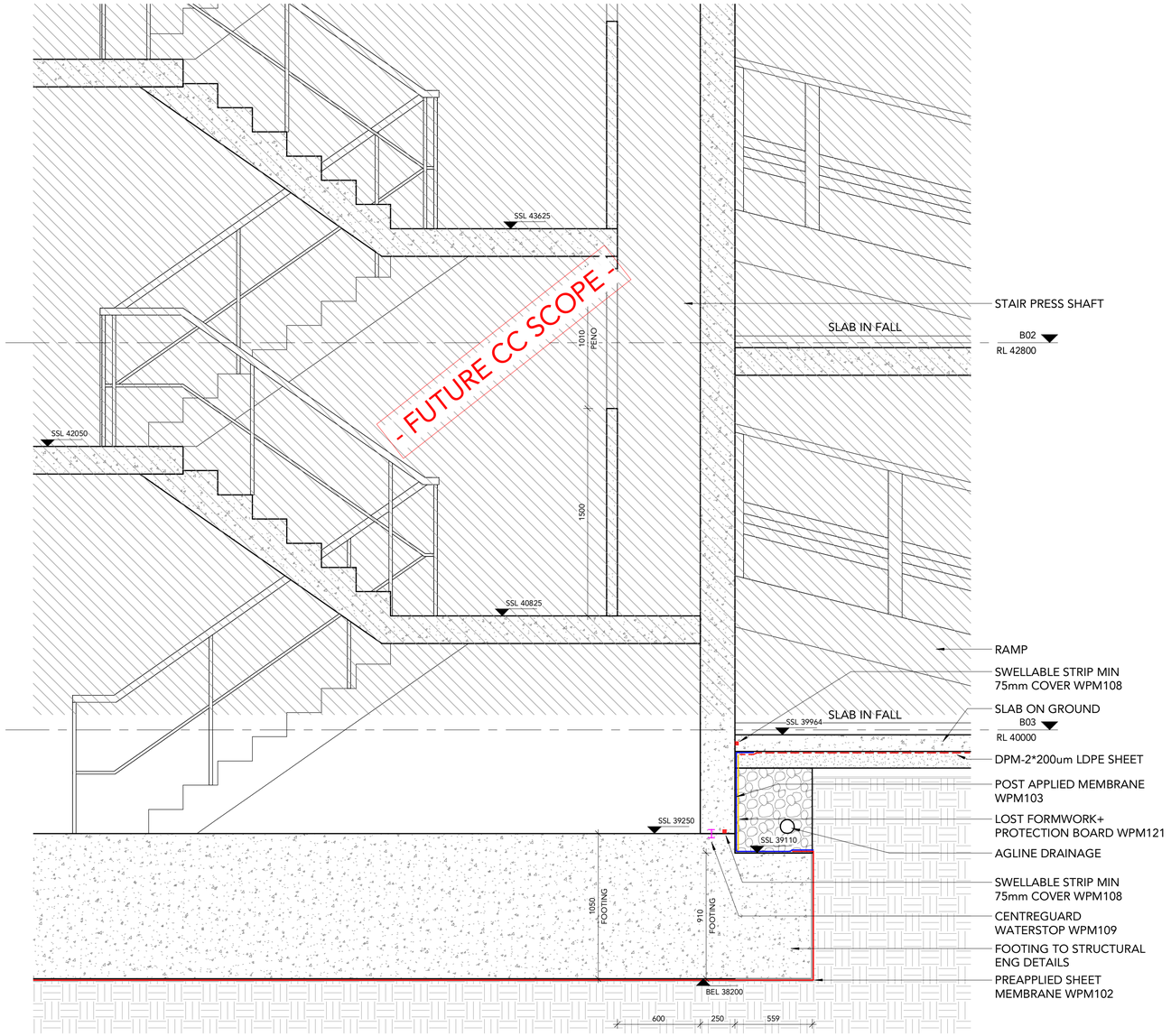
Project:
C3 Midtown Treehouse
1 Ivanhoe Place, Macquarie Park
NSW



1 Lift B - Pit Section 2
Scale: 1 : 20

REGULATED DESIGN RECORD

Project Address:	1 Ivanhoe Place, Macquarie Park NSW
Project Title:	C3 Midtown Treehouse
Consent No:	SSD-15822622-Mod-1
Body Corporate Reg No:	DEP0000612
Drawing Title:	Details - Basement Sections 5
Drawing No:	A-7035

Rev	Date	Description	DP Full Name - Reg No
1	21.03.2025	CC2 SUBMISSION	THOMAS MAGUER DEP 0000170

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DRAWING STATUS:

CONSTRUCTION CERTIFICATE

Rev	Revision Description	Date
	INTERNAL CHECK	N/A
A	FOR COORDINATION	07.03.2025
B	FOR COORDINATION	11.03.2025
C	DRAFT CC2	18.03.2025
D	CC2 SUBMISSION PRE DECLARE	20.03.2025
1	CC2 SUBMISSION	21.03.2025

Certified: Certificate Services Pty Ltd
BDC1974 | 10791/2
Date: 07/04/2025
Construction Certificate
Chris Michaels
Director
BDC1974

Client
FRASERS PROPERTY
1 Homebush Bay Drive
Rhodes NSW, 2138

Builder
RICHARD CROOKES
Level 14, 558 Pacific Highway
St Leonards NSW 2065

0 0.5 1
SCALE 1:20

Title:
Details - Basement Sections 5

Project #:	Scale:	Drwn:	Chkd:
1199	1 : 20 @A1	CH	ML

Drawing #: A-7035 Rev: 1

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Reg Vic: 19340

Project:
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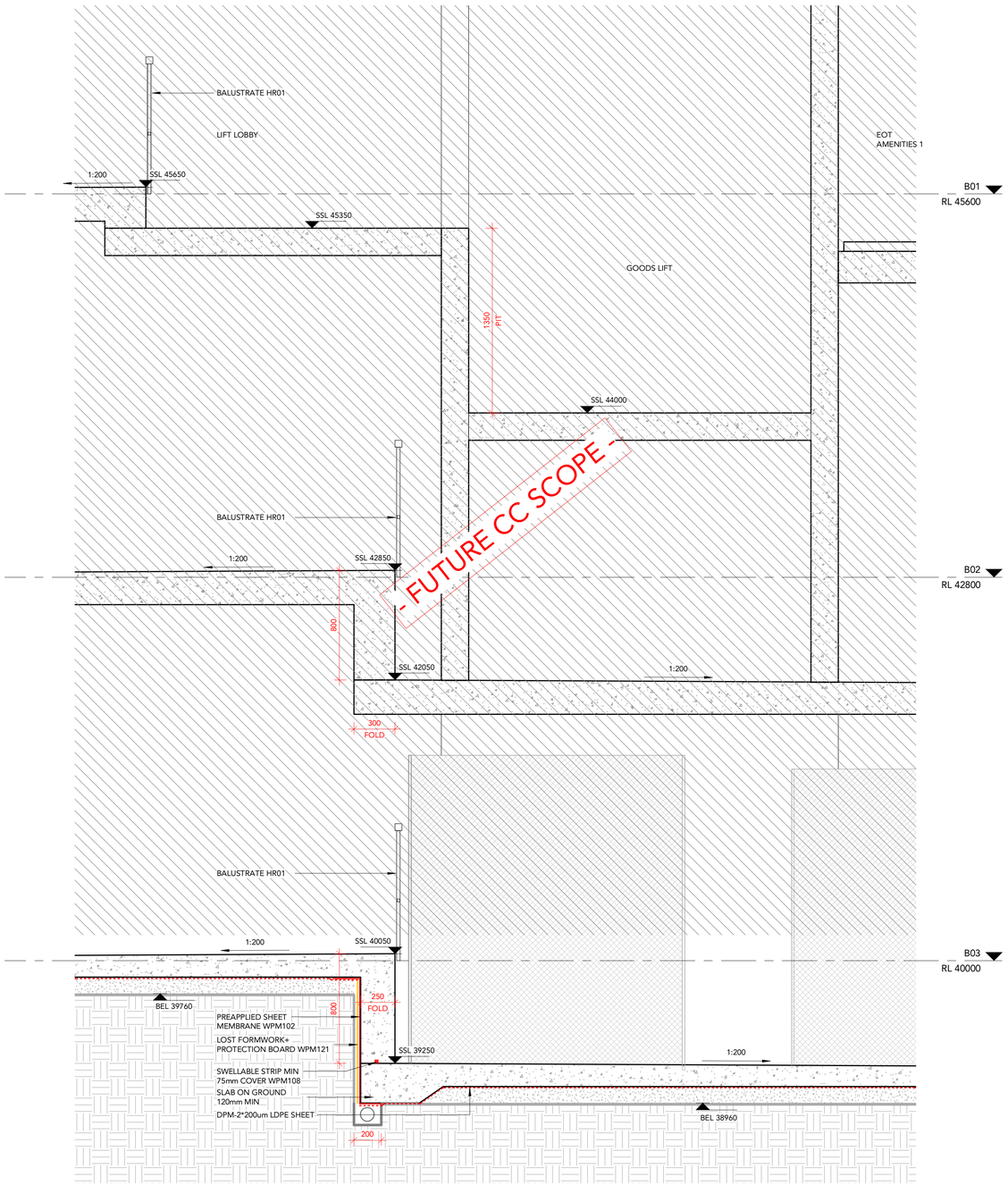
1 Ivanhoe Place, Macquarie Park
NSW



1 Basement Section 13
Scale: 1 : 20

20/03/2025 9:56:47 AM

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Regulated Design Record			
Project Address:	1 Ivanhoe Place, Macquarie Park, NSW		
Project Title	IVANHOE STAGE 2 BUILDING C3		
Consent No:	DA 2019/00096 S4.55 MOD 2020/0364	**Body Corporate Reg No:**	DEP0000532
Drawing Title: FOOTING PLAN		**Drawing Number:** S-S1040	

Rev	Date dd.mm.yy	Description	DP Full Name	Reg No
1	21.03.25	ISSUED FOR CONSTRUCTION	KEVIN BERRY	DEP0001336

City Plan Services Pty Ltd
Reference: 210791/2
Date: 03/04/2025
Construction Certificate
Chris Michaels
Director
BDC1974

FOOTING PLAN

Scale: 1 : 100

1. TOP OF FOOTINGS TO BE DETERMINED BY THE CONTRACTOR.
2. REFER TO ARCHITECTURAL DRAWINGS FOR LOCATION AND SETOUT OF ALL COLUMNS AND WALLS.
3. ALL LIFT PIT BASES AND WALLS BELOW GROUND LEVEL ARE TO HAVE XYPEX ADMIXTURE.
4. ALLOW ADDITIONAL CLEARANCE TO TOP OF FOOTINGS FOR HYDRAULIC SERVICES WHERE REQUIRED.
5. CONTRACTOR TO ALLOW FOR GEOTECHNICAL ENGINEER TO INSPECT AND CERTIFY THAT THE REQUIRED BEARING CAPACITIES HAVE BEEN ACHIEVED BEFORE CASTING FOOTINGS.
6. DENOTES BOREHOLE LOCATIONS.
   REFER TO GEOTECHNICAL REPORT No. 86043.06 BY DOUGLAS PARTERS DATED MAY 2021.
7. GEOTECHNICAL ENGINEER TO PERFORM SPOON TESTING FOR 1/3 FOOTINGS.

PAD FOOTING SCHEDULE FOR 6000kPa				
MARK	LENGTH	WIDTH	DEPTH	REINFORCEMENT
PF1	1300	1300	1000	N28-200 U BARS EACHWAY TOP AND BOTTOM
PF1A	1600	1600	1000	N28-200 U BARS EACHWAY TOP AND BOTTOM
PF2	1100	1100	1000	N20-200 U BARS EACHWAY TOP AND BOTTOM
PF3	1100	600	600	N20-200 U BARS EACHWAY TOP AND BOTTOM
PF4	1100	800	600	N24-200 U BARS EACHWAY TOP AND BOTTOM
PF5	3200	900	600	N28-200 U BARS EACHWAY TOP AND BOTTOM
PF6	850	600	600	N20-200 U BARS EACHWAY TOP AND BOTTOM

NOTE:
1. F's 50 MPa
2. GEOTECH TO PERFORM SPOON TESTING FOR 1/3 OF FOOTINGS

S1040 1
Printed : 21/03/2025 2:07:31 PM by Michael PHAM

TO BE PRINTED IN COLOUR

A1 0 1 2 3 4 5 6 7 8 9 10

FOR CONSTRUCTION

Rev	Description	Eng	Draft	Date
1	ISSUED FOR CC2	HN	MPH	21.03.25

Project
IVANHOE STAGE 2
BUILDING C3

Sheet Subject
FOOTING PLAN

Client
RICHARD CROOKES CONSTRUCTIONS
FRASERS PROPERTY

Architect
TEAM2 ARCHITECTS
www.team2.com.au

Structural Engineer
TTW Structural Civil Traffic Façade
+61 2 9439 7288 | L6 73 Miller Street North Sydney NSW 2065

Scale : A1	Drawn	Authorised
1 : 100	MPH	HN

Job No	Drawing No	Revision
211086	S1040	1

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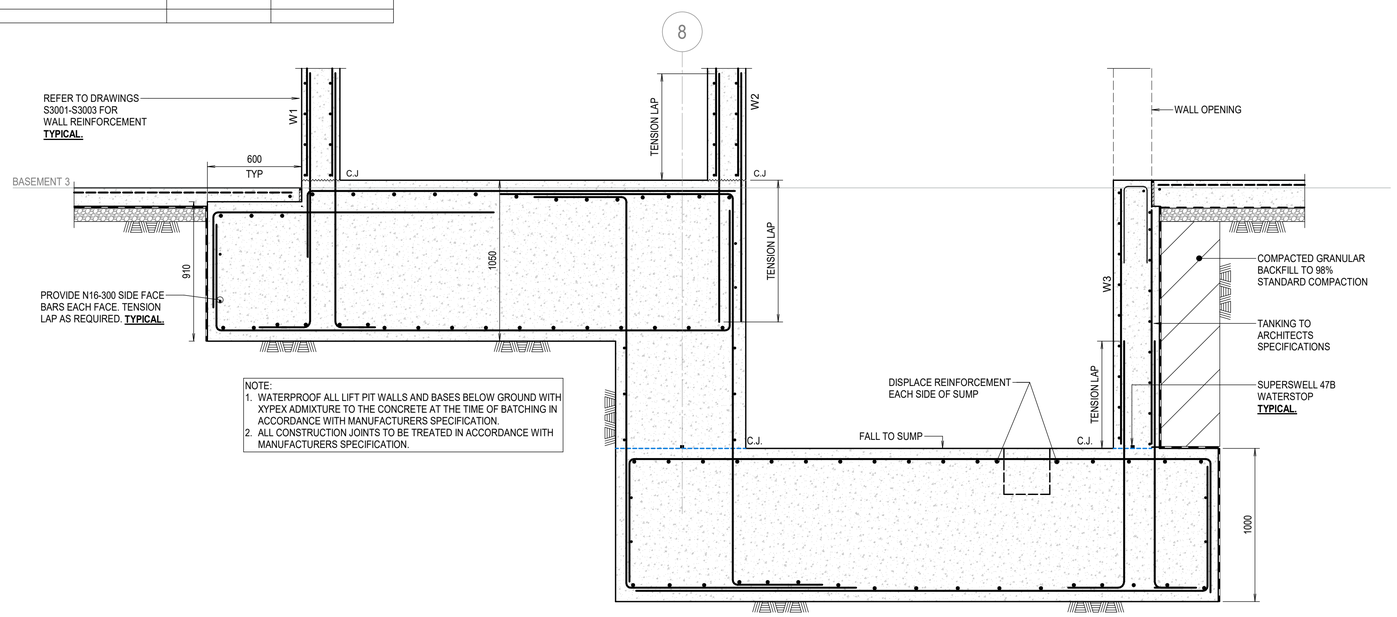
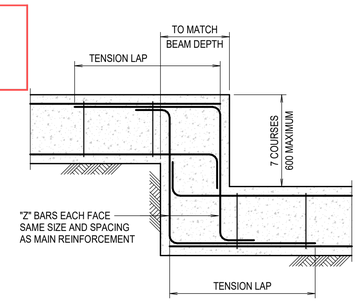
Regulated Design Record				
Project Address:	1 Ivanhoe Place, Macquarie Park, NSW			
Project Title	IVANHOE STAGE 2 BUILDING C3			
Consent No:	DA 2019/00096 S4.55 MOD 2020/0364	**Body Corporate Reg No:**	DEP0000532	
Drawing Title: FOOTING SECTIONS AND DETAILS - SHEET 1		**Drawing Number:** S-S1041		
Rev	**Date** dd.mm.yy	**Description**	**DP Full Name**	**Reg No**
1	21.03.25	ISSUED FOR CONSTRUCTION	KEVIN BERRY	DEP0001336

City Plan Services Pty Ltd
Reference: 210791/2
Date: 03/04/2025
Construction Certificate
Chris Michaels
Director
BDC1974

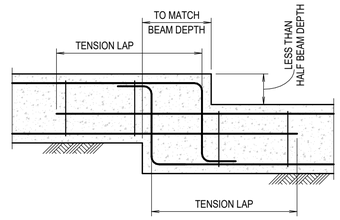


NOTE:
1. WATERPROOF ALL LIFT PIT WALLS AND BASES BELOW GROUND WITH XYPEX ADMIXTURE TO THE CONCRETE AT THE TIME OF BATCHING IN ACCORDANCE WITH MANUFACTURERS SPECIFICATION.
2. ALL CONSTRUCTION JOINTS TO BE TREATED IN ACCORDANCE WITH MANUFACTURERS SPECIFICATION.

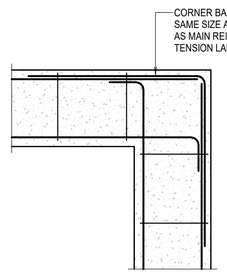
SECTION 1 / S1040
Scale 1 : 20



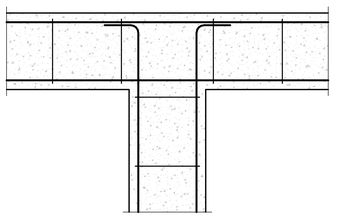
STEP GREATER THAN 1/2 BEAM DEPTH



STEP LESS THAN 1/2 BEAM DEPTH



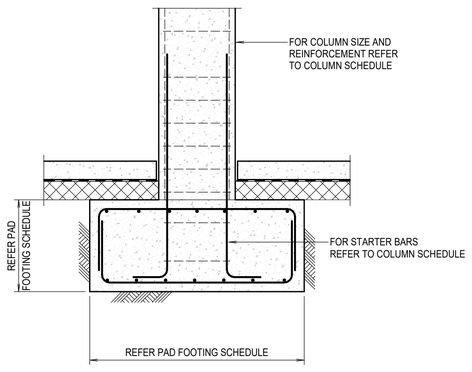
CORNER



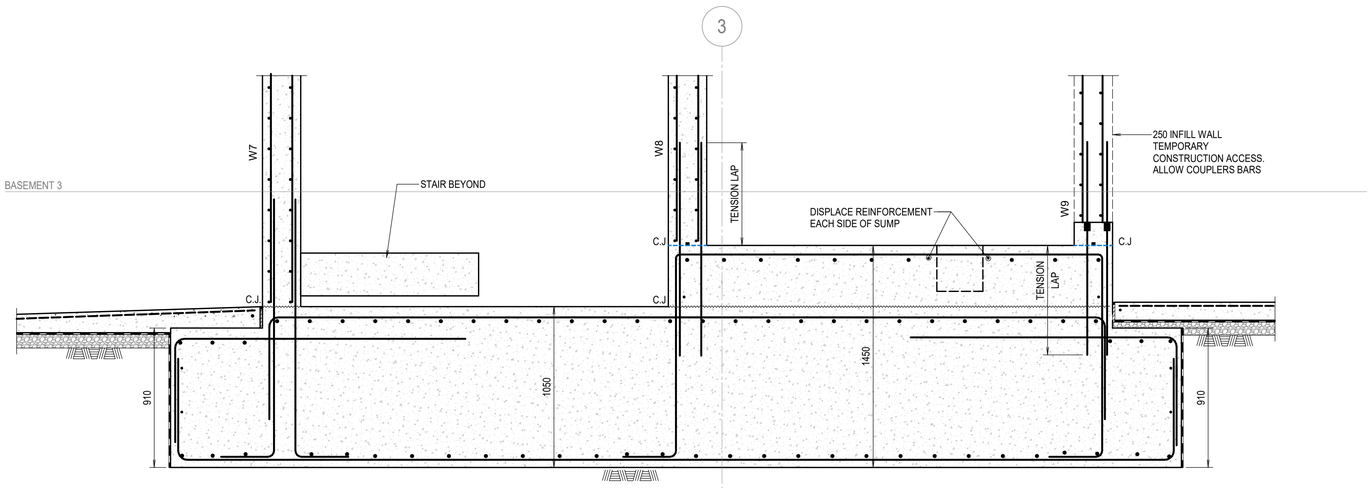
JUNCTION

STRIP FOOTING DETAILS

SCALE 1:20



TYPICAL PAD FOOTING DETAIL
SCALE 1:20



SECTION 2 / S1040
Scale 1 : 20

Rev	Description	Eng	Draft	Date
1	ISSUED FOR CC2	HN	MPH	21.03.25

Project
IVANHOE STAGE 2
BUILDING C3

Sheet Subject
FOOTING SECTIONS AND DETAILS - SHEET 1

Client
RICHARD CROOKES CONSTRUCTIONS
FRASERS PROPERTY

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Scale : A1	Drawn	Authorised
1 : 20	MPH	HN

Job No	Drawing No	Revision
211086	S1041	1

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S1041 1
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A1 0 1 2 3 4 5 6 7 8 9 10

Regulated Design Record				
Project Address:	1 Ivanhoe Place, Macquarie Park, NSW			
Project Title	IVANHOE STAGE 2 BUILDING C3			
Consent No:	DA 2019/00096 S4.55 MOD 2020/0364	**Body Corporate Reg No:**	DEP0000532	
Drawing Title: FOOTING SECTIONS AND DETAILS - SHEET 2		**Drawing Number:** S-S1042		
Rev	**Date** dd.mm.yy	**Description**	**DP Full Name**	**Reg No**
1	21.03.25	ISSUED FOR CONSTRUCTION	KEVIN BERRY	DEP0001336

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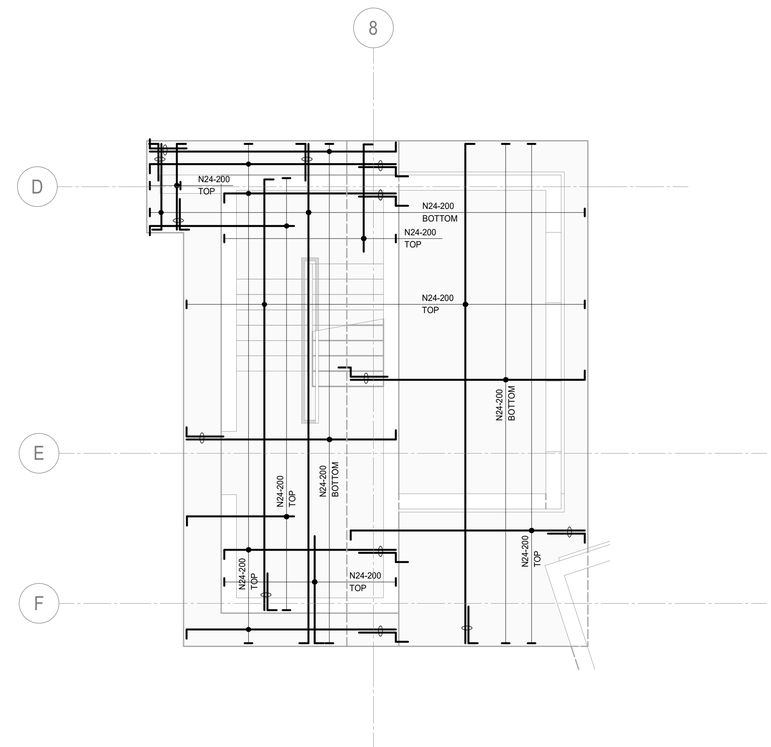
City Plan Services Pty Ltd
Reference: 210791/2
Date: 03/04/2025
Construction Certificate
Chris Michaels
Director
BDC1974

REINFORCEMENT LEGEND

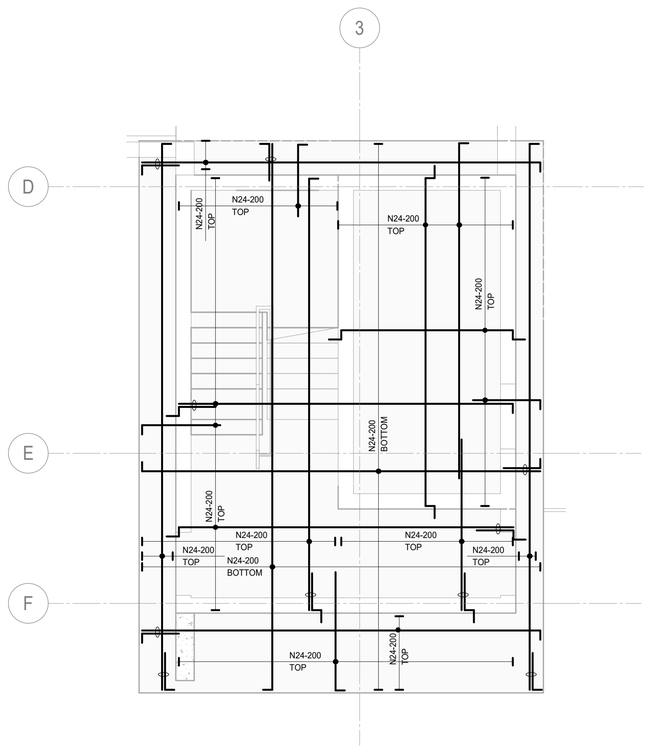
1. Denotes the extent of area covered by bars.
2. Denotes a change in bar shape and/or length.
3. T1 — Indicates to repeat bars tagged thus T1 etc. LAY BARS IN DIRECTION INDICATED BY ARROW
4. Bars shown staggered on plan are to be placed alternately.
5. ALT. denotes bars of different length and/or shape to be laid alternately.
6. 13N16 10-250+3 — Indicates 10 bars at 250 centres plus 3 bars placed one per space centrally over column.

ABBREVIATIONS USED ON DRAWINGS :

UNO	-	Unless Noted Otherwise	EW	-	Each Way
NSOP	-	Not Shown On Plan	EF	-	Each Face
NSOE	-	Not Shown On Elevation	NF	-	Near Face
LV	-	Bar Lengths Vary	FF	-	Far Face
NTS	-	Not To Scale			



BASEMENT 03 STAIR 1 & LIFT 1 REINFORCEMENT PLAN
Scale: 1 : 50



BASEMENT 03 STAIR 3 & LIFT 2 REINFORCEMENT PLAN
Scale: 1 : 50

Rev	Description	Eng	Draft	Date
1	ISSUED FOR CC2	HN	MPH	21.03.25

Project
IVANHOE STAGE 2
BUILDING C3

Sheet Subject
FOOTING SECTIONS AND DETAILS - SHEET 2

Client
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Scale : A1	Drawn	Authorised
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Job No	Drawing No	Revision
211086	S1042	1

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S1042 1
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A1 0 1 2 3 4 5 6 7 8 9 10

Regulated Design Record			
Project Address:	1 Ivanhoe Place, Macquarie Park, NSW		
Project Title	IVANHOE STAGE 2 BUILDING C3		
Consent No:	DA 2019/00096 S4.55 MOD 2020/0364	**Body Corporate Reg No:**	DEP0000532
Drawing Title: BASEMENT 03 OUTLINE PLAN		**Drawing Number:** S-S5001	

Rev	Date dd.mm.yy	Description	DP Full Name	Reg No
1	21.03.25	ISSUED FOR CONSTRUCTION	KEVIN BERRY	DEP0001336

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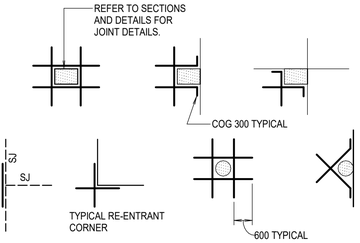

ALL TRIMMERS TO BE 1N16 UNO

TYPICAL SLAB ON GROUND TRIMMER DETAILS

SCALE 1:100

AT ALL COLUMNS, WALLS, PITS, FLOOR WASTES, ETC THAT CAUSE A PENETRATION THROUGH THE SLAB.

City Plan Services Pty Ltd
Reference: 210791/2
Date: 03/04/2025
Construction Certificate
Chris Michaels
Director
BDC1974

BASEMENT 03 OUTLINE PLAN -120 SLAB ON GROUND U.N.O..

Scale: 1 : 100

1. SLABS ON ROCK TO BE 120 THICK, CAST ON 2 LAYERS OF CONCRETE UNDERLAY (0.2mm THICK HIGH IMPACT RESISTANCE FILM TO AS/NZS 4347) OVER 50mm MINIMUM OF 10mm MAXIMUM AGGREGATE SIZE , f'c = 40 MPa, REO RATES = 90 kg/m³
2. REINFORCE SLABS ON GROUND WITH 1 LAYER OF SL82 FABRIC TOP THROUGHOUT 30 COVER
3. ALL LEVELS AND FALLS TO ARCHITECTS DETAILS.
4. REFER TO HYDRAULIC ENGINEERS DETAILS FOR ALL SUB SOIL DRAINAGE, SUMPS, PITS AND GRATED DRAINS UNO
5. REFER TO THE GEOTECHNICAL ENGINEER FOR ALL SUBBASE REQUIREMENTS.
6. STRUCTURAL DRAWINGS INDICATES MINIMUM COLUMN / WALL SIZE, REFER TO ARCHITECTURAL DRAWINGS FOR THE EXTENT.
7. ALLOW JOINTS AT 6000 CTS.
8. 200 THICK BONDEK BMT 1.0 WITH SL102 TOP MESH.

S5001 1
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A1 0 1 2 3 4 5 6 7 8 9 10

FOR CONSTRUCTION

Rev	Description	Eng	Draft	Date
1	ISSUED FOR CC2	HN	MPH	21.03.25

Project
IVANHOE STAGE 2
BUILDING C3

Sheet Subject
BASEMENT 03 OUTLINE PLAN

Client
RICHARD CROOKES CONSTRUCTIONS
FRASERS PROPERTY

Architect
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Job No	Drawing No	Revision
211086	S5001	1

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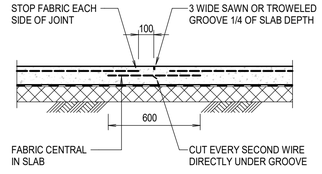
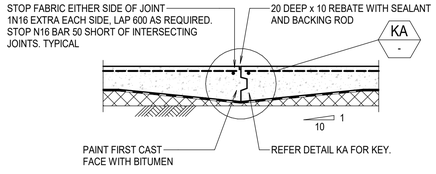
Regulated Design Record				
Project Address:	1 Ivanhoe Place, Macquarie Park, NSW			
Project Title	IVANHOE STAGE 2 BUILDING C3			
Consent No:	DA 2019/00096 S4.55 MOD 2020/0364	**Body Corporate Reg No:**	DEP0000532	
Drawing Title: TYPICAL SLAB ON GROUND DETAILS - SHEET 1		**Drawing Number:** S-S6001		
Rev	**Date** dd.mm.yy	**Description**	**DP Full Name**	**Reg No**
1	21.03.25	ISSUED FOR CONSTRUCTION	KEVIN BERRY	DEP0001336



SJ - SAWN CONTROL JOINT

SCALE 1:20

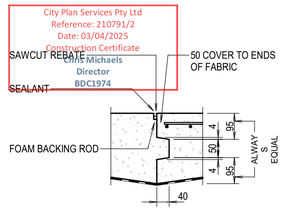
NOTE: SAWCUT TO BE MADE WITHIN 16 HOURS OF CASTING SLAB



KJ - KEYED CONSTRUCTION JOINT

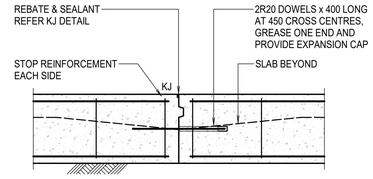
SCALE 1:20

City Plan Services Pty Ltd
Reference: 210791/2
Date: 03/04/2025
Construction Certificate
Clive Michaels
Director
BDC1974



DETAIL KA

SCALE 1:10



KJ DETAIL THROUGH EDGE THICKENING

SCALE 1:20

DOWELS TO BE GALVANISED AT ALL EXTERNAL SLABS

EDGE OF SLAB

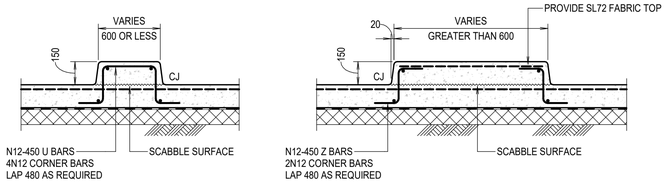
SCALE 1:20

SLAB PENETRATION

SCALE 1:20

DEJ - DOWELLED EXPANSION JOINT

SCALE 1:20



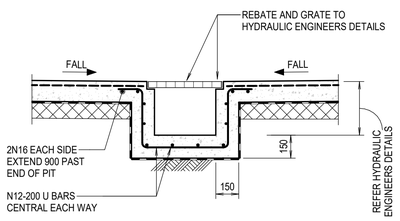
FOR KERBS 600 WIDE OR LESS

FOR KERBS 600 WIDE OR GREATER

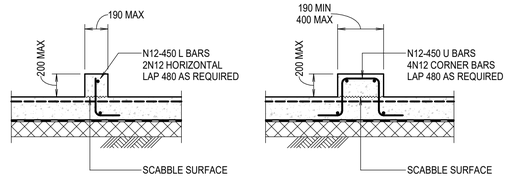
TYPICAL KERB DETAILS

SCALE 1:20

1. REFER ARCHITECTURAL DRAWINGS FOR KERB SIZE AND LOCATIONS.
2. JOINTS IN KERBS TO CORRESPOND WITH SLAB JOINT LOCATIONS.
3. ALTERNATE DRILL AND EPOXY N12-300, 100 EMBEDMENT INTO SLAB.



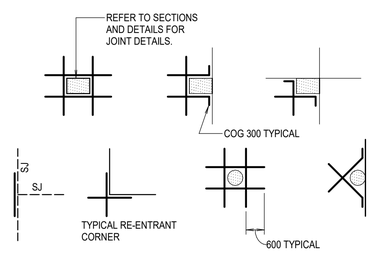
TYPICAL PIT DETAIL



TYPICAL HOB DETAILS

SCALE 1:20

1. REFER ARCHITECTURAL DRAWINGS FOR HOB SIZE AND LOCATIONS.
2. JOINTS IN HOBS TO CORRESPOND WITH SLAB JOINT LOCATIONS.
3. ALTERNATE DRILL AND EPOXY N12-300, 100 EMBEDMENT INTO SLAB.



ALL TRIMMERS TO BE 1N16 UNO

TYPICAL SLAB ON GROUND TRIMMER DETAILS

SCALE 1:100

AT ALL COLUMNS, WALLS, PITS, FLOOR WASTES, ETC THAT CAUSE A PENETRATION THROUGH THE SLAB.

Rev	Description	Eng	Draft	Date
1	ISSUED FOR CC2	HN	MPH	21.03.25

Project

IVANHOE STAGE 2
BUILDING C3

Sheet Subject

TYPICAL SLAB ON GROUND DETAILS - SHEET 1

Client

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FRASERS PROPERTY

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Structural Engineer

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Scale : A1	Drawn	Authorised
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Job No	Drawing No	Revision
211086	S6001	1

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S6001 1
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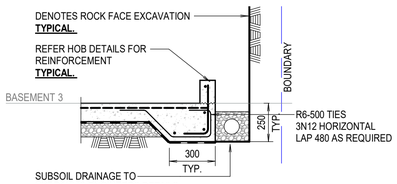
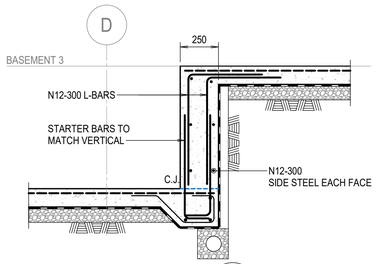
Regulated Design Record				
Project Address:	1 Ivanhoe Place, Macquarie Park, NSW			
Project Title	IVANHOE STAGE 2 BUILDING C3			
Consent No:	DA 2019/00096 S4.55 MOD 2020/0364	**Body Corporate Reg No:**	DEP0000532	
Drawing Title: BASEMENT 03 SECTIONS - SHEET 1		**Drawing Number:** S-S6011		

Rev	Date dd.mm.yy	Description	DP Full Name	Reg No
1	21.03.25	ISSUED FOR CONSTRUCTION	KEVIN BERRY	DEP0001336

City Plan Services Pty Ltd
Reference: 210791/2
Date: 03/04/2025
Construction Certificate
Chris Michaels
Director
BDC1974



SECTION 1 — Scale 1 : 20 — S5001



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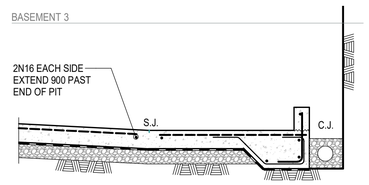

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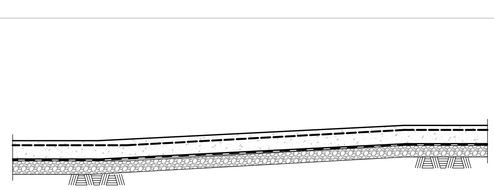

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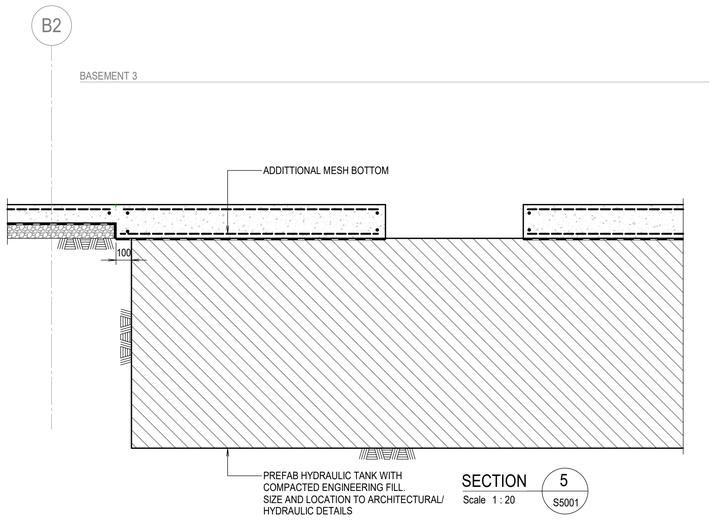

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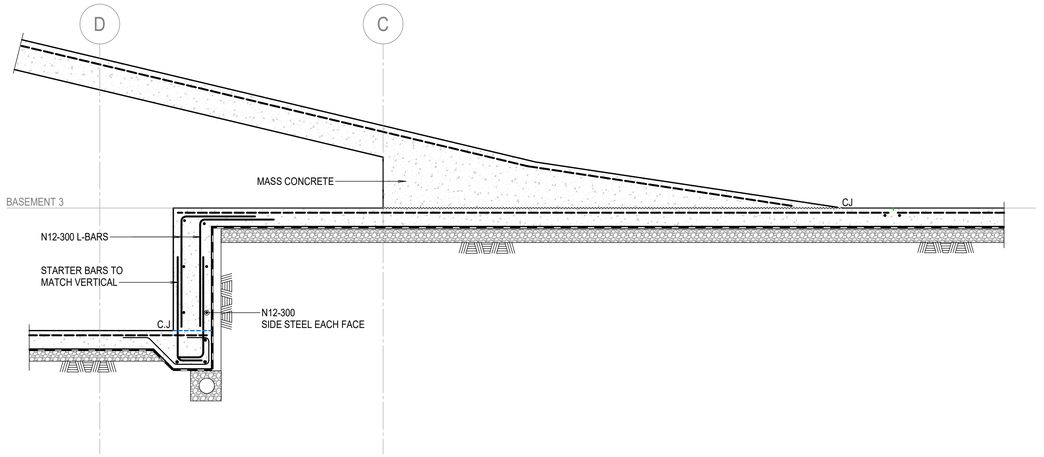

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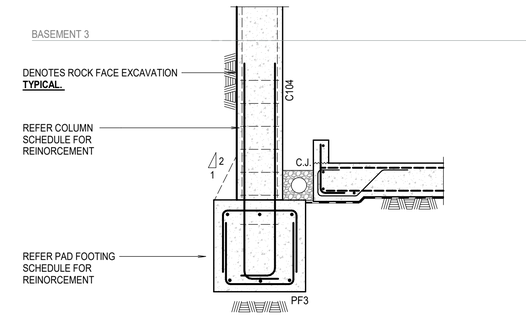
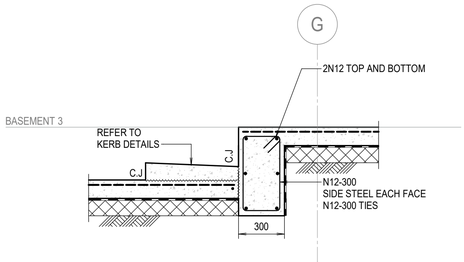


SECTION 7 — Scale 1 : 20 — S5001



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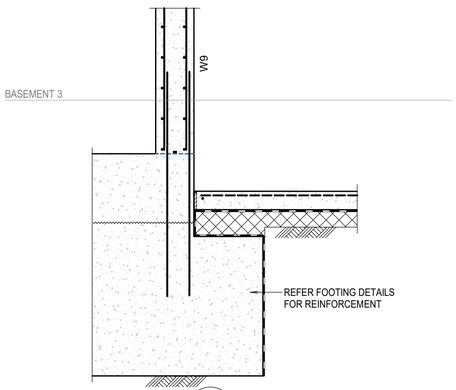

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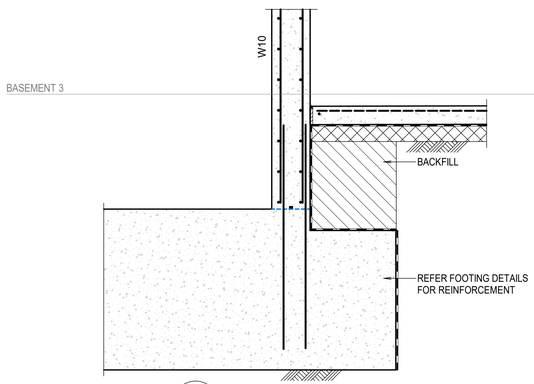

SECTION 10 — Scale 1 : 20 — S5001

Rev	Description	Eng	Draft	Date
1	ISSUED FOR CC2	HN	MPH	21.03.25

Project
IVANHOE STAGE 2
BUILDING C3

Sheet Subject
BASEMENT 03 SECTIONS - SHEET 1

Client
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Scale : A1	Drawn	Authorised
1 : 20	MPH	HN

Job No	Drawing No	Revision
211086	S6011	1

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S6011 1
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A1 0 1 2 3 4 5 6 7 8 9 10

FOR CONSTRUCTION

Regulated Design Record	
Project Address: NO. 1 IVANHOE PLACE, MACQUARIE PARK NSW 2113	
Project Title: C3 MIDTOWN TREEHOUSE	
Consent No: SSD-10405	Body Corporate Reg No: DEP0001273
Drawing Title: COVER PAGE & DRAWING SCHEDULE	Drawing No: H1101

Rev	Date	Description	DP Full Name	Reg No
A	21.03.2025	CC2 DECLARED DESIGN	LEONARDO DIMINO	BDC3360

City Plan Services Pty Ltd
Certified Design Professional
Chris Hamilton
Director
BDC1074

C3 - MIDTOWN TREEHOUSE
1 IVANHOE PLACE, MACQUARIE PARK NSW 2113
HYDRAULIC SERVICES

LOCALITY PLAN
NOT TO SCALE - COURTESY OF SIX MAPS

HYDRAULIC DRAWING SCHEDULE	
H1101	COVER PAGE & DRAWING SCHEDULE
H1201	SPECIFICATION SHEET 1
H1202	SPECIFICATION SHEET 2
H1203	SPECIFICATION SHEET 3
H2101	GRAVITY SERVICES PLAN - BASEMENT 3
H2102	GRAVITY SERVICES PLAN - BASEMENT 2
H2103	GRAVITY SERVICES PLAN - BASEMENT 1
H2104	GRAVITY SERVICES PLAN - GROUND FLOOR
H2105	GRAVITY SERVICES PLAN - LEVEL 1
H2106	GRAVITY SERVICES PLAN - LEVEL 2
H2107	GRAVITY SERVICES PLAN - LEVEL 3
H2108	GRAVITY SERVICES PLAN - LEVEL 4
H2109	GRAVITY SERVICES PLAN - LEVEL 5
H2110	GRAVITY SERVICES PLAN - LEVEL 6
H2111	GRAVITY SERVICES PLAN - LEVEL 7
H2112	GRAVITY SERVICES PLAN - LEVEL 8
H2113	GRAVITY SERVICES PLAN - LEVEL 9
H2114	GRAVITY SERVICES PLAN - LEVEL 10
H2115	GRAVITY SERVICES PLAN - LEVEL 11
H2116	GRAVITY SERVICES PLAN - LEVEL 12
H2117	GRAVITY SERVICES PLAN - LEVEL 13
H2118	GRAVITY SERVICES PLAN - LEVEL 14
H2119	GRAVITY SERVICES PLAN - LEVEL 15
H2120	GRAVITY SERVICES PLAN - LEVEL 16

HYDRAULIC DRAWING SCHEDULE	
H2121	GRAVITY SERVICES PLAN - ROOF PLAN
H3101	PRESSURE SERVICES PLAN - BASEMENT 3
H3102	PRESSURE SERVICES PLAN - BASEMENT 2
H3103	PRESSURE SERVICES PLAN - BASEMENT 1
H3104	PRESSURE SERVICES PLAN - GROUND FLOOR
H3105	PRESSURE SERVICES PLAN - LEVEL 1
H3106	PRESSURE SERVICES PLAN - LEVEL 2
H3107	PRESSURE SERVICES PLAN - LEVEL 3
H3108	PRESSURE SERVICES PLAN - LEVEL 4
H3109	PRESSURE SERVICES PLAN - LEVEL 5
H3110	PRESSURE SERVICES PLAN - LEVEL 6
H3111	PRESSURE SERVICES PLAN - LEVEL 7
H3112	PRESSURE SERVICES PLAN - LEVEL 8
H3113	PRESSURE SERVICES PLAN - LEVEL 9
H3114	PRESSURE SERVICES PLAN - LEVEL 10
H3115	PRESSURE SERVICES PLAN - LEVEL 11
H3116	PRESSURE SERVICES PLAN - LEVEL 12
H3117	PRESSURE SERVICES PLAN - LEVEL 13
H3118	PRESSURE SERVICES PLAN - LEVEL 14
H3119	PRESSURE SERVICES PLAN - LEVEL 15
H3120	PRESSURE SERVICES PLAN - LEVEL 16
H5101	DETAILS SHEET 1
H5102	DETAILS SHEET 2

0 2 5 10m

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REFERENCES

DATE	AMENDMENT	INIT	REV
07.02.25	PRELIMINARY ISSUE	AD	1
07.03.25	PRELIMINARY ISSUE	SW	2
14.03.25	DRAFT CC2 ISSUE	JF	3
20.03.25	CC2 ISSUE PRE DECLARE	JF	4
21.03.25	CC2 DECLARED DESIGN	JF	A

DATE	AMENDMENT	INIT	REV

STRUCTURAL
MECHANICAL
ELECTRICAL
CIVIL

CLIENT
FRASERS PROPERTY
FRASERS PROPERTY
1 HOMEBUSH BAY DRIVE
RHODES, NSW 2138

BUILDER
RICHARD CROOKES CONSTRUCTIONS
RICHARD CROOKES
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PROJECT
C3 MIDTOWN TREEHOUSE
1 IVANHOE PLACE, MACQUARIE PARK
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PRELIMINARY ISSUE

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DRAWING TITLE
HYDRAULIC SERVICES
COVER PAGE & DRAWING SCHEDULE

DATE	DRAWN	DESIGNED	CHECKED
MAR. 2025	AD	II	-

SCALE	SIZE	REVISION
N.T.S.	A1	A

PROJECT No 25023
DRAWING No H1101

Regulated Design Record

Project Address: NO. 1 IVANHOE PLACE, MACQUARIE PARK NSW 2113

Project Title: C3 MIDTOWN TREEHOUSE

Consent No: SSD-10405 | Body Corporate Reg No: DEP0001273

Drawing Title: SPECIFICATION SHEET 1 | Drawing No: H1201

Rev	Date	Description	DP Full Name	Reg No
A	21.03.2025	CC2 DECLARED DESIGN	LEONARDO DIMINO	BDC3360

LEGEND

DRAWING SYMBOLS

FH	FIRE HYDRANT
	DUAL SUCTION POINTS
DFH	DUAL FIRE HYDRANT
	BOOSTER ASSEMBLY (DCV)
FHR	FIRE HOSE REEL
CO	CLEAROUT
FW	FLOOR WASTE
RWO	RAINWATER OUTLET
ORG	OVERFLOW RELIEF GULLY
BT	BOUNDARY TRAP
	CONNECT INTO EXISTING
GM	GAS METER
WM	WATER METER
	CAPPED SERVICE
	CONTINUED OVER/UNDER
	CONTINUED UNKNOWN
	PIPE RISER
	PIPE DROPPER
	PIPE TEE RISER
	PIPE TEE DROPPER
	PIPE CAST-IN SLAB (CIS)
	PUMP
	BALANCING VALVE
	FLOAT VALVE
	FLOW SWITCH
	FLUSH SENSOR
	GAS ISOLATION VALVE
	GAS MAIN VALVE
	GAS OVER PRESSURE SHUT-OFF
	GAS REGULATOR
	ISOLATION PATH VALVE
	ISOLATION VALVE
	MONITOR VALVE
	NON-RETURN VALVE
	RATIO VALVE
	REFLUX PATH VALVE
	REFLUX VALVE
	RPZD VALVE
	SOLENOID VALVE
	STRAINER
	TEMPERATURE PRV
	STORMWATER PIT (SOLID LID)
	STORMWATER PIT (GRATED LID)
	SEWER MAN HOLE
ST	RISER
100	SERVICE SIZE DROPPER
H1.01	FOR CONTINUATION REFER TO DWG No.

LINETYPES

CW	COLD WATER
FCW	FILTERED COLD WATER
IRR	IRRIGATION
NPCW	NON POTABLE COLD WATER
NPHW	NON POTABLE COLD WATER
CONDUIT	ELECTRICAL CONDUIT
DEX	DIESEL EXHAUST
FD	FIRE DRENCHER
FHR	FIRE HOSE REEL
FH	FIRE HYDRANT
FS	FIRE SPRINKLER
DR	FIRE SPRINKELR DRAIN
GAS	NATURAL GAS
LPG	LIQUEFIED PETROLIUM GAS
HW	HOT WATER
HWR	HOT WATER RETURN
PG	PRESSURE GAUGE
RW	RAINWATER DRAINAGE
RWR	RAINWATER REUSE
RM	SEWER RISING MAIN
SRM	STORMWATER RISING MAIN
SD	SANITARY DRAINAGE (PVC-U)
SD(HDPE)	SANITARY DRAINAGE (HDPE)
SIP	SIPHONIC DRAINAGE
SOF	SIPHONIC OVERFLOW DRAINAGE
SLEEVE	SLEEVE (FUTURE)
SW	STORMWATER
SWOF	STORMWATER DRAINAGE
SSD	SUBSOIL DRAINAGE
SL	SUCTION LINE
TW	TRADEWASTE
CVP	CHAMBER VENT PIPE
GCVP	GREASE CHAMBER VENT PIPE
VP	VENT PIPE
TWVP	TRADEWASTE VENT PIPE
WW	WARM WATER
WWR	WARMWATER RETURN

ABBREVIATIONS

AAV	AIR ADMITTANCE VALVE
A/C	AIR CONDITIONING UNIT
B	BASIN
BG	BOX GUTTER
BO	BALCONY OUTLET
BT	BOUNDARY TRAP
BTFW	BUCKET TRAP FLOOR WASTE
BTH	BATH
BWU	BOILING WATER UNIT
CI	CAST IRON
CIC	CAST IN COLUMN
CICL	CAST IRON CONCRETE LINED
CIS	CAST IN SLAB
CO	CLEAR OUT
CS	CLEANERS SINK
CT	COOKTOP
CW	COLD WATER
C/W	COMPLETE WITH
CVP	CHAMBER VENT PIPE
DCDV	DOUBLE CHECK DETECTOR VALVE
DF	DRINKING FOUNTAIN
DFH	DOUBLE FIRE HYDRANT
DICL	DUCTILE IRON PIPE
DTU	DRAINAGE TURN UP
DP	DOWNPIPE
DW	DISHWASHER
EA	EACH
EG	EAVES GUTTER
EW	EYE WASH
EX	EXISTING
FC	FIRE COLLAR
FH	FIRE HYDRANT
FHR	FIRE HOSE REEL
FTW	FOOT WASHER
FW	FLOOR WASTE
GB	GAS BAYONET
GD	GRATED DRAIN
HD	HEAVY DUTY
HDPE	HIGH DENSITY POLYETHYLENE
H/L	HIGH LEVEL
HH	HEAD HEIGHT
HP	HIGH POINT
HT	HOSE TAP
HW	HOT WATER
HWR	HOT WATER RETURN
HWU	HOT WATER UNIT
IL	INVERT LEVEL
IPMF	INDUCT PIPE MICA FLAP
IRR	IRRIGATION
L	LITRES
L/L	LOW LEVEL
LT	LAUNDRY TUB
KPa	KILOPASCAL
KS	KITCHEN SINK
MDL	METER DATA LOGGER
MIN	MINIMUM
m	METRES
mm	MILLIMETERS
MPa	MEGAPASCAL
No.	NUMBER
O/F	OVERFLOW
ORG	OVERFLOW RELIEF GULLY
OSD	ON SITE DETENTION
PBO	PLANTER BOX OUTLET
PG	PRESSURE GAUGE
PLV	PRESSURE LIMITING VALVE
PRV	PRESSURE RELIEF VALVE
PS	PAN STERILIZER
psi	POUNDS PER SQUARE INCH
RCP	REINFORCED CONCRETE PIPE
REV	REVISION
RH	RAIN HEAD
RHS	RECTANGULAR HOLLOW SECTION
RHT	RECYCLE HOSE TAP
RL	REDUCED LEVEL
RO	REVERSE OSMOSIS
RPZD	REDUCED PRESSURE ZONE DEVICE
RV	RELIEF VENT
RWO	RAINWATER OUTLET
RWR	RAINWATER RE-USE
RWT	RAINWATER TANK
SA	SUDS ARRESTOR
SB	SURGEON BASIN
SD	SANITARY DRAINAGE
SDO	SPOON DRAIN OUTLET
SDP	SIPHONIC DOWNPIPE
SGO	SPOON GUTTER OUTLET
SHR	SHOWER
SK	SINK
S/S	STAINLESS STEEL
SMH	SEWER MANHOLE
SRM	SEWER RISING MAIN
SW	STORMWATER
SWRM	STORMWATER RISING MAIN
SWP	STORMWATER PIT
SWS	STORMWATER SUMP
SYP	SYPHONIC DRAINAGE
ST	SEWER STACK
STW	STORMWATER
SV	STACK VENT
TB	THRUST BLOCK
TBC	TO BE CONFIRMED
TD	TUNDISH
TMV	THERMOSTATIC MIXING VALVE
TR	TROUGH
TTD	TRAPPED TUNDISH
TW	TRADE WASTE
TWV	TRADE WASTE VENT PIPE
U.N.O.	UNLESS NOTED OTHERWISE
uPVC	UNPLASTICISED POLYVINYL CHLORIDE
Ur	URINAL
VP	VENT PIPE
WC	WATER CLOSET
WW	WARM WATER
WWR	WARM WATER RETURN
VB	VACUUM BREAKER
VSD	VARIABLE SPEED DRIVE
VP	VENT PIPE

GENERAL

1. ALL WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH RELEVANT AUTHORITY REQUIREMENTS, COUNCIL REGULATIONS, SUPERINTENDENT'S APPROVAL, THE NCC VOLUME 3, AS.1596, AS.1841, AS.2444, AS.3500, AS.5601 & AS.2419.1 2005.

2. THIS PLAN SHALL BE READ IN CONJUNCTION WITH APPROVED ARCHITECTURAL, STRUCTURAL, MECHANICAL, ELECTRICAL AND LANDSCAPE PLANS AND SPECIFICATIONS.

3. EXISTING SERVICES HAVE BEEN PLOTTED FROM SUPPLIED DATA. THE SUPERINTENDENT DOES NOT GUARANTEE THEIR ACCURACY AND IT IS THE CONTRACTOR'S RESPONSIBILITY TO ESTABLISH THE LOCATION OF ALL EXISTING SERVICES PRIOR TO COMMENCEMENT OF ANY WORK. CLEARANCES SHALL BE OBTAINED FROM THE RELEVANT AUTHORITY.

4. THE EXTENT OF THE HYDRAULICS WORK COVERED IN THE DOCUMENTATION AND AS SHOWN ON THE DRAWINGS CONSISTS OF THE FOLLOWING BUT NOT LIMITED TO:
   a. SUB-SOIL DRAINAGE
   b. STORMWATER DRAINAGE
   c.SANITARY PLUMBING
   d. DOMESTIC COLD WATER
   e. DOMESTIC HOT WATER
   f.DOMESTIC WARM WATER
   g. GAS SERVICE
   h. FIRE HYDRANT SERVICE
   i. FIRE HOSE REEL SERVICE
   j. SANITARY FIXTURES AND TAPWARE

5. ALL SERVICES SHALL BE FREE OF EACH OTHER AND EASILY REPLACEABLE FOR THEIR FULL LENGTH. PIPES SHALL BE SO ARRANGED WITH INSPECTION OPENINGS, VALVES, AND SIMILAR ITEMS OF EQUIPMENT PLACED TO BE ACCESSIBLE.

6. WHEREVER POSSIBLE, PIPES SHALL RETICULATE PARALLEL WITH EACH OTHER, MINIMISE CROSSOVERS AND UNSIGHTLY GROUPINGS. ALL PIPES SHALL BE ACCURATELY SET OUT, FULLY DESIGNED AND COORDINATED PRIOR TO COMMENCING FABRICATION AND INSTALLATION.

7. WHERE DIRECTED, SAMPLES OF EACH TYPE OF MATERIAL TO BE USED SHALL BE LABELED AND SUBMITTED FOR APPROVAL DETAILING MANUFACTURE AND SOURCE OF SUPPLY. AFTER APPROVAL THE MATERIALS DELIVERED TO THE WORKS SHALL BE IN ACCORDANCE WITH THE APPROVED SAMPLES.

8. IN THE EVENT OF THE SYSTEM INSTALLED BEING OF A MIXED MATERIAL AND QUALITY, THE SUPERINTENDENT SHALL HAVE JURISDICTION TO ORDER TO HAVE THOSE PORTIONS OF THE MATERIALS WHICH ARE SUITABLE FOR THE WORKS, PICKED OUT, MARKED AND STACKED WHERE DIRECTED AND ALL DEFECTIVE OR UNSUITABLE MATERIALS REMOVED FROM THE SITE.

9. SITE MODIFICATIONS, DIVERSIONS AND/OR DISCONNECTIONS AFFECTING SUPPLY SHALL BE REPORTED IMMEDIATELY. PROVIDE ALL NECESSARY ASSISTANCE FOR REINSTATEMENT OF SERVICE IN CONJUNCTION WITH THE SUPERINTENDENT AND THE AUTHORITIES.

10. DURING CONSTRUCTION, LEAVE ALL UNFINISHED WORK IN A SAFE CONDITION, PROTECTING THE WORKS AGAINST DAMAGE, SEAL OFF OPEN ENDS OF PIPES IN SUCH A MANNER AS TO PREVENT THE ENTRY OF FOREIGN MATTER INTO THE LINES, UNTIL THE WORKS HAVE BEEN HANDED OVER ON COMPLETION.

11. THE CONTRACTOR SHALL ALLOW TO PAY ALL NECESSARY FEES AND CHARGES AND OBTAIN APPROVAL CERTIFICATES ASSOCIATED WITH THE DESIGN DOCUMENTATION AND INSTALLATION OF HYDRAULIC SERVICES WORKS FROM THE RELEVANT AUTHORITY. SUBMIT ALL APPROVAL CERTIFICATES TO THE SUPERINTENDENT.

12. TENDERERS ARE REQUIRED TO VISIT AND INSPECT PRIOR TO TENDERING TO FAMILIARISE THEMSELVES WITH ITS CONDITION, MEANS OF ACCESS, WORKING SPACE, LEVELS AND ALLOW FOR IN THE TENDER ALL NECESSARY ITEMS WHICH ARE IMPLIED BUT WHICH MAY NOT BE STATED. THE TENDERER ACKNOWLEDGES THAT BEFORE TENDERING THEY HAVE INSPECTED THE SITE AND HAS BECOME CONVERSANT WITH ALL VISIBLE EXISTING CONDITIONS OF ACCESS TO THE SITE AND HAS ALLOWED FOR ALL SUCH FACTORS IN THEIR TENDER. NO CLAIMS ARISING FROM THE NEGLECT OF THE FOREGOING ON THE GROUNDS OF IGNORANCE OF THE AMOUNT AND KIND OF WORK INVOLVED AND THE CONDITIONS UNDER WHICH THE WORKS WILL BE EXECUTED, WILL BE APPROVED.

13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE RECTIFICATION OF ALL DEFECTS IN THE WORK DUE TO FAULTY MATERIALS AND/OR WORKMANSHIP FOR THE DURATION OF THE TWELVE (12) MONTHS, THE DEFECTS LIABILITY PERIOD COMMENCING FROM THE DATE OF PRACTICAL COMPLETION OR AS AGREED WITH SUPERINTENDENT. SUCH DEFECTS SHALL BE MADE GOOD IMMEDIATELY ON RECEIPT BY THE CONTRACTOR ON ADVICE FROM THE SUPERINTENDENT. ANY DEFECTS DISCOVERED DURING THE DEFECTS LIABILITY PERIOD WHICH ARE DUE TO DEFAULT OR NEGLIGENCE BY THE CONTRACTOR IN THE PERFORMANCE OR OBSERVANCE OF ANY OF HIS OBLIGATIONS, SHALL EXTEND THE PERIOD TO ENABLE SUCH DEFECTS TO BE MADE GOOD BY THE CONTRACTOR AND TO ALLOW THE WHOLE WORK AFTER BEING MADE GOOD IN EVERY WAY, TO BE PROVED SATISFACTORY.

14. WHEN IN THE OPINION OF THE SUPERINTENDENT, THE BUILDING AND THE WORKS ARE PRACTICALLY COMPLETED, A NOTICE OF PRACTICAL COMPLETION WILL BE ISSUED, STATING THE DATE UPON WHICH THE WORKS WERE PRACTICALLY COMPLETED. THIS DATE SHALL BE THE DATE FROM WHICH THE GUARANTEE, WARRANTY AND DEFECTS LIABILITY PERIODS SHALL OPERATE. THIS NOTICE WILL NOT BE ISSUED UNTIL THE SYSTEMS HAVE BEEN PROPERLY COMMISSIONED AND UNTIL THE CONTRACTOR HAS SUPPLIED OPERATING AND MAINTENANCE INSTRUCTIONS.

15. ON PRACTICAL COMPLETION THE CONTRACTOR IS TO PRODUCE CERTIFICATION FOR ALL HYDRAULIC SERVICES INSTALLED BY THE CONTRACTOR AS REQUIRED BY THE BCA, LOCAL COUNCIL, AUSTRALIAN STANDARDS & PROJECT REQUIREMENTS.

16. THE CONTRACTOR SHALL THOROUGHLY EXAMINE THE DRAWINGS, CHECK ALL INDICATED DIMENSIONS IMMEDIATELY DURING THE CONTRACT AND OBTAIN SUCH INFORMATION AND MEASUREMENTS AS MAY BE REQUIRED TO CARRY OUT THE WORK. ALLOW TO NOTIFY ANY DISCREPANCIES AND HAVE THEM VERIFIED BY THE SUPERINTENDENT. CAREFULLY SUPERVISE, LAYOUT, CHECK AND DO ALL LEVELING AND MEASURING NECESSARY TO PROPERLY PLACE WORK. UNDER NO CIRCUMSTANCES SHALL PAYMENT BE MADE FOR REINSTALLATION OR ALTERATION OR WORK INCORRECTLY PLACED DUE TO INSUFFICIENT SUPERVISION AND INSTALLATION PRIOR TO ONSITE VERIFICATION.

17. THE CONTRACTOR SHALL ALLOW TO DELIVER TO THE PROJECT MANAGER BEFORE APPLICATION FOR NOTICE OF PRACTICAL COMPLETION FOR CHECKING ONE COPY OF THE WORK AS EXECUTED DRAWINGS, ACCURATELY INDICATING THE INVERT DEPTHS AND INSTALLED POSITION OF ALL SERVICES, FIXTURES, FITTINGS, VALVES, INCLUDING DIAGRAMMATIC, DETAILS, DRAWINGS AND MAINTENANCE MANUALS. ANY NECESSARY CORRECTIONS WILL BE MADE AND A FURTHER COPY OF THE WORK AS EXECUTED DRAWINGS SUBMITTED TO THE PROJECT MANAGER/ SUPERINTENDENT FOR CHECKING.

18. GUARANTEE THE PERFORMANCE OF THE INSTALLATIONS UNDER NORMAL WORKING CONDITIONS FOR A PERIOD OF TWELVE (12) MONTHS FROM THE DATE OF PRACTICAL COMPLETION OF THE WORKS. SHOULD THE INSTALLATION OF ANY PART FAIL TO FULFIL THE REQUIREMENTS OF THIS SPECIFICATION, PERFORMANCE OF THE RELEVANT EQUIPMENT SHALL BE CORRECTED BY THE CONTRACTOR AT HIS OWN EXPENSE OR THE EQUIPMENT WILL BE LIABLE TO REJECTION. BE RESPONSIBLE FOR THE REPLACEMENT OF ANY PORTION OF THE INSTALLATIONS SO REJECTED AND FOR ALL COSTS INCURRED THEREBY, INCLUDING THE COSTS OF ANY ASSOCIATED WORKS OR OTHER TRADES. THE GUARANTEE PERIOD FOR THE REPLACED PORTION SHALL THEN BE EXTENDED TO COVER TWENTY-FOUR (24) MONTHS TROUBLE-FREE PERFORMANCE.

19. SUBMIT WORKSHOP DRAWINGS AND DETAILED CALCULATIONS FOR APPROVAL PRIOR TO THE INSTALLATION SHOWING DETAILS OF THE FABRICATION AND INSTALLATION OF ALL HYDRAULIC SERVICES AND EQUIPMENT, INCLUDING RELATIONSHIP TO BUILDING STRUCTURE AND SERVICES, SERVICE TYPE AND SIZE, AND MARKING DETAILS. CO-ORDINATE WORKS SHOWN DIAGRAMMATICALLY IN THE CONTRACT DOCUMENTS AND SUBMIT DIMENSIONED SETOUT DRAWINGS.

TESTING AND INSPECTION

1. THE CONTRACTOR SHALL PAY ALL COST FOR THE TESTING OF THE INSTALLATION AND COSTS FOR INSPECTION BY LOCAL AUTHORITY, UNO.

2. THE CONTRACTOR SHALL UNDERTAKE ALL OF THE TESTING REQUIREMENTS OF THESE DRAWINGS, THE CONTRACT DOCUMENTS, RELEVANT CODES, STANDARDS AND LEGISLATION, UNO.

SITE WORKS

1. ALL WORKS TO BE IN ACCORDANCE WITH LOCAL RELEVANT COUNCIL REQUIREMENTS, SPECIFICATIONS, AUSTRALIAN STANDARDS. CONFLICTS SHALL BE REFERRED TO THE SUPERINTENDENT FOR DIRECTION.

2. THIS SPECIFICATION IS TO BE READ IN CONJUNCTION WITH THE ENGINEERING PLANS, AND ANY OTHER PLANS OR WRITTEN INSTRUCTIONS THAT MAY BE ISSUED AND RELATING TO DEVELOPMENT AT THE SUBJECT SITE.

3. THE CONTRACTOR SHALL OBTAIN ALL APPROVALS AND CARRY OUT REQUIRED TEMPORARY TRAFFIC CONTROL PROCEDURES DURING CONSTRUCTION IN ACCORDANCE WITH RTA AND LOCAL COUNCIL REGULATIONS AND REQUIREMENTS.

4. THE CONTRACTOR IS OBLIGATED TO INSPECT THE SITE AND SATISFY THEMSELVES AS TO THE CONDITIONS UNDER WHICH HIS WORK WILL BE CARRIED OUT.

5. REINSTATE ALL PAVED, COVERED, GRASSED AND LANDSCAPED AREAS TO THEIR ORIGINAL CONDITION ON COMPLETION OF WORKS. WHERE PLANTING OF NEW GRASS IS NECESSARY REFER TO LANDSCAPE ARCHITECT DOCUMENTATION.

6. ON COMPLETION OF ANY TRENCHING WORKS ALL DISTURBED AREAS SHALL BE REINSTATED TO ORIGINAL CONDITION, INCLUDING KERBS, FOOTPATHS, CONCRETE AREAS, GRAVEL AND GRASSED AREAS, AND ROAD PAVEMENTS.

7. THE CONTRACTOR SHALL ARRANGE ALL SURVEY SETOUT TO BE CARRIED OUT BY A REGISTERED SURVEYOR.

8. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND EXISTING LEVELS ON SITE PRIOR TO COMMENCEMENT OF WORK.

9. ANY EXISTING TREES WHICH FORM PART OF THE FINAL LANDSCAPING PLAN SHALL BE PROTECTED FROM CONSTRUCTION ACTIVITIES IN ACCORDANCE WITH THE ARBORIST REPORT/REQUIREMENTS.

10. IN CASE OF DOUBT OR DISCREPANCY REFER TO SUPERINTENDENT FOR CLARIFICATION OR CONFIRMATION PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.

11. WHERE NEW WORKS ABUT EXISTING THE CONTRACTOR SHALL ENSURE THAT A SMOOTH EVEN PROFILE, FREE FROM ABRUPT CHANGES IS OBTAINED.

12. THESE PLANS SHALL BE READ IN CONJUNCTION WITH ALL APPROVED DRAWINGS AND SPECIFICATIONS PREPARED BY OTHER PROJECT CONSULTANTS.

20. PENETRATIONS REQUIRED THROUGH THE STRUCTURE; SUCH DRAWINGS SHALL BE DIMENSIONED AND SHALL BE SUBMITTED AND APPROVED PRIOR TO THE PENETRATIONS BEING MADE EITHER BY CAST IN FORMS OR DRILLING. DRAWINGS SUBMITTED BY THE SUB-CONTRACTOR SHALL HAVE A MINIMUM SCALE OF 1:100 AND SHALL BE OF THE SAME DOCUMENTATION STANDARD, SCALE AND FORMAT AS THE OTHER TRADE WORKSHOP DRAWINGS FOR CO-ORDINATION PURPOSES.

21. SUBMIT WORKSHOP DRAWINGS FOR APPROVAL 14 DAYS PRIOR TO REQUIRED APPROVAL. APPROVAL OF WORKSHOP DRAWINGS WILL NOT RELIEVE THE CONTRACTOR OF HIS RESPONSIBILITIES FOR ERRORS AND INCORRECT SETTING OUT. APPROVAL OF DRAWINGS IS NOT INTENDED TO SERVE AS A CHECK AND DOES NOT RELIEVE THE CONTRACTOR FROM FURNISHING MATERIALS AND PERFORMING WORK AS REQUIRED BY THE CONTRACT DRAWINGS AND SPECIFICATION. OBTAIN FROM SITE ALL NECESSARY DIMENSIONS TO ENABLE WORK TO PROCEED.

22. NON METALLIC PIPELINES IN GROUND SHALL HAVE A COPPER TRACE FIXED FOR ENTIRE LENGTH.

23. DO NOT OBTAIN DIMENSIONS BY SCALING THE DRAWINGS.

BCA SECTION J COMPLIANCE

1. PIPING SHALL BE THERMALLY INSULATED TO ACHIEVE A MINIMUM R-VALUE AS LISTED IN AS3500.4. INSULATION AS FOLLOWS:

   a. THE COLD WATER SUPPLY PIPE BETWEEN THE STORAGE WATER HEATER AND THE CLOSEST VALVE.

   b. THE OUTLET PIPE FROM A STORAGE WATER HEATER EXCLUDING VALVES, FOR AT LEAST THE FIRST 500mm OR, WHERE AN EXTERNAL HEAT TRAP IS FITTED, TO A POINT 150mm DOWN THE FIRST VERTICAL LEG OF THE HEAT TRAP

   c. THE PRIMARY FLOW AND RETURN PIPES BETWEEN AS AUXILIARY HEATER AND A STORAGE WATER HEATER.

   d. ALL VENT PIPES TO 300mm ABOVE THE OPERATING WATER LEVEL OF THE HEATED WATER SYSTEM.

   e. ON MULTIPLE INSTALLATIONS, THE WHOLE HEATED WATER MAINFOLD TO A POINT AT LEAST 500mm PAST THE HEATER WATER OUTLET BRANCH FROM THE LAST WATER HEATER.

2. HEAT TRAPS ARE REQUIRED IN NEW AND REPLACEMENT INSTALLATION AS FOLLOWS IN ACCORDANCE WITH AS 3500.4 SECTION 8;

   a. ALL STORAGE WATER HEATERS SHALL HAVE A HEAT TRAP WITHIN 1m FROM THE OUTLET OF THE WATER HEATER AND BEFORE THE FIRST BRANCH.

   b. THE HEAT TRAP SHALL HAVE A VERTICAL DROP OF 250mm FROM THE OUTLET LEVEL OF THE STORAGE WATER HEATER IF THE HEAT TRAP IS NOT AN INTEGRAL PART OF THE WATER HEATER.

   c. AN EXTERNAL HEAT TRAP IS NOT REQUIRED WHERE A HEAT TRAP IS INTEGRAL WITH THE STORAGE WATER HEATER.

INSPECTION HOLD POINTS

1. TO ALLOW FOR FINAL CERTIFICATION OF WORKS THE CONTRACTOR IS TO ENSURE ALL INSPECTIONS ARE UNDERTAKEN AS NOTED IN THE INSPECTION SCHEDULE BY THE ENGINEER. SHOULD INSPECTIONS NOT BE CARRIED OUT, CERTIFICATION OF THE WORKS MAY NOT BE ABLE TO BE PROVIDED.

2. CONTRACTOR TO PROVIDE MINIMUM 48HRS NOTICE OF WHEN AN INSPECTION IS REQUIRED TO THE ENGINEER.

INSPECTION SCHEDULE

ITEM No.	ITEM	TYPE	COMMENTS
Inground			
1	INGROUND PIPE INSTALLATION - BEDDING, LAYING PIPE, BACKFILL	WITNESS/PHOTO	
2	INGROUND PRESSURE / FIRE SERVICES	WITNESS/PHOTO	
As Required			
3	ROUGH IN INSPECTIONS & ABOVE GROUND WORK	HOLD POINT	
4	PIPEWORK CAST-IN CONCRETE	WITNESS/PHOTO	
Final Inspection			
5	ROOF DRAINAGE, OVERFLOW AND DP LOCATIONS	INSPECTION	
6	FIRE HYDRANT & FIRE HOSEREEL LOCATION	INSPECTION	
7	FIT OFF	INSPECTION	
Post Construction			
8	APPROVALS AND CERTIFICATES (GAS,WATER,SEWER,SECTION 73	REVIEW	
9	FIRE TESTING AND COMMISSIONING	REVIEW	
10	FIRE HYDRANT FLOW TEST & HYDROSTATIC TEST	REVIEW	
11	MANUALS, AS BUILTS, BLOCKPLANS & SIGNAGE	REVIEW	

IMPORTANT
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DRAWINGS TO BE READ IN CONJUNCTION WITH SPECIFICATION.
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NORTH POINT

REFERENCES

DATE	AMENDMENT	INIT	REV
07.02.25	PRELIMINARY ISSUE	AD	1
07.03.25	PRELIMINARY ISSUE	SW	2
14.03.25	DRAFT CC2 ISSUE	JF	3
20.03.25	CC2 ISSUE PRE DECLARE	JF	4
21.03.25	CC2 DECLARED DESIGN	JF	A

DATE	AMENDMENT	INIT	REV

STRUCTURAL

MECHANICAL

ELECTRICAL

CIVIL

CLIENT
FRASERS PROPERTY
FRASERS PROPERTY
1 HOMEBUSH BAY DRIVE
RHODES, NSW 2138

BUILDER
RICHARD CROOKES CONSTRUCTIONS
RICHARD CROOKES
LEVEL 14, 558 PACIFIC HIGHWAY
ST LEONARDS, NSW 2065

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DRAWING TITLE
HYDRAULIC SERVICES
SPECIFICATION SHEET 1

DATE	DRAWN	DESIGNED	CHECKED
MAR. 2025	AD	II	-

SCALE	SIZE	REVISION
N.T.S.	A1	A

PROJECT No 25023
DRAWING No H1201

Regulated Design Record

Project Address: NO. 1 IVANHOE PLACE, MACQUARIE PARK NSW 2113

Project Title: C3 MIDTOWN TREEHOUSE

Consent No: SSD-10405 | Body Corporate Reg No: DEP0001273

Drawing Title: SPECIFICATION SHEET 2 | Drawing No: H1202

Rev	Date	Description	DP Full Name	Reg No
A	21.03.2025	CC2 DECLARED DESIGN	LEONARDO DIMINO	BDC3360

STANDARDS

1. ENSURE ALL HYDRAULIC SERVICES, MATERIALS AND WORKMANSHIP COMPLY WITH THE RELEVANT AUSTRALIAN STANDARDS AND CODES.

2. THE STANDARDS AND CODES ARE AS FOLLOWS:
   a. AS 1596
   b. AS 1841
   c. AS 2419
   d. AS 2941
   e. AS 2441
   f. AS 2444
   g. AS 3500
   h. AS 5601
   i. AS 4645
   j. LOCAL COUNCIL REQUIREMENT
   k. GOVERNING AUTHORITIES AND UTILITIES REQUIREMENTS
   l. SYDNEY WATER
   m. GAS AUTHORITY
   n. WORK COVER AUTHORITY

EXISTING SERVICES

1. ALL UTILITY SERVICES INDICATED ON THE DRAWINGS ORIGINATE FROM SUPPLIED DATA, THEREFORE THEIR ACCURACY AND COMPLETENESS IS NOT GUARANTEED. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE AND CONFIRM THE LOCATION AND LEVEL OF ALL EXISTING SERVICES PRIOR TO THE COMMENCEMENT OF ANY WORK. ANY DISCREPANCIES SHALL BE REPORTED TO THE SUPERINTENDENT. CLEARANCES SHALL BE OBTAINED FROM THE RELEVANT SERVICE AUTHORITY.

2. CARE TO BE TAKEN WHEN EXCAVATING NEAR EXISTING SERVICES. NO MECHANICAL EXCAVATION SHALL BE UNDERTAKEN WITHIN 1m OF COMMUNICATION, GAS OR ELECTRICAL SERVICES. HAND EXCAVATION ONLY IN THESE AREAS.

3. THE CONTRACTOR SHALL PROTECT AND MAINTAIN ALL EXISTING SERVICES THAT ARE TO BE RETAINED IN THE VICINITY OF THE PROPOSED WORKS. ANY AND ALL DAMAGE TO THESE SERVICES AS A RESULT OF THESE WORKS SHALL BE REPAIRED BY THE CONTRACTOR UNDER THE DIRECTION OF THE SUPERINTENDENT, AND AT NO EXTRA COST.

4. THE CONTRACTOR SHALL ALLOW FOR THE ADJUSTMENT/RELOCATION (IF NECESSARY) OF EXISTING SERVICES IN AREAS AFFECTED BY WORKS.

5. THE CONTRACTOR SHALL ALLOW FOR THE CAPPING OFF, EXCAVATION AND REMOVAL (IF REQUIRED) OF EXISTING SERVICES IN AREA AFFECTED BY WORKS UNLESS DIRECTED OTHERWISE ON THE DRAWINGS OR BY THE SUPERINTENDENT.

6. THE CONTRACTOR SHALL ENSURE THAT AT ALL TIMES SUPPLIES TO ALL BUILDINGS ARE NOT AFFECTED AND OR DISRUPTED BY THE PROPOSED WORKS.

7. PRIOR TO COMMENCEMENT OF ANY WORKS THE CONTRACTOR SHALL OBTAIN APPROVAL OF THE PROGRAM FOR THE RELOCATION AND/OR CONSTRUCTION OF TEMPORARY SERVICES AND FOR ANY ASSOCIATED INTERRUPTION OF SUPPLY.

8. THE CONTRACTOR SHALL CONSTRUCT TEMPORARY SERVICES TO MAINTAIN EXISTING SUPPLY TO BUILDINGS REMAINING IN OPERATION DURING WORKS TO THE SATISFACTION AND APPROVAL OF THE SUPERINTENDENT. ONCE DIVERSION IS COMPLETE AND COMMISSIONED THE CONTRACTOR SHALL REMOVE ALL SUCH TEMPORARY SERVICES AND MAKE GOOD TO THE SATISFACTION OF THE SUPERINTENDENT.

9. INTERRUPTION TO EXISTING SUPPLIES SHALL BE DONE SO AS NOT TO CAUSE ANY INCONVENIENCE TO THE PRINCIPAL. THE CONTRACTOR IS TO OBTAIN APPROVAL OF THE SUPERINTENDENT FOR THE TIME OF INTERRUPTION.

10. EXISTING BUILDINGS, EXTERNAL STRUCTURES AND TREES SHOWN ON THESE DRAWINGS ARE FEATURES EXISTING PRIOR TO ANY DEMOLITION WORKS.

SUBSOIL DRAINAGE

1. SUB-SOIL DRAINAGE LINES WITH NON-WOVEN GEOTEXTILE SOCK SURROUND SHALL BE CONNECTED TO A STORMWATER DRAINAGE PIT (AT min. 1% LONGITUDINAL GRADE) AND PROVIDED IN THE FOLLOWING LOCATIONS:

   a. THE HIGH SIDE OF PROPOSED TRAFFICKED AND CARPARK PAVEMENT AREAS.

   b. ALL PLANTER AND TREE BEDS PROPOSED ADJACENT TO PAVEMENT AREAS

   c. BEHIND RETAINING WALLS (IN ACCORDANCE WITH DRAWINGS)

   d. ALL OTHER AREAS SHOWN ON THE DRAWINGS.

2. THE CONTRACTOR SHALL INSTALL INSPECTION OPENINGS TO ALL SUBSOIL DRAINAGE LINES AND DOWNPIPE LINES AS SPECIFIED ON DRAWINGS, AT MAXIMUM 30m CENTERS AND AT ALL UPSTREAM ENDPOINTS.

3. WHERE SUBSOIL DRAINAGE LINES PASS UNDER FLOOR SLABS AND VEHICULAR PAVEMENTS SEALED uPVC SEWER GRADE PIPE SHALL BE USED:

   a. THE HIGH SIDE OF PROPOSED TRAFFICKED AND CARPARK PAVEMENT AREAS.

   b. ALL PLANTER AND TREE BEDS PROPOSED ADJACENT TO PAVEMENT AREAS.

   c. BEHIND RETAINING WALLS (IN ACCORDANCE WITH DRAWINGS).

   d. ALL OTHER AREAS SHOWN ON THE DRAWINGS.

4. THE CONTRACTOR SHALL INSTALL INSPECTION OPENINGS TO ALL SUBSOIL DRAINAGE LINES AND DOWNPIPE LINES AS SPECIFIED ON DRAWINGS, AT MAXIMUM 30m CENTERS AND AT ALL UPSTREAM ENDPOINTS.

5. WHERE SUBSOIL DRAINAGE LINES PASS UNDER FLOOR SLABS AND VEHICULAR PAVEMENTS SEALED uPVC SEWER GRADE PIPE SHALL BE USED.

6. PROVIDE 3.0m LENGTH OF 100Φ SUBSOIL DRAINAGE PIPE WRAPPED IN A NON-WOVEN GEOTEXTILE FABRIC, TO THE UPSTREAM SIDE OF STORMWATER PITS, LAID IN STORMWATER PIPE TRENCHES AND CONNECTED TO THE DRAINAGE PIT.

MANUALS

1. CONTRACTOR SHALL PROVIDE THE FOLLOWING:
   GENERAL:

   a. OPERATING INSTRUCTIONS & TECH DATA (INCLUDING SUPPLIER LISTING)
   b. WARRANTIES
   c. CERTIFICATES
   d. COMMISSIONING INFORMATION
   e. AS-BUILTS (PDF & DWG FORMAT)
   f. SPECIFICATIONS (PDF & DWG FORMAT)
   g. HELP & CONTACT

2. HYDRAULIC SERVICES:
   a. OVERVIEW & PROJECT DESCRIPTION
   b. ASSET REGISTER (PUMPS/TANKS/HOT WATER UNITS/COLD WATER UNITS ETC)
   c. MAINTENANCE SCHEDULE/ACTIONS (CONTRACTOR RESPONSIBLE FOR 12 MONTH DLP)
   d. OPERATING INSTRUCTIONS & TECH DATA (INCLUDING SUPPLIER LISTING
   e. WARRANTIES
   f. CERTIFICATE (INLCUDING RPZ'S/BACKFLOW PREVENTION DEVICE/ THERMOSTATIC MIXING VLAVE ETC)
   g. COMMISSIONING INFORMATION (INCLUDING HOSE- REEL FLOW/PRESSURE TEST RESULTS
   h. AS-BUILTS(PDF & DWG FORMAT)
   i. HELP & CONTACT

STORMWATER DRAINAGE

1. ALL PIPES LESS THAN OR EQUAL TO Φ225mm ARE TO BE SOLVENT WELD-JOINTED SEWER GRADE uPVC CLASS SH, OR (min) CLASS 2 RUBBER-RING JOINTED RCP (UNO).

2. WHERE uPVC STORMWATER LINES PASS UNDER FLOOR SLABS SEWER GRADE RUBBER RING JOINTS ARE TO BE USED.

3. PIPES GREATER THAN OR EQUAL TO Φ300mm ARE TO BE (min) CLASS 2 RUBBER-RING JOINTED RCP (UNO) OR FRC.

4. FRC PIPES EQUIVALENT TO THE STEEL REINFORCED CONCRETE PIPE CLASS SPECIFIED ON THE DRAWINGS MAY BE USED - OBTAIN SUPERINTENDENTS APPROVAL.

5. ALL PIPES ARE TO BE LAID AT (min) 1.0% GRADE (UNO).

6. THE USE OF PRE-CAST STORMWATER DRAINAGE PITS IS NOT ACCEPTED WITHOUT CONFIRMATION BETWEEN SPARKS AND PARTNERS ENGINEERS AND THE CONTRACTOR REGARDING QUALITY CONTROL, AND CERTIFICATION OF FINISHES.

7. COVERS:

   a. USE HOT DIPPED GALVANISED COVERS AND GRATES COMPLYING WITH RELEVANT AUSTRALIAN AND COUNCIL STANDARDS

   b. ALL COVERS AND GRATES TO BE POSITIONED IN A FRAME AND MANUFACTURES AS A UNIT

   c. ALL COVERS AND GRATES TO BE FITTED WITH POSITIVE COVER LIFTING KEYS

   d. OBTAIN SUPERINTENDENT'S APPROVAL FOR THE USE OF CAST IRON SOLID COVERS AND GRATES. CAST IRON SOLID COVERS (IF APPROVED) TO CONSIST OF CROSS-WEBBED, CELLULAR CONSTRUCTION WITH THE RIBS UPPERMOST TO ALLOW INFILLING WITH CONCRETE. INSTALL POSITIVE COVER LIFTING KEYS AND PLASTIC PLUGS.

   e. UNLESS DETAILED OR SPECIFIED OTHERWISE COVERS AND GRATES TO BE MINIMUM CLASS "C" IN VEHICULAR PAVEMENTS AND CLASS "B" ELSEWHERE (UNO).

8. ALL PIPE BENDS, JUNCTIONS, ETC. ARE TO BE PROVIDED USING PURPOSE MADE FITTINGS OR STORMWATER PITS.

9. ALL CONNECTIONS TO EXISTING DRAINAGE PITS SHALL BE MADE IN A TRADESMAN-LIKE MANNER AND THE INTERNAL WALL OF THE PIT AT PIPE PENETRATIONS SHALL BE CEMENT RENDERED TO ENSURE A SMOOTH FINISH AND BASE OF PIT BENCHED.

10. THE CONTRACTOR SHALL SUPPLY AND INSTALL ALL FITTINGS AND SPECIALS INCLUDING VARIOUS PIPE ADAPTERS TO ENSURE PROPER CONNECTION BETWEEN DISSIMILAR PIPEWORK.

11. U.N.O. MATERIAL USED FOR BEDDING OF PIPES SHALL BE APPROVED NON-COHESIVE GRANULAR MATERIAL HAVING HIGH PERMEABILITY AND HIGH STABILITY WHEN SATURATED AND FREE OF ORGANIC AND CLAY MATERIAL.

12. WHERE TRENCHES ARE IN ROCK, THE PIPE SHALL BE BEDDED ON A MIN. 100mm CONCRETE BED (OR 75mm THICK BED OF 12mm BLUE METAL) UNDER THE BARREL OF THE PIPE. THE PIPE COLLAR AT NO POINT SHALL BEAR ON THE ROCK.

13. IN OTHER THAN ROCK, PIPES SHALL BE LAID ON A 100mm THICK SAND BED. IN ALL CASES BACKFILL THE TRENCH WITH SAND TO 200mm ABOVE THE PIPE. WHERE THE PIPE IS UNDER PAVEMENTS, BACKFILL REMAINDER OF TRENCH WITH APPROVED GRANULAR MATERIAL TO SUBGRADE LEVEL IN 150mm LAYERS COMPACTED TO 100% STANDARD MAXIMUM DRY DENSITY. A MINIMUM PAVEMENT OF 125 THICK DGB20 BASE AND 25 THICK AC10 WEARING COARSE SHALL BE PROVIDED (UNLESS SHOWN OTHERWISE ON THE CIVIL ENGINEERS DRAWINGS).

14. BEDDING SHALL BE (UNO) TYPE HS2 UNDER ROADS; H2 GENERAL AREAS, IN ACCORDANCE WITH CURRENT RELEVANT INDUSTRY STANDARDS AND GUIDELINES.

15. THE SUB-CONTRACTOR SHALL ENSURE AND PROTECT THE INTEGRITY OF ALL STORMWATER PIPES DURING CONSTRUCTION. ANY AND ALL DAMAGE TO THESE PIPES AS A RESULT OF THESE WORKS SHALL BE REPAIRED BY THE SUB-CONTRACTOR UNDER THE DIRECTION OF THE SUPERINTENDENT, AND AT NO EXTRA COST.

16. ALL RECTANGULAR HOLLOW SECTIONS (RHS) SPECIFIED AS STORMWATER CONDUITS TO BE HOT DIPPED GALVANISED AND HAVE (MINIMUM) 5mm WALL THICKNESS.

STORMWATER DRAINAGE Cont.

17. NOTE THAT THE PIT COVER LEVEL NOMINATED IN KERB'S ARE TO THE INVERT BASE OF THE KERB WHICH ARE 40mm LOWER THAN THE PAVEMENT LEVEL AT LIP OF GUTTER.

SEWER DRAINAGE

1. THE CONTRACTOR SHALL SUPPLY, INSTALL, TEST AND COMMISSION ALL SEWER DRAINAGE FROM SOIL AND WASTE FIXTURES TO THE EXISTING SEWER LINES. PROVIDE ALL NECESSARY PIPES, JUNCTIONS, BENDS, PITS, FLOOR WASTES, EXCAVATION, SUPPORTS, AND BACKFILLING, TESTING AND SUNDRY EQUIPMENT REQUIRED FOR THE INSTALLATION. PIPELINE POSITIONS SHALL BE DETERMINED ON SITE IN CONJUNCTION WITH ALL OTHER DISCIPLINES TO ENSURE ADEQUATE COORDINATION OF ALL SERVICES AND ELEMENTS. COORDINATION SHALL BE CARRIED OUT PRIOR TO ANY SETTING OUT, EXCAVATION AND PIPE INSTALLATION TAKING PLACE.

2. ALL SANITARY DRAINAGE PIPEWORK SHALL BE uPVC UNLESS NOTED OTHERWISE. DEEP EXCAVATION OVER 3.0m SHALL BE SN8 GRADE WITH RUBBER RING JOINTS.

3. THE CONTRACTOR SHALL ALLOW FOR ADDITIONAL EXCAVATION (INCLUDING ROCK) AND BACKFILL OF PIPES. FITTINGS AND ALL JUMP-UPS TO THE LOCAL AUTHORITY REQUIREMENTS, INCLUDING THOSE TO BRANCH DRAINS.

4. ALL BRANCH LINES SHALL BE GRADED AND/OR LOWERED TO AVOID PENETRATING FOOTING BEAMS UNLESS SHOWN OTHERWISE. THE CONTRACTOR SHALL ALLOW FOR ADDITIONAL PIPE LENGTHS AND WORK INCLUDING CONSTRUCTION OF ADDITIONAL INSPECTION OPENINGS AS DIRECTED BY THE LOCAL AUTHORITY AND THE PROJECT REQUIREMENTS.

5. CO-ORDINATE WITH STRUCTURAL DRAWINGS. NO STEEL REINFORCING BARS TO BE CUT WITHOUT PRIOR WRITTEN APPROVAL FROM STRUCTURAL ENGINEER.

6. APPROVED GRANULAR MATERIAL SHALL BE USED FOR ALL BACKFILL AND COMPACTED TO 98% STANDARD MAXIMUM DRY DENSITY IN ACCORDANCE WITH AS. 1289. E1.1.

7. ON COMPLETION OF PIPE INSTALLATION, ALL DISTURBED AREAS MUST BE RESTORED TO ORIGINAL CONDITION INCLUDING KERBS, FOOTPATHS, CONCRETE AREAS, GRAVEL AREAS, GRASSED AREAS AND ROAD PAVEMENTS.

8. SAW CUT TO THE FULL DEPTH OF CONCRETE AND A MIN. OF 100mm IN BITUMINOUS PAVING. REINSTATE TO EQUIVALENT OF ORIGINAL ROAD AND CONCRETE AREA. ALLOW TO PAY ALL FEES AND CHARGES.

9. WHERE NEW WORK ABUTS EXISTING, THE CONTRACTOR SHALL ENSURE THAT A SMOOTH, EVEN PROFILE, FREE FROM ABRUPT CHANGES, IS OBTAINED.

10. THE CONTRACTOR SHALL ALLOW FOR ALL TIMBERING, SHORING AND SHUTTERING AS NECESSARY TO CONSTRUCT PIPEWORK AND INCLUDE THE REMOVAL OF SAME UPON COMPLETION OF PIPEWORK.

11. PROVIDE 80mm COMPRESSIBLE MATERIAL OVER PIPEWORK WHERE CLEARANCE TO UNDERSIDE OF FOOTING IS LESS THAN 150mm (U.N.O.).

12. ALL uPVC PIPE EXPOSED TO SUNLIGHT SHALL BE DWV.

13. TRENCHES THROUGH TREE PROTECTION ZONE OR WITHIN TREE ROOT ZONES MUST BE EXCAVATED BY HAND.

14. CONTRACTOR SHALL ALLOW TO FLUSH AND OBTAIN A CCTV REPORT ON THE EXISTING PIPEWORK WHERE RE-USE OF THE EXISTING SYSTEM IS MAINTAINED.

SANITARY PLUMBING

1. ALL ROOF PENETRATIONS TO DETAIL AND PAINTED COLOUR TO BE ADVISED. ALL VENTS SHALL BE OFFSET IN ROOF SPACE MINIMUM 600mm FROM EAVES AND AS SHOWN ON ARCHITECTURAL DRAWINGS. ALL VENTS TO TERMINATE 150mm ABOVE ROOF LEVEL.

2. ALL PIPEWORK LOCATED WITHIN AREAS DEEMED NOISE SENSITIVE SHALL BE ACOUSTICALLY TREATED IN ACCORDANCE WITH THE PROJECT REQUIREMENTS.

3. EXPOSED INTERNAL PIPEWORK SHALL BE CHROME-PLATED.

4. ALL ROOF PENETRATIONS SHALL BE FLASHED WITH "DEKTITE" FLASHING. COLOUR TO MATCH ROOF.

ROOF NOTES

City Plan Services Pty Ltd
Reference: 210791/2
Construction Certificate
Lovie Mahinay
BDC1974

1. CONTRACTOR SHALL ALLOW FOR ALL FLASHING AND WATERPROOFING IN ACCORDANCE WITH THE AUSTRALIAN STANDARD. HB39 AND AS REQUIRES TO PERMIT IN A "WATERTIGHT" JOINT.

2. CONTRACTOR SHALL ALLOW TO INSTALL 100% EMERGENCY OVERFLOW MEASURES TO ATMOSPHERE IN ACCORDANCE WITH AS3500.

3. CONTRACTOR SHALL ALLOW FOR ADEQUATE FALL AT A MINIMUM OF 1 : 200 TO ALLOW COMPLIANT FALL TO THE SUMP/ DOWNPIPE.

4. CONTRACTOR SHALL ALLOW FOR ALL REQUIRED EXPANSION JOINTS AND ADJUSTMENTS FOR THERMAL VARIATION ALL EXPANSION SPACE SHALL BE A MINIMUM OF 50MM.

5. CONTRACTOR SHALL ALLOW TO INSTALL GUTTER GUARDS AND MESH SCREENS ON ALL GUTTERS, DOWNPIPES AND SUMPS.

6. CONTRACTOR TO PROVIDE A MAINTENANCE SCHEDULE FOR REGULAR CLEANING AND HOSE FLUSHING OF ALL DOWN PIPES AND GUTTERS.

7. CONTRACTOR TO PROVIDE A WATER TEST FOR ALL INTERNAL DOWNPIPES FOR 10 MINUTES AT 100MM OF HEAD WATER/ OR AIR TEST PRESSURE OF NOT LESS THAN 30 kPa FOR A MINIMUM OF 3 MINUTES ALL IN ACCORDANCE WITH AS3500.

TRADEWASTE

1. CONTRACTOR TO SUPPLY, INSTALL AND COMMISSION ALL ARRESTORS AND ANCILLARY ITEMS, IN ACCORDANCE WITH MANUFACTURERS AND AS.3500

2. ALL EXTERNAL HOSE TAPS WITHIN 20m OF TRADE WASTE AREA TO BE COMPLETE WITH BACKFLOW PREVENTION DEVICE (RPZD).

3. ALL TRADE WASTE DRAINAGE PIPEWORK SHALL BE HDPE 'GEBERIT' PIPEWORK WITH THERMAL FUSION JOINTS.

4. CONTRACTOR SHALL ENSURE THAT ALL FIXED PUMP-OUT LINES USE LONG RADIUS BENDS & ARE AS STRAIGHT AS POSSIBLE. LINES SHALL BE A MINIMUM DIAMETER OF 75MM IN A ROBUST MATERIAL, SUCH AS GALVANISED IRON.

FIRE RATED PENETRATIONS

1. PROVIDE FIRE RATED PENETRATIONS FOR SERVICES PASSING THROUGH EACH FIRE RATED ELEMENT. FIRE RATED PENETRATIONS SHALL ACHIEVE THE SAME RATING AS THE BUILDING ELEMENT PENETRATED SEAL PENETRATIONS WITH A SYSTEM CONFORMING TO AS 4072.1

2. THE METHOD AND MATERIAL USED SHALL BE IDENTICAL WITH A PROTOTYPE ASSEMBLY FOR THE SERVICE AND BUILDING ELEMENT WHICH HAS BEEN TESTED IN ACCORDANCE WITH AS 4072.1-1992 AND AS 1530.4-1997 AND HAS ACHIEVED THE REQUIRED FRL OR RESISTANCE TO THE INCIPIENT SPREAD OF FIRE OR COMPLY WITH OTHER RELEVANT PROVISIONS OF PART 3.7.1 FIRE SEPARATION OF THE BUILDING CODE OF AUSTRALIA VOLUME 2. ANY PENETRATIONS CREATED OR TREATED SHALL BE PROVIDED WITH A SERVICE LABEL COMPLYING WITH AS1851-2005 CLAUSE 17.2.4.2. PROVIDE SCHEDULE OF ALL PENETRATIONS EITHER CREATED OR TREATED. THE SCHEDULE SHALL BE SET OUT IN ACCORDANCE WITH AS-4072.1-2005. FIGURE B1 - AND SHALL BE SUITABLE FOR SUBSEQUENT USE BY THE BUILDING OWNER AS REQUIRED BY AS 1851-2005 CLAUSE 17.4.

3. WHEREVER OR WHENEVER THE PROPOSED WORK REQUIRE THE PENETRATION OF AN ELEMENT HAVING A FIRE RESISTANCE RATING. THE CONTRACTOR SHALL ENSURE THAT ANY PERSON RESPONSIBLE FOR THE INSTALLATION OF ANY SYSTEM USED TO PROTECT REINSTATE THE FRL OF THE PENETRATION:
   A. HOLDS AN APPROPRIATE LICENSE
   B. PROVIDES AN INSTALLATION STATEMENT IN THE FORMAT PRESCRIBED BY APPENDIX B OF AS 4072.1 TO DESCRIBE THE PENETRATION ITS LOCATION AND METHOD OF TREATMENT; AND
   C. THE CONTRACTOR SHALL FURNISH A COPY OF THE INSTALLATION STATEMENT AS PROVIDED IN (B) ABOVE THE INSPECTING OFFICER PRIOR TO REQUESTING AN INSPECTION FOR 'SUBSTANTIAL COMPLETION'

4. PROVIDE ACCESS TO PASSIVE FIRE PROTECTION DEVICES FOR INSPECTION IN ACCORDANCE WITH AS 1851:2005.

CONDUCT OF INSPECTIONS BY CCTV

1 GENERAL

CCTV INSPECTIONS ARE EFFECTIVE WAYS TO IDENTIFY THE STRUCTURAL CONDITION OF SANITARY PLUMBING AND DRAINAGE INSTALLATIONS AND TO IDENTIFY AND REPORT ON ANY SPECIFIC DEFECTS OR FEATURES. ALLOW TO CCTV ALL EXISTING SEWER AND STORMWATER DRAINAGE LINES TO BE RETAINED AND ISSUE CCTV TO CONSULTANT TO REVIEW. INSPECTIONS SHOULD BE CONDUCTED UNDER NO-FLOW CONDITIONS THAT IS THE SANITARY PLUMBING SYSTEM IS NOT BEING USED SO THAT THE FLOW (WATER) LEVEL MAY BE MEASURED AND REPORTED.
TYPICAL APPLICATIONS FOR CCTV SURVEYS INCLUDE:
a. INSPECTION OF STOWMATER DRAINS, SEWERS AND PIPELINES;
b. INSPECTION OF DEEP SHAFTS;
c. INSPECTION OF DUCTS;
d. MONITORING SPECIALIST REPAIR WORKS IN SEWERS; AND
e. SURVEYS OF INDUSTRIAL PROCESS PIPELINES.
f. WHERE REQUIRED, SPECIALIZED INSTRUMENTS, APPARATUS AND/OR SOFTWARE SHOULD BE USED TO FACILITATE THE SURVEY. HARDWARE AND SOFTWARE USED IN MEASURING THE PARAMETER HAVE TO BE CORRECTLY CALIBRATED FOR EACH APPLICATION USING THE MANUFACTURER'S RECOMMENDED METHODS.

2 OPERATOR'S REPORT

THE OPERATOR SHOULD PROVIDE A WRITTEN REPORT.
THE REPORT SHOULD CONTAIN, BUT NOT BE LIMITED TO, THE FOLLOWING:
a. LOCATION OF THE SANITARY PLUMBING AND DRAINAGE INSTALLATION.
b. THE DATE(S) OF INSPECTIONS.
c. DETAILS AS REQUIRED, TO IDENTIFY THE DRAIN(S) INSPECTED.
d. SIZE AND TYPE OF MATERIAL INSTALLED.
e. CONDITION OF THE SANITARY PLUMBING AND DRAINAGE INSTALLATION INCLUDING THE LOCATION AND CHARACTERISTICS OF REPORTABLE FEATURES SUCH AS DEFECTS.
f. WHERE REQUIRED, A DETERMINATION FOR ACCEPTANCE.

STANDARDS

1. ENSURE ALL HYDRAULIC SERVICES, MATERIALS AND WORKMANSHIP COMPLY WITH THE RELEVANT AUSTRALIAN STANDARDS AND CODES.

2. THE STANDARDS AND CODES ARE AS FOLLOWS:
   a. AS 1596
   b. AS 1841
   c. AS 2419
   d. AS 2941
   e. AS 2441
   f. AS 2444
   g. AS 3500
   h. AS 5601
   i. AS 4645
   j. LOCAL COUNCIL REQUIREMENT
   k. GOVERNING AUTHORITIES AND UTILITIES REQUIREMENTS
   l. SYDNEY WATER
   m. GAS AUTHORITY
   n. WORK COVER AUTHORITY

DEMOLITION NOTES

1. UNLESS NOTED OTHERWISE IN THESE HYDRAULIC DRAWINGS, REFER TO ARCHITECT'S DRAWINGS, EXISTING CONDITIONS DRAWINGS AND DEMOLITION DRAWINGS FOR EXTENT OF DEMOLITION WORKS ASSOCIATED WITH THESE WORKS.

2. DISCONNECT AND REMOVE EXISTING SERVICES TO AND FROM EXISTING FIXTURES AND PLANT AREAS AFFECTED BY THE PROPOSED WORKS.

3. THE CONTRACTOR IS TO UNDERTAKE AN INDEPENDENT SURVEY OF ALL AREAS TO DETERMINE THE EXTENT OF EXISTING SERVICES THAT ARE TO BE DISCONNECTED AND DEMOLISHED.

4. EXISTING SERVICES REQUIRED FOR THE OPERATION OF OTHER FIXTURES ARE TO BE DIVERTED/EXTENDED AS REQUIRED.

BCA SECTION J COMPLIANCE

1. PIPING SHALL BE THERMALLY INSULATED TO ACHIEVE A MINIMUM R-VALUE AS LISTED IN AS3500.4. INSULATION AS FOLLOWS:

   a. THE COLD WATER SUPPLY PIPE BETWEEN THE STORAGE WATER HEATER AND THE CLOSEST VALVE.

   b. THE OUTLET PIPE FROM A STORAGE WATER HEATER EXCLUDING VALVES, FOR AT LEAST THE FIRST 500mm OR, WHERE AN EXTERNAL HEAT TRAP IS FITTED, TO A POINT 150mm DOWN THE FIRST VERTICAL LEG OF THE HEAT TRAP

   c. THE PRIMARY FLOW AND RETURN PIPES BETWEEN AS AUXILIARY HEATER AND A STORAGE WATER HEATER.

   d. ALL VENT PIPES TO 300mm ABOVE THE OPERATING WATER LEVEL OF THE HEATED WATER SYSTEM.

   e. ON MULTIPLE INSTALLATIONS, THE WHOLE HEATED WATER MAINFOLD TO A POINT AT LEAST 500mm PAST THE HEATER WATER OUTLET BRANCH FROM THE LAST WATER HEATER.

2. HEAT TRAPS ARE REQUIRED IN NEW AND REPLACEMENT INSTALLATION AS FOLLOWS IN ACCORDANCE WITH AS 3500.4 SECTION 8;

   a. ALL STORAGE WATER HEATERS SHALL HAVE A HEAT TRAP WITHIN 1m FROM THE OUTLET OF THE WATER HEATER AND BEFORE THE FIRST BRANCH.

   b. THE HEAT TRAP SHALL HAVE A VERTICAL DROP OF 250mm FROM THE OUTLET LEVEL OF THE STORAGE WATER HEATER IF THE HEAT TRAP IS NOT AN INTEGRAL PART OF THE WATER HEATER.

   c. AN EXTERNAL HEAT TRAP IS NOT REQUIRED WHERE A HEAT TRAP IS INTEGRAL WITH THE STORAGE WATER HEATER.

SEISMIC ENGINEERING SERVICES DESIGN

REVIEW THE HYDRAULIC SERVICES DESIGN TO DETERMINE WHICH SERVICES DO AND DO NOT REQUIRE SEISMIC RESTRAINT. IN ACCORDANCE WITH AS1170.4 - 2007 THE FOLLOWING SERVICES ALWAYS NEED TO BE PROVIDED WITH SEISMIC RESTRAINTS:

· FIRE AND SMOKE DETECTION SYSTEMS.

· FIRE SUPPRESSION SYSTEMS (INCLUDING SPRINKLERS).

· BOILERS, FURNACES, INCINERATORS, WATER HEATERS, AND OTHER EQUIPMENT USING COMBUSTIBLE ENERGY SOURCES OR HIGH ENERGY SOURCES, CHIMNEYS, FLUES, SMOKESTACKS, VENTS AND PRESSURE VESSELS.

· UTILITY AND SERVICES INTERFACES DUCTS AND PIPING DISTRIBUTION SYSTEMS ALSO NEED TO BE PROVIDED WITH RESTRAINTS/BRACING TO RESIST SEISMIC LOADS EXCEPT WHERE THEY ARE BELOW THE THRESHOLDS SET IN AS1170.4. THE THRESHOLDS BELOW WHICH DUCT AND PIPING DISTRIBUTION DO NOT NEED TO BE SEISMICALLY RESTRAINED ARE:

· GAS PIPING LESS THAN 25mm INSIDE DIAMETER.

· PIPING IN BOILER AND MECHANICAL ROOMS LESS THAN 32mm INSIDE DIAMETER

· ALL OTHER PIPING LESS THAN 64mm INSIDE DIAMETER.

· ALL DUCTS AND PIPING SUSPENDED BY INDIVIDUAL HANGERS 300mm OR LESS IN LENGTH FROM THE TOP OF THE PIPE TO THE BOTTOM OF THE SUPPORT FOR THE HANGER. NOTE THAT IF A STRAIGHT RUN OF DUCT STARTS AT 0.2m² AT ONE END AND GROWS TO GREATER THAN 0.4m² AT THE OTHER END THEN THE WHOLE RUN SHOULD BE BRACED, NOT JUST THE SECTION OVER 0.4m² . THE SAME APPLIES WHERE THE HANGING DISTANCE VARIES FROM LESS THAN 300mm TO MORE THAN 300mm IN A STRAIGHT.

IMPORTANT
- DO NOT SCALE OFF THIS DRAWING. USE DIMENSIONS & ARCHITECTURAL DRAWINGS ONLY.
- DRAWINGS TO BE READ IN CONJUNCTION WITH SPECIFICATION.
- THE INFORMATION ON THIS DRAWING REMAINS THE PROPERTY OF SPARKS & PARTNERS CONSULTING ENGINEERS REPRODUCTION OF THE WHOLE OR PART OF THE DOCUMENT CONSTITUTES AN INFRINGEMENT OF COPYRIGHT®

NORTH POINT

REFERENCES

DATE	AMENDMENT	INIT	REV
07.02.25	PRELIMINARY ISSUE	AD	1
07.03.25	PRELIMINARY ISSUE	SW	2
14.03.25	DRAFT CC2 ISSUE	JF	3
20.03.25	CC2 ISSUE PRE DECLARE	JF	4
21.03.25	CC2 DECLARED DESIGN	JF	A

DATE	AMENDMENT	INIT	REV

STRUCTURAL
MECHANICAL
ELECTRICAL
CIVIL

CLIENT
FRASERS PROPERTY
FRASERS PROPERTY
1 HOMEBUSH BAY DRIVE
RHODES, NSW 2138

BUILDER
RICHARD CROOKES CONSTRUCTIONS
RICHARD CROOKES
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HCAA | FPA AUSTRALIA GOLD MEMBER Fire Protection Association Australia | QUALITY SYSTEM COMPLIANCE DNV·GL ISO 9001 | JAS-ANZ

DRAWING TITLE
HYDRAULIC SERVICES
SPECIFICATION SHEET 2

DATE	DRAWN	DESIGNED	CHECKED
MAR. 2025	AD	II	-

SCALE	SIZE	REVISION
N.T.S.	A1	A

PROJECT No 25023
DRAWING No H1202

Regulated Design Record

Project Address: NO. 1 IVANHOE PLACE, MACQUARIE PARK NSW 2113

Project Title: C3 MIDTOWN TREEHOUSE

Consent No: SSD-10405 | Body Corporate Reg No: DEP0001273

Drawing Title: SPECIFICATION SHEET 3 | Drawing No: H1203

Rev	Date	Description	DP Full Name	Reg No
A	21.03.2025	CC2 DECLARED DESIGN	LEONARDO DIMINO	BDC3360

WATER SERVICE

1. SUPPLY, INSTALL, TEST AND COMMISSION ALL BACK-FLOW/RPZD DOMESTIC COLD WATER PIPES FROM THE AUTHORITY'S MAIN TO ALL FIXTURES, FITTINGS AND TAPS REQUIRING DOMESTIC COLD WATER. INCLUDE FOR ALL PIPEWORK, BENDS, OFFSETS, BRACKETS, PUMPS, TAPS AND FAUCETS AND SUNDRY EQUIPMENT REQUIRED FOR THE INSTALLATION.

2. ALL EXPOSED HOT, WARM AND COLD WATER PIPEWORK SHALL BE INSULATED IN ACCORDANCE WITH AS. 3500.

3. COPPER PIPES TO BE IN ACCORDANCE WITH AS. 1432-1990 TABLE 2 TYPE "B" TUBES.

4. ALL PIPES SIZES SHALL BE INTERNAL BORE UNLESS NOTED OTHERWISE.

5. ALL WATER CONNECTIONS TO INDIVIDUAL FIXTURES SHALL BE 15mmØ UP TO A MAXIMUM LENGTH OF 3 METERS.

6. ALL HOSE TAPS TO BE INSTALLED WITH A VACUUM BREAKER AND ISOLATION VALVE.

7. THE CONTRACTOR SHALL INSTALL ISOLATING VALVES TO ALL HOT AND COLD WATER FIXTURES.

8. ALL BENDS, T JOINTS etc. SHALL BE COPPER FITTINGS AND SHALL BE SILVER-BRAZED JOINTED AND COMPLY WITH AS 1589.

9. SUPPLY AND INSTALL THERMOSTATIC MIXING VALVES TO ALL ACCESSIBLE TOILETS AND ADAPTABLE UNITS, AS INDICATED ON THE DRAWINGS, USED FOR PERSONAL HYGIENE STRICTLY TO MANUFACTURERS REQUIREMENTS AND BE IN ACCORDANCE WITH THE LOCAL AUTHORITIES REQUIREMENTS.

10. INSTALL ALL NECESSARY INSULATION TO HOT WATER PIPING TO PREVENT HEAT LOSS. INSULATION SHALL NOT BE INSTALLED UNTIL ALL RELEVANT TESTS AND INSPECTIONS HAVE BEEN CARRIED OUT.

11. SUPPLY AND INSTALL AN APPROVED BACKFLOW PREVENTION DEVICE IN THE DOMESTIC COLD WATER SUPPLY AND IRRIGATION SYSTEM AS REQUIRED BY THE WATER AUTHORITY.

12. THE CONTRACTOR IS TO MAINTAIN THE DEVICE FOR A PERIOD OF 12 MONTHS AND WILL INCLUDE MAINTENANCE INSTRUCTIONS IN AS-BUILT MANUALS TO BE SUPPLIED AT END OF PROJECT ESTABLISHING AN AUTHORISED MAINTENANCE PROGRAM INCLUDING REGISTRATION AND CERTIFICATION OF THE DEVICE.

HEATED WATER SERVICE

1. THE WORK IN THIS SECTION COMPRISES THE SUPPLY AND INSTALLATION OF THE POTABLE HEATED WATER SYSTEM INCLUDING ALL NECESSARY FIXTURES AND FITTINGS, PLANT AND EQUIPMENT, ACCESSORIES, TESTING AND COMMISSIONING REQUIRED TO COMPLETE THE INSTALLATION.

2. THE POTABLE HEATED WATER SYSTEMS SHOWN ON THE DRAWINGS ARE DIAGRAMMATIC AND REQUIRE COORDINATION AS PART OF WORKSHOP DRAWINGS TO DETERMINE THE EXACT LOCATION ON SITE.

3. UNDER NO CIRCUMSTANCES WILL A COMPRESSION FITTING OR BACKNUT AND RUBBER RING BRASS OR COPPER CONE TYPE FITTINGS BE PERMITTED TO BE USED ON THE INSTALLATION.

4. INTERNAL PIPEWORK SHALL BE SIZED AS INDICATED ON THE PLANS.

5. ALL CHASED PIPEWORK SHALL BE LAGGED.

6. ALL HEATED WATER FIXTURES WITH AN OUTLET TEMPERATURE EXCEEDING 50.00C SHALL HAVE A SIGN, USING SYMBOL AND RED WRITING ON A WHITE BACKGROUND IN APPROPRIATE LANGUAGES, DISPLAYED ADJACENT TO THE FIXTURE WHICH STATES, "WARNING - THIS FIXTURE MAY DELIVER HOT WATER WHICH WILL SCALD."

7. SUPPLY, INSTALL AND CERTIFY ENWARE OR EQUAL THERMOSTATIC MIXING VALVE IN ACCORDANCE WITH AS 3500 AND AS SHOWN ON THE DRAWINGS.

8. THE HEATED WATER SYSTEM SHALL BE TEMPERATURE CONTROLLED USING THERMOSTATIC MIXING VALVES (TMV'S) TO ALL AREAS THAT ARE CONSIDERED A RISK TO THE OCCUPANTS. IT IS THE REASONABILITY OF THE PLUMBING CONTRACTOR TO PROVIDE A SAFE ENVIRONMENT FOR THE OCCUPANTS.

9. THE TMV SHALL BE INSTALLED A HEIGHT OF 1.500M AFFL AND IN ACCORDANCE WITH O. H & S REQUIREMENTS UNLESS INSTALLED IN A CUPBOARD. THE TMV'S SHALL NOT BE LOCATED IN THE CEILING VOID. WHERE LOCATED IN A CUPBOARD ALLOW A MINIMUM OF 250mm FREE SPACE AROUND THE VALVE FOR ACCESS AND MAINTENANCE.

10. SUPPLY, INSTALL AND CERTIFY ENWARE OR EQUAL TEMPERING MIXING VALVE WITH SETTING NO GREATER THAN 50°C IN ACCORDANCE WITH AS 3500.

HOT WATER CIRCULATING PUMPS

1. SUPPLY AND INSTALL BRONZE GRUNDFOS MODEL UPS 20-60B INLINE CIRCULATING PUMP. THE PUMP SHALL BE SUPPLIED WITH AND WIRED TO TEMPERATURE SENSING DEVICE.

HOT WATER UNITS

1. SUPPLY AND INSTALL MAINS PRESSURE HOT WATER UNITS COMPLETE WITH ALL STOP, CHECK, DRAIN VALVES AND PRESSURE RELIEF VALVES NECESSARY TO COMPLETE THE INSTALLATION. THE UNITS SHALL BE OF THE CAPACITY AND SIZE AS INDICATED ON THE DRAWINGS AND SHALL BE EQUAL TO RHEEM AUSTRALIA RHEEMGLASS.

RAINWATER RE-USE

1. PROVIDE RAINWATER RE-USE SYSTEM TO SUPPLY WATER FOR IRRIGATION/TIOLET FLUSHING (UNO).

2. A PERMANENT SIGN IS TO BE LOCATED IN THE VICINITY OF THE TANKS AND SUPPLY POINTS STIPULATING THAT THE WATER IS NOT FOR DRINKING.

3. PIPEWORK USED FOR RAINWATER SERVICES SHALL BE COLOURED PURPLE IN ACCORDANCE WITH AS1345.

4. ALL VALVES & PIPEWORK SHALL BE CLEARLY AND PERMANENTLY LABELED WITH SAFETY SIGNS TO COMPLY WITH AS1319.

5. AN AIR GAP OR A RPZD TO BE INSTALLED TO ENSURE BACKFLOW PREVENTION (IF MAINS 'TOP-UP / BYPASS' UTILISED).

6. RAINWATER TANK RETICULATION SYSTEM AND MAINS TOP ARRANGEMENT TO BE INSTALLED IN ACCORDANCE WITH AS/NZS 3500.1.16.3.2-2015 AND THE NCC VOLUME 3: PLUMBING CODE OF AUSTRALIA

7. A FIRST FLUSH DEVICE IS TO BE PROVIDED AT RAINWATER TANK TO BY PASS THE FIRST 0.5l/m² OF RAINWATER RUNOFF FROM ROOFED AREAS.

8. AS 3500.1 CLAUSE 14.3.2 REQUIRES THE WATER SUPPLY SYSTEM FROM A RAINWATER TANK IS CLEARLY MARKED AT INTERVALS NOT MORE THAN 500mm WITH THE WORD 'RAINWATER'. THIS CAN BE DONE FOR ABOVE GROUND PIPES BY USING ADHESIVE PIPE MARKERS (IN LINE WITH AS 1345). FOR BELOW GROUND PIPES, THIS CAN BE DONE BY USING IDENTIFICATION TAPE, WHICH IS AT LEAST 75mm WIDE WITH THE WORD 'RAINWATER' (IN LINE WITH AS 1345). THE IDENTIFICATION TAPE MUST BE INSTALLED ON TOP OF THE RAINWATER PIPELINE, RUNNING LONGITUDINALLY, AND FASTENED TO THE PIPE AT NOT MORE THAN THREE METRE INTERVALS.

9. EVERY RAINWATER TANK MUST BE LABELED RAINWATER' ON A PERMANENT SIGN OR BY HAVING THE COVER PLATE AND TAP HANDLE CLEARLY MARKED: 'FILTRATION', 'UV' OR '1st FLUSH'.

10. THE RETICULATION WILL BE A SEPARATE SYSTEM TO THE DOMESTIC COLD WATER, BUT WILL DIVERT TO THE TOWN MAINS WATER SUPPLY TO SERVICE THE IRRIGATION AND THE TOILETS IN CASE THERE IS INSUFFICIENT WATER WITHIN THE TANK. ONCE THE RAINWATER TANK LEVELS ARE REPLENISHED, THE SYSTEM WILL HAVE AN AUTOMATIC TRANSFER BACK TO TANK RAINWATER SUPPLY.

11. IF THE RAINWATER REUSE SYSTEM IS OUTSIDE, PROVIDE A LEAN TO ROOF OVER THE TOP FOR PROTECTION AGAINST THE ELEMENTS.

12. THE SYSTEM SHALL BE COMPLETE WITH THE FOLLOWING:
DUAL VARIABLE SPEED PUMPS COMPLETE WITH ALTERNATING STARTS. IF THE TANKS ARE UNDERGROUND, THE PUMPS MUST BE DESIGNED SO THEY ARE ON A CHAIN WHICH CAN BE EASILY ACCESSIBLE FROM GROUND LEVEL IE NO REQUIREMENT TO ENTER THE TANK FOR SERVICING.

13. AUTOMATIC COLD WATER MAINS CHANGEOVER COMPLETE WITH RPZD ASSEMBLY (SHALL BYPASS THE FILTRATION STAGING)
AUTOMATIC BACKWASH FACILITY (100MICRON - STAGE 1)
2 X BAG FILTRATION (25 & 5 MICRON - STAGE 2)
SELF-CLEANSING UV STERILIZATION (1 MICRON STAGE 3)

THE RAINWATER RE-USE CONFIGURATION SHALL BE AS FOLLOWS:
WC SUPPLY SHALL BE TREATED THROUGH THE ENTIRE FILTRATION SYSTEM. (STAGE 1,2 & 3).
HOSE TAP SUPPLY SHALL BE TREATED THROUGH THE ENTIRE FILTRATION SYSTEM (STAGE 1,2 & 3).
THE IRRIGATION PROVISION SHALL BYPASS THE STAGE 2 & 3 AND SHALL ONLY BE TREATED THROUGH STAGE 1 FILTRATION.

FIRE HOSE REEL

City Plan Services Pty Ltd
Reference: 210791/2
Chris Michaels
Director

1. HOSE REELS SHALL BE WALL MOUNTED CONTAINING 36M OF 20MM INTERNAL DIAMETER FABRIC REINFORCED NON-KINKING RUBBER HOSE WITH ADJUSTABLE NOZZLE. THE REELS SHALL BE FITTED WITH A GUNMETAL HUB, RED BAKED ENAMEL MILD STEEL SIDE PLATES AND STAINLESS STEEL SPACING RODS AND SHALL BE IN ACCORDANCE WITH AS 1221 AND APPROVED BY THE INSURANCE COUNCIL OF AUSTRALIA.

2. THE HOSE SHALL BE SUPPLIED WITH WATER FROM THE WATER SERVICE THROUGH A 25MM SCREWED VALVE FITTED WITH A UNION BETWEEN VALVE AND REEL FOR MAINTENANCE PURPOSES. THE NOZZLE SHALL BE ATTACHED TO THE VALVE BY A DEVICE SO THAT IT CANNOT BE REMOVED UNTIL WATER SUPPLY IS TURNED ON.

3. THE HOSE SHALL OPERATE WITH A MINIMUM FLOW RATE OF 0.33 LITRES PER SECOND AND A RUNNING PRESSURE OF 210 kPa AT THE OUTLET OF THE NOZZLE WHEN THE HOSE IS FULLY EXTENDED.

4. FIRE HOSE REELS SHALL BE PROVIDED IN ACCORDANCE WITH THE BCA REQUIREMENTS. THE SYSTEM SHALL ALSO BE APPROVED FOR USE BY THE LOCAL WATER AUTHORITY.

5. ALL FIRE HOSE REELS UNLESS NOTED OTHERWISE SHALL BE LOCATED WITHIN 4M OF A FIRE EGRESS EXIT.

6. FREE STANDING SUPPORT BRACKET SHALL BE GMS SECURED WITH A MINIMUM OF 3x10mm GMS APPROVED FIXINGS.

7. SUPPLY & INSTALL AN ELECTRIC FIRE HOSE REEL PUMP CAPABLE OF DELIVERING 0.66L/sec AGAINST AHEAD OF 42m.

GREENSTAR REQUIREMENTS

1. COMMISSIONING SHALL BE COMPLETED BY CONTRACTORS USING SYPSI

2. MAINTENANCE SCHEDULE OF GREENSTAR OBJECTIVES SHALL BE COMPLETED BY CONTRACTOR

3. ALL INSTALLED WATER METERS MUST BE SUPPLIED WITH ASSOCIATED PULSE METERING DEVICES THE CONTRACTORS MUST MAKE PROVISIONS FOR WIRING BACK TO THE BMS ENCLOSURE. A BMS PULSE WILL BE USED TO LOCALLY CONNECT SEVERAL REMOTE PULSE METERS IF CLUSTERED TOGETHER

4. WHERE RAINWATER HARVESTING TANKS ARE INSTALLED EACH TANK SHALL HAVE WATER METERING INSTALLED TO MONITOR THE TOTAL WATER CONSUMED FROM THE TANKS.

5. EACH METER IS TO BE CALIBRATED CORRECTLY AND A VALIDATION CERTIFICATE SHALL BE PROVIDED FOR EACHINSTALLED METER. 'AS BUILT' SINGLE LINE SCHEMATIC DRAWINGS WILL ALSO NEED TO BE PROVIDED WHICH WILL BE UPLOADED TO THE BMS CLOUD PLATFORM ALONG WITH THE VALIDATION CERTIFICATES.

INSULATION

1. ALL HEATED WATER PIPING SHALL BE INSULATED WITH APPROVED PERFORMED INSULATION IN ACCORDANCE WITH THE RELEVANT AUSTRALIAN STANDARDS, BCA AND ESD REQUIREMENTS.

2. THE MINIMUM PIPE INSULATION FOR THE HEATED WATER PIPEWORK SHALL BE 13mm THICK IN ACCORDANCE WITH THE BCA AND AS 3500 FOR A CLIMATE ZONE 1. ALLOW TO CONFIRM THE CLIMATE ZONE AND CORRECT THICKNESS WITH THE MANUFACTURER IF THE CLIMATE ZONE IS 2 OR 3.

3. WHERE THE OPERATING TEMPERATURE OF THE PIPELINE IS NO MORE THAN +90ºC, ALLOW TO PROVIDE AND INSTALL FIRE RETARDANT, CLOSED CELL POLYETHYLENE FOAM, HAVING A DENSITY OF NOT LESS THAN 50kg/m³ TO THE HOT, HEATED AND WARM WATER PIPELINES EQUAL TO THERMOTEC 4 ZERO.

4. ALLOW TO INSULATE ALL THE MAIN RUN OF HEATED WATER PIPEWORK FROM THE HEATER TO THE KITCHENS SINK IN ACCORDANCE WITH AS 3500 AND SECTION J OF THE BCA IN A MINIMUM OF 13mm THICK INSULATION.

5. RIOR TO APPLICATION OF INSULATION MATERIALS, ALL SURFACES SHALL BE THOROUGHLY CLEANED TO REMOVE SCALE, GREASE, OIL, DIRT AND ANY OTHER FOREIGN MATTER, AND WHERE SUBJECT TO CONDENSATION SHALL BE PROTECTED AGAINST CORROSION. ALL INSULATING MATERIAL SHALL BE OF THE BEST QUALITY IN THEIR RESPECTIVE TYPES.

6. PRE-FORMED SECTIONS SHALL BE COMPLETE WITH A SISAL COVERING CONNECTED TO THE ENTIRE EXTERNAL SURFACE. THE COVERING SHALL BE INSTALLED TO PROVIDE A LAP OF NOT LESS THAN 25mm AT ALL LONGITUDINAL AND CIRCUMFERENTIAL JOINTS. THE INSULATION THUS APPLIED SHALL BE FURTHER SECURED WITH BANDS OF NON-CORROSIVE METAL. METAL BANDS SHALL BE NOT LESS THAN 19mm WIDE, INSTALLED GENERALLY AT 450mm CENTRES AND AT ALL POINTS WHERE INSULATION HAS BEEN CUT OR SHAPED.

7. AT FLANGES, VALVES AND OTHER SIMILAR CONNECTIONS, THE INSULATION SHALL BE BEVELLED AND CUT BACK TO PROVIDE ADEQUATE ACCESS TO BOLTS AND FITTINGS. VALVES, FLANGES AND UNIONS, ARE REQUIRED TO BE INSULATED.

8. NO INSULATION SHALL BE APPLIED PRIOR TO PRESSURE TESTING OF THE RESPECTIVE PARTS OF THE INSTALLATION. INSULATION SHALL BE APPLIED IN AN APPROVED MANNER.

9. APPROVED WOOD BLOCKS, THE SAME EXTERNAL DIAMETER AS THE INSULATION MATERIAL SHALL BE PROVIDED AT ALL BRACKET POINTS. THE BLOCKS SHALL BE IN TWO HALVES AND SHALL BE A MINIMUM OF 25mm WIDE AND SEALED USING A SILICON SEALANT.

10. SERVICE PENETRATION AREAS SHALL BE DESIGNED TO MEET A FOUR (4) HOUR FIRE RATING AS PER AS 1530.4.

11. METAL SHEATHING IS REQUIRED FOR AREAS EXPOSE TO THE WEATHER OR WHERE THE PRODUCT IS SUBJECT TO MECHANICAL DAMAGE.

12. IRRESPECTIVE OF PIPING MATERIALS USED, ALL HOT, HEATED, WARM AND TEMPERED WATER SERVICES ARE TO BE INSULATED WITH A MINIMUM WALL THICKNESS AS STATED IN THIS SPECIFICATION.

SAFETY IN DESIGN

1. PRELIMINARY SAFETY IN DESIGN ASSESSMENT HAS BEEN COMPLETED BY SPARKS AND PARTNERS CONSULTING ENGINEERS AND HAS BEEN INCORPORATED INTO THE DESIGN, HOWEVER WILL BE SUBJECT TO OTHER EXTERNAL INFLUENCES THAT REQUIRE CONSULTATION, COORDINATION AND COOPERATION TO ELIMINATE OR MINIMISE RISK/ HAZARDS.

2. A PRELIMINARY LIFE CYCLE ASSESSMENT FOR SAFETY IN DESIGN WAS CONSIDERED, HOWEVER, OTHER INFLUENTIAL PARTIES THAT MAKE FINANCIAL, COMMERCIAL OR TECHNICAL DECISIONS OVER THE PROJECT MUST BE CONSULTED PRIOR TO THE COMPLETION OF THIS ASSESSMENT.

3. THE CONTRACTOR SHALL COMPLETE A SAFETY AND RISK ASSESSMENT PRIOR TO AND DURING THE CONSTRUCTION OF THE WORKS TO IDENTIFY AND POTENTIAL RISKS IN ACCORDANCE WITH WORK, HEATH SAFETY GUIDELINES: THESES SHALL INCLUDE:

   a. ELECTRICAL SAFETY
   b. FIRE AND EMERGENCIES
   c. MOVEMENT OF PEOPLE AND MATERIALS
   d. WORKING ENVIRONMENT
   e. PLANT
   f. AMENITIES AND FACILITIES
   g. EARTHWORKS
   h. STRUCTURAL SAFETY
   i. MANUAL TASKS
   j. SUBSTANCES
   k. FALL PREVENTION
   l. SPECIFIC RISKS
   m. NOISE EXPOSURE

NOTE: A DETAILED EXAMPLE AND GUIDELINES CAN BE FOUND WITHIN THE "SAFE DESIGN OF STRUCTURES" CODE OF PRACTICE JULY 2012

4. THE CONTRACTOR SHALL ALLOW TO DEVELOP SAFE WORKING METHODS & PROCEDURES FOR ALL ITEMS ASSOCIATED WITH THE CONSTRUCTION THAT ARE A POTENTIAL RISK/ HAZARD.

5. THE CONTRACTOR SHALL LIAISE WITH THE ENGINEER FOR ANY ISSUES ARISING FROM THE SAFETY AND RISK ASSESSMENT.

6. BELOW IS A PRELIMINARY LIST IDENTIFYING POTENTIAL SAFETY RISKS AND MITIGATION WHICH WAS UNDERTAKEN WITHIN THE HYDRAULIC DESIGN IN REGARDS TO THE CONSTRUCTION AND THE OPERATION AND MAINTENANCE PHASES. THE BELOW MENTIONED IS NOT A COMPLETE LIST AND THE CONTRACTOR SHALL COMPLETE THERE OWN ASSESSMENT:

a. EXISTING UNDERGROUND SERVICES
   i. SERVICES SURVEY TO BE PRODUCED AND PIPE TRACING TO BE CARRIED OUT PRIOR TO EXCAVATION
   ii. EXISTING SERVICES SURVEY TO BE OVERLAID INTO CONTRACTORS WORKSHOP DRAWINGS TO ENSURE THEY ARE AWARE OF EXISTING SERVICES WITHIN THE AREA OF WORKS.
   iii. EXCAVATE BY HAND IN AREAS OF KNOWN EXISTING SERVICES

b. EXISTING STRUCTURE FOOTINGS / PIERS
   i. ENSURE ZONE OF INFLUENCE IS NOT AFFECTED BY PROPOSED WORKS
   ii. MAINTAIN CLEARANCES IN ACCORDANCE WITH STRUCTURAL ENGINEERS REQUIREMENTS

c. CONFINED SPACE AND ACCESS
   i. ASSESS AREA PRIOR TO ENGAGEMENT

d. WORKING AT HEIGHT
   i. WEAR APPROPRIATE PPE AND FALL ARREST DEVICES
   ii. PIPING MAINLY CONSISTS OF CEILING VOID ROUTED WHICH ARE ACCESSIBLE BY LADDER

e. OPERATION AND MAINTENANCE
   i. AS-BUILT INFORMATION INCLUDING O&M MANUALS, AS-BUILT DRAWINGS, AND SAFE SHUT DOWN, MAINTENANCE AND START-UP PROCEDURES TO INFORM WORKERS WHO ARE NOT FAMILIAR WITH THE INSTALLATION SHALL BE PRODUCED BY THE INSTALLATION CONTRACTOR AND KEPT ON SITE IN SOFT AND HARD COPY FORMATS FOR ACCESS BY MAINTENANCE CONTRACTORS.

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DATE	AMENDMENT	INIT	REV
07.02.25	PRELIMINARY ISSUE	AD	1
07.03.25	PRELIMINARY ISSUE	SW	2
14.03.25	DRAFT CC2 ISSUE	JF	3
20.03.25	CC2 ISSUE PRE DECLARE	JF	4
21.03.25	CC2 DECLARED DESIGN	JF	A

DATE	AMENDMENT	INIT	REV

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MECHANICAL
ELECTRICAL
CIVIL

CLIENT
FRASERS PROPERTY
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HCAA | FPA AUSTRALIA GOLD MEMBER Fire Protection Association Australia | DNV·GL ISO 9001 | JAS-ANZ

DRAWING TITLE
HYDRAULIC SERVICES
SPECIFICATION SHEET 3

DATE	DRAWN	DESIGNED	CHECKED
MAR. 2025	AD	II	-

PROJECT No	SCALE	SIZE	REVISION
25023	N.T.S.	A1	A

DRAWING No: H1203

Regulated Design Record				
Project Address: NO. 1 IVANHOE PLACE, MACQUARIE PARK NSW 2113				
Project Title: C3 MIDTOWN TREEHOUSE				
Consent No: SSD-10405		Body Corporate Reg No: DEP0001273		
Drawing Title: GRAVITY SERVICES PLAN - BASEMENT 3		Drawing No: H2101		
Rev	**Date**	**Description**	**DP Full Name**	**Reg No**
A	21.03.2025	CC2 DECLARED DESIGN	LEONARDO DIMINO	BDC3360

City Plan Services Pty Ltd
Reference: 210791/2
Date: 03/04/2025
Construction Certificate
Chris Michaels
Director
BDC1974

CRITICAL DESIGN NOTES & ALLOWANCES - TO BE READ PRIOR TO CONSTRUCTION

EXCAVATION ALLOWANCES: ALLOWANCE OF 100MM FILL BELOW GIVEN PIPE INVERT LEVELS APPLIES TO ALL INGROUND PIPEWORK.

SEWER PUMP-OUT ALLOWANCES (6kL EFFECTIVE STORAGE)

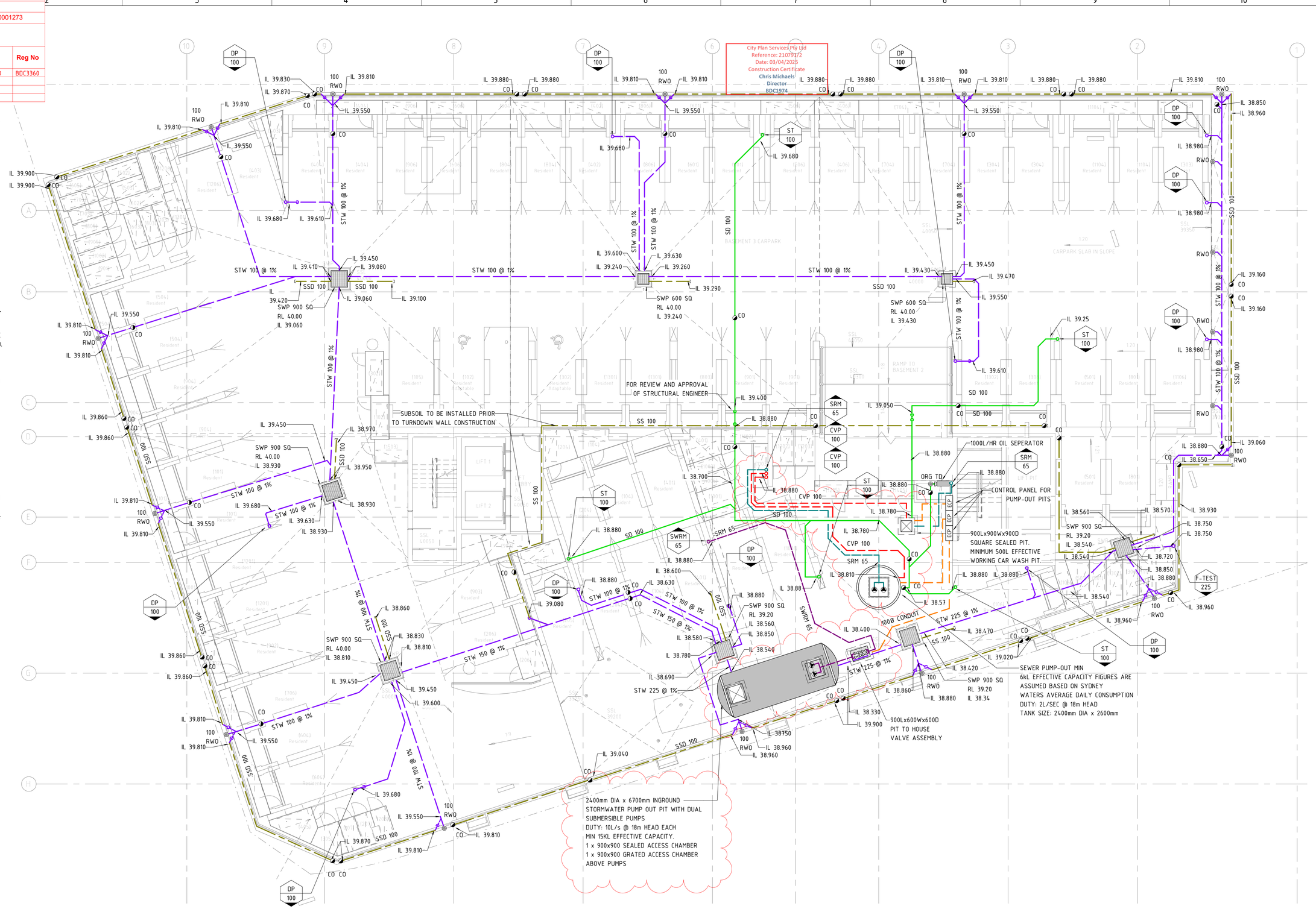
THESE ALLOWANCES ARE BASED ON SYDNEY WATERS RETAIL FOOD BUSINESS GUIDELINES & 'AVERAGE DAILY WATER USE BY PROPERTY DEVELOPEMENT TYPE' =
"SHOPPIING CENTRE = 3L/m2/DAY"
CALCULATED M2 OF RETAIL ON GROUND FLOOR = 3L x 870m2 = 2610L/DAY
RETAIL MECH AC CONDENSOR DRAINS 1.5L/HR x 15 UNITS = 23 L/HR x 12 HR = 276L/DAY
ANTICIPATE DAILY STORAGE ROUNDED UP = 3kL/DAY
PROPOSED EMERGANCY STORAGE = 3kL/DAY
TOTAL EFFECTIVE STORAGE = 6kL

STORMWATER PUMP-OUT ALLOWANCES (15KL EFFECTIVE STORAGE)

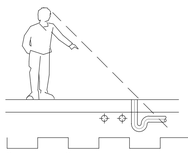
NO FIRE SERVICES PUMP TEST CAN BE CONDUCTED DURING A RAINFALL EVENT, STORMWATER TANK SHALL BE PUMPED OUT PRIOR TO FIRE SERVICES PUMP BEING TESTED.

MINIMUM EFFECTIVE STORAGE = 15 kL (100mm BELOW PIPE INVERT ENTRY)
SURFACE AREA CATCHMENT 80M2 @ 10% ARI 29.3mm/HR x 2 HRS = 4.5kL 2 HR PERIOD. (2.25kL/HR)
SUBSOIL FLOW PROVIDED BY GEOTECHNICAL ENGINEER REPORT DOUGLAS AND PARTNERS = 3,000,000 L/YEAR = 8.2kL/DAY (0.342 kL/HR)
ANTICIPATED HOURLY INFLOW RATE EXCLUDING FIRE = 2.6 kL/HR
ANTICIPATED DAILY STORAGE = 8.2kL + 2.25 kL = 10.45kL/DAY
PROPOSED EMERGANCY STORAGE = 4.65kL
PROPOSED OUTLET DISCHARGE WITH PUMP DUTY 10L/S @ 15 MIN = 9kL

ANTICIPATED FIRE SERVICES PUMP TEST = 24L/S x 10 MIN = 14.4kL. (FIGURES PROVIDED BY FIRE ENGINEER, FIRE ENGINEER TO CONFIRM TESTING COMPLIES WITH NATHERS & BASIX ASSESSMENT)



SERVICES SHOWN OUT OF STRATA



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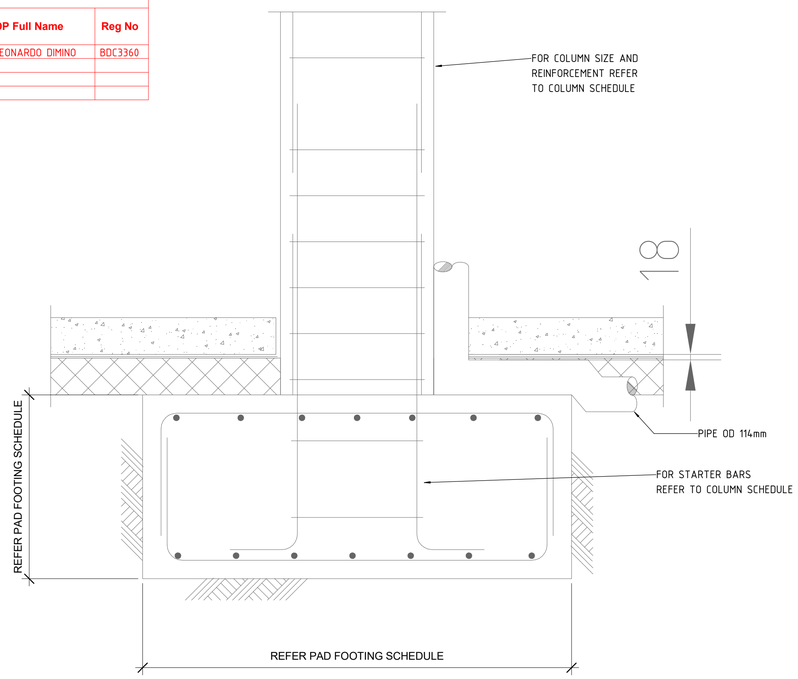
DRAWING TITLE
HYDRAULIC SERVICES
GRAVITY SERVICES PLAN - BASEMENT 3

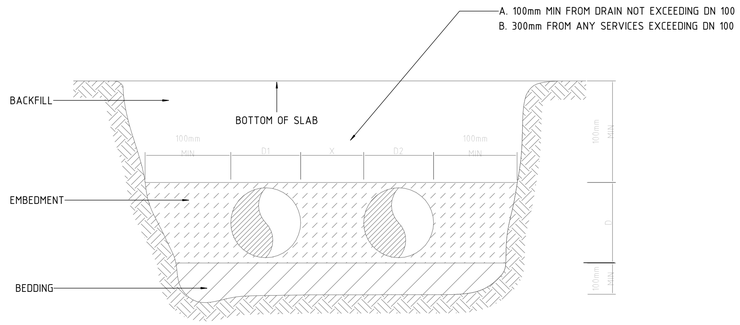
DATE	DRAWN	DESIGNED	CHECKED
MAR. 2025	AD	II	-
SCALE	1 : 100	SIZE	A1
PROJECT No	25023	DRAWING No	H2101
REVISION	A		

Regulated Design Record	
Project Address: NO. 1 IVANHOE PLACE, MACQUARIE PARK NSW 2113	
Project Title: C3 MIDTOWN TREEHOUSE	
Consent No: SSD-10405	Body Corporate Reg No: DEP0001273
Drawing Title: DETAILS SHEET 1	Drawing No: H5101

Rev	Date	Description	DP Full Name	Reg No
A	21.03.2025	CC2 DECLARED DESIGN	LEONARDO DIMINO	BDC3360



TYPCIAL PAD FOOTING DETAIL
1 : 10



TYPCIAL SHARED TRENCH DETAIL
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Reference: 210791/2
Date: 03/04/2025
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Chris Michaels
Director
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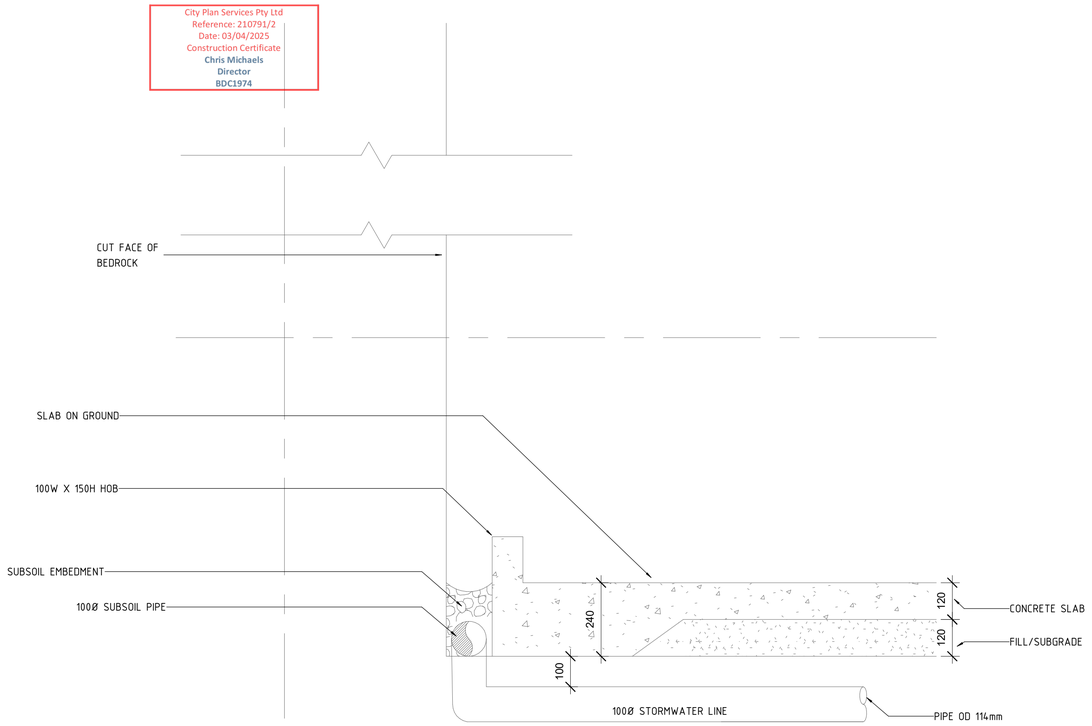
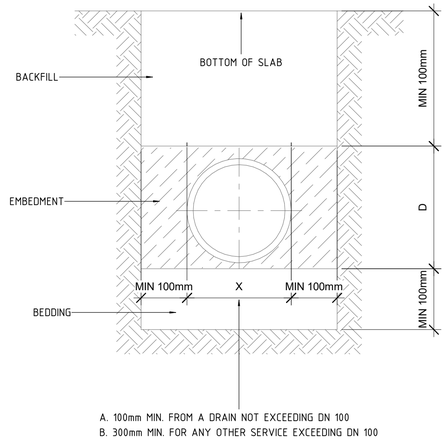


TYPCIAL SUBSOIL DETAIL
1 : 10



TYPCIAL TRENCH DETAIL
1 : 10

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20.03.25	CC2 ISSUE PRE DECLARE	JF	2
21.03.25	CC2 DECLARED DESIGN	JF	A

DATE	AMENDMENT	INIT	REV

STRUCTURAL
MECHANICAL
ELECTRICAL
CIVIL

CLIENT
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1 HOMEBUSH BAY DRIVE
RHODES, NSW 2138

BUILDER
RICHARD CROOKES CONSTRUCTIONS
LEVEL 14, 558 PACIFIC HIGHWAY
ST LEONARDS, NSW 2065

PROJECT
C3 MIDTOWN TREEHOUSE
1 IVANHOE PLACE, MACQUARIE PARK
NSW

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DRAWING TITLE
HYDRAULIC SERVICES
DETAILS SHEET 1

DATE	DRAWN	DESIGNED	CHECKED
MAR. 2025	SW	II	-

PROJECT No	SCALE	SIZE	REVISION
25023	As indicated	A1	A

DRAWING No H5101

Regulated Design Record	
Project Address: NO. 1 IVANHOE PLACE, MACQUARIE PARK NSW 2113	
Project Title: C3 MIDTOWN TREEHOUSE	
Consent No: SSD-10405	Body Corporate Reg No: DEP0001273
Drawing Title: DETAILS SHEET 2	Drawing No: H5102

Rev	Date	Description	DP Full Name	Reg No
A	21.03.2025	CC2 DECLARED DESIGN	LEONARDO DIMINO	BDC3360

City Plan Services Pty Ltd
Reference: 210791/2
Date: 03/04/2025
Construction Certificate
Chris Michaels
Director
BDC1974

BOONE & WILLARD PREFERRED TRENCH DEPTH TO WIDTH

Nom. ID (mm)	Trench Width	Trench Width (m)	Depth
100	450	0.45	500
100	450	0.45	750
100	600	0.6	1000
100	600	0.6	1250
100	800	0.8	1500
100	800	0.8	1750
100	1200	1.2	2000
100	1200	1.2	2250
100	1200	1.2	2500
100	1200	1.2	2750
100	1500	1.5	3000
150	450	0.45	500
150	450	0.45	750
150	600	0.6	1000
150	600	0.6	1250
150	800	0.8	1500
150	800	0.8	1750
150	1200	1.2	2000
150	1200	1.2	2250
150	1200	1.2	2500
150	1200	1.2	2750
150	1500	1.5	3000
225	600	0.6	500
225	600	0.6	750
225	800	0.8	1000
225	800	0.8	1250
225	1200	1.2	1500
225	1200	1.2	1750
225	1500	1.5	2000
225	1500	1.5	2250
225	1500	1.5	2500
225	1500	1.5	2750
225	1500	1.5	3000
375	600	0.6	500
375	600	0.6	750
375	800	0.8	1000
375	800	0.8	1250
375	800	0.8	1500
375	1000	1	1750
375	1000	1	2000
375	1200	1.2	2250
375	1200	1.2	2500
375	1200	1.2	2750
375	1500	1.5	3000
450	900	0.9	500
450	900	0.9	750
450	1200	1.2	1000
450	1200	1.2	1250
450	1500	1.5	1500
450	1500	1.5	1750
450	1500	1.5	2000
450	1800	1.8	2250
450	1800	1.8	2500
450	1800	1.8	2750
450	1800	1.8	3000
525	900	0.9	500
525	900	0.9	750
525	1200	1.2	1000
525	1200	1.2	1250
525	1500	1.5	1500
525	1500	1.5	1750
525	1500	1.5	2000
525	1800	1.8	2250
525	1800	1.8	2500
525	1800	1.8	2750
525	1800	1.8	3000
600	900	0.9	500
600	900	0.9	750
600	1200	1.2	1000
600	1200	1.2	1250
600	1500	1.5	1500
600	1500	1.5	1750
600	1500	1.5	2000
600	1800	1.8	2250
600	1800	1.8	2500
600	1800	1.8	2750
600	1800	1.8	3000
600			3250
600			3500
600			3750
600			4000
600			4250
600			4500
600			4750
600			5000
675			500
675			750
675			1000
675			1250
675			1500
675			1750
675			2000
675			2250
675			2500
675			2750
675			3000
675			3250
675			3500
675			3750
675			4000
675			4250
675			4500
675			4750
675			5000
750			500
750			750
750			1000
750			1250
750			1500
750			1750
750			2000
750			2250
750			2500
750			2750
750			3000
750			3250
750			3500
750			3750
750			4000
750			4250
750			4500
750			4750
750			5000
825			500
825			750
825			1000
825			1250
825			1500
825			1750
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825			4000
825			4250
825			4500
825			4750
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900			500
900			750
900			1000
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900			1500
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900			4000
900			4250
900			4500
900			4750
900			5000
1050			500
1050			750
1050			1000
1050			1250
1050			1500
1050			1750
1050			2000
1050			2250
1050			2500
1050			2750
1050			3000
1050			3250
1050			3500
1050			3750
1050			4000
1050			4250
1050			4500
1050			4750
1050			5000

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20.03.25	CC2 ISSUE PRE DECLARE	JF	2
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DRAWING TITLE
HYDRAULIC SERVICES
DETAILS SHEET 2

DATE	DRAWN	DESIGNED	CHECKED
MAR. 2025	SW		

PROJECT No	SCALE	SIZE	REVISION
25023	1 : 100	A1	A

DRAWING No H5102

TREEHOUSE MACQUARIE PARK

TREEHOUSE MAQUARIE PARK

City Plan Services Pty Ltd
Reference: 210791/2
Date: 03/04/2025
Construction Certificate
Chris Michaels
Director
BDC1974

Architectural Specification

Construction of multi-residential apartment building with ground floor retail and basement carparking
C3 Midtown MacPark
Ivanhoe Estate
Macquarie Park

Revision	Date	Approved by
Rev 01 – CC2 Submission	21.03.2025	ML

Team2 Architects
ABN: 72 104 833 507

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0131 PRELIMINARIES

1 GENERAL

1.1 GENERAL

General conditions

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Interpretation

Requirement: The words owner and architect have the same meaning, respectively, as principal and contract administrator, unless the context requires otherwise.

Cross reference: **INTERPRETATION** in *0171 General requirements* also applies.

1.2 THE SITE

Site restrictions

Site limitations: Comply with the following restrictions on the use of the site: As per superintendent instruction

Access area restrictions: Access onto and within the site, and use of the site for temporary works and construction plant, including working and storage areas, location of offices, workshops, sheds, roads and parking, is restricted to the following areas: As per superintendent instruction

Secure areas

Designated secure areas: As per superintendent instruction

Conditions of entry: As per superintendent instruction

Entry permits: Make available, to persons entering designated secure areas, valid entry permits. Make sure these persons comply with conditions of entry.

Personnel: Submit the full name, address, and date and place of birth of persons required to enter designated secure areas.

- Purpose of submission: For review.
- Timing of submission: At least 10 working days before entry is required.

Occupied premises

General: For the parts of the site documented in the **Occupied premises schedule**:

- Allow occupants to continue in secure possession and occupancy of the premises for the required period.
- Maintain safe access for occupants.
- Arrange work to minimise nuisance to occupants and for their safety.
- Protect occupants against weather, dust, dirt, water or other nuisance.

Proposals: Submit details of proposed methods.

- Purpose of submission: For information.
- Timing of submission: Before commencement of work.

Reinstatement

Accessways and services: Do not obstruct or damage roadways and footpaths, drains and watercourses and other existing services in use on or adjacent to the site. Determine the location of such services. Rectify immediately any obstruction or damage to such services and provide temporary services whilst repairs are carried out.

Trees and properties: Do not interfere with or damage trees and properties that are to remain on or adjacent to the site, including adjoining property encroaching onto the site. Rectify immediately any interference or damage to such trees and properties.

Existing services

Service to be continued: Repair, divert or relocate service, as documented.

Trenches: If the existing service crosses the line of a required trench or will lose support when the trench is excavated, provide permanent support for the existing service.

Redundant services: Remove redundant parts and make safe.

Interruptions to services: Minimise the number and duration of interruptions.

Changes to existing services: Submit proposals.

- Purpose of submission: For review.
- Timing of submission: Before starting work to existing services.

Adjoining properties

Notice: At least 10 working days before commencing work, give written notice to owners and occupants of adjoining properties of intention to commence work and an outline description of the type and extent of work.

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Revealed encroachments: If the works reveal unknown encroachments of adjoining properties onto the site or of existing site structures onto adjoining properties, immediately notify the architect and seek instruction.

Records: For each property documented in the **Adjoining properties to be recorded schedule**:

- Inspect the property with the architect and owner and occupant of the property, before commencement of work.
- Make detailed records of conditions existing within the property, especially structural defects and other damage or defacement.
- Arrange for at least 2 copies of each record, including drawings, written descriptions and photographs, to be endorsed by the owner and occupant of the property, or their representatives, as evidence of conditions existing before commencement of work.

Endorsed copies: Submit one endorsed copy of each record. Keep the other endorsed copy on site.

- Purpose of submission: For information.
- Timing of submission: Before commencement of work.

1.3 CONSTRUCTION PLANT

General

Temporary works: Provide and maintain required hoardings, barricades, guards, fencing, shoring, temporary roadways, footpaths, signs, lighting and traffic management.

Access roads

Owner's existing roads: Use only designated roads.

Parking

Owner's existing parking areas: Use only designated parking areas.

Owner's site office

Requirement: Provide a weathertight site office for the use of the owner or the owner's agents before major site operations are started and as follows:

- Pay charges for services.
- Maintain in good order and in clean condition, with secure access, for duration of the work.
- Obtain permission for removal.
- Remove on completion.

Protective clothing

Requirement: Make available protective clothing for the use of visitors, as follows:

- Safety helmets: Type 1 to AS/NZS 1801 (1997).
- High visibility safety vests: To AS 4602.1 (2024).

Certification: Required.

- Certification provider: An organisation accredited by the Joint Accreditation System of Australia and New Zealand (JASANZ).

Use of existing services

General: Existing services may be used as temporary services for the performance of the contract subject to conditions of use, as documented in the **Existing services schedule**.

Project signboards

General: Provide project specific signboards and as follows:

- Locate where directed.
- Maintain in good condition for duration of the work.
- Obtain permission for removal.
- Remove on completion.

1.4 BUILDING THE WORKS

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Survey marks

Definition: A survey peg, benchmark, reference mark, signal, alignment, level mark or any other mark used or intended to be used for the purpose of setting out, checking or measuring the work.

Care of survey marks: Preserve and maintain the owner's survey marks in their true positions.

Rectification: If survey marks are disturbed or obliterated, immediately rectify.

Safety

Accidents: Promptly notify the architect of the occurrence of the following:

- Accidents involving death or personal injury.
- Accidents involving loss of time.
- Incidents with accident potential such as equipment failure, slides and cave-ins.

Accident reports: Submit reports of accidents.

- Purpose of submission: For information.

Contractor's representative

General: Must be accessible, and fluent in English and technical terminology.

Contacts: Submit names and telephone numbers of responsible persons who may be contacted after hours during the course of the contract.

- Purpose of submission: For information.
- Timing of submission: At the first site meeting.

Subcontracting

General: Submit a complete list of proposed subcontractors and suppliers.

- Purpose of submission: For information.

Program of work

Construction program: Submit a construction program showing the following:

- Sequence of work.
- Critical paths of activities related to the work.
- Allowance for holidays.
- Activity inter-relationships.
- External dependencies including provision of access, document approvals and work by others.
- Periods within which various stages or parts of the work are to be executed.

Time scale: Working days.

Updated program: Identify changes since the previous issue, and show the estimated percentage of completion for each item of work.

Purpose of submission: For information.

Program chart: Display in the contractor's site office an up-to-date bar chart and network diagram based on the construction program.

Site meetings

General: Hold and attend site meetings throughout the contract and arrange for the attendance of appropriate subcontractors, architect and appropriate consultants.

Minutes: Make a record of site meetings. Distribute a copy of the minutes to each party.

- Purpose of submission: For review.
- Timing of submission: Within 5 working days after each meeting.

Progress photographs
General: Take colour progress photographs within 5 working days, before each site meeting. Submit 2 sets of prints and the digital files. Identify the project, date, time, location and orientation.

- Purpose of submission: For information.
- Timing of submission: At each site meeting.

Items supplied by owner
General: Materials and other items supplied free of charge to the contractor for installation in the execution of the works. Unload and take delivery, inspect for defects and take care of the items. If defects are found, advise. Return unused items to the owner.

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Changes to existing items
General: At least 5 working days before changing existing items, give notice.

Persons other than contractor
Facilities: Refer to person other than contractor documentation.

Contractor/person other than contractor interfaces: Refer to person other than contractor documentation.

1.5 COMPLETION OF THE WORKS

Final cleaning
General: Before the date for practical completion, clean throughout, including interior and exterior surfaces exposed to view. Vacuum carpeted and soft surfaces. Clean debris from the site, roofs, gutters, downpipes and drainage systems. Remove waste and surplus materials.

Samples: Remove non-incorporated samples, prototypes and sample panels.

Reinstatement
Requirement: Before the date for practical completion, clean and repair damage caused by installation or use of temporary work and restore existing facilities used during construction to original condition.

Adjoining properties
Evaluation: At practical completion, for each property documented in the **Adjoining properties to be recorded schedule**, inspect the property with the architect and owner and occupant of the property, recording any damage that has occurred since the pre-commencement inspection.

Pest eradication
Requirement: Employ suitably qualified pest exterminators. At practical completion, verify that completed works are free of pest types documented in the **Pest eradication treatment schedule**.

Removal of plant
General: Within 10 working days after practical completion, remove temporary works and construction plant no longer required. Remove the balance before the end of the defects liability period.

1.6 PAYMENT FOR THE WORKS

Progress claims
Anticipated progress claims: Submit a schedule of anticipated progress claims for the contract period.

- Purpose of submission: For information.
- Timing of submission: At commencement of the works.

Progress claim breakdown: Submit a statement of amounts claimed in respect of each worksection or trade heading designated in the specification.

- Purpose of submission: For review.
- Timing of submission: With each progress claim.

Import costs
Definition: Import costs include costs attributable to exchange rates, customs and import duty of imported content of items purchased for incorporation in the works.

Adjustment: If there are changes in rates applying to import costs of items documented in the **Import costs adjustment schedule**, add or deduct the amount of the difference to or from the contract sum, as applicable.

Method of measurement
General: In conformance with the principles of the Australian and New Zealand standard method of measurement of building works (ANZSMM) (2022).

1.7 MISCELLANEOUS

Contractor and owner to observe confidentiality
Publicity: Do not issue information concerning the project for publication in the media without prior written approval of the owner. Refer enquiries from the media concerning the project to the owner.

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0171 GENERAL REQUIREMENTS

1 GENERAL

1.1 PRECEDENCE

General

Order of precedence: If there is conflict or inconsistency between the worksections of this specification, the requirements of worksections take the following order of precedence:

- All worksections other than those listed below.
- *0701 Mechanical systems, 0801 Hydraulic systems, 0901 Electrical systems* and *1001 Fire services systems.*
- *018 Common requirements* worksections.
- *0171 General requirements*.

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Date: 03/04/2025
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1.2 CROSS REFERENCES

Common requirements

Requirement: Conform to the following worksections:

- *0181 Adhesives, sealants and fasteners*.
- *0182 Fire-stopping*.
- *0183 Metals and prefinishes*.
- *0184 Termite management*.
- *0185 Timber products, finishes and treatment*.
- *0193 Building access safety systems*.

Cross referencing styles

General: Within the text, titles are cross referenced using the following styles:

- Worksection titles are indicated by *Italicised* text.
- Subsection titles are indicated by CAPITAL text.
- Clause titles are indicated by **BOLD CAPITAL** text.
- Subclause titles are indicated by **Bold Sentence case** text.

1.3 REFERENCED DOCUMENTS

General

Precedence: The requirements of worksections override conflicting requirements of their referenced documents. The requirements of the referenced documents are minimum requirements.

Contractual relationships: Responsibilities and duties of the principal, contractor and contract administrator are not altered by requirements in the documents referenced in this specification.

Current editions: All referenced documents are the editions, with amendments, current on 1st September 2024.

Exception to current editions: If statutory requirements reference other editions or standards, conform to those other editions or standards. If the NCC (2022) references editions other than the current edition, the same editions cited in the NCC (2022) are referenced in each worksection.

Maintenance and repair works: If statutory requirements applicable to the maintenance or repair works reference other editions or standards, conform to those other editions or standards.

European standards: Any national European Standard (e.g. IS EN or DIN EN) may be used in place of the equivalent referenced European Standard (EN).

1.4 CONTRACT DOCUMENTS

Services diagrammatic layouts

General: Layouts of service lines, plant and equipment shown on the drawings are diagrammatic only, except where figured dimensions are provided or calculable.

Before commencing work:

- Obtain measurements and other necessary information.

- Coordinate the design and installation in conjunction with all trades.

Levels

General: Spot levels take precedence over contour lines and ground profile lines.

Warranty: No warranty is given as to the completeness or accuracy of drawings and/or manuals of existing services.

1.5 INTERPRETATION

Abbreviations

General: For the purposes of this specification the following abbreviations apply:

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- BCA: National Construction Code Series Volume One: Building Code of Australia Class 2 to 9 Buildings and Volume Two: Building Code of Australia Class 1 and Class 10 Buildings.
- GRP: Glass Reinforced Plastic.
- IP: Ingress protection.
- NATA: National Association of Testing Authorities.
- NCC: National Construction Code.
- PCA: National Construction Code Series Volume 3: Plumbing Code of Australia.
- PVC: Polyvinyl Chloride.
- PVC-U: Unplasticised Polyvinyl Chloride. Also known as UPVC.
- SDS: Safety data sheets.
- VOC: Volatile Organic Compound.
- WHS: Work Health and Safety.

Definitions

General: For the purposes of this specification, the following definitions apply:

- Access for maintenance: Includes access for maintenance, inspection, measurement, operation, adjustment, repair, replacement and other maintenance related tasks.
- Accessible, readily: Readily accessible, easily accessible, easy access and similar terms mean capable of being reached quickly and without the use of a tool, without hazard, climbing over or removing obstructions, using a movable ladder and in any case not more than 2.0 m above the ground, floor or platform.
- Accredited Testing Laboratory:
  - An organisation accredited by the National Association of Testing Authorities (NATA) to undertake the relevant tests; or
  - An organisation outside Australia accredited to undertake the relevant tests by an authority recognised by NATA through a mutual recognition agreement; or
  - An organisation recognised as being an Accredited Testing Laboratory under legislation at the time the test was undertaken.
  - An organisation accredited for compliance with AS ISO/IEC 17025 (2018) to undertake the relevant tests.
- Appropriately qualified person: To NCC (2022) Schedule 1.
- Attendance: Attendance, provide attendance and similar expressions mean give assistance for examination and testing.
- Baseline data: Data derived from the final design, installation and commissioning, which serve as a basis for verification of results of routine servicing.
- Commissioning: Advancement of an installation from static completion to full working order, including verification that the systems, subsystems, and their components meet the project requirements. This includes all work described as commissioning in referenced documents, even if carried out before static completion.
- Consumable: Materials or components intended to be replaced within the service life of the associated plant or equipment.
- Contract administrator: Has the same meaning as architect, superintendent or principal's authorised person and is the person appointed by the owner or principal under the contract.
- Contractor: Has the same meaning as builder and is the person or organisation bound to carry out and complete the work under the contract.

- Default: Specified value, product or installation method that is to be provided unless otherwise documented.
- Design life: The period of time for which it is assumed, in the design, that an asset will be able to perform its intended purpose with only anticipated maintenance but no major repair or replacement being necessary.
- Design parameters: Information used as the basis for design. It includes design requirements, performance criteria, performance parameters and similar terms.
- Documented: Documented, as documented and similar terms mean contained in the contract documents.
- Economic life: The period of time from the acquisition of an asset to the time when the asset, while still physically capable of fulfilling its function and with only anticipated maintenance, ceases to be the lowest cost alternative for satisfying that function.
- Electricity distributor: Any person or organisation that provides electricity from an electricity distribution system to one or more electrical installations. Includes distributor, supply authority, network operator, local network service provider, electricity retailer or electricity entity, as may be appropriate in the relevant jurisdiction.
- Errors and omissions: For the design prepared by the contractor, errors and omissions have the same meaning as defects.
- Fire hazard properties: To NCC (2022) Schedule 1.
- Gas Network Operator: Has the same meaning as network operator in AS/NZS 5601.1 (2022).
- Geotechnical site investigation: The process of evaluating the geotechnical characteristics of the site in the context of existing or proposed construction.
- Give notice: Give notice, submit, advise, inform and similar expressions mean give notice (submit, advise, inform) in writing to the contract administrator.
- High level interface: Systems transfer information in a digital format using an open system interface.
- Hot-dip galvanized: Zinc coated to AS/NZS 4680 (2006) after fabrication with coating thickness and mass to AS/NZS 4680 (2006) Table 1.
- Ingress protection: IP, IP code, IP rating and similar expression have the same meaning as IP Code in AS 60529 (2004).
- Joints: Construction joint: A joint with continuous reinforcement provided to suit construction sequence.
  - Contraction joint: An opening control joint with a bond breaking coating separating the joint surfaces to allow independent and controlled contraction of different parts or components, induced by shrinkage, temperature changes or other causes. It may include unbound dowels to assist vertical deflection control.
  - Control joint: An unreinforced joint between or within discrete elements of construction that allows for relative movement of the elements.
  - Expansion joint: A closing control joint with the joint surfaces separated by a compressible filler to allow axial movement due to thermal expansion or contraction with changes in temperature or creep. It may include unbound dowels to assist vertical deflection control.
  - Sealant joint: A joint filled with a flexible synthetic compound that adheres to surfaces within the joint to prevent the passage of dust, moisture and gases.
  - Structural control joint: A control joint (contraction, expansion and isolation) in structural elements when used with applied material and finishes.
  - Substrate joint: A joint in the substrate, which includes construction joints and joints between different materials.
  - Weakened plane joint: A contraction joint created by forming a groove, extending at least one quarter the depth of the section, either by using a grooving tool, by sawing or by inserting a premoulded strip.
- Local authority (local council): A body established for the purposes of local government by or under a law applying in a state or territory.
- Low level interface: Systems transfer information via terminals and voltage free contacts.
- Maintenance: Work that is carried out to preserve an asset, to allow for its continued use and function over its designed service life.

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  - Corrective maintenance: Maintenance initiated as a result of plant, equipment, systems, elements, before or after functional failure. This work can be planned or unplanned and includes repairs and replacement.
  - Preventive maintenance: Planned maintenance of plant, equipment and other systems or elements, including cyclical or periodic maintenance, fire safety measures and statutory requirements.
- Manufacturer's recommendations: Recommendations, instructions, requirements, specifications (and similar expressions) provided in written or other form by the manufacturer and/or supplier relating to the suitability, use, installation, storage and/or handling of a product.
- Metallic-coated: Steel coated with zinc or aluminium-zinc alloy as follows:
  - Metallic-coated steel sheet: To AS 1397 (2021). Metal thicknesses specified are base metal thicknesses.
  - Ferrous open sections zinc coated by an in-line process: To AS/NZS 4791 (2006).
  - Ferrous hollow sections zinc coated by a continuous or specialised process: To AS/NZS 4792 (2006).
- Network Utility Operator: To NCC (2022) Schedule 1. A person who undertakes the piped distribution of drinking water or non-drinking water for supply; or is the operator of a sewerage system or a stormwater drainage system.
- Obtain: Obtain, seek and similar expressions mean obtain (seek) in writing from the contract administrator.
- Pipe: Includes pipe and tube.
- Practical completion or defects free completion: The requirements for these stages of completion are defined in the relevant building contract for the project.
- Pre-commissioning: Verifying that the installation of a system is complete and ready for commissioning.
- Principal: Principal has the same meaning as owner, client and proprietor and is the party to whom the contractor is legally bound to construct the works.
- Professional engineer: To NCC (2022) Schedule 1.
- Proprietary: Identifiable by naming the manufacturer, supplier, installer, trade name, brand name, catalogue or reference number.
- Prototype: A full size mock-up of components, systems or elements to demonstrate or test construction methods, junctions and finishes, and to define the level of quality.
- Provide: Provide and similar expressions mean supply and install and include development of the design beyond that documented.
- Record drawings: Record drawings has the same meaning as as-installed drawings, as-built drawings and work-as-executed drawings.
- Recovered/reclaimed materials: Material previously used in a building or project that is then re-used in another project. The material may be altered, re-sized, refinished, or adapted, but is not reprocessed in any way, and remains in its original form.
- Referenced documents: Standards and other documents whose requirements are included in this specification by reference.
- Required: Required by the contract documents, the local or statutory authorities.
  - If required: A conditional specification term for work that may be shown in the documents or is a legislative requirement.
- Sample: A physical example that illustrates workmanship, materials or equipment, and establishes standards by which the work will be judged. It includes samples and sample panels.
- Static completion: The state of a system when installation works are complete but have not been commissioned.
- Statutory authority: A public sector entity created by legislation, that is, a specific law of the Commonwealth, State or Territory.
- Supply: Supply, furnish and similar expressions mean supply only.
- Tests - integrated system: Tests conducted on the project as a complete, integrated system to verify successful integration, interaction, and operation of all interrelated systems to the project requirements.

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- Tests - production: Tests carried out on an item, before delivery to the site.
- Tests - site: Tests carried out on site.
- Tests - type: Tests carried out on an item identical with a production item, including with respect to materials, material suppliers, manufacturing processes, dimensions and marking.
- Tolerance: The permitted difference between the upper limit and the lower limit of dimension, value or quantity.
- Utility service provider: Includes Electricity distributor, Network Utility Operator, Gas Network Operator and organisations providing other reticulated utilities including data and telecommunications services.
- Verification: Provision of evidence or proof that a performance requirement has been met or a default exists.

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2 SUBMISSIONS AND INSPECTIONS

2.1 SUBMISSIONS

General

Requirement: Make submissions, as documented.

Submit to: Superintendent and Architect

Contractor review: Before submitting, review each submission item, and check for coordination with other work of the contract and conformance to contract documents.

Submission times

Default timing: Submit information or other material for information, comment or approval at least 5 working days before ordering products or starting installation of the respective portion of the works.

Submission response times: Allow in the construction program for at least the following times:

- Shop drawings: 7 Working days
- Samples and prototypes: 5 Working days
- Manufacturers' or suppliers' recommendations: 5 Working days
- Product data: 5 Working days
- Product/design substitution or modification: 7 Working days

Proposed products schedules: Submit a schedule of proposed products that have not been specified as proprietary items within 3 weeks of starting work on site.

Identification

Requirement: Identify the project, contractor, subcontractor or supplier, manufacturer, applicable product, model number and options, as appropriate and include relevant contract document references. If the submission covers more than one item, identify the item in the contract documents the submitted items relate to.

Non-conformance: Identify proposals that do not conform with project requirements, and characteristics that may be detrimental to successful performance of the completed work.

Errors

Requirement: If a submission contains errors, make a new or amended submission as appropriate, indicating changes made since the previous submission.

Electronic submissions

Electronic copies file format: .pdf format and .dwg where applicable

Transmission medium: Contractor provided file sharing platform; Aconex

Hard copy submissions

Hard copy quantity: 2 hard copies

Standard contract drawing size: A1

Project requirements

General: Submit the following, as documented:

- Authority approvals: Notes of meetings with regulatory authorities and utility service providers whose requirements apply to the work and evidence that notices, fees and permits have been sought and paid, that utility service provider connections are complete and that statutory approvals by the authorities whose requirements apply to the work have been received.

- Baseline data: To **BASELINE DATA**.
- Building penetrations: Details of the methods to maintain the required structural, fire and other properties to **BUILDING PENETRATIONS**.
- Certification: Certificates of conformance to documented and statutory requirements.
- Commissioning plan: For the whole of the work to **COMMISSIONING**.
- Commissioning program: For the whole of the work to **COMMISSIONING**.
- Design documentation: Drawings, calculations and specifications as documented.
- Electronic facility and asset management information: For the whole of the work to **ELECTRONIC FACILITY AND ASSET MANAGEMENT INFORMATION**.
- Execution details: Execution programs, schedules and details of proposed methods and equipment. For building services include the following:
  - Embedded services: Proposed method for embedding services in concrete walls or floors or chasing into concrete or masonry walls.
  - Fixing of services: Typical details of locations, types and methods of fixing services to the building structure.
  - Inaccessible services: If services will be enclosed and not accessible after completion, submit proposals for location of service runs and fittings.
- Fire performance: Evidence of conformity to requirement for combustibility, fire hazard properties and fire-resistance of building elements.
- Marking and labelling: Samples and schedules of proposed marking and labels to **MARKING AND LABELLING**.
- Operation and maintenance manuals: For the whole of the work to **OPERATION AND MAINTENANCE MANUALS**.
- Products and materials: Products and materials data, including manufacturer's technical specifications and drawings, product data sheets, type tests results, evidence of conformity to documented requirements, product certification, performance and rating tables, service connection requirements and installation and maintenance recommendations.
- Prototypes: Prototypes of components, systems or elements.
- Records: As-built documents, photographs, system diagrams, schedules and logbooks to **RECORD DRAWINGS**.
- Safe Work Method Statement: For high risk construction works.
- Safety in design report: For the proposed work to **DESIGN DEVELOPMENT**, **Safety in design**.
- Samples: Representative of proposed products and materials and including proposals to incorporate samples into the works, if any to **SAMPLES AND PROTOTYPES**.
- Shop drawings: To **SHOP DRAWINGS**.
- Substitutions: To **SUBSTITUTIONS**.
- Tests: Test reports for testing performed under the contract.
- Warranties: To **WARRANTIES**.

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2.2 INSPECTION

Notice

Concealment: If notice of inspection is required for parts of the works that are to be concealed, give notice when the inspection can be made before concealment.

Notification times

Minimum notice: As documented.

Light levels

Lighting levels for inspection: To AS/NZS 1680.2.4 (2017).

Attendance

General: Provide attendance for documented inspections and tests.

3 PERFORMANCE

3.1 BUSHFIRE-PRONE AREAS

General

Bushfire Attack Level (BAL) to AS 3959 (2018): N/A

Bushfire-resistant design and construction: N/A

3.2 CORROSION RESISTANCE

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Galvanizing

Requirement: Galvanize mild steel components (including fasteners) to AS/NZS 1214 (2016) or AS/NZS 4680 (2006) as appropriate, if:

- Exposed to weather.
- Embedded in masonry.
- Exposed to or in air spaces behind the external leaf of masonry walls.
- In contact with chemically treated timber, other than copper chrome arsenate (CCA).

3.3 NOISE LEVELS

General

Requirement: Install systems to operate within the noise level limits, as documented for the contract design and documented equipment performance.

3.4 STRUCTURE

General

Requirement: If provision of the works requires structural design, provide structures, installations and components as follows:

- Fixed accessways: To AS 1657 (2018).
- Structural design actions: To the AS/NZS 1170 series.

4 DESIGN

4.1 DESIGN DEVELOPMENT

General

Requirement: Complete the design of the work, including development of the design beyond that documented.

Conflict with the documents: If it is believed that a conflict exists between statutory requirements and the documents, notify the contract administrator immediately and provide a recommendation to resolve the conflict.

Certification of the design

Requirement: Submit certification verifying conformance of the design to the documented and statutory requirements.

Certifier: To **DESIGNER**.

Safety in design

Requirement: Provide a design that allows for safe construction, operation and maintenance, and demolition in conformance with statutory requirements.

4.2 DESIGNER

General

Design by contractor: If the contractor provides design, use only appropriately qualified and registered persons.

5 PRODUCTS AND MATERIALS

5.1 GENERAL

Consistency

General: For each material or product use the same source or manufacturer and provide consistent type, size, quality and appearance.

Low VOC emitting paints

Paint types: To the recommendations of AS/NZS 2311 (2017) Table 4.2.

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Prohibited materials

General: Do not provide the following:

- Materials exceeding the limits of those listed in the Safe Work Australia *Hazardous Chemical Information System* (HCIS) Workplace exposure standards.
- Blowing agents:
  - . Materials that use chlorofluorocarbon (CFC) or hydrochlorofluorocarbon (HCFC) in the manufacturing process.
  - . A blowing agent with a global warming potential (GWP) not less than 700.

5.2 PROPRIETARY ITEMS

Manufacturer's or supplier's recommendations

General: Provide manufactured items to the manufacturer's or supplier's recommendations.

Proprietary items/systems/assemblies: Assemble, install or fix to substrate to the manufacturer's or supplier's recommendations.

Project modifications: Advise of activities that supplement, or are contrary to the manufacturer's or supplier's recommendations.

Identification of proprietary items

Sealed containers: If items are supplied by the manufacturer in closed or sealed containers or packages, bring them to point of use in the original containers or packages.

Other items: Marked to show the following, as applicable:

- Manufacturer’s identification.
- Brand name.
- Product type.
- Quantity.
- Reference code and batch number.
- Date of manufacture.

5.3 SUBSTITUTIONS

General

Identified proprietary items: Identification of a proprietary item does not necessarily imply exclusive preference for the identified item, but indicates the necessary properties of the item.

Alternatives: If alternatives to the documented products, methods or systems are proposed, submit sufficient information to permit evaluation of the proposed alternatives, including the following:

- Product, method or system identification.
- Product data sheets.
- Manufacturer's contact details.
- Detailed comparison between the properties of the documented product and proposed substitution.
- Details of manufacturer and/or installer warranty.
- Statement of NCC compliance, if applicable.
- Evidence of conformity to a cited standard or code of practice.
- Evidence that the performance is at least equal to that specified.
- Samples.
- Essential technical information, in English.

- Comparison between the products in relation to assembly method, finishes, installation methods and any protection/packaging.
- Reasons for the proposed substitutions.
- Statement of the extent of revisions to the contract documents.
- Statement of the extent of revisions to the construction program.
- Statement of cost implications including costs outside the contract.
- Statement of consequent alterations to other parts of the works.
- Statement of consequent maintenance conditions of warranty.

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Availability: If the documented products or systems are unavailable within the time constraints of the construction program, submit evidence.

Criteria: If the substitution is for any reason other than unavailability, submit evidence that the substitution:

- Is of net enhanced value to the principal.
- Is consistent with the contract documents and is as effective as the identified item, detail or method.

5.4 SAMPLES AND PROTOTYPES

General

Incorporation of samples: Only incorporate samples that have been endorsed for inclusion in the works. Do not incorporate other samples.

Retention of samples: Keep endorsed samples in good condition on site, until the date for practical completion.

Unincorporated samples: Remove on completion.

5.5 SHOP DRAWINGS

General

Standard: To AS 1100.101 (1992), AS 1100.201 (1992), AS 1100.301 (2008), AS 1100.401 (1984) and AS/NZS 1100.501 (2002) as applicable.

Documentation: Include dimensioned drawings showing details of the fabrication and installation of structural elements, building components, services and equipment, including relationship to building structure and other services, cable type and size, and marking details.

Diagrammatic layouts: Coordinate work shown diagrammatically in the contract documents, and prepare dimensioned set-out drawings.

Services coordination: Coordinate with other building and service elements. Show adjusted positions on the shop drawings.

Space requirements: Check space and access for maintenance requirements of equipment and services indicated diagrammatically in the contract documents.

Commissioning requirements: Show provisions for testing and commissioning on the drawings.

Access for maintenance: Show space and provisions for access for maintenance.

Building work drawings for building services: On dimensioned drawings show the following:

- Access doors and panels.
- Conduits to be cast in slabs.
- Holding down bolts and other anchorage and/or fixings required complete with loads to be imposed on the structure during installation and operation.
- Openings, penetrations and block-outs.
- Sleeves.
- Plinths, kerbs and bases.
- Required external openings.

Record drawings: Amend all documented shop drawings to include changes made during the progress of the work and up to the end of the defects liability period.

6 ANCILLARY BUILDING WORK

6.1 WALL CHASING

Holes and chases

General: If holes and chases are required in masonry walls, make sure structural integrity of the wall is maintained. Do not chase walls with a fire-resistance level or an acoustic rating.

Parallel chases or recesses on opposite faces of a wall: Not closer than 600 mm to each other.

Chasing blockwork: Only chase core-filled hollow blocks or solid blocks that are not documented as structural.

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Concrete blockwork chasing table

Block thickness (mm)	Maximum depth of chase (mm)
190	35
140	25
90	20

6.2 FIXING

General

Suitability: If equipment is not suitable for fixing to non-structural building elements, fix directly to structure and trim around penetrations in non-structural elements.

Fasteners

General: Use proprietary fasteners capable of transmitting the loads imposed, and sufficient for the rigidity of the assembly.

6.3 BUILDING PENETRATIONS

Penetrations

Requirement: Maintain the required structural integrity, fire performance, waterproofing performance and other properties when penetrating or fixing to the following:

- Structural building elements including external walls, fire walls, fire doors and access panels, other tested and rated assemblies or elements, floor slabs and beams.
- Membrane elements including damp-proof courses, waterproofing membranes and roof coverings. If penetrating membranes, provide a waterproof seal between the membrane and the penetrating component.

Sealing

Fire-resisting building elements: Seal penetrations with a system conforming to AS 4072.1 (2005).

Non fire-resisting building elements: Seal penetrations around conduits and sleeves. Seal around cables within sleeves. If the building element is acoustically rated, maintain the rating.

Sleeves

General: If piping, cables or conduits penetrate building elements, provide metal or PVC-U sleeves formed from pipe sections as follows:

- Movement: Arrange to permit normal pipe or conduit movement.
- Diameter (for non fire-resisting building elements): Sufficient to provide a ring shaped space around the pipe or pipe insulation of at least 12 mm.
- Ferrous surfaces: Prime paint.
- Sealing: Seal between pipes or conduits and sleeves to prevent the entry of vermin.
- Terminations:
  - Cover plates fitted: Flush with the finished building surface.
  - Fire-resisting and acoustic rated building elements: 50 mm beyond finished building surface.
  - Floors draining to floor wastes: 50 mm above finished floor.
  - Other locations: 5 mm beyond finished building surface.
  - Termite management: To AS 3660.1 (2014).
- Thickness:

. Metal: 1 mm or greater.
. PVC-U: 3 mm or greater.

6.4 SUPPORT OF PLANT AND EQUIPMENT

Concrete plinths

General: Provide concrete plinths as documented and under all equipment located on concrete floor slabs as follows:

- Surround: Zinc (hot-dipped) coated steel, at least 75 mm high and 1.6 mm thick. Fix to the floor with masonry anchors. Fill with concrete.
- Height: 75 mm or greater, as documented.
- Reinforcement: Single layer of F62 fabric.
- Concrete: Grade N20.
- Finish: Steel float, flush with top edge of the surround.

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Support of ground level plant and equipment

Ground level: Conform to the following:

- If the ground slope is 15° or more, or the area of the plant and equipment is extensive, obtain the advice of a professional engineer for the documentation of a suitable slab or platform.
- In all other cases, provide proprietary plastic or concrete supports installed with falls that achieve a raised, impervious and water shedding bearing surface.

Balustrades: If balustrades or screening are required, obtain the advice of a registered architect.

Support of plant and equipment mounted on roofs or elevated platforms

Platforms: If a platform is required, or the area of the plant and equipment mounted on roofs or elevated platforms is extensive, obtain the advice of a professional engineer for the documentation of a suitable platform.

Balustrades: If balustrades or screening are required, obtain the advice of a registered architect.

Roof level support: If any of the following apply to roof level support, obtain the advice of a professional engineer:

- The total load from any unit of plant or equipment exceeds 500 kg.
- The load from a unit of plant or equipment to any single support point exceeds 100 kg.
- The average loading of plant and equipment over the area extending 1 m on all sides beyond the plant and equipment exceeds 25 kg/m².

6.5 RESTRAINT OF NON-STRUCTURAL PARTS AND COMPONENTS

Wind restraint

General: Provide restraints to resist the effect of ultimate limit state wind pressures.

Wind pressure: To AS/NZS 1170.2 (2021).

7 BUILDING SERVICES

7.1 SERVICES CONNECTIONS

Connections

General: Connect to utility service provider services or service points. Excavate to locate and expose connection points. Reinstate the surfaces and facilities that have been disturbed.

Utility service provider requirements

General: If the utility service provider elects to perform or supply part of the works, make the necessary arrangements. Install equipment supplied, but not installed, by the utility service provider.

7.2 SERVICES INSTALLATION

General

Installation: Install equipment and services as follows:

- Plumb and securely fixed.
- Allow for movement in both structure and services.
- Arrange services running together, parallel to each other and adjacent building elements.

Concealment: Conceal all cables, ducts, trays and pipes except where installed in plant spaces, ceiling spaces and riser cupboards or documented to be exposed. If alternative routes are available, do not locate on external walls.

Lifting: Provide heavy items of equipment with permanent fixtures for lifting to the manufacturer's recommendations.

Suspended ground floors: Keep all parts of services suspended under ground floors at least 150 mm clear of the ground surface. Make sure services do not impede access.

Dissimilar metals

Jointing: Join dissimilar metals with fittings of electrolytically compatible material.

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Temporary capping

Pipe ends: During construction, protect open ends of pipe with metal or plastic covers or caps.

Piping

General: Install piping in straight lines at uniform grades without sags. Arrange to prevent air locks. Provide sufficient unions, flanges and isolating valves to allow removal of piping and fittings for maintenance or replacement of plant.

Spacing: Provide at least 25 mm clear between pipes and between pipes and building elements, additional to insulation.

Changes of direction: Provide as follows:

- If practicable, long radius elbows or bends and sets, and swept branch connections.
- If pipes are led up or along walls and then through to fixtures, provide elbows or short radius bends.
- Do not provide mitred fittings.

Vibration: Arrange and support piping to prevent vibration whilst permitting necessary movement. Minimise the number of joints.

Embedded pipes: Do not embed pipes that operate under pressure in concrete or surfacing material.

Valve groupings: If possible, locate valves in groups.

Pressure testing precautions: Isolate items not rated for the test pressure. Restrain pipes and equipment to prevent movement during pressure testing.

Support and structure

Requirement: Provide incidental supports and structures to suit the services.

Pipe support systems

Standard: To AS 4041 (2006) clause 3.28.

General: Provide hangers, brackets, saddles, clips, and support system components to resist live and dead loads and to control pipe movement caused by thermal and water pressure effects. Incorporate provisions for adjustment of spacing, alignment, grading and load distribution. Support pipework from associated equipment or building structure. Support valves, strainers and major line fittings so that no load is placed on connected piping or transmitted to it during operation and maintenance.

Fixings: Provide fixings to the associated equipment or building structure designed to withstand the loads imposed by the pipe supports.

Channel section supports: Proprietary channel section with clamps and hangers sized to match external diameter of pipe being supported. Provide all components from the same manufacturer.

Channel and fixing material: Metallic-coated steel.

Vertical pipes: Provide anchors and guides to maintain long pipes in position, and supports designed for the mass of the pipe and its contents.

Saddles: Do not use saddle type supports for pipes larger than DN 20.

Dissimilar metals: If pipe and support materials are dissimilar, provide industrial grade electrically non-conductive material securely bonded to the pipe to separate them. Provide fasteners of electrolytically compatible material.

Fixing to masonry and concrete: Provide metallic-coated steel or non-ferrous metal bolts or screws into chemical or expanding metal masonry anchors.

Uninsulated pipes: Clamp piping supports directly to pipes. Provide electrical isolation of dissimilar metals.

Insulated pipes:

- Spacers: Provide spacers at least as thick as the insulation between piping supports and pipes. Extend either side of the support by at least 20 mm.
- Spacer material: Rigid insulation material of sufficient strength to support the piping and suitable for the temperature application.
- Vapour barriers: For cold pipes, apply aluminium foil tape over the circumference of the spacer to form a vapour barrier. Fit to spacer before installation of the bracket on the pipe.
- Metal sheathing: If metal sheathing is documented, provide a band of the documented sheathing materials between the aluminium foil tape and the support for the full width of the spacer.

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Hanger sizes: Conform to the following:

- Gas installations: To AS/NZS 5601.1 (2022) Table 5.8.3.
- Other pipes: Provide hangers sized to the manufacturer's recommendations to suit operating conditions and regulatory requirements including the loads due to valves and other attached components, pipe material, pipe contents and temperature and seismic loads.

Support spacing: Provide supports at no greater spacing than the following:

- Cold and heated water: To AS/NZS 3500.1 (2021) Table 5.7.4.
- Sanitary plumbing: To AS/NZS 3500.2 (2021) Table 10.2.1.
- Stormwater: To AS/NZS 3500.2 (2021) clause 4.9.
- Fuel gas: To AS/NZS 5601.1 (2022) Table 5.8.2.
- Fire sprinklers and combined wet suppression systems: To AS 2118.9 (1995) Table 2.6.1.
- Fire hydrants:
  - Metal piping: To AS 2419.1 (2021) clause 10.6.
  - Plastic piping: To AS/NZS 3500.1 (2021).
- Gaseous fire suppression systems:
  - General gaseous fire suppression systems: To AS 4214 (2018) clause 6.3.4.
  - Carbon dioxide fire suppression systems: To AS 6183 (2011) clause 6.3.4.
- Medical gases: To AS 2896 (2021) Table 4.1.
- Refrigerant: To AS/NZS 5149.2 (2016) Tables 5 and 6.
- Other ferrous pipes under pressure: To AS 4041 (2006) Table 3.28.2.
- Other copper pipes: To AS 4809 (2017) Table 6.2.
- ABS pipes: To AS/NZS 3690 (2009) Table 6.2.
- PVC pipes: To AS/NZS 2032 (2006) Table 6.3.
- Polyolefin including PE and PP pipes: To AS/NZS 2033 (2024) clause 7.3.2.
- Other non-ferrous pipe carrying liquids: To AS/NZS 3500.1 (2021) Table 5.7.4.
- Other pipes carrying air or gases: To AS/NZS 5601.1 (2022) Table 5.8.2.
- Proprietary grooved piping systems: To the manufacturer's recommendations.

Additional supports: Provide additional supports as follows:

- Proprietary grooved piping systems: To the manufacturer's recommendations.
- Valves and other heavy pipe mounted components: Adjacent to the valve or component.
- Adjacent pipe mounted components requiring regular maintenance.
- At changes of direction and adjacent to wall or floor penetrations.
- Where required to anchor piping or control thermal or other movement.

Differential movement

General: If the geotechnical site investigation report predicts differential movements between buildings and the ground in which pipes or conduits are buried, provide control joints in the pipes or conduits, as follows:

- Arrangement: Arrange pipes and conduits to minimise the number of control joints.
- Magnitude: Accommodate the predicted movements.

7.3 PLANT AND EQUIPMENT

General

Location: Locate so failure of plant and equipment (including leaks) does not create a hazard for the building occupants and causes a minimum or no damage to the building, its finishes and contents including water sensitive equipment or finishes.

Safe tray and an overflow pipe: Provide to each tank, hot water heater and storage vessel.

7.4 ACCESS FOR MAINTENANCE

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General

Requirement: Provide access for maintenance of all items requiring inspection, measurement, operation, adjustment, repair, replacement and other maintenance-related tasks.

Standards: Conform to the relevant requirements of AS 1657 (2018), AS 1892.1 (2018), AS 2865 (2009) and AS/NZS 3666.1 (2011).

Work Health and Safety: Conform to the requirements of the applicable Work Health and Safety regulations.

Access safety systems: Provide access safety systems to *0193 Building access safety systems.*

Refrigerated or cooling plant: If the space is a refrigerated or cooling chamber inside a duct, air handling plant or similar, provided with an access door or personnel access panel and of sufficient size for a person to enter, provide the following to BCA (2022) G1D3:

- An access door.
- Internal lighting with external indicator lamp.
- An alarm.

Protection from injury: Protect personnel from injury caused by contact with objects including those that are sharp, hot or protrude at low level.

Plant room flooring surfaces: R10 Slip resistance classification to AS 4586 (2013).

Trip hazards: Do not run small services including drains and conduits across floors where they may be a trip hazard.

Manufacturer's standard equipment: If necessary, modify manufacturer's standard equipment to provide the plant access documented.

Clearances

Minimum clearances for access: Conform to the following:

- Vertical clearance: Not less than 2100 mm, vertically above horizontal floors, ground and platforms.
- Horizontal clearance: Preferably not less than 750 mm clear, but in no case less than 600 mm between equipment or between equipment and building features including walls.
- If tools are required to operate, adjust or remove equipment, provide sufficient space so the tools can be used in their normal manner and without requiring the user to employ undue or awkward force.
- Hinged or removable components: To the manufacturer's recommendations.
- Within plant items: Conform to the preceding requirements, and not less than the clearances recommended in BS 8313 (1997).

Elevated services other than in occupied areas

Access classifications:

- Access class A: Readily accessible. Provide clear and immediate access to and around plant items. If plant or equipment is located more than 2.0 m above the ground, floor or platform, provide a platform with handrails accessible by a stair, all to AS 1657 (2018).
- Access class B: If the plant item requiring access is located more than 2.0 m above the ground, floor or platform, provide a platform with handrails accessible by a non-vertical ladder, all to AS 1657 (2018).
- Access class C: Locate plant so temporary means of access conforming to Work Health and Safety regulations can be provided.

Temporary means of access: Make sure there is adequate provision in place, which is safe and effective.

Areas in which access is restricted to authorised maintenance personnel: Provide access as follows:

- Instruments, gauges and indicators (including warning and indicating lights) requiring inspection at any frequency: Readily accessible.
- Access required monthly or more frequently: Access class A.
- Access required between monthly and six monthly: Access class A or B.
- Access required less frequently than six monthly: Access class A, B or C.

Other areas: Provide access as follows:

- Locate to minimise inconvenience and disruption to building occupants or damage to the building structure or finishes.
- In suspended ceilings, locate items of equipment that require inspection and/or maintenance above tiled parts. If not possible, provide access panels where located above set plaster or other inaccessible ceilings. Arrange services and plant locations to reduce the number of access panels. Coordinate with other trades to use common access panels where feasible.
- Do not locate equipment requiring access above partitions.
- Instruments, gauges and other items requiring inspection at any frequency: Readily accessible.
- Labelling: If equipment is concealed in ceilings, provide marking to **MARKING AND LABELLING**, **Equipment concealed in ceilings**.

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Facilities for equipment removal and replacement

Requirement: Provide facilities to permit removal from the building and replacement of plant and equipment, including space large enough to accommodate it and any required lifting and/or transportation equipment. Arrange plant so large and/or heavy items can be moved with the minimum changes of direction.

Removal of components: Allow sufficient space for removal and replacement of equipment components including air filters, tubes of shell and tube heat exchangers, removable heat exchanger bundles, coils and fan shafts. Provide access panels or doors large enough to permit the safe removal and replacement of components within air handling units.

Facilities for access

Equipment behind hinged doors: Provide doors opening at least 150°.

Equipment behind removable panels: Provide panels with quick release fasteners or captive metal thread screws.

Removable panels: Provide handles to permit easy and safe removal and replacement.

Insulated plant and services: If insulation must be removed to access plant and services for maintenance, arrange it to allow for removal and replacement without damage.

Piping

Requirement: Conform to the following:

- Provide access and clearance at fittings that require maintenance, inspection or servicing, including control valves and joints intended to permit pipe removal.
- Arrange piping so it does not interfere with the removal or servicing of associated equipment or valves or block access or ventilation openings.
- Preferably run piping, conduits, cable trays and ducts at high level and drop vertically to equipment.

Electrical equipment and controls

Electrical equipment: Provide clearances and access space to AS/NZS 3000 (2018).

Switchboards and electrical control equipment: Locate near the main entrance to plant space and with switchboards visible from the plant being operated.

Control panels: Locate near and visible from the plant being controlled.

7.5 VIBRATION SUPPRESSION

General

Requirement: Minimise the transmission of vibration from rotating or reciprocating equipment to other building elements.

Standard

Machinery noise and vibration: Vibration severity in Zone A to ISO 20816-1 (2016) and ISO 20816-3 (2022).

Speeds

General: If no maximum speed is prescribed, do not exceed 1500 r/min for direct driven equipment.

Connections

General: Provide flexible connections to rotating machinery and assemblies containing rotating machinery. Isolate pipes by incorporating sufficient flexibility into the pipework or by use of proprietary flexible pipe connections installed to prevent placing stress on pipes due to end reaction.

Inertia bases

General: If necessary to achieve the required level of vibration isolation, provide inertia bases having appropriate mass and to the following:

- Construction: Steel or steel-framed reinforced concrete with reinforcing bars welded between base sections. Position foundation bolts for equipment before pouring concrete.
- Supports: Support on vibration isolation mountings using height saving support brackets.

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Vibration isolation mountings

General: Except for external equipment that is not connected to the structure of any building, support rotating or reciprocating equipment on mountings as follows:

- Static deflections less than 15 mm: Single or double deflection neoprene in-shear mountings incorporating steel top and base plates and a tapped hole for bolting to equipment.
- Static deflections not less than 15 mm: Spring mountings.

Selection: Provide mountings selected to achieve 95% isolation efficiency at the normal operating speeds of the equipment.

Installation: Set and adjust vibration isolation mounting supports to give clearance for free movement of the supports.

Spring mountings: Provide freestanding laterally stable springs as follows:

- Clearances: Not less than 12 mm between springs and other members such as bolts and housing.
- High frequency isolation: 5 mm neoprene acoustic isolation pads between base plate and support.
- Levelling: Provide bolts and lock nuts.
- Minimum travel to solid: Not less than 150% of the designated minimum static deflection.
- Ratio of mean coil diameter to compressed length at the designated minimum static deflection: Not less than 0.8:1.
- Snubbing: Snub the springs to prevent bounce at start-up.
- Vertical resilient limit stops: To prevent spring extension when unloaded, to serve as blocking during erection and which remain out of contact during normal operation.

7.6 FINISHES TO BUILDING SERVICES

General

Requirement: If exposed to view (including in plant rooms), paint building services and equipment.

Surfaces painted or finished off-site: Conform to *0183 Metals and prefinishes*.

Exceptions: Do not paint chromium or nickel plating, anodised aluminium, GRP, stainless steel, non-metallic flexible materials and normally lubricated machined surfaces. Surfaces with finishes applied off-site need not be re-painted on-site provided the corrosion resistance of the finish is not less than that of the respective finish documented.

Standard: Conform to the recommendations of AS/NZS 2311 (2017) Sections 3, 6 and 7 or AS 2312.1 (2014) Sections 6, 7 and 8, as applicable.

Inaccessible surfaces: If surfaces are inaccessible after installation, complete finish before installation.

Painting systems

New unpainted interior surfaces: To AS/NZS 2311 (2017) Table 5.1.

New unpainted exterior surfaces: To AS/NZS 2311 (2017) Table 5.2.

Paint application

Coats: Apply the first coat immediately after substrate preparation and before contamination of the substrate can occur. Make sure each coat of paint or clear finish is uniform in colour, gloss, thickness and texture and free of runs, sags, blisters or other discontinuities.

Combinations: Do not combine paints from different manufacturers in a paint system.

Protection: Remove fixtures before starting to paint and refix in position undamaged when painting is complete.

Underground metal piping

Requirement: Provide corrosion protection for the following:

- Underground ferrous piping.
- Underground non-ferrous metal piping in chemically aggressive soils and environments.

Corrosion protection: Select from the following:

- Cathodic protection: Sacrificial anodes or impressed current. Incorporate a facility for periodic testing. Conform to the recommendations of AS 2832.1 (2015).
- Continuous wrapping using proprietary petroleum taping material.
- Impermeable flexible plastic coating.
- Sealed polyethylene sleeve.

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Aggressive soils: If metallic piping or components are installed in chemically aggressive soil, provide additional protection as follows:

- Material: Continuous polyethylene sleeve to ASTM D1248 (2016) with a minimum thickness of 0.25 mm.
- Installation: Wrap or sleeve pipes and components. Tape joints between sections of polyethylene and between polyethylene and piping.

Repairs to finishes

Requirement: Repair damaged finishes to restore their corrosion protection, appearance and service life.

Painting of pipe threads: After pipe installation and before other finishes or insulation are applied, paint exposed threads in metallic-coated steel pipe with zinc rich paint.

7.7 MARKING AND LABELLING

General

Requirement: Mark and label services and equipment for identification purposes as follows:

- Locations exposed to weather: Provide durable materials.
- Pipes, conduits and ducts: To AS 1345 (1995) throughout its length, including in concealed spaces.
- Cables: Label to indicate the origin and destination of the cable.

Consistency: Label and mark equipment using a consistent scheme across all services elements of the project.

Label samples and schedules

Requirement: For each item or type of item, prepare a schedule of marking and labelling, including the following:

- A description of the item or type of item for identification.
- The proposed text for marking or labelling.
- The proposed location of the marking and labelling.

Submission timing: Before marking or labelling.

Electrical accessories

Circuit identification: Label isolating switches and outlets to identify circuit origin.

Operable devices

Requirement: Mark to identify the following:

- Controls.
- Indicators, gauges, meters.
- Isolating switches.

Equipment concealed in ceilings

Location: Provide a label on the ceiling, to indicate the location of each concealed item requiring access for routine inspection, maintenance and/or operation and as follows:

- Tiled ceilings, locate the label on the ceiling grid closest to the concealed item access point.
- Flush lined ceilings, locate adjacent to closest access panel.

Concealed equipment: Label items including the following:

- Fan coil units and terminal equipment (e.g. VAV terminals).
- Fire and smoke dampers.

- Isolating valves not directly connected to items otherwise labelled.
- Motorised dampers.

Wall mounted equipment in occupied areas

Location: Provide labels on wall mounted items in occupied areas including the following:

- Services control switches.
- Temperature and humidity sensors.

Points lists

Automatic control points: Provide plasticised, fade-free points lists for each automatic control panel and include terminal numbers, point addresses, short and long descriptors in the lists. Store in a pocket on the door of the panel.

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Pressure vessels

General: Mount manufacturer's certificates in glazed frames on a wall next to the vessel.

Valves and pumps

General: Label to associate pumps with their starters and valves. Screw fix labels to body or attach label to valve handwheels with a key ring.

Underground services

Survey: Accurately record the routes of underground cables and pipes before backfilling. Include on the record drawings.

Records: Provide digital photographic records of underground cable and pipe routes before backfilling. Include in operation and maintenance manual.

Location marking: Accurately mark the location of underground cables and pipes with route markers consisting of a marker plate set flush in a concrete base, engraved to show the direction of the line and the name of the service.

Markers: Place markers at ground level at each joint, route junction, change of direction, termination and building entry point and in straight runs at intervals of not more than 100 m.

Marker bases: 200 mm diameter x 200 mm deep, minimum concrete.

Direction marking: Show the direction of the cable and pipe run by means of direction arrows on the marker plate. Indicate distance to the next marker.

Plates: Brass, aluminium or stainless steel with black filled engraved lettering, minimum size 75 x 75 x 1 mm thick.

Plate fixing: Waterproof adhesive and 4 brass or stainless steel countersunk screws.

Marker height: Set the marker plate flush with paved surfaces, and 25 mm above other surfaces.

Marker tape: Where electric bricks or covers are not provided over underground wiring, provide a 150 mm wide yellow or orange marker tape bearing the words WARNING – electric cable buried below, laid in the trench 150 mm below ground level.

Plastic pipe: Provide a detectable marker tape with trace wire to identify the route of buried piping. Terminate with 1000 mm coil in a readily accessible location. Tag to match the record drawings.

Labels and notices

Materials: Select from the following:

- Cast metal.
- For indoor applications only, engraved two-colour laminated plastic.
- Proprietary pre-printed self-adhesive flexible plastic labels with machine printed black lettering.
- Stainless steel or brass minimum 1 mm thick with black filled engraved lettering.

Emergency functions: To AS 1319 (1994).

Colours: Generally to AS 1345 (1995) as appropriate, otherwise black lettering on white background except as follows:

- Danger, warning labels: White lettering on red background.
- Main switch and caution labels: Red lettering on white background.

Edges: If labels exceed 1.5 mm thickness, radius or bevel the edges.

Labelling text and marking: To correspond to terminology and identifying number of the respective item as documented on the record drawings and documents and in operating and maintenance manuals.

Lettering heights:

- Danger, warning and caution notices: Minimum 10 mm for main heading, minimum 5 mm for remainder.
- Equipment labels within cabinets: Minimum 5 mm.
- Equipment nameplates: Minimum 40 mm.
- Identifying labels on outside of cabinets: Minimum 5 mm.
- Isolating switches: Minimum 5 mm.
- Switchboards, main assembly designation: Minimum 25 mm.
- Switchboards, outgoing functional units: Minimum 10 mm.
- Switchboards, sub assembly designations: Minimum 15 mm.
- Valves:
  - Not less than DN 65: Minimum 25 mm.
  - Less than DN 65: Minimum 10 mm.
- Self-adhesive flexible plastic labels:
  - Labels less than 2000 mm above floor: 5 mm.
  - Labels minimum 2000 mm above floor: 10 mm.
  - Other locations: Minimum 5 mm.

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Label locations: Locate labels so they are easily seen and are either attached to, below or next to the item being marked.

Fixing: Fix labels securely using screws, rivets, proprietary self-adhesive labels or double-sided adhesive tape and as follows:

- If labels are mounted in extruded aluminium sections, use rivets or countersunk screws to fix the extrusions.
- Use aluminium or monel rivets for aluminium labels.

Vapour barriers: Do not penetrate vapour barriers.

8 COMPLETION

8.1 TOOLS AND SPARE PARTS

Spare parts

General: Provide spare parts listed as documented.

Replacement: Replace spare parts used during the maintenance period.

Tools and spare parts schedule

Submission timing: At least 8 weeks before the date for practical completion.

Requirement: Prepare a schedule of tools, portable instruments and spare parts necessary for maintenance of the installation. For each item state the recommended quantity and the manufacturer's current price. Include the following in the prices:

- Checking receipt, marking and numbering in conformance with the spare parts schedule.
- Packaging and delivery to site.
- Painting, greasing and packing to prevent deterioration during storage.
- Referencing equipment schedules in the operation and maintenance manuals.
- Suitable means of identifying, storing and securing the tools and instruments. Include instructions for use.

8.2 TRAINING

General

Standard: To SA TS 5342 (2021).

Duration: Instruction to be available for the whole of the commissioning and running-in periods.

Format: Conduct training at agreed times, at system or equipment location. Also provide seminar instruction to cover all major components.

Operation and maintenance manuals: Use items and procedures listed in the final draft operation and maintenance manuals as the basis for instruction. Review contents in detail with the principal's staff.

Certification: Provide written certification of attendance and participation in training for each attendee. Provide register of certificates issued.

Demonstrators

General: Use only qualified manufacturer's representatives who are knowledgeable about the installations.

Operation

General: Explain and demonstrate to the principal's staff the purpose, function and operation of the installations.

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Maintenance

General: Explain and demonstrate to the principal's staff the purpose, function and maintenance of the installations.

Seasonal operation

General: For equipment requiring seasonal operation, demonstrate during the appropriate season.

8.3 CLEANING

Final cleaning

General: Before the date for practical completion, clean throughout, including all exterior and interior surfaces except those totally and permanently concealed from view.

Labels: Remove all visible labels not required for maintenance.

Removal of material

General: Dispose of building waste material off site to the requirements of the relevant authorities.

8.4 WARRANTIES

General

Requirement: If a warranty is documented, name the principal as warrantee. Register with manufacturers as necessary. Retain copies delivered with components and equipment.

Approval of applicator or installer: If the warranty is conditional on the manufacturer's approval of the applicator or installer, submit the manufacturer's written approval of the installing company, and authorised personnel, with evidence of qualifications and experience in the specific use of the product, material or system.

Principal's responsibilities: Submit details of responsibilities of the principal required to keep warranties in force.

Warranty types

Manufacturer's warranty: Warranty to cover manufacturing defects and defects with products and materials delivered to site.

Manufacturer and applicator's/installer's interlocking warranty: Interlocking warranty to cover manufacturing defects and defects with products and materials delivered to site, including their application or installation.

Supplier's warranty: Warranty to defects in materials delivered to site.

9 TESTING AND COMMISSIONING

9.1 TESTING - GENERALLY

Inspection and testing plan

Requirement: Provide inspection and testing plan consistent with the construction program including details of test stages and procedures.

Notice

Site tests: Give notice of the time and place of documented tests.

Inspection: Give sufficient notice for inspection to be made of the commissioning, testing and verification tests on completion of commissioning.

Attendance

General: Provide attendance at tests.

Suppliers: If necessary to carry out documented tests, arrange equipment suppliers to assist.

Testing authorities

Requirement: Have tests carried out by an Accredited Testing Laboratory, accredited for the documented test method, except for site tests or test methods that do not have an Accredited Testing Laboratory.

Test equipment

Accuracy: Use testing equipment designed to test and/or measure system performance within the documented tolerances.

Calibration: Use only instruments that have current calibration certificates issued by an Accredited Testing Laboratory. Tag or label instruments with calibration date and calibration authority name. Provide copies of certification if requested.

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Maximum period since last calibration: As recommended by the manufacturer but less than 12 months, except as documented.

Recalibration: If dropped or damaged, recalibrate instruments.

Testing equipment: Provide test equipment and tools to perform documented tests as follows:

- Special testing equipment: If documented, provide special equipment, tools and instruments required for testing or calibration.
- Other testing equipment: Provide standard testing equipment.

Testing procedures

Verification: Verify test procedures by:

- Manual testing.
- Monitoring performance and analysing results using the control system trend logs.
- A combination of the above methods.

Sampling: Sampling may be used subject to the following:

- Use a sampling strategy only for multiple identical pieces of non-life-safety or otherwise non-critical equipment.
- If at any point, more than one identical item has failed, stop testing, determine the cause, rectify and document changes made to remaining units, before continuing with functional testing of the remaining units.

Type tests

Type test reports: Required, as evidence of conformance of proprietary equipment.

Sound pressure level measurements

Requirement: Conform to the following:

- Correction for background noise: To AS/NZS 2107 (2016) Table B1.
- External: To AS 1055 (2018).
- Internal: To AS/NZS 2107 (2016).
- Measurement positions: If a test position is designated only by reference to a room or space, do not take measurements less than 1 m from the floor, ground or walls. For large equipment items including chillers, measure at 2 m and 7 m from the equipment item.
- Sound pressure level analysis: Measure the sound pressure level and the background sound pressure level over the full range of octave band centre frequencies from 31.5 Hz to 8 kHz at the designated positions.
- Sound pressure levels: Measure the A-weighted sound pressure levels and the A-weighted background sound pressure levels at the designated positions.

Test outcome

Requirement: Test as documented and achieve the following:

- Pass the documented Pass/Fail test, and/or
- Values that meet documented requirements, and/or
- Verification of manufacturer's claimed performance.

Failure of multiple items

Requirement: If 10% or 3, whichever is greater, of identical pieces (size does not constitute a difference) of equipment fail to perform as documented for any reason, treat all identical units as having failed. Submit notice of failure and conform to the following:

- Within one week of notification, examine all other identical units and record the results. Submit a report of the findings within two weeks of the original failure notice.
- Within two weeks of the original failure notification, submit a signed and dated explanation of the problem, including the cause of failure, the proposed solution, full equipment details and any other information. Do not exceed the documented requirements of the original installation with the proposed solution.

Rectification of failure under test

Requirement: If an item fails a documented test, rectify the cause of failure and repeat the test.

Submissions: If submission of test results is documented, submit results of both successful and unsuccessful tests.

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Test reports

Requirement: Include the following:

- Documented performance criteria including, if documented, tolerances.
- Observations and results of tests and conformance or non-conformance with documented requirements.

Test validity period

Requirement: As documented or, if no validity period is documented, no older than 5 years.

Controls

General: Calibrate, set and adjust control instruments, control systems and safety controls.

Circuit protection

General: Confirm that circuit protective devices are sized and adjusted to protect installed circuits.

Certification

General: On satisfactory completion of the installation, testing and commissioning and before the date for practical completion, certify that each installation is operating correctly.

Integrated system tests

Requirement: Conduct integrated system tests as documented.

Tests: Provide the following:

- Test the integrated operation of the systems listed in each mode documented.
- Restoration of the systems to their pre-test condition on completion of the tests above.

Failure: If any of the systems fails to perform as documented, including return to normal operation, rectify the cause and repeat the integrated system test.

Deferred and seasonal tests

Deferred tests: If documented testing cannot be completed at the scheduled or documented time, the Superintendent may direct that they be deferred to a later time but as soon as possible after the scheduled or documented time.

Seasonal tests: If documented tests are dependent on specific weather conditions, they may be deferred to a time when weather conditions are close to the documented test conditions. Complete seasonal testing as soon as possible but no later than one month before the end of the defects liability period.

Functional tests

Function: Carry out functional and operational tests on each energised equipment item and circuit.

9.2 COMMISSIONING

Standard

Requirement: Conform to SA TS 5342 (2021).

Static completion

Requirement: Systems, components and building elements are statically complete when:

- Their construction and installation is complete and as documented, including completion of all systems, components and building elements on which they are dependent for commissioning.
- All pre-commissioning tests have been successfully completed.
- They are safe and ready for commissioning.
- All cleaning that may adversely affect commissioning is complete.

- They have been inspected and all outstanding remedial work that may adversely affect commissioning is complete.
- All spaces required for access for commissioning are safe to use and cleared of obstructions that may adversely affect commissioning.

Commissioning plan

Requirement: Provide a commissioning plan to SA TS 5342 (2021) including the following:

- A summary of the work covered by the commissioning plan.
- The parties responsible for this work and any commissioning interrelationships.
- The basis of the design.
- General sequence of commissioning.
- Project specific commissioning methodologies for each system and building element to be commissioned.
- Pre-commissioning requirements.
- Project specific commissioning procedures for each commissioning activity including integrated system tests, deferred and seasonal tests.
- A project specific building tuning plan for all commissioned systems. Include building tuning procedures and tuning team members.
- Requirements for witnessing of tests and documented demonstrations of completion of commissioning.
- Commissioning program to **COMMISSIONING**, **Commissioning program**.

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Commissioning program

Submissions: Submit a program consistent with, and forming part of, the construction program as follows:

- Set out the proposed program for completion, commissioning, testing and instruction.
- Identify related works and timing of the works prerequisite to successful and timely completion of the works.

Revisions: Submit revisions of the program as the project proceeds.

Plant operating period: Include time in the program for the documented plant operating period before the date for practical completion.

Commissioning activities

Requirement: Provide the following to SA TS 5342 (2021):

- Manage the commissioning process.
- Establish and manage the completion process.
- Review design documents for commissionability. Submit a report including any recommended changes.
- Review documented commissioning requirements. Submit a report including any recommended changes.
- Review construction documents for commissionability. Submit a report including any recommended changes.
- Develop, review and update the commissioning plan and commissioning program.
- Develop, review and update commissioning methodologies.
- Develop, review and update commissioning procedures.
- Report on interdependencies between trades that may affect commissioning.
- Develop, review and update procedures for initial start-up of systems.
- Develop, review and update integrated system test procedures.
- Carry out pre-commissioning activities. Record results and submit pre-commissioning records.
- Conduct commissioning activities to the commissioning methodologies and procedures. Record and submit commissioning records.
- Facilitate and conduct integrated system tests and demonstrations. Record and submit integrated system test records.
- Conduct documented demonstrations of completion of commissioning.

- Report on the progress of commissioning work.
- Report on conformance to the commissioning plan and program.
- Report on commissioning defects and issues and progress on their resolution.
- Develop, review and update commissioning report.
- Develop, review and update training materials, conduct training sessions to **TRAINING**.
- Develop, review and update operation and maintenance manuals to **OPERATION AND MAINTENANCE MANUALS**.
- Manage and report deferred and seasonal testing activities to **TESTING - GENERALLY**.
- Management and reporting of building tuning process.
- Periodically review performance data.

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Verification of commissioning

Requirement: On completion of commissioning of the equipment or system, provide additional tests to verify that it is fully commissioned and operating to documented requirements.

9.3 BUILDING TUNING

General

Standard: To SA TS 5342 (2021).

Frequency: Three monthly or more frequently.

Duration: Until the end of the maintenance period. Provide last building tuning in the month before the end of the maintenance period.

Requirement: Provide the following:

- Review data from all recording systems against documented requirements.
- Review of building occupant feedback.
- If discrepancies are identified from the above, take corrective action to rectify them.
- Report on the findings of the reviews, corrective action and effect of corrective action.
- Recommend other action to improve the effectiveness, reliability and efficiency of systems.

10 PROJECT RECORDS

10.1 TACTICAL FIRE DRAWINGS

General

Requirement: Provide sets of colour coded tactical fire drawings, showing all items and systems relevant in a fire to BCA (2022) Spec 19.

Scale: 1:200 or larger if required to be easily read under emergency conditions.

Coordination: Agree the format, colour coding and contents of the tactical fire plans with the Local Fire Authority before beginning documentation.

Location: Provide one set of the laminated drawings fixed to the wall or supplied in a vertical plan hanger in the fire control room.

Loose set: Provide a second set of identical drawings.

Operation and maintenance manuals: Provide a set of colour coded tactical fire drawings in each copy of the operating and maintenance manual.

Inclusions

Requirement: Include the following on the tactical fire drawings:

- Legend sheet at front of set.
- Colour coding key.
- Building: As follows:
  - Floor plans.
  - Pressurised and non-pressurised fire isolated stairs and passages.
  - Smoke and fire compartments.
  - Special risk areas.
- Fire services: As follows:

. Automatic fire detection systems.
. Automatic suppression systems including gas flooding systems.
. Communications including warden intercommunication points.
. Fire control room.
. Fire equipment including booster connections.
. Fire hydrants, hose reels, portable fire extinguishers.
. Fire detection control and indicating equipment (FDCIE).
. Fire service lifts.
. Fire telephone and control panel.
. Hydrant and sprinkler pumps.
. Hydrant/hose reels.
. Sprinkler and hydrant, suction and booster connections.
. Sprinkler control valves.

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- Electrical services: As follows:
  . Emergency power supplies.
  . Essential services switchboards.
  . Evacuation warning panel.
  . Stand-by power plant.
  . Substations/transformers.
  . Switchboards, main switchroom.
- Mechanical ventilation and air handling equipment: As follows:
  . Air intakes, fans, ducts, shafts.
  . Conditioners and mixing boxes.
  . Fire dampers.
  . General exhaust air fans, ducts, shafts, discharges.
  . Smoke dampers.
  . Smoke fans including exhaust fans, zone and stair pressurisation fans.
  . Stair pressurisation systems.
  . Supply air system.
- Mechanical ventilation and air handling equipment operation: As follows:
  . Statement of normal condition.
  . Condition upon fire alarm.
  . Manual controls available.
- Hydraulic services: As follows:
  . Gas meters.
  . Gas supply control.
  . Incoming water supplies and valves for the sprinkler, hydrant and fire hose reel systems.
  . Water tank.

10.2 RECORD DRAWINGS

General

Requirement: Prepare record drawings showing the following:

- Installed locations of building elements, services, plant and equipment.
- Off-the-grid dimensions and depth if applicable.
- Any provisions for the future.

Recording, format and submission

Requirement: Record changes made during the progress of the works on a set of drawings kept on site for that specific purpose.

Drawing layout: Use the same borders and title block as the contract drawings.

Quantity and format: Conform to **SUBMISSIONS**.

Endorsement: Sign and date all record drawings.

Accuracy: If errors in, or omissions from, the record drawings are found, amend the drawings and re-issue in the quantity and format documented for **SUBMISSIONS**.

Date for submission: Not later than 2 weeks after the date for practical completion.

Services record drawings

General: To **RECORD DRAWINGS**, **General** and **Recording, format and submission** and the following:

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- Extensions and/or changes to existing: If a drawing shows extensions and/or alterations to existing installations, include sufficient detail of the existing installation to make the drawing comprehensible without reference to drawings of the original installation.
- Detention: If on-site detention tanks or pondage are provided, include the volume required on the drawing and the permitted flow rate to the connected system.
- Domestic cold water or fire mains: Show the pressure available at the initial connection point and the pressure available at the most disadvantaged location on each major section of the works.
- Stormwater: If storm water pipes are shown, include the pipe size and pipe grade together with the maximum acceptable flow and the actual design flow.

Diagrams: Provide diagrammatic drawings of each system including the following:

- Controls.
- Piping including all valves and valve identification tags.
- Principal items of equipment.
- Single line wiring diagrams.
- Acoustic and thermal insulation.
- Access provisions and space allowances.
- Fasteners.
- Fixtures.
- Switchgear and control gear assembly circuit schedules including electrical service characteristics, controls and communications.
- Charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

Subsurface services: Record information on underground or submerged services to the documented quality level, conforming to AS 5488.1 (2022).

10.3 BASELINE DATA

General

Requirement: Provide baseline data to permit routine service of fire protection systems and equipment to AS 1668.1 (2015), the NCC cited AS 1670.1 (2018), AS 1851 (2012) and AS/NZS 2293.1 (2018). Include baseline data for the following:

- Active fire and smoke systems including automatic fire sprinkler systems, fire pumpsets, fire hydrant systems and water storage tanks for fire protection systems.
- Fire detection and alarm systems.
- EWIS, exit signs and emergency lighting.
- Stand-by generator sets and batteries.
- Lay flat fire hose, fire hose reels, portable and wheeled fire extinguishers and fire blankets.
- Passive fire and smoke systems, including the following:
  - Fire and smoke elements (vertical and horizontal) - walls, floors, ceilings, access panels and hatches.
  - Structural fire-resistant elements - beams, columns, girders and trusses.
  - Fire-resisting doorsets - hinged, pivoted and horizontal sliding.
  - Smoke doors - hinged and pivoted.
  - Fire shutters.
  - Fire-resisting glazing.

. Ducts.
. Dampers.

- Fire and smoke control features of mechanical services.
- Emergency planning in facilities.

Format: Provide baseline data in a format that facilitates the carrying out and recording of routine service tasks including drawings showing the extent and location of items to be serviced, schedules of items and unique identification of each item.

10.4 OPERATION AND MAINTENANCE MANUALS

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General

Standard: To SA TS 5342 (2021).

Authors and compilers: Personnel experienced in the maintenance and operation of equipment and systems installed, and with editorial ability.

Referenced documents: If referenced documents or worksections require submissions of manuals, include corresponding material in the operation and maintenance manuals.

Subdivision: By installation or system, depending on project size.

Revisions: Amend the operation and maintenance manuals to include changes made to the installation during construction and maintenance including changes to software and commissioning records.

Contents of manual

Table of contents: Include a table of contents in each volume. Title to match cover.

Table of amendments: Include a table of amendments.

Directory: Include names, addresses, email addresses and telephone and facsimile numbers of principal consultant, subconsultants, contractor, subcontractors and names of responsible parties.

Record drawings: Include complete set of record drawings, full size.

Drawings and technical data: Include as necessary for the efficient operation and maintenance of the installation.

Installation description: Include a general description of the installation.

Systems descriptions and performance: Include a technical description of the systems installed including the basis of design, the interrelation with other systems and the building and mode of operation, presented in a clear and concise format readily understandable by the principal's staff. Identify function, normal operating characteristics, safety features and limiting conditions.

Baseline data: Include the baseline data to **BASELINE DATA**.

Commissioning records: Include commissioning records to SA TS 5342 (2021). Link commissioning records to item codes on the record drawings.

Training material: Include materials used to provide training, to **TRAINING**, in a form that can be used to train others.

Fire systems and equipment: Include documentation to AS 1851 (2012), including the schedule of essential functionality and performance requirements.

Digital photographic and video records: Provide documented digital photographic and video records, keyed to the drawings.

Equipment: Include schedules with the following details for installed equipment:

- Item code for use on record and diagrammatic drawings, and spare parts schedule.
- Equipment name plate data including serial number, if any.
- Name and contact details of the manufacturer and supplier.
- Catalogue list number(s).
- Location.
- Function.
- Performance figures and capacity data.
- Date of manufacture.

- Manufacturer’s product data sheets including only relevant matter for the project. Mark each product data sheet to clearly identify specific products and component parts used in the installation, and data applicable to the installation.
- Additional information and commentary to illustrate relations of component parts.

Certificates:

- Certificates from authorities.
- Product certification.
- Test certificates for each service installation and all equipment.
- Warranties.

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Trends: 7 day record of all trends at commissioning.

Operation procedures: Include for systems installed:

- Manufacturer's technical literature as appropriate.
- Safe starting up, running-in, operating and shutting down procedures. Include logical step-by-step instructions for each procedure.
- Control sequences and flow diagrams.
- Legend for colour-codes services.
- Schedules of fixed and variable equipment settings established during commissioning and maintenance.
- A list of special safety devices and their set points.
- Procedures for seasonal changeovers.
- Warnings to operators.
- Procedures for identifying and rectifying common faults.
- Recommendations for efficient plant operation.
- If the installation includes cooling towers, recommendations for water efficiency.
- Building tuning plan and procedure to **COMMISSIONING**, **Commissioning plan**.

Building occupants' guide: Include a concise guide written and illustrated for building occupants with no technical background. Include the following:

- Security provisions.
- Safety and access.
- Environmental features, including energy and water efficiency and waste management.
- Occupant relevant information on design and operation.
- Information for occupants on environmental systems that rely partially or wholly on local controls for heating, lighting, cooling, and ventilation.
- Contact details for faults, maintenance and emergencies.

Maintenance procedures:

- Detailed recommendations for periodic maintenance and procedures, including schedule of maintenance work with frequency and manufacturers’ recommended tests.
- Manufacturer’s technical literature as appropriate. Register with manufacturer as necessary. Retain copies delivered with equipment.
- Safe trouble-shooting, disassembly, repair and reassembly, cleaning, alignment and adjustment, balancing and checking procedures. Provide logical step-by-step instructions for each procedure.
- Schedule of spares, recommended to be held on site, for those items subject to wear or deterioration and that may involve the principal in extended deliveries when replacements are required. Include complete nomenclature and model numbers, and local sources of supply.
- Schedule of normal consumable items, local sources of supply, and expected replacement intervals up to a running time of 40 000 hours. Include lubrication schedules for equipment.
- Instructions for use of tools and testing equipment.
- Troubleshooting procedures.
- Emergency procedures, including telephone numbers for emergency services, and procedures for fault finding.
- Safety data sheets (SDS).

- Instructions and schedules conforming to AS 1851 (2012), AS/NZS 3666.2 (2011), AS/NZS 3666.3 (2011) and AS/NZS 3666.4 (2011).

Maintenance records:

- Prototype routine service records conforming to AS 1851 (2012) prepared to include project specific details.
- Prototype periodic maintenance records and report to AS/NZS 3666.2 (2011), AS/NZS 3666.3 (2011) and AS/NZS 3666.4 (2011) as appropriate, prepared to include project specific details.
- Hard copies: Binders to match the manuals, containing loose leaf logbook pages designed for recording completion activities including operational and maintenance procedures, materials used, test results, comments for future maintenance actions and notes covering the condition of the installation. Include completed logbook pages recording the operational and maintenance activities performed up to the date for practical completion.
- Number of pages: The greater of 100 pages or enough pages for the maintenance period and a further 12 months.

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Emergency information: For each type of emergency, including fire, flood, gas leak, water leak, power failure, water failure, system or subsystem failure, chemical release or spill, include the following:

- Emergency instructions.
- Emergency procedures including:
  - Instructions for stopping or isolating.
  - Shutdown procedures and sequences.
  - Instructions for actions outside the property.
  - Special operating instructions relevant to the emergency.
  - Contact details relevant to the emergency.

Emergency information manual

Form of emergency information: Provide one of the following:

- An index and coloured tabs identifying emergency information for each type of emergency within the Operation and maintenance manual.
- A separate Emergency manual containing copies of emergency information from the main Operation and maintenance manual.

Format – electronic copies

Scope: Provide the same material as documented for hardcopy in electronic format.

Quantity and format: Conform to **SUBMISSIONS**, **Electronic submissions**.

Printing: Except for drawings required in **RECORD DRAWINGS** provide material that can be legibly printed on A4 size paper.

Format – hard copies

General: A4 size loose leaf, in commercial quality, 4 ring binders with hard covers, each indexed, divided and titled. Include the following features:

- Cover: Identify each binder with typed or printed title *OPERATION AND MAINTENANCE MANUAL*, to spine. Identify title of project, volume number, volume subject matter, and date of issue.
- Dividers: Durable divider for each separate element, with typed description of system and major equipment components. Clearly print short titles under laminated plastic tabs.
- Drawings: Fold drawings to A4 size with title visible, insert in plastic sleeves (one per drawing) and accommodate them in the binders.
- Pagination: Number pages.
- Ring size: 50 mm maximum, with compressor bars.
- Text: Manufacturers' printed data, including associated diagrams, or typewritten, single-sided on bond paper, in clear concise English.

Number of copies: 3.

Date for submission

Draft submission: The earlier of the following:

- 4 weeks before the date for practical completion.

- Commencement of training.

Final submission: Within 2 weeks after practical completion.

10.5 ELECTRONIC FACILITY AND ASSET MANAGEMENT INFORMATION

Data

Facility and asset data: N/A

11 MAINTENANCE

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11.1 PERIODIC MAINTENANCE

General

Requirement: Provide documented maintenance so that the condition and performance of the maintained work throughout and at the end of the maintenance period is equal to or better than that at the beginning of the maintenance period including with respect to the following:

- Performance, service delivery.
- Service life and reliability.
- Compliance with statutory requirements.
- Compliance with building rating requirements.
- Energy and water efficiency.
- Environmental impact.
- Health and safety.
- Risk management.

Inclusions: Include the following:

- Periodic and statutory maintenance, cleaning and replacement of consumables.
- Emergency repairs.
- Condition reporting.

Duration: From the time systems and equipment are put into service to the end of the maintenance period.

Maintenance period: The greater of the defects liability period and the period documented.

Faults: Rectify promptly.

Emergencies: Attend emergency calls promptly.

Annual maintenance: Carry out recommended annual maintenance procedures within the four weeks before the end of the maintenance period.

Maintenance program

General: Submit details of maintenance procedures and program, relating to installed plant and equipment, 6 weeks before the date for practical completion. Indicate dates of service visits. State contact telephone numbers of service operators and describe arrangements for emergency calls.

Maintenance records

General: Record in binders provided with the operation and maintenance manuals.

Referenced documents: If referenced documents or technical worksections require that logbooks or records be submitted, include this material in the maintenance records.

Certificates: Include test and approval certificates.

Service visits: Record comments on the functioning of the systems, work carried out, items requiring corrective action, adjustments made and name of service operator. On completion of the visit, obtain the signature of the principal's designated representative on the record of the work undertaken.

Site control

General: Report to the principal’s designated representative on arriving at and before leaving the site.

11.2 STATUTORY INSPECTIONS AND MAINTENANCE

General

Duration: From the time systems and equipment are put into service to the end of the maintenance period.

Requirement: Provide inspections and maintenance of safety measures required by the following:

- AS 1851 (2012).
- Other statutory requirements applicable to the work.

Records: Provide mandatory records.

Certification: Certify that mandatory inspections and maintenance have been carried out and that the respective items conform to statutory requirements.

Annual inspection: Perform an annual inspection and maintenance immediately before the end of the maintenance period.

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0181 ADHESIVES, SEALANTS AND FASTENERS

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide adhesives, sealants and fasteners, as documented.

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Performance

Requirements: Conform to the following:

- Fitness for purpose: Suitable for particular use, capable of transmitting imposed loads, sufficient to maintain the rigidity of the assembly, or integrity of the joint.
- Finished surface: That will not cause discolouration.
- Compatibility: Compatible with the products to which they are applied.
- Sealant replacement: Capable of safe removal without compromising the application of the replacement sealant for future refurbishment.
- Movement: If an adhered or sealed joint is subject to movement, select a system certified to accommodate the projected movement under the conditions of service.

1.2 CROSS REFERENCES

General

Requirement: Conform to the following:

- *0171 General requirements*.

1.3 SUBMISSIONS

Products and materials

Adhesives and sealants: Submit product data sheets.

Type tests: Submit adhesion and compatibility testing data demonstrating that adhesive, sealant or fastener is compatible with materials to be fixed and is suitable for the project conditions.

Samples

Requirement: Submit samples to PRODUCTS, **GENERAL**, **Samples**.

Warranties

Requirement: Submit warranties to **COMPLETION**, **Warranties**.

2 PRODUCTS

2.1 GENERAL

Samples

Visible joint sealants: Provide colour samples.

2.2 ADHESIVES

Standards

Gypsum plaster adhesive: To AS 2753 (2018).

High strength adhesive tape

General description: A foam of cross linked polyethylene or closed cell acrylic coated both sides with a high performance acrylic adhesive system, encased in release liners of paper or polyester.

Product classification: Select tape to suit substrate as follows:

- Firm high strength foam tapes: For high energy surfaces including most bare metals such as stainless steel and aluminium.
- Conformable high strength foam: For the following:
  - Medium energy surfaces including many plastics, paints and unfinished metals.
  - Lower energy surfaces including many plastics, most paints and powder coatings, and unfinished metals.

Thickness: Select the tape to make sure a mismatch between surfaces does not exceed half the tape thickness under the applied lamination pressure.

Total VOC limits

Requirement: Conform to the following maximum limits:

- General purpose adhesives: 50 g/L.
- Structural glazing adhesive, timber flooring and laminate adhesives: 100 g/L.

2.3 SEALANTS

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Standards

General: To ISO 11600 (2002).

External masonry joints

General: Provide sealant and bond breaking materials that are non-staining to masonry. Do not use bituminous materials with absorbent masonry units.

Bond breaking backing:

- Bond breaking materials: Non-adhesive to sealant, or faced with a non-adhering material.
- Foamed materials: Closed cell or impregnated, not water-absorbing.

Lightweight building element joints

Joints subject to rapid changes of movement: Provide sealants that accommodate the movement of the contact materials.

Floor control joints

General: Provide trafficable sealants.

Bond breaking backing:

- Bond breaking materials: Non-adhesive to sealant, or faced with a non-adhering material.
- Foamed materials: Closed cell or impregnated, not water-absorbing.

Total VOC limits

Requirement: Conform to the following maximum limits:

- General purpose sealants: 50 g/L.
- Acoustic sealants, architectural sealants, waterproofing sealants: 250 g/L.
- Wood flooring and laminate sealant: 100 g/L.

2.4 FASTENERS

General

Masonry anchors: Proprietary expansion or bonded type anchors, as documented.

Plain washers: To AS 1237.1 (2002).

- Provide washers to the heads and nuts of bolts, and the nuts of coach bolts.

Plugs: Proprietary purpose-made plastic.

Stainless steel fasteners: To ASTM A276/A276M (2024).

Steel nails: To AS 2334 (1980).

- Length: At least 2.5 times the thickness of the member being secured, and at least 4 times the thickness if the member is plywood or building board less than 10 mm thick.

Unified hexagon bolts, screws and nuts: To AS/NZS 2465 (1999).

Fasteners in CCA treated timber: Epoxy coated or stainless steel.

Bolts

Coach bolts: To AS/NZS 1390 (1997).

Hexagon bolts Grades A and B: To AS 1110.1 (2015).

Hexagon bolts Grade C: To AS 1111.1 (2015).

Nuts

Hexagon chamfered thin nuts Grades A and B: To AS 1112.4 (2015).

Hexagon nuts Grade C: To AS 1112.3 (2015).

Hexagon nuts Style 1 Grades A and B: To AS 1112.1 (2015).

Hexagon nuts Style 2 Grades A and B: To AS 1112.2 (2015).

Screws

Coach screws: To AS/NZS 1393 (1996).

Hexagon screws Grades A and B: To AS 1110.2 (2015).

Hexagon screws Grade C: To AS 1111.2 (2015).

Hexagon socket screws: To AS 1420 (2008).

Self-drilling screws: To AS 3566.1 (2002).

Self-tapping screws:

- Cross-recessed countersunk (flat – common head style): To AS/NZS 4407 (2015).
- Cross-recessed pan: To AS/NZS 4406 (2015).
- Cross-recessed raised countersunk (oval): To AS/NZS 4408 (2015).
- Hexagon: To AS/NZS 4402 (2015).
- Hexagon flange: To AS/NZS 4410 (2015).
- Hexagon washer: To AS/NZS 4409 (2015).
- Slotted countersunk (flat – common head style): To AS/NZS 4404 (2015).
- Slotted pan: To AS/NZS 4403 (2015).
- Slotted raised countersunk (oval – common head style): To AS/NZS 4405 (2015).

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Blind rivets

Description: Expanding end type with snap mandrel.

Type: Closed end for external application, open end for internal application.

End material:

- Aluminium base alloy for metallic-coated or pre-painted steel.
- Stainless steel for stainless steel sheet.
- Copper for copper sheet.

Size:

- Sheet metal to sheet metal: 3 mm.
- Sheet metal to supports, brackets and rolled steel angles: 4.8 mm.

Corrosion resistance

Atmospheric corrosivity category: To *0171 General requirements*.

Steel products: Conform to the **Corrosion resistance table** or provide proprietary products with metallic and/or organic coatings of equivalent corrosion-resistance.

Corrosion resistance table

Atmospheric corrosivity category to AS 4312 (2019)	**Threaded fasteners and anchors**		**Powder actuated fasteners**
	Material	**Minimum local metallic coating thickness (µm)**	**Material**
C1 and C2	Electroplated zinc or Hot-dip galvanized	30	Stainless steel Type 316
C3	Hot-dip galvanized	45	Stainless steel Type 316
C4	Stainless steel Type 316	-	Stainless steel Type 316
Note: For categories C5, CX and T to the AS/NZS 2312 series, seek specialist advice.			

Finishes

Electroplating:

- Metric thread: To AS 1897 (2016).
- Imperial thread: To AS 4397 (2007).

Galvanizing:

- Threaded fasteners: To AS/NZS 1214 (2016).

- Other fasteners: To AS/NZS 4680 (2006).

Mild steel fasteners: Galvanize if:

- Embedded in masonry.
- In external timbers.
- Exposed to or in air spaces behind the external leaf of masonry walls.
- In contact with chemically treated timber other than CCA treated timber.

Epoxy coated: CCA treated timber.

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3 EXECUTION

3.1 ADHESIVES

General

Requirement: Install to the manufacturer's recommendations.

Preparation

Substrates: Conform to the following:

- Remove any deposit or finish that may impair adhesion.
- If framed or discontinuous, provide support members in full lengths without splicing.
- If solid or continuous, remove excessive projections.
- If previously painted, remove cracked or flaking paint and lightly sand the surface.

Contact adhesive

Precautions: Do not use contact adhesive if:

- A substrate is polystyrene foam.
- A PVC substrate may allow plasticiser migration.
- The adhesive solvent can discolour the finished surface.
- Dispersal of the adhesive solvent is impaired.

Two-way method: Immediately after application, press firmly to transfer adhesive and then pull both surfaces apart. Allow to tack off and then reposition and press firmly together. Tap areas in contact with a hammer and padded block.

One-way method: Immediately after application, bring substrates together and maintain maximum surface contact for 24 hours by clamps, nails or screws as appropriate. If highly stressed, employ permanent mechanical fasteners.

High strength adhesive tape

Preparation:

- Non-porous surfaces: Clean with surface cleaning solvents such as isopropyl alcohol/water, wash down and allow to dry.
- Porous surfaces: Prime the surface with a contact adhesive compatible with the tape adhesive system.

Application to copper, brass, plasticised vinyl and hydrophilic surfaces such as glass and ceramics in a high humidity environment: Conform to manufacturer's recommendations.

Applied lamination pressure: Make sure the tape experiences 100 kPa.

Application temperature: Generally above 10°C and to the manufacturer's recommendations.

Completion: Do not apply loads to the assembly for 72 hours at 21°C.

3.2 JOINT SEALING

General

Requirement: Install to the manufacturer's recommendations.

Joint preparation

Cleaning: Cut flush joint surface protrusions and rectify if required. Mechanically clean joint surfaces free of any deposit or finish that may impair adhesion of the sealant. Immediately before sealant application, remove loose particles from the joint, using oil-free compressed air.

Bond breaking: Install bond breaking backing material.

Taping: Protect the surface on each side of the joint using 50 mm wide masking tape or equivalent means. On completion of sealant application, remove the tape and remove any stains or marks from adjacent surfaces.

Primer: Apply the recommended primer to the surfaces in contact with sealant materials.

Sealant joint proportions

General weatherproofing joints (width:depth):

- 1:1 for joint widths less than 12 mm.
- 2:1 for joint widths greater than 12 mm.

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Sealant application

General: Apply the sealant to dry joint surfaces using a pneumatic applicator gun. Make sure the sealant completely fills the joint to the required depth, provides good contact with the full depth of the sides of the joint and traps no air in the joint. Do not apply the sealant outside the recommended working time for the material or the primer.

Weather conditions

Two pack polyurethanes: Do not apply the sealant if ambient conditions are outside the following:

- Temperature: Less than 5°C or greater than 40°C.
- Humidity: To the manufacturer's recommendations.

Joint finish

General: Force the sealant into the joint and finish with a smooth, slightly concave surface using a tool designed for the purpose.

Excess sealant: Remove from adjoining surfaces using cleaning material nominated by the sealant manufacturer.

Protection

General: Protect the joint from inclement weather during the setting or curing period of the material.

Rectification

General: Cut out and remove damaged portion of joint sealant and reinstall so repaired area is indistinguishable from undamaged portion.

3.3 FASTENERS

General

Requirement: Install to the manufacturer's recommendations.

Fastening to wood and steel

Timber substrates: To AS 1720.1 (2010) Section 4.

Self-drilling screws: To AS 3566.1 (2002) for timber and steel substrates.

4 SELECTIONS

4.1 ADHESIVES

Application schedule

Application	Product	Relevant worksections
Adhesive fixed timber strip flooring and parquetry systems	*To be confirmed by Architect*	*0655 Timber flooring*
Colourback glass faced wall panels or splashbacks	*1-part polyurethane sealant/adhesive with permanent elasticity*	*0551 Joinery*, *0641 Applied wall finishes*
Drywall lining/wall panels	*High strength contact adhesive*	*0463 Glass blockwork*, *0511 Lining*, *0522 Partitions - framed and lined*
Multilayered board floors	*High strength contact adhesive*	*0654 Multilayered board flooring*
Joinery doors	*PVA or 1-part polyurethane*	*0453 Doors and access panels*
Mirrors	*1-part polyurethane*	*0467 Glass components*

Application	Product	Relevant worksections
	sealant/adhesive with permanent elasticity	
Stainless steel faced wall panels or splashbacks	*1-part polyurethane sealant/adhesive with permanent elasticity*	*0551 Joinery*, *0553 Stainless steel benching*
Timber joinery fitments	*PVA or 1-part polyurethane*	*0551 Joinery*
Trim, mouldings, skirtings and architraves	*High strength contact adhesive*	*0511 Lining*
Mechanical Services	*To Mechanical and Acoustic consultants' requirements – refer to separate Mechanical services specification and acoustic report*	*Air filters*, *Ductwork insulation*, *Mechanical piping insulation*, *Cool rooms*
Hydraulic Services	*To Hydraulic and Acoustic consultants' requirements – refer to separate Hydraulic services specification and acoustic report*	*Hydraulic design and install*, *Tapware*

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4.2 SEALING, POINTING AND BEDDING

Application schedule

Application	Product	Relevant worksections
Metal flashings and rainwater goods	*Silicone neutral cure*	*0421 Roofing - combined*, *0423 Roofing - profiled sheet metal*, *0424 Roofing - seamed sheet metal*, *0425 Roofing - shingles and shakes*, *0426 Roofing - slate*, *0427 Roofing - tiles*
Metal flashings and sealing non-porous substrates	*1-part elastomeric polyurethane for fast moving joints in light components*	*0431 Cladding - combined*, *0432 Curtain walls*, *0434 Cladding - flat sheets and panels*, *0435 Cladding - planks and weatherboards*, *0436 Cladding - profiled and seamed sheet metal*
Window and external doors	*1-part elastomeric polyurethane*	*0432 Curtain walls*, *0451 Windows and glazed doors*, *0453 Doors and access panels*, *0463 Glass blockwork*
Hydraulic services	*To Hydraulic and Acoustic consultants' requirements – refer to separate Hydraulic services specification and acoustic report*	*0811 Sanitary fixtures*, *0812 Tapware*, *0813 Water heaters*, *0815 Drinking water dispensers*

Adhesives, sealants and fasteners combined function schedule

Application	Product	Relevant worksections
Cool rooms fixing and sealing	*To Mechanical and Acoustic consultants' requirements – refer to separate Mechanical services specification and acoustic report*	*0762 Cool rooms*

Application	Product	Relevant worksections
Fixing and sealing acoustic ceiling tiles	*Polyurethane modified silicone for general purpose gap filing*	*0531 Suspended ceilings - combined*
Control joints, tile adhesives and wet area sealants	*Silicone neutral cure formulated to prevent microbiological growth for kitchen and sanitary ware applications*	*0631 Ceramic tiling, 0632 Stone and terrazzo tiling*
Timber floor control joints, adhesives and fixings	*2-part elastomeric polyurethane for fast moving joints in light structures*	*0655 Timber flooring, 0654 Multilayered board flooring*
Wet area sealants and lightweight detail items	*Silicone neutral cure formulated to prevent microbiological growth for kitchen and sanitary ware applications*	*0525 Cubicle systems, 0551 Joinery, 0811 Sanitary fixtures*

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4.3 SEALING STRUCTURALLY DESIGNED CONTROL JOINTS

Application schedule

Application	Sealant type	Bond breaking	Sealant colour	Relevant worksection
Masonry control joints	*2-part elastomeric polyurethane for fast moving joints in light structures or slow moving joints in heavy structures*	*Closed cell Expanded polythene. Final selection to sealant manufacturer's written instructions*	*To be confirmed by Architect*	*0321 Precast concrete, 0322 Tilt-up concrete, 0331 Brick and block construction, 0332 Stone masonry*
Trafficable masonry control joints	*2-part elastomeric polyurethane for fast moving joints in light structures or slow moving joints in heavy structures*	*Closed cell expanded polythene. Final selection to sealant manufacturer's written instructions*	*To be confirmed by Architect*	*0274 Concrete pavement, 0275 Paving - mortar and adhesive bed*

4.4 FIRE RATED SEALANTS

Application schedule

Application	Sealant type	Bond breaking	Sealant colour	Relevant worksection
Masonry control joints	*Intumescent 1-part polyurethane*	*Closed cell Expanded polythene. Final selection to sealant manufacturer's written instructions*	*To be confirmed by Architect*	*0321 Precast concrete, 0322 Tilt-up concrete, 0331 Brick and block construction, 0332 Stone masonry*
Trafficable masonry control joints	*Intumescent 1-part polyurethane*	*Closed cell expanded polythene. Final selection to sealant manufacturer's written instructions*	*To be confirmed by Architect*	*0274 Concrete pavement, 0275 Paving - mortar and adhesive bed*

0182 FIRE-STOPPING

1 GENERAL

1.1 RESPONSIBILITIES

General
Requirement: Provide fire-stopping, as documented.

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1.2 CROSS REFERENCES

General
Requirement: Conform to the following:
- *0171 General requirements*.
- *0181 Adhesives, sealants and fasteners*
- *0183b Metals and prefinishes*
- *0185 Timber Products, finishes and treatment*
- *0431 Cladding – combined*
- *0451b Windows and Glazed doors*

Consultant Documentation
- Refer to the following consultant reports, specification worksections and other documentation for further information and requirements relating to this worksections:
- 0181 Adhesives, sealants and fasteners
- *0183b Metals and prefinishes*
- *0185 Timber Products, finishes and treatment*
- *0431 Cladding – combined*
- *0451b Windows and Glazed doors*

1.3 STANDARDS

General
Service penetration fire-stopping systems: To AS 4072.1 (2005) and BCA (2022) C4D15.
Control/construction joint fire-stopping systems: To AS 4072.1 (2005) and BCA (2022) C4D16.

1.4 INTERPRETATION

Definitions
General: For the purposes of this worksection, the definitions given in AS 4072.1 (2005) apply.

1.5 SUBMISSIONS

Certification
General: Submit evidence of conformity with the recommendations of AS 4072.1 (2005) Appendix B.
Certification: Submit a completed statement of compliance and schedule of installed fire-stopped penetrations and control/construction joints.
- Schedule: To AS 4072.1 (2005) Figure B1.
- Statement of compliance: To AS 4072.1 (2005) Figure B2.

Operation and maintenance manuals
Requirement: Submit manual to **COMPLETION**, **Operation and maintenance manuals**.

Products and materials
General: Submit the following:
- Evidence that systems conform to documented requirements.
- Copies of relevant manufacturers' instructions.
- Product data sheets (PDS).
- Safety data sheets (SDS), if applicable.

Type tests: Submit type test reports including drawings detailing the tested system as evidence of conformance for each combination of fire-stopping system, application, type of service, substrate and penetration orientation. Conform to PRODUCTS, **GENERAL**, **Tests**.

Samples
Requirement: Submit samples to PRODUCTS, **GENERAL**, **Samples**.

Subcontractors
General: Submit names and contact details of proposed suppliers and installers.

Evidence of experience: provide evidence of experience

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Warranties
Requirement: Submit warranties to **COMPLETION**, **Warranties**.

1.6 INSPECTION

Notice
Inspection: Give notice so that inspection may be made of the following:
- Service penetrations completed and ready for fire-stopping.
- Control/construction joints completed and ready for fire-stopping.
- Finished fire-stopping, before being concealed.

2 PRODUCTS

2.1 GENERAL

Samples
Requirement: Provide a sample panel of each fire-stopping assembly, on representative substrates. If built into the works, identify by marking it as a control sample.

Size: 500 mm run for junction seals and 500 x 500 mm area for penetration seals.

Tests
Service penetration fire-stopping systems: Fire-resistance tested to AS 1530.4 (2014).

Fire-stop mortars: Resistance to explosive spalling to AS 1774.36 (2019).

Control joint fire-stopping systems: Fire-resistance tested to AS 1530.4 (2014).

2.2 MATERIALS

Storage and handling
General: Deliver, unload and store products and accessories in unbroken manufacturer's packaging in a dry, well-ventilated and secure storage area, unaffected by weather.

Shelf life: Use materials that have not exceeded their shelf life.

Control joints
General: To AS 4072.1 (2005) clauses 2.3 and 4.7 and Appendix C.

Toxicity
Toxic materials: Free of asbestos and lead, and free of, nor requiring the use of, toxic solvents.

Toxicity in fire: Non-toxic.

Toxicity before curing: Select products with very limited, or no health hazards, where applicable.

Total VOC limits
Requirement: Conform to the following maximum limits:
- Fire stopping sealants: 250 g/L.

Product certification
Conformance: Address the following:
- Statutory and performance requirements.
- Adequacy of application/installation.

Appointment: In the joint names of the contractor and the principal.

2.3 FIRE-STOPPING PRODUCTS

Fire-stop mortars
Type: Re-enterable cement-based compound, mixed with water. Non-shrinking, moisture resistant. Insoluble in water, after setting.

Formulated compound of incombustible fibres
Material: Formulated compound mixed with mineral fibres, non-shrinking, moisture resistant. Insoluble in water after setting.

Non-combustible mineral fibre stuffing
Material: Mineral fibre stuffing insulation, dry and free of other contaminants.

Standard: To AS/NZS 4859.1 (2018) Section 7.

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Intumescent fire pillows
Material: Self-contained self-locking intumescent fire pillows for medium to large openings, where no additional support is required.

Fire-stop composite sheets
Material: Composite system comprised of a number of components, including a fire-resistive elastomeric sheet, bonded on either side with layers of sheet steel and/or steel-wire mesh covered with aluminium foil.

Fire-stop sealants
Material: Elastomeric sealant. Soft, permanently flexible, non-sag, non-shrinking, moisture resistant. Capable of providing a smoke-tight, gas-tight and waterproof seal when properly installed. Insoluble in water after setting.

Fire-stop foams
Material: Single component compound of reactive foam ingredients, non-shrinking, moisture resistant. Insoluble in water after setting.

Fire-stop putty
Material: Single component, mouldable, permanently flexible, non-shrinking, moisture resistant, intumescent compound that conforms to the following:

- Expands on exposure to surface heat gain to form a high-volume thermally insulating char that closes gaps and voids.
- Resists the turbulence of a severe fire.
- Can be placed by hand to form an immediate fire seal.
- Insoluble in water after setting.

Cavity barriers
Cavity barrier: Formed compressible fire-stopping strip.

Intumescent cavity barrier: Formed fire-stopping strip with high expansion intumescent seal.

2.4 COMPONENTS

Fire-stop collars
Material: Mechanical device with incombustible intumescent fillers covered with sheet steel jacket. Airtight and watertight.

Fire-stop pillows
Material: Formed self-contained compressible flexible mineral fibre in cloth bags, rated to permit frequent changes in service.

Multi-service cable transit box
Material: Mechanical device consisting of a sheet steel sleeve containing heat reactive intumescent polymer, including intumescent seals and smoke rated brushes. The insulation rating can be increased by the incorporation of other fire-stopping products.

Control joint insert – elastomeric foam strip
Material: Elastomeric foam strip laminated with a graphite based intumescent compound on both sides, which is a water resistant seal that expands when exposed to heat.

Accessories
Primer: As recommended by manufacturer for substrates

Permanent dam material: Non-combustible.

Permanent dam material type: Mineral Fibreboard

Metal lath: for cable tray penetrations – used to enclose both sides of the vertical penetration, to keep fire-stop pillows in place, and to prevent unauthorised or accidental removal of fire-stopping.

Stickers and labels: To **COMPLETION**, **Labelling**.

Installation accessories: Provide clips, collars, fasteners, stainless steel cable ties, temporary stops and dams, backing rods and other devices required to position, support and contain fire-stopping and accessories.

3 EXECUTION

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3.1 PREPARATION

Substrates

General: Give notice, if substrates or penetrants or both are not suitable for fire-stopping.

Cleaning: Clean substrates of dirt, dust, grease, oil, loose material, and other matter that may affect the bond of fire-stopping products.

Primer: Dry substrates for primers and sealants.

Restraint: Install backing and/or damming materials to arrest liquid material leakage. Remove temporary dams after material has cured.

3.2 INSTALLATION

General

Extent: Fire-stop and smoke-stop interruptions to fire-resistance rated assemblies, materials and components, including penetrations through fire-resisting elements, breaks within fire-resisting elements such as expansion joints, and junctions between fire-resisting elements.

Sequence: Fire-stop after services have been installed through penetrations and properly spaced and supported, after sleeving where appropriate, and after removal of temporary lines, but before restricting access to the penetrations, including before dry lining.

Fire-resistance level (FRL): Install products to the manufacturer's recommendations. Install to achieve the documented FRL in accordance with the manufacturer's tested system.

Ventilation: Supply ventilation for non-aqueous solvent-cured materials.

Density: Apply fire-stopping material to a uniform density.

Fire-stopping exposed to view: Finish surfaces to a uniform and level condition.

Cable separation: Maintain cable separation.

Protection: Protect adjacent surfaces from damage arising through installation of fire-stopping. Protect completed fire-stopping from damage arising from other work.

Loose or damaged fire-stopping material: Remove and replace.

Penetrations by pipes and ducts: Allow for thermal movement of the pipes and ducts.

Preventing displacement: Reinforce or support fire-stopping materials with non-combustible materials when:

- The unsupported span of the fire-stopping materials is greater than 100 mm.
- The fire-stopping materials are non-rigid (unless shown to be satisfactory by test).

Environmental management: To the manufacturer's Safety Data Sheets for WHS and environmental management of the materials.

Ambient conditions:

- Maintain building temperature at over 5ºC before, during and for 3 days after installation.
- Permanent HVAC should be in operation as per manufacturer's requirements.

Penetrations: Provide structural support around the opening.

3.3 FIRE-STOPPING SYSTEMS

Control joint insert – elastomeric foam strip

Site conditions: Make sure that the application area is free from dust, oil, solvents or any other foreign substances.

Installation: To the manufacturer's recommendations to completely close and seal the joint.

Fire-stop mortars
Ambient conditions: Do not install below 5°C.

Installation: To the manufacturer's recommendations to completely close and seal the opening.

Formulated compound of incombustible fibres
Installation: To the manufacturer's recommendations to completely close and seal the opening.

Non-combustible mineral fibre stuffing
Installation: Install in accordance with a type-tested installation to achieve the required FRL. Completely close and seal the opening.

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Fire-stop composite sheets
Installation: To the manufacturer's recommendations to completely close and seal the opening.

Fire-stop sealants
Ambient conditions: Do not store above 32°C. Do not install outside the temperature range recommended by the sealant manufacturer. Do not install when humidity exceeds that recommended by the sealant manufacturer for safe installation.

Installation: To the manufacturer's recommendations to completely close and seal the opening.

Fire-stop foams
Ambient conditions: Do not store above 32°C. Do not install below 15°C or above 32°C. Do not apply when temperature of substrate and air is below 15°C. Maintain this minimum temperature before, during and for 3 days after installation.

Installation: Test substrates for adhesion and prime if necessary. Place in layers for homogenous density, filling cavities and spaces to the manufacturer's recommendations. Place sealant to completely seal junctions with adjacent dissimilar materials.

Fire-stop putty
Ambient conditions: Do not install below 5°C. Do not allow the material to freeze.

Installation: To the manufacturer's recommendations to completely close and seal the opening.

Fire-stop collars
Installation: To the manufacturer's recommendations.

Fire-stop pillows
Ambient conditions: Do not install in conditions outside the manufacturer's recommendations.

Installation: To the manufacturer's recommendations to completely close and seal the opening.

Cavity barriers
Installation: To the manufacturer's recommendations.

Multi-service cable transit box
Installation: To the manufacturer's recommendations.

3.4 COMPLETION

Cleaning
Requirement: Clean the finished surfaces and remove spilled and excess fire-stopping materials without damaging other work.

Labelling
Requirement: To the recommendations of AS 4072.1 (2005) Appendix B.

Additional marking: Include the following text in addition to the above: CAUTION – FIRE BARRIER MUST REMAIN SEALED.

Location: Attach labels to cables, conduits, pipes and ducts on both sides of and close to, the control joint or penetration. On large items, provide multiple labels.

Operation and maintenance manuals
General: Prepare a manual that includes schedules showing type of system installed, fire rating, location, date of installation and inspection requirements. For fire-stopping systems that are intended to be modified in service, include the manufacturers' data as follows:

- Recommendations for changes in service and reinstallation.
- Recommendations for service use, care and maintenance.
- List of manufacturers and suppliers for replacement parts.

Warranties
Requirement: Provide warranties as offered by the manufacturer

4 SELECTIONS

4.1 FIRE-STOPPING PRODUCTS

Fire-stopping products to be proposed/nominated by Builder

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Fire-stopping materials schedule

	FS1	FS2	FS3
Proprietary item			
Material or component			
Elongation/shrinkage (%)			
Potential expansion: minimum (%)			
Adhesion and bond to substrate (kPa)			
Compressive strength (kPa)			
Density (kg/m³)			
Vapour permeability (ng/Pa/s/m²)			
Air permeability (L/s/m²)			
Durability in service (years)			
Surface durability			
Recycled content (%)			
VOC content (gram/L)			
Colour			

4.2 FIRE-STOPPING SYSTEMS

Fire-stopping systems schedule

	A	B	C
System			
Substrate			
Penetrants			
Fire-stopping material or component			
FRL (--/--/--)			
Resistance to the incipient spread of fire			

0183B METALS AND PREFINISHES

1 GENERAL

1.1 RESPONSIBILITIES

General
Requirements: Provide metal and prefinishes, as documented.

Performance
Requirement: Provide metals in sections of strength and stiffness suited to their required function, finish and method of fabrication.

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1.2 CROSS REFERENCES

General
Requirement: Conform to the following:
- *0171 General requirements*.
- *Wall types schedule*
- *Exterior/Interior finishes schedules*
- *FF&E Schedule*
- *Joinery schedule*
- *Door Schedule*

1.3 SUBMISSIONS

Samples
Requirement: Submit samples to PRODUCTS, **GENERAL**, **Samples**.
- Stainless steel: One sample of every mill grade and finish process.
- Anodising: One sample of every colour and finishing option.
- Powder coating: One sample of every colour and finishing option.

2 PRODUCTS

2.1 GENERAL

Samples
Requirement: Provide samples of the following:
- Stainless steel: One sample of every documented surface finish.
- Anodising: One sample of every colour and finishing option.

2.2 METALS

Stainless steel
Bars: To ASTM A276/A276M (2024).
Plate, sheet and strip: To ASTM A240/A240M (2024).
Welded pipe (plumbing applications): To AS 1769 (1975).
Welded pipe (round, square, rectangular): To ASTM A554 (2021).

3 EXECUTION

3.1 GENERAL

Metal separation
Incompatible sheet metals: Prevent direct contact between incompatible metals. Provide separation by one of the following:
- Apply an anti-corrosion, low moisture transmission coating such as alkyd zinc phosphate primer or aluminium pigmented bituminous paint to contact surfaces.

- Insert a concealed, non-conductive separation layer such as polyethylene film, adhesive tape, neoprene, nylon or bituminous felt.

Incompatible fixings: Do not use.

Incompatible service pipes: Install lagging or grommets. Do not use absorbent, fibrous or paper products.

Brazing

Lap-joints: Make sure brazed lap-joints have sufficient lap to provide a mechanically sound joint.

Butt joints: Do not use butt jointing for joints subject to load. If butt joints are used, do not rely on the filler metal fillet only.

Filler metal: To AS/NZS ISO 17672 (2023).

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Soldering

Lap-joints: Provide a mechanically sound soldered joint with sufficient lap for roofing, guttering, metalwork.

Pipes: Make a leakproof soldered joint using joiners for copper pipes.

Solder: To AS 1834.1 (1991).

Welding

Aluminium: To AS/NZS 1665 (2004).

Stainless steel: To AS/NZS 1554.6 (2012).

Steel: To AS/NZS 1554.1 (2014).

Finishing

Visible joints: Finish visible joints made by welding, brazing or soldering using methods appropriate to the class of work (including grinding or buffing) before further treatment such as painting, galvanizing or electroplating. Make sure self-finished metals are without surface colour variations after jointing.

Preparation

General: Before applying decorative or protective prefinishes to metal components, complete welding, cutting, drilling and other fabrication, and prepare the surface using a suitable method.

Standard: To the AS 1627 series.

Priming steel surfaces: If site painting is documented to otherwise uncoated mild steel or similar surfaces, prime as follows:

- After fabrication and before delivery to the works.
- After installation, repair damaged priming and complete the coverage to unprimed surfaces.

3.2 FERROUS STEEL FINISHES

Metallic-coated steel

General: Steel coated with zinc or aluminium-zinc alloy as follows:

- Electrogalvanized (zinc) coating on ferrous hollow and open sections: To AS 4750 (2003).
- Ferrous open sections by an in-line process: To AS/NZS 4791 (2006).
- Ferrous hollow sections by a continuous or specialised process: To AS/NZS 4792 (2006).
- Steel sheet and strip: To AS 1397 (2021).
- Steel wire: To AS/NZS 4534 (2006).

3.3 STAINLESS STEEL FINISHES

General

Requirement: Provide a surface finish to match the approved sample.

Sample identification: 304 Stainless Steel brushed finish

Pre-assembly

Mechanically polished and brushed finishes: Apply grit faced belts or fibre brushes that achieve uni-directional finishes with buffing, as required to provide the following:

- Finish designation: Brush finish No. 4/2J

Post-assembly pre-treatment

Heat discolouration: Remove by pickling to ASTM A380/A380M (2017).

Welds: Grind excess material, brush, and polish to match the pre-assembly finish.

Post-assembly finish
Electropolish finish: Provide an electro-chemical process to stainless steel Type 316.
Brushed electropolish finish: Conform to the following:
- Pre-assembly finish: No. 4 polished.
- Post-assembly finish: Provide an electro-chemical process to achieve a surface roughness R_a, no greater than 0.50 µm.

Mirror finish: Conform to the following:
- Pre-assembly finish: 2B cold-rolled finish.
- Post-assembly finish: Apply a polishing and buffing process to achieve a No. 8 mirror finish.

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Completion
Cleaning: Clean and rinse to an acid free condition and allow to dry. Do not use carbon steel, abrasives or materials containing chloride.
Protection: Secure packaging or strippable plastic sheet.

3.4 ELECTROPLATED FINISHES

Electroplated coatings
Chromium on metals: To AS 1192 (2004).
- Service condition number: At least 2.

Nickel on metals: To AS 1192 (2004).
- Service condition number: At least 2.

Zinc on iron or steel: To AS/NZS 1789 (2023).

3.5 ANODISED FINISHES

General
Standard: To AS 1231 (2000).
Thickness grade: To the recommendations of AS 1231 (2000) Appendix H.
Application: AA 25 unless noted otherwise.
Description/Colour and Finish: Refer to Architectural Schedules for requirements.
Warranty: 15 years.

3.6 PREPAINTED FINISHES

Air-drying enamel
Application: Spray or brush.
Finish: Full gloss.
General use:
- Primer: Two-pack epoxy primer to AS/NZS 3750.13 (1997).
- Topcoats: 2 coats to AS 3730.6 (2006).

Oil resistant use:
- Primer: Two-pack epoxy primer to AS/NZS 3750.13 (1997).
- Topcoats: 2 coats to AS/NZS 3750.22 (2008).

Equipment paint system
Description: Brush or spray application using paint as follows:
- Full gloss enamel finish coats, oil and petrol resistant: To AS/NZS 3750.22 (2008), two coats.
- Prime coat to metal surfaces generally: To AS/NZS 3750.19 (2008) or AS/NZS 3750.20 (2008).
- Prime coat to zinc-coated steel: To AS 3730.15 (2006) or AS/NZS 3750.16 (1998).
- Undercoat: To AS/NZS 3750.21 (2008).

Prepainted metal products
Standard: To AS/NZS 2728 (2013).
Product finish: Powdercoat
Product type: To AS/NZS 2728 (2013): Not lower than the type appropriate to the documented atmospheric corrosivity category.

Stoving enamel
Application: Spray or dip.
Internal use:
- Primer: Two pack epoxy primer to AS/NZS 3750.13
- Topcoat:
  - Internal use: Proprietary polyurethane or epoxy acrylic system.
  - External use: Proprietary polyurethane system.

Two-pack liquid coating
Application: Spray.
Finish: Full gloss.
Primer: Two pack epoxy primer to AS/NZS 3750.13 (1997).
Topcoat:
- Internal use: Proprietary polyurethane or epoxy acrylic system.
- External use: Proprietary polyurethane system.

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3.7 COMPLETION

Damage
Damaged prefinishes: Remove and replace items, including damage caused by unauthorised site cutting or drilling.

Repair
Anodising: Use sprayers or pens for minor scratches and mitre cuts as required.
Metallic-coated sheet: If repair is required to metallic-coated sheet or electrogalvanizing on inline galvanized steel products, clean the affected area and apply a two-pack organic primer to AS/NZS 3750.9 (2009).

Cleaning
General: On completion, clean all surfaces. Do not use abrasive cleaners.

0185 TIMBER PRODUCTS, FINISHES AND TREATMENT

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide timber products with finishes and treatments, as documented.

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Performance

Requirements:

- Appropriate for durability and fire-resistance.
- Appropriate surface finish.
- Appropriate certification for the finishing applications.

1.2 CROSS REFERENCES

General

Requirement: Conform to the following:

- *0171 General requirements*.
- *0431 Cladding – combined*
- *-0551 Joinery*
- *0671b Painting.*

1.3 STANDARDS

General

Sawn and milled products:

- Hardwood: To AS 2796.1 (1999).
- Softwood: To AS 4785.1 (2002).

Reconstituted wood based panels:

- Particleboard: To AS 1859.1 (2017).
- Particleboard flooring: To AS/NZS 1860.1 (2017).
- Dry process fibreboard: To AS/NZS 1859.2 (2017).
- Decorative overlaid wood panels: To AS/NZS 1859.3 (2017).
- Wet process fibreboard: To AS/NZS 1859.4 (2018).

Plywood:

- Structural: To AS/NZS 2269.0 (2012).
- Interior: To AS/NZS 2270 (2006).
- Exterior: To AS/NZS 2271 (2004).
- Marine: To AS/NZS 2272 (2006).

Glued laminated timber: To AS/NZS 1328.1 (1998).

Laminated veneer lumber: To AS/NZS 4357.0 (2022).

Timber grading methods:

- Stress graded: To the AS/NZS 1748 series.
- Visually graded F-grade: To AS 2082 (2007) or AS 2858 (2023).

1.4 INTERPRETATION

Abbreviations

General: For the purposes of this worksection, the following abbreviations apply:

- LVL: Laminated Veneer Lumber.

Definitions

General: For the purposes of this worksection, the definitions given in AS/NZS 4491 (1997) and the following apply:

- Dry process fibreboard: Panel material with a nominal thickness of 1.5 mm or greater, manufactured from lignocellulosic fibres (derived from wood or other materials) with application of heat and pressure, the bond of which is derived from a synthetic adhesive added to the fibres and the panels are manufactured with a forming moisture content less than 20%.
- Particleboard: Panel material manufactured under pressure and heat from particles of wood (wood flakes, strands, chips, shavings, sawdust and similar) and/or lignocellulosic material in particle form (flax shives, hemp hurds, bagasse fragments, rice hulls, wheat straw and similar) with the addition of an adhesive.
- Wet process fibreboard: Panel material with a nominated thickness of 1.5 mm or greater, manufactured from lignocellulosic fibres (derived from wood or other materials) with application of heat and/or pressure, the bond of which is derived from the felting of the fibres and the panels are manufactured with a forming moisture content greater than 20%.

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1.5 SUBMISSIONS

Products and materials

Chain of custody of forest products: Submit the following as evidence of conformity to **CERTIFICATION**, **Timber source certification**:

- Third party certification of supplier's chain of custody management system.
- Formal claim of chain of custody by supplier.

Preservative treatment of timber: Submit a certificate from an independent testing authority to AS/NZS 1604.1 (2021) clause 1.5.3.6. Include details of treatment and a copy of the charge sheet.

Tests: Submit moisture content test results.

Warranties

Requirement: Submit warranties to **COMPLETION**, **Warranties**.

2 PRODUCTS

2.1 GENERAL

Storage and handling

General: Deliver timber products to site in unbroken wrapping or containers and store so that the moisture content is not adversely affected.

Product identification

Preservative-treated timber: Marking to AS/NZS 1604.1 (2021) clause 1.5.3 and including the following:

- A unique identifier for the treatment plant.
- A unique identifier for the preservative.
- Hazard class.

2.2 CERTIFICATION

Timber certification

Recognised product certification programs:

- Pine framing: Plantation Timber Certification.

- Hardwoods: Australian Timber Industry Certification (ATIC) Quality Scheme.

- Glued-laminated timber: Glued Laminated Timber Association of Australia (GLTAA) Product Certification System.

- Laminated veneer lumber: Engineered Wood Products Association of Australasia (EWPAA) Quality Control and Product Certification Scheme.

- Finger jointed structural timber: Plantation Timber Certification.

Timber to be certified in lieu of branding: Clear finished decorative exposed timber.

Formaldehyde-based Products

- Composite wood products (plywood, particleboard, MDF, veneer panel and decoratively overlaidwood panels) used internally (excluding formwork, reused products and raw timber) shall meet the following formaldehyde emission limits:

- -Plywood. E-ply E0 certified emissions: in accordance with the testing procedure outlined in AS/NZS 2098.11 method 11.

- -Particleboard (to AS/NZS 1859.1): emissions are less than (<) 1.5mg/ litre in accordance with the testing procedure outlined in AS/NZS 4266.16 method 16.

- -MDF (to AS/NZS 1859.2): emissions are less than (<) 1.0mg/ litre in accordance with the testing procedure outlined in AS/NZS 4266.16 method 16.

- -Particleboard and plywood (to JIS A 5908): emissions are less than (<) 1.0mg/ litre in accordance with the testing procedure outlined in JIS A 1460

- -MDF (to JIS A 5905): emissions are less than (<) 1.0mg/ litre in accordance with the testing procedure outlined in JIS A 1460.

- -Engineered timber products (excluding plywood): emissions are less than (<) 1.0mg/ litre in accordance with the testing procedure outlined in JIS A 1901.

- -Emissions are less than (<) 0.1 ±0.0005 mg/ m²/ hr when measured in accordance with ASTM D 5116-06.

- -Emissions are less than (<) 0.1 ±0.0005 mg/ m²/ hr when measured in accordance with ISO 16000 parts 9, 10 and 11 (also known as EN 13419).

- -Emissions are less than (<) 0.12 mg/ m³ when measured in accordance with ASTM D6007.The test report must confirm that the conditions of this clause comply for the particular wood product type, the final results must be presented in EN 717-1 equivalent using the correlation ratio of 0.98.

- -Emissions are less than (<) 0.12 mg/ m³ when measured in accordance with ASTM E1333.The final results must be presented in EN 717-1 equivalent, using the correlation ratio of0.98.

- -Emissions are less than (<) 0.12 mg/ m³ when measured in accordance with EN 717-1(also known as DIN EN 717-1). - -Emissions are less than (<) 3.5 mg/ m²/ hr when measured in accordance with EN 717-2(also known as DIN EN 717-2).

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Timber panel products

Certification program: Brand panels under the authority of a recognised certification program applicable to the product. Locate the brand on faces or edges which will be concealed in the works. Certification programs:

- Plywood and block board: Engineered Wood Products Association of Australia (EWPAA) Quality Control and Product Certification Scheme.

- Wet processed fibreboard, dry processed fibreboard, particle board and decorative overlay wood panels: Engineered Wood Products Association of Australia (EWPAA) Quality Control and Product Certification Scheme.

Plywood formaldehyde emission class to AS/NZS 2270

Reconstituted wood-based panel certified formaldehyde emission class to AS/NZS 1859 series

2.3 FIRE-RESISTANCE

General

Structural timber: To AS/NZS 1720.4 (2019) or alternative conforming to NCC (2022) A5G3.

Bushfire-prone areas

Standard: To AS 3959 (2018).

2.4 DURABILITY

General

Requirement: Provide timbers with natural durability appropriate to the conditions of use, or preservative-treated timber of equivalent durability.

Natural durability class: To AS 5604 (2022).

Naturally termite-resistant timbers: To AS 3660.1 (2014) Appendix C.

Timber quality: Free of core wood (material within 50 mm of the tree's centre) and free of splits, checks, loose knots and cavities. Free of sapwood (lighter coloured wood found on the outer layer of the tree).

Lyctid susceptible timbers: To AS 5604 (2022). Do not provide untreated timbers containing lyctid susceptible sapwood.

Untreated sapwood: Do not use in applications requiring treated timber or natural durability.

Preservative treatment
Wood-based products: To AS/NZS 1604.1 (2021) or preservative-treated products conforming to NCC (2022) A5G3.

Verification requirements: To AS/NZS 1604.2 (2021).

Test methods: To AS/NZS 1604.3 (2021).

Moisture content
Test: To AS/NZS 1080.1.

Protection: Protect timber and timber products stored on site from moisture and weather. For milled, prefinished, prefabricated and similar elements which are to be protected in the final structure, provide temporary weather protection until the permanent covering is in place.

Subfloor ventilation: To BCA F1.12 or BCA 3.4.1.2 as applicable.

Timber shall be naturally seasoned for one year per 25mm thickness of board or kiln dried in accordance with BRE's Timber Drying Manual.

The moisture content of all timbers nominated as 'kiln dried' shall not exceed 15% at time of delivery. For external use or in other high moisture content areas, timber shall be graded and marked "WET". Such timber shall not be used internally.

Moisture content at the time of erection shall not exceed:

-Under cover in generally non-conditioned spaces: 24%.

-Under cover in generally conditioned spaces: 20%.

-Internal spaces: 20%.

Termite treatment Requirement: To the Termite management worksection.

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2.5 FINISHING

Production finish
Glued laminated timber: To AS/NZS 1328.1 (1998).

Hardwood: To AS 2796.1 (1999) Table B1.

Plywood: To AS/NZS 2269.0 (2012), AS/NZS 2270 (2006), AS/NZS 2271 (2004) and AS/NZS 2272 (2006).

Softwood: To AS 4785.1 (2002) Table B1.

Surface finish: Dressed all round unless noted otherwise

Edge detail: Arrised

Surface coating
Painting and staining: To *0671 Painting*.

Water-repellent treatment: To manufacturer’s specifications

Application: To the manufacturer’s specification.

2.6 RECYCLED TIMBER

General
Standard: To FWPA PN06.1039. Grit blasted or re-machined: Remove all nails and screws.
Classification: Visually graded.

3 EXECUTION

3.1 JOINTS

General
Joints and connections: Use hot-dipped galvanized or stainless steel fasteners, composite bolts, nails or nailed metal connectors.

Timber-to-timber interfaces: To the manufacturer’s recommendations and the following:

- Provide a seal coating of preservative treatment.
- Make sure the inside of bolt holes and the end grains of the timber are coated.

Water retention: Avoid details that may trap water including housing or birdsmouth joints.

Fasteners: To prevent chemical treatments reacting with fasteners, install to manufacturer's recommendations.

3.2 SHRINKAGE RESTRAINT

General

Requirement: If possible, use seasoned timber, particularly where timber elements are integrated with steel and/or concrete.

Moisture content: Maintain a timber moisture content near the anticipated in-service equilibrium moisture content.

Fasteners: Where possible, align fasteners along member axis.

Connections: Use connections that allow for movement without adversely affecting the performance of the connection.

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Unseasoned timber: Provide as follows:

- Drill bolt holes 2 mm or 10% larger than the bolt diameter.
- Use species with similar shrinkage values to reduce movement and shrinkage.
- Provide adequate clearance between unseasoned timber framing, and interfacing structures and materials to allow for movement.

3.3 FINISHING

Ploughing

General: Back plough boards liable to warp (e.g. if exposed externally on one face). Make the width, depth and distribution of ploughs appropriate to the dimensions of the board and degree of exposure.

Painting

Edges: Chamfer edges of work to receive paint or similar coatings.

Priming: For woodwork to be painted, prime hidden surfaces before assembly.

3.4 COMPLETION

Warranties

Type: [complete/delete]

Period: [complete/delete]

4 SELECTIONS

4.1 PRODUCT SCHEDULES

Preservative treatment schedule

	A	B	C
Timber product application	200 Veneer Flooring		
Hazard class to AS/NZS 1604.1 (2021)	Timber Flooring to apartments internal		
Species	Chateau Oak 510 Summer Blonde		
Supplier	Godfrey Hirst		
Natural durability class to AS 5604 (2022)			
Preservative treatment	Intergrain Timber Stain Colour: Natural Note: 2 coats		

0193 BUILDING ACCESS SAFETY SYSTEMS

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide building access safety systems, as documented.

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Performance

Roofing and cladding: Maintain waterproofing integrity without damage or distortion. Maintain the structural integrity of the supporting elements.

1.2 DESIGN

General

Designer: [complete/delete]

Requirements

General: To DESIGN in *0171 General requirements*.

Responsibility: [complete/delete]

Performance requirements: [complete/delete]

Authority requirements: [complete/delete]

Access: Provide a system for three workers at any one time, to access the following:

- Full extent of gutters.
- Roof mounted plant and equipment.
- Roof areas within 2.5 m of fall hazards not otherwise protected by parapets or guard rails.
- External facade areas including glazing.
- External lighting.
- Aerials and telecommunications equipment.
- Photovoltaic panels.

1.3 CROSS REFERENCES

General

Requirement: Conform to the following:

- *0171 General requirements*.

1.4 STANDARDS

General

Fixed platforms, walkways, stairways and ladders for use by operating, inspection, maintenance and servicing personnel: To AS 1657 (2018).

Personal equipment for working at height: To AS/NZS 1891.1 (2020), AS/NZS 1891.2 (2001), AS 1891.3 (2020), AS/NZS 1891.4 (2009) and AS 1891.5 (2020).

Rope access system: To AS/NZS 4488.1 (1997), AS/NZS ISO 22846.1 (2020) and AS/NZS ISO 22846.2 (2020).

1.5 INTERPRETATION

Abbreviations

General: For the purposes of this worksection, the following abbreviation applies:

- PPE: Personal protective equipment.

Definitions

General: For the purposes of this worksection, the definitions given in AS 1657 (2018), AS/NZS 1891.1 (2020), AS/NZS 5532 (2013) and AS/NZS ISO 22846.1 (2020) apply.

1.6 SUBMISSIONS

Certification

General: Submit certification of installed system to **COMPLETION**, **Certification**.

Design documentation

General: To *0171 General requirements* and the following:

- Calculations: Submit calculations by a professional engineer experienced in building access safety systems.
- Certification: Submit certification by a professional engineer experienced in building access safety systems design as evidence of conformance to documented requirements.
- Drawings: Submit the following drawings:
  - . Layout of roof access stairways and ladders, platforms and walkways.
  - . Details of stairways and ladders, walkways, including elevated walkways and required guardrailing.
  - . Layout of anchors, static lines and system components in plan and elevation.
  - . Proposed methods of fixing to each substrate type in the building.

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Marking and labelling

Requirement: Samples and schedules of proposed marking and labels for each system component.

Operation and maintenance manuals

Requirement: Submit manual to **COMPLETION**, **Operation and maintenance manuals**.

Products and materials

Manufacturer's data: Submit manufacturer’s data including the following:

- Product data sheets.
- Installation and maintenance recommendations.

Type tests: Submit results for the following:

- Proprietary stairways and fixed ladders: To **FIXED STAIRWAYS AND LADDERS**, **Tests**.
- Proprietary platforms, walkways and guardrailing: To **FIXED PLATFORMS, WALKWAYS AND GUARDRAILING**, **Tests**.
- Personal equipment for working at height: To **FALL PROTECTION SYSTEMS**, **Tests**.
- Rope access systems: To **FALL PROTECTION SYSTEMS**, **Tests**.
- Single point anchors: To **FALL PROTECTION SYSTEMS**, **Tests**.

Samples

Requirement: Submit samples to PRODUCTS, **GENERAL**, **Samples**.

Subcontractors

General: Submit names and contact details of proposed suppliers and installers as recommended by the manufacturer.

Evidence of experience: [complete/delete]

Tests

Site tests: Submit results of proof load tests of all friction and glued-in anchors.

Warranties

Requirement: Submit warranties to **COMPLETION**, **Warranties**.

1.7 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following:

- Shop fabricated or assembled items ready for delivery to the site.
- Commencement of shop or site welding.
- All equipment attachments with concealed fixings, before they are covered.
- Site erected assemblies on completion of erection, before applying finishes.
- Steel surfaces prepared for, and immediately before, site applied finishes.

Installation inspector: Registered height safety inspector or professional engineer.

2 PRODUCTS

2.1 GENERAL

Product identification
General: Marked to show the following:
- Manufacturer's identification.
- Installer's contact details.
- Intended location.
- Load rating and direction.
- Current inspection/service date.
- Batch number or serial number of the components.

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Samples
Samples required: [complete/delete]

Signage
General: Include all mandatory and documented signage.

2.2 FIXED STAIRWAYS AND LADDERS

General
Product: Fixed stairways and fixed ladders complete with all required handrails, guardrailing, cages and restricted access devices.

Standard: To AS 1657 (2018).

Tests
Stair assembly: To AS 1657 (2018) Appendix D.

Fixed ladders: To AS 1657 (2018) Appendix F.

Test reports: To AS 1657 (2018) Appendix E.

Ladder fall protection systems
Product: Vertical systems including cables, rails, guides and fall arrestor trolleys.

Standard: Selection of system to AS 1657 (2018) Table H1.

Design of fall protection devices: To AS 1891.3 (2020).

2.3 FIXED PLATFORMS, WALKWAYS AND GUARDRAILING

General
Product: Fixed platforms and walkways complete with all required guardrailing and toe boards.

Balustrades: Provide a proprietary or bespoke fabricated system, as documented.

Standard: To AS 1657 (2018).

Material: Aluminium, corrosion-resistant steel, fibre reinforced polymer.

Tests
Guardrailing: To AS 1657 (2018) Appendix B.

Infill: To AS 1657 (2018) Appendix C.

Test reports: To AS 1657 (2018) Appendix E.

2.4 FALL PROTECTION SYSTEMS

Anchors
Single point anchors: To AS/NZS 5532 (2013).

PPE
Harness: Supply two full body harnesses to AS/NZS 1891.1 (2020) with shock absorbing lanyards to AS 1891.5 (2020).

Storage: PPE storage holdall supplied by the manufacturer.

Tests
Personal equipment for working at height: Tested as follows:
- Harnesses: To AS/NZS 1891.1 (2020) Section 4 and Appendix A to F.

- Horizontal lifeline and rail systems: To AS/NZS 1891.2 (2001) Appendix A to E.
- Lanyard assemblies and pole straps: To AS 1891.5 (2020) clause 3.4.

Rope access systems:

- Rope grabs and descenders: Static load test to AS/NZS 4488.1 (1997) Appendix A.
- Back-up type rope grabs and descenders: Dynamic load and performance test to AS/NZS 4488.1 (1997) Appendix B.

3 EXECUTION

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3.1 INSTALLATION

General

Installation: To the manufacturer's recommendations and the following:

- Fixed platforms, walkways, stairways and ladders: To AS 1657 (2018).
- Personal equipment for working at height: To the AS/NZS 1891 series.
- Rope access systems: To AS/NZS 4488.1 (1997).
- Incompatible materials: Separate using concealed layers of suitable materials in appropriate thicknesses.

Subcontractor

Installer: Registered installer, approved by the manufacturer.

Fixing to structure

General: Provide fabricated predrilled or purpose-made brackets and bases and attach to the building structure with fixings compatible with the substrate.

Proprietary items: Install to the manufacturer's recommendations.

Labels and signage

General: To AS/NZS 1891.4 (2009) clause 2.2.9.

3.2 TESTING

Testing of installed work

General: On completion of the installation, carry out tests to confirm the system's competence in accordance with AS/NZS 5532 (2013), AS/NZS 1891.2 (2001) and AS/NZS 1891.4 (2009), and issue certification confirming compliance with all installation requirements.

Proof load test for anchors

Testing: Following completion of the installation, proof load test all friction and glued-in anchors to 50% of the design ultimate strength capacity in conformance with AS/NZS 1891.4 (2009) clause 3.1.2(g).

Report: Record the following:

- Details of organisation and inspector performing the test.
- Date test was performed.
- Load cell details and calibration date.
- A reference of each item tested including a description of the item location.
- The item ultimate load.
- The test load applied.
- Duration of test.
- Results of test.
- Photo of each item showing peak load applied.

3.3 TRAINING

General

Responsibilities: Coordinate the training of owner’s facilities management personnel in conformance with *0171 General requirements*.

Training records: Video record all training sessions. Catalogue and include recordings with the operation and maintenance manuals.

Additional training: [complete/delete]

3.4 COMPLETION

Certification

Completion certificate: Provide inspection, testing and certification by an Accredited Installer and/or Accredited Height Safety Inspector:

- Upon completion of the installation at the date for practical completion.
- Upon the expiry of the defects liability period or 12 months after completion of the installation, whichever is the lesser, and valid for a further 12 month period.

Reinstatement

Extent: Repair or replace damage to the roofing and rainwater system. If the work cannot be repaired satisfactorily, replace the whole area affected.

Touch up: If it is necessary to touch up minor damage to prepainted metal roofing, do not overspray onto undamaged surfaces.

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Cleaning

Roofing and rainwater drainage system: Remove debris, metal swarf, solder, sealants and unused materials.

Operation and maintenance manuals

Requirement: Prepare a manual that includes the following:

- Instructions and recommended procedures for operating and routinely maintaining the equipment.
- Technical information relating to all access and anchorage equipment provided including design, testing, installation, and conformance of the system to relevant industry standards and manufacturer's instructions.
- Special provisions for use (e.g. training, additional equipment, rescue provisions).
- A statement that devices are for personnel use and note specific equipment that is not for personnel use.
- Include certification and equipment logs in conformance with AS 1657 (2018) Section 8 and Appendices, and AS/NZS 1891.4 (2009) Section 9.
- As-built documentation: Suitable for use for long-term operations and maintenance.

Warranties

Type: [complete/delete]

Period: [complete/delete]

3.5 MAINTENANCE

General

Preventive and mandatory system maintenance: By an Accredited Height Safety Inspector/Certifier, in conformance with AS/NZS 1891.4 (2009) Section 9 and manufacturer's maintenance/recertification recommendations.

Checklist for all inspections: To AS/NZS 1891.2 Supp 1 (2001) Table 8, and AS/NZS 1891.4 (2009) Section 9 and Appendices C and D.

The competent person: To AS/NZS 1891.4 (2009) clause 1.4.8.

Regular scheduled periodic inspections

Standard: To AS/NZS 1891.4 (2009) clause 9.3 and the following:

- Provide inspection, testing and certification by an Accredited Installer and/or Accredited Height Safety Inspector.
- Record the date of the next system inspection and period of validity and display the certificate at the access points of the work area or on the individual system components where provision is made.

Inspection after a fall or other event

Standard: To AS/NZS 1891.4 (2009) clause 9.5.

Ongoing maintenance

Certificate: Submit the completion certificates and notify the proprietor of the requirement for continued interval testing.

4 SELECTIONS

4.1 FALL RESTRAINT/ARREST SYSTEM

Anchor and Static Line

Product: Safemaster Proprietary anchor and static line system

Supplier: Safemaster Height Safety Solution, www.safemaster.net.au

System to allow for window cleaning where necessary.

Roof anchor fixing: Concrete substrate fixed.

Roof anchor flashing: Proprietary system.

Roof anchorage system: Proprietary system.

Roof type: Membrane concrete roof system.

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4.2 ROOF ACCESS

Roof Hatch, Fire Rated EI as per AS1530-4, Steel

Product: - Gorter Roof Hatch

RHTEI9024: 900 x 2400 mm

Supplier: Gorter www.gorterhatches.com.au

STAIR – In situ concrete stair to AS1657-2013

Aluminium handrails with extendible stiles – Aluminium to AS1657-2013 Proprietary access ladder

0194P RAVEN DOOR SEALS AND WINDOW SEALS

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide RAVEN door seals and window seals, as documented.

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Performance

Handing: Before supply, verify on site, the correct handing of hardware items.

Operation: Make sure working parts are accurately fitted to smooth close bearings, without binding or sticking, free from rattle or excessive play, lubricated if appropriate.

1.2 PERFORMANCE

Bushfire-prone areas

Bushfire Attack Level (BAL): To AS 3959 (2018).

1.3 COMPANY CONTACTS

RAVEN technical contacts

Website: www.raven.com.au.

1.4 CROSS REFERENCES

General

Requirement: Conform to the following:

- *0171 General requirements*.
- Requirement: Conform to the following:
  - 0171 General requirements.
  - Windows and glazed doors
  - Doors and Access panels for door types
  - Overhead doors for door types - Door Hardware
  - Glazing
  - Acoustic insulation

  Consultant Documentation:

  Refer to the following consultant reports, specification and other documentation for further information and requirements relating to this worksection:
  - Accessibility
  - BASIX
  - Fire Engineering
  - BCA Report

1.5 STANDARDS

Seals general

Quality management for manufacture: To ISO 9001 (2015).

Acoustic applications: Tested to AS 1191 (2002) or EN ISO 10140-2 (2021) and rated to the NCC cited AS/NZS ISO 717.1 (2004).

Fire door assemblies: To AS 1530.4 (2014) and AS 1905.1 (2015).

Smoke door assemblies: To BCA (2022) Spec 12, tested to AS 1530.7 (2007) and rated to AS 6905 (2007), and tested to EN 1634-3 (2004).

Combined fire and smoke door assemblies: To BCA (2022) Spec 12, AS 1530.4 (2014), AS 1905.1 (2015), AS 1530.7 (2007) and AS 3959 (2018) for weather seals providing BAL-FZ.

Buildings in bushfire-prone areas: To AS 3959 (2018):

- BAL-40: Flame retardant silicon, PVC and TPE weather seals with a Flammability Index not more than 5 when tested to AS 1530.2 (1993).
- BAL-FZ: Approved door seals for use with fire doorsets tested to AS 1530.4 (2014).

Weather and energy saving seals for proprietary windows and door assemblies: To AS 4420.1 (2016) clause 5 and clause 6, and AS 2047 (2014).

Door bottom and perimeter seals for glazed external doors: To AS 2047 (2014).

Threshold plates: To the NCC cited AS 1428.1 (2009).

1.6 MANUFACTURER'S DOCUMENTS

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Technical manuals
Website: www.raven.com.au.

1.7 INTERPRETATION

Abbreviations and definitions
General: For the purposes of this worksection the following abbreviations and definitions apply:

Ordering abbreviations:

- Al: Aluminium.
- B/A: Bronze anodised (15 µm for door bottom seals and perimeter seals, 25 µm for threshold plates).
- B/K: Black anodised (15 µm for door bottom seals and perimeter seals, 25 µm for threshold plates).
- C/A: Clear anodised (15 µm for door bottom seals and perimeter seals, 25 µm for threshold plates).
- EPDM: Ethylene Propylene Diene Monomer.
- PE: Painted Polyester Enamel finish (special order and extra cost).
- PVC: Polyvinyl Chloride.
- Si: Silicone Rubber.
- TPE: Thermoplastic Elastomer.

1.8 SUBMISSIONS

Samples
Requirement: Submit samples to PRODUCTS, **GENERAL**, **Samples**.

2 PRODUCTS

2.1 GENERAL

Product substitution
Other products: Conform to **SUBSTITUTIONS** in *0171 General requirements*.

Product identification
General: Marked to show the following:

- Manufacturer's identification.
- Product brand name.
- Product type.
- Quantity.
- Product reference code and batch number.
- Date of manufacture.

Samples
Particular samples required: [complete/delete]

2.2 MATERIALS

Aluminium
Material: Commercial grade alloy 6060, 6061 or 6063 with T5 or T6 temper.

Finish to visible extrusions:

- Satin clear, bright gold, bronze or black anodised.

- Anodising thickness:
  - . Perimeter seal extrusions: Minimum 15 µm.
  - . Threshold plates and threshold plate seals: Minimum 25 µm.

PVC

RAVEN proprietary grade PVC extrusions:

- Highest quality available.
- Added UV inhibitors if exposed to sunlight.
- Self-extinguishing grade.
- Antimicrobial additive.
- Service temperature -5°C to +70°C.

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Si

RAVEN proprietary grade silicon rubber extrusions:

- Are unique and if designated (SE) are self-extinguishing.
- Added UV inhibitors.
- Antimicrobial additive.
- Service temperature of -60°C to +230°C.

TPE

RAVEN proprietary grade TPE extrusions:

- Highest quality available.
- Added UV inhibitors.
- Flammability Index less than 5 to AS 1530.2 (1993) if indicated for bushfire-prone areas.
- Service temperature -40°C to +100°C.

EPDM

RAVEN proprietary grade closed cell EPDM rubber extrusions:

- Highest quality available as developed by the automotive industry.
- Added UV inhibitors.
- Classified SE/B self-extinguishing burn rate to SAE J 369 (2019), and ISO 3795 (1989).
- Service temperature -40°C to +70°C.

3 EXECUTION

3.1 INSTALLATION

Handing

Requirement: Match door seals to the handing of doors.

Supply

Factory fit and retrofit: Deliver door seals for door perimeter seals and door bottom seals in complete sets for each door, ready for installation.

Identification: Mark packaging with relevant floor level and door location number.

Packaging: For rigid length seals, provide recyclable cartons and recyclable polyethylene with fixings and fitting instructions.

Off-site installation to proprietary window and door assemblies: Supply RAVEN TPE and silicon rubber weather stripping on bulk reels.

Door assemblies

Modification: Rebate and groove door assemblies to suit the dimensions recommended by RAVEN.

Fitting instructions: Conform to RAVEN's fitting instructions, supplied with each product.

Fixing

Fasteners:

- Unexposed applications: Zinc-plated self-tapping fasteners supplied by RAVEN with each product.
- External coastal exposure applications: Substitute the standard fasteners supplied with equivalent stainless steel fasteners.

Backset: Allow backset clearances as required for hinging, latching and automatic closers.

Proprietary aluminium door/window frames: Select the fixing options to suit the documented RAVEN perimeter/frame seals.

3.2 COMPLETION

Warranties

Type: Manufacturer's warranty to cover manufacturing defects and defects with products and materials delivered to site.

Period: 2 years.

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4 SELECTIONS

4.1 SELECTING A SEALING SYSTEM DUTY LEVEL

Sealing System Duty Level guide

SYSTEM DUTY LEVEL	Building/Room type	Suggested sealing systems	
		Single door	Double doors
LIGHT DUTY (Residential) Generally used in residential and light traffic areas, such as Class 1 to 4 buildings.	Apartments Bedrooms/sleeping areas Guest house rooms Living areas	RP120 + RP60 RP113 + RP3	RP120 + RP123 + RP510 RP520 + RP4 + RP150
MEDIUM DUTY (Commercial / Light industrial) Generally used in commercial and medium traffic areas, such as Class 3 to 6 buildings.	Art studios Auditoriums Bars and lounges Board rooms Boarding house rooms Cafés Car parks Cinemas/home theatres Classrooms Computer rooms Consulting rooms Control rooms Convention centres Corridors / lobbies Drama studios Executive offices Film or television studios Gyms Hotel rooms/motel rooms Laboratories Libraries Meeting rooms Music practice/studio rooms Offices Places of worship University tutorial rooms/lecture theatres	RP78Si + RP8Si RP94Si + RP127Si RP10Si + RP38Si	RP78Si + RP8Si + RP71Si RP94Si + RP127Si + RP16Si RP10Si + RP126Si + RP16Si
HEAVY DUTY	Airports	RP10Si +	RP10Si +

SYSTEM DUTY LEVEL	Building/Room type	Suggested sealing systems	
		Single door	Double doors
(Heavy Commercial / Public / Industrial) Generally used in heavy pedestrian and wheeled traffic areas, such as Class 5 to 10 buildings.	Court rooms Delivery suites Factories Food courts Government and defence rooms/buildings High security rooms Intensive care wards Music recording studios Prisons Recovery rooms Utility rooms Shopping malls/supermarkets Sound stages	RP38Si RP87Si + RP70Si RP24Si + RP70Si	RP38Si + RP16Si RP87Si + RP70Si + RP16Si RP24Si + RP70Si + RP37

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4.2 NOISE – ACOUSTIC

R_w 30 to R_w 33 acoustic sealing system schedule

R_w	Raven acoustic sealing systems	Refer to the categories in the Raven Acoustic Sealing System Catalogue	Door			System Duty level	Door No.
			Hinge	Configuration	Thickness (mm)		
30	RP78Si + RP8Si	R_w 30 to R_w 33 Acoustic Sealing Systems	Butt	Single	37	M	
	RP78Si + RP35Si		Butt	Single	35	M	
	RP10 / RP10Si + RP99Si		Butt	Single	37	H	
	RP10Si + RP8Si		Butt	Single	40	M	
	RP94Si + RP8Si		Butt	Single	46	M	
	RP94Si + RP99Si		Butt	Single	46	M	
	RP10Si + RP126Si + RP16Si		Butt	Double	45	H	
	RP10Si + RP128Si + RP71Si		Butt	Double	45	H	
	RP24 + RP38 + RP71		Butt	Double	45	H	

R_w	Raven acoustic sealing systems	Refer to the categories in the Raven Acoustic Sealing System Catalogue	Door			System Duty level	Door No.
			Hinge	Configuration	Thickness (mm)		
	RP24Si + RP38Si + RP16Si		Butt	Double	45	H	
	RP44Si + RP127Si + RP71Si		Butt	Double	45	M	
	RP84Si + RP126Si + RP16Si		Butt	Double	45	H	
	RP84Si + RP128Si + RP71Si		Butt	Double	45	H	
	RP84Si + RP8Si + RP71		Butt	Double	45	M	
	RP87HSi + RP126Si + RP16Si		Butt	Double	45	H	
31	RP120 + RP8Si		Butt	Single	44	M	
	RP84Si + RP127Si + RP71Si		Butt	Double	45	H	
32	RP10 / RP10Si + RP99Si		Butt	Single	44	H	
	RP10 / RP10Si + RP99Si		Butt	Single	46	H	
	RP10 / RP10Si + RP99Si + RP16Si		Butt	Double	46	H	
	RP10 / RP10Si + RP99Si + RP71Si		Butt	Double	46	H	
	RP10 / RP10Si + RP99Si + RP85		Butt	Double	46	H	
	RP24 + RP38		Butt	Single	46	H	
	RP24 + RP70		Butt	Single	46	H	
	RP47Si + RP38		Butt	Single	46	H	

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R_w	Raven acoustic sealing systems	Refer to the categories in the Raven Acoustic Sealing System Catalogue	Door			System Duty level	Door No.
			Hinge	Configuration	Thickness (mm)		
	RP47Si + RP70		Butt	Single	46	H	
	RP93Si + RP99Si		Butt	Single	44	M	
	RP120 + RP38		Butt	Single	44	M	
	RP10Si + RP127Si		Butt	Single	48	H	
33*	RP78Si + RP8Si		Butt	Single	40	M	
Note: (*) Door Assembly R_w ratings above R_w32 require acoustically constructed door leaves.							

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R_w 36 to R_w 40 acoustic sealing system schedule

R_w	Raven acoustic sealing systems	Refer to the categories in the Raven Acoustic Sealing System Catalogue	Door			System Duty level	Door No.
			Hinge	Configuration	Thickness (mm)		
36*	RP78Si + RP124 + RP8Si	R_w 36 to R_w 40 Acoustic Sealing System	Butt	Single	35	M	
	RP120 + RP520 + RP8Si + RP99Si		Butt	Single	44	M	
	RP10Si + RP127Si		Butt	Single	68	H	
37*	RP78Si + RP8Si		Butt	Single	35	M	
	RP10Si + RP128Si		Butt	Single	35	H	
	RP24Si + RP38Si		Butt	Single	35	H	
	RP120 + RP520 + RP38 + RP99Si		Butt	Single	44	M	
	RP24Si + RP127Si + RP126Si		Butt	Single	48	H	
38*	RP120 + RP127Si		Butt	Single	48	M	

R_w	Raven acoustic sealing systems	Refer to the categories in the Raven Acoustic Sealing System Catalogue	Door			System Duty level	Door No.
			Hinge	Configuration	Thickness (mm)		
40*	RP124 + RP127Si		Butt	Single	48	M	
Note: (*) Door Assembly R_w ratings above R_w32 require acoustically constructed door leaves.							

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R_w 42 to R_w 46 acoustic sealing system schedule

R_w	Raven acoustic sealing systems	Refer to the categories in the Raven Acoustic Sealing System Catalogue	Door			System Duty level	Door No.
			Hinge	Configuration	Thickness (mm)		
42*	RP24Si + RP124 + RP8Si + RP38Si	R_w 42 to R_w 46 Acoustic Sealing Systems	Butt	Single	35	H	
	RP87Si + RP124 + RP8Si + RP128Si		Butt	Single	35	H	
	RP10Si + RP124 + RP127Si		Butt	Single	68	H	
	RP24Si + RP127Si + RP126Si		Butt	Single	68	H	
43*	RP78Si + RP124 + RP8Si + RP128Si		Butt	Single	35	M	
	RP10Si + RP124 + RP8Si + RP128Si		Butt	Single	35	M	
	RP10Si + RP124 + RP127Si		Butt	Single	48	M	
45*	RP24Si + RP124 + RP127Si + RP126Si		Butt	Single	68	M	
46*	RP85 + RP124 + RP127Si + RP126Si		Butt	Single	68	M	

R_w	Raven acoustic sealing systems	Refer to the categories in the Raven Acoustic Sealing System Catalogue	Door			System Duty level	Door No.
			Hinge	Configuration	Thickness (mm)		
Note: (*) Door Assembly R_w ratings above R_w32 require acoustically constructed door leaves.							

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Other acoustic sealing system schedule

R_w	Raven acoustic sealing systems	Refer to the categories in the Raven Architectural Catalogue	Door			System Duty level	Door No.
			Hinge	Configuration	Thickness (mm)		
30	RP47Si + RP47Si	Noise-Acoustic-Sealing System (Bulkhead, Interconnecting, Sliding, Pivot)	Broad butt	Single	37	H	
	RP118Si + RP71Si + RP117Si		Broad butt	Double	45	M	
31	RP84Si + RP51F + RP52F		Sliding	Single	35	M	
	RP93Si + RP71Si + RP97Si		Broad butt	Double	45	M	
	RP118Si + RP8Si + RP16Si		Broad butt	Double	45	M	
32	RP47Si + RP47Si		Broad butt	Single	44	H	
34*	RP10Si + RP51F + RP52F		Sliding	Single	35	M	
35*	RP71Si + RP71Si + RP96		Pivot	Single	50	M	
38*	RP94Si + RP8Si		Broad butt	Interconnecting	40	M	
Note: (*) Door Assembly R_w ratings above R_w32 require acoustically constructed door leaves.							

4.3 SMOKE DOORS

Smoke sealing system schedule

RAVEN smoke sealing system	Refer to the categories in the Raven Architectural Catalogue	Door			System Duty level	Door No.
		Hinge	Configuration	Thickness (mm)		
RP120 + RP8Si + RP120	Smoke Door Sealing Systems	Butt	Single	35+	M	

RAVEN smoke sealing system	Refer to the categories in the Raven Architectural Catalogue	Door			System Duty level	Door No.
		Hinge	Configuration	Thickness (mm)		
RP78Si + RP8Si	(Tested & Certified on Solid Core Doors)	Butt	Single	35+	M	
RP78Si + RP38Si		Butt	Single	35+	M	
RP78Si + RP35Si		Butt	Single	35+	M	
RP78Si + RP128Si		Butt	Single	35+	M	
RP124 + RP128Si		Butt	Single	35+	M	
RP124 + RP126Si		Butt	Single	35+	M	
RP160 + RP35Si		Butt	Single	35+	M	
RP124 + RP127Si		Butt	Single	40+	M	
RP23 + RP8Si		Butt	Single	35+	M	
RP24Si + RP38Si		Butt	Single	40+	H	
RP87Si + RP126Si		Butt	Single	40+	H	
RP78Si + RP38Si + RP16Si		Butt	Double	40+	M	
RP120 + RP8Si + RP120		Butt	Double	40+	M	
RP150 + RP8Si + RP150		Butt	Double	40+	M	
RP124 + RP35Si + RP71Si		Butt	Double	40+	M	
RP130Si + RP129F + RP130Si + RP115 threshold plate		Pivot double acting	Double	40+	H	

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Smoke sealing system schedule - fire engineered alternative solution tested to AS 1530.7 (2007)

RAVEN smoke sealing system	Refer to the categories in the Raven Architectural Catalogue	Door			System Duty level	Door No.
		Hinge	Configuration	Thickness (mm)		
RP120 + RP8Si	Smoke Door Sealing	Butt	Single	35+	M	

RAVEN smoke sealing system	Refer to the categories in the Raven Architectural Catalogue	Door			System Duty level	Door No.
		Hinge	Configuration	Thickness (mm)		
RP670 + RP8Si	Systems (Fire Engineered – Performance Solutions)	Butt	Single	35+	M	
RP124 + RP35Si		Butt	Single	35+	M	
RP76Si + RP8Si		Butt	Single	35+	M	
RP160 + RP8Si		Butt	Single	35+	M	
RP160 + RP35Si		Butt	Single	35+	M	
RP78Si + RP38Si + RP16Si		Butt	Double	46+	M	
RP124 + RP8Si + RP16Si		Butt	Double	40+	M	
RP150 + RP126Si + RP150		Butt	Double	40+	M	
RP130Si + RP129F + RP130Si + RP115 threshold plate		Pivot double acting	Double	40+	H	

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4.4 FIRE DOORS

Combined smoke and acoustic sealing system schedule

RAVEN smoke sealing system	Refer to the categories in the Raven Architectural Catalogue	Door			System Duty level	Door No.
		FRL (Fire Rating)	Configuration	Thickness (mm)		
RP120 + RP8Si	Smoke Sealing Systems (Fire Rated 'Labelled' Doors)	-/120/30 -/180/30	Single/Double	38 47	M	
RP10Si + RP8Si		-/120/30 -/240/30	Single/Double	38 47	M	
RP24Si + RP38Si		-/120/30	Single/Double	47	H	
RP78Si + RP8Si		-/120/30 -/240/30	Single/Double	38 47	M	
RP78Si + RP35Si		-/120/30 -/240/30	Single/Double	38 47	M	
RP78Si + RP38Si		-/120/30 -/240/30	Single/Double	38 47	M	
RP78Si + RP127Si		Up to -/120/30	Single/Double	47	M	
RP93Si + RP99Si		Up to -/240/30	Single/Double	47	M	

RAVEN smoke sealing system	Refer to the categories in the Raven Architectural Catalogue	Door			System Duty level	Door No.
		FRL (Fire Rating)	Configuration	Thickness (mm)		
RP87Si + RP128Si		-/120/30 -/120/30	Single/Double	38 47	H	
RP94Si + RP126Si		-/120/30	Single/Double	38	M	
RP160 + RP8Si		-/120/30	Single/Double	38 47	M	
RP160 + RP35Si		-/120/30	Single/Double	38 47	M	

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Threshold at doorways schedule

RAVEN threshold (plates/ ramps and plate seals)	NCC cited AS 1428.1 (2009) (Design for access and mobility) clauses 7.2 Construction tolerances for abutment of surfaces and 10.5 Threshold	Durability ANSI/BHMA A156.21 (2019) designation	Fire door		System Duty level	Door No.
			FRL (fire resistance level)	Configuration		
RP4b	-	J33100	Up to -/240/30	Single/Double	M	
RP13	Yes	J30300	Up to -/240/30	Single/Double	H	
RP19	-	-	Up to -/240/30	Single/Double	H	
RP27	-	J33100	Up to -/240/30	Single/Double	H	
RP28	-	J32130	Up to -/240/30	Single/Double	H	
RP29	-	J32130	Up to -/240/30	Single/Double	H	
RP66	Yes	J32140	Up to -/240/30	Single/Double	H	
RP77	Yes	J38130	Up to -/240/30	Single/Double	H	
RP82	Yes	J32300	Up to -/240/30	Single/Double	H	
RP91	-	J30300	Up to -/240/30	Single/Double	H	
RP95	Yes	J32300	Up to -/240/30	Single/Double	H	
RP96	Yes	J32300	Up to -/240/30	Single/Double	H	
RP97Si	Yes	J38130	Up to -/240/30	Single/Double	H	

RAVEN threshold (plates/ ramps and plate seals)	NCC cited AS 1428.1 (2009) (Design for access and mobility) clauses 7.2 Construction tolerances for abutment of surfaces and 10.5 Threshold	Durability ANSI/BHMA A156.21 (2019) designation	Fire door		System Duty level	Door No.
			FRL (fire resistance level)	Configuration		
RP98	Yes	J38130	Up to -/240/30	Single/Double	H	
RP109Si	-	J36100	Up to -/240/30	Single/Double	H	
RP110Si	-	J36100	Up to -/240/30	Single/Double	H	
RP111Si	-	J36100	Up to -/240/30	Single/Double	H	
RP112	Yes	J38130	Up to -/240/30	Single/Double	M	
RP115	Yes	J32130	Up to -/240/30	Single/Double	H	
RP116	Yes	J32130	Up to -/240/30	Single/Double	H	
RP117Si	-	J36100	Up to -/240/30	Single/Double	H	
RP137	Yes	J32130	Up to -/240/30	Single/Double	H	
RP138	Yes	J38130	Up to -/240/30	Single/Double	H	
RP151	Yes	J32130	Up to -/180/30	Single/Double	H	

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4.5 BUSHFIRE-PRONE AREAS

Door sealing system schedule

RAVEN bushfire sealing system	Refer to the categories in the Raven Architectural Catalogue	Door configuration Doorsets to AS 3959 (2018) BAL requirements	BAL	Door No.
RP78Si + RP4FZ	Bushfire Sealing Systems (Bushfire Prone Areas)	Butt hinged single	BAL - FZ	
RP78Si + RP51Si + RP16Si + RP82		Butt hinged single and double	BAL - 40	
RP600 series - Weather Stripping		Folding doors and windows to AS 3959 (2018)	BAL - 40	
RP600 + RP51Si		Folding doors and windows to AS 3959 (2018)	BAL - 40	
RP41 + RP75 + RP114 + RP91		Panel lift garage door	BAL - 40	

RAVEN bushfire sealing system	Refer to the categories in the Raven Architectural Catalogue	Door configuration Doorsets to AS 3959 (2018) BAL requirements	BAL	Door No.
RP75 + RP75		Sliding garage doors	BAL - 40	

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Garage door sealing system schedule

Bushfire Attack Level (BAL) to AS 3959 (2018)	Side hung (ember attack) - Perimeter and door bottom seals	Garage doors (ember attack) - roller and sectional overhead doors	Door No.
BAL – LOW Note: There is no further requirement from AS 3959 (2018).	RAVEN weather and energy draught seals	RAVEN Nylon Brush Strip seal with a flammability rating no greater than 5. Includes: RP2a, RP2b, RP41, RP49, RP50, RP51F, RP57, RP58, RP74, RP74F, RP75 at door head and sides if required. Door bottom seal RP4T or RP51Si (if bottom seal not supplied with door). Option: Threshold plate RP91	
BAL 12.5 - BAL 29	RAVEN weather and energy draught seals	RAVEN Nylon Brush Strip seal with a flammability rating no greater than 5. Includes: RP2a, RP2b, RP41, RP49, RP50, RP51F, RP57, RP58, RP74, RP74F, RP75 at door head and sides if required. Door bottom seal RP114 or RP51Si (if bottom seal not supplied with door). Option: Threshold plate RP91	
BAL - 40	RAVEN seals with a flammability index ≤ 5 tested to AS 1530.2 (1993)	RAVEN Nylon Brush Strip seal with a flammability rating no greater than 5. Includes: RP2a, RP2b, RP41, RP49, RP50, RP51F, RP74, RP74F, RP75 at door head and sides if required.	

Bushfire Attack Level (BAL) to AS 3959 (2018)	**Side hung (ember attack) - Perimeter and door bottom seals**	**Garage doors (ember attack) - roller and sectional overhead doors**	**Door No.**
		Door bottom seal RP4T or RP51Si (if bottom seal not supplied with door). Option: Threshold plate RP91	
BAL - FZ	RAVEN seals tested to AS 1530.4 (2014) used with fire-resisting doorsets to AS 1905.1 (2015) and BCA (2022) Spec 12	RAVEN Nylon Brush Strip seal includes: RP2a, RP2b, RP41, RP49, RP50, RP51F, RP74, RP74F, RP75 at door head and sides if required. Door bottom seal RP4T or RP51Si (if bottom seal not supplied with door). Option: Threshold plate RP91	

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4.6 WEATHER AND ENERGY

Weather sealing system schedule

RAVEN weather sealing systems	**Refer to the categories in the Raven Architectural Catalogue**	**Door**		**System Duty level**	**Door No**
		Hinge	**Configuration**		
RP78Si + RP4 + RP16Si	Weather and Energy Sealing System (Butt Hinged Doors)	Butt	Timber single and double	M	
RP10 + RP8Si + RP98		Butt	Aluminium - single	H	
RP84Si + RP89 + RP77		Butt	Aluminium - single	M	
RP74F + RP74F + RP52F + RP82		Pivot	Timber single and double	H	
RP130Si + RP129Si + RP130Si + RP115		Pivot	Timber single and double	H	
RP89 + RP89 + RP116		Pivot	Aluminium - single and double	M	
RP74F + RP74F + RP19		Pivot	Aluminium - single and double	H	
RP51F + RP2a		Sliding	Timber	H	

RAVEN weather sealing systems	Refer to the categories in the Raven Architectural Catalogue	Door		System Duty level	Door No
		Hinge	Configuration		
RP51F + RP74F		Sliding	Timber	H	
RP73 + RP17b		Sliding	Timber	L	
RP41 + RP4T + RP91		Panel lift garage door	Metal	H	
RP57 + RP4T + RP91		Roll-up garage door	Metal	H	
RP500 Series Weather Stripping		Folding doors and windows	Timber	H	
RP500 + RP550 + RP73		Folding doors and windows	Timber	H	
RP600 Series Weather Stripping		Folding doors and windows	Timber	H	

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4.7 ACCESS AND MOBILITY

Application - thresholds at doorways

4.8 HEALTH AND AGED CARE

Acoustic and smoke sealing system schedule

RAVEN sealing system	Refer to the categories in the Raven Architectural Catalogue	Door		System Duty level	Door No.
		Hinge	Configuration		
RP24Si + RP38Si	Health and Aged Care - Sealing System (Butt Hinged Doors)	Butt	Timber single	H	
RP78HSi + RP8Si		Butt	Timber single	M	
RP87HSi + RP126Si		Butt	Timber Single	H	
RP87HSi + RP128Si		Butt	Single	H	
RP84Si + RP126Si + RP71Si		Butt	Timber single and double	M	
RP124 + RP127Si + RP71Si		Butt	Timber single and double	M	
RP71Si + RP71Si + RP71Si + RP96		Pivot	Timber single and double	M	
RP130Si + RP52F + RP130Si		Pivot	Timber single and double	H	

RAVEN sealing system	Refer to the categories in the Raven Architectural Catalogue	Door		System Duty level	Door No.
		Hinge	Configuration		
RP130Si + RP129F + RP130Si		Pivot	Timber single and double	H	
RP130Si + RP129Si + RP130Si + RP96		Pivot	Timber single and double	H	

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4.9 CHILDCARE

Anti-finger Jam Seals schedule

RAVEN seals	BS 8613 (2017) Class 1 compliant	Comments	Door		System Duty level	Door No.
			Hinge	Configuration		
RP62	Yes	-	Butt	Timber/Aluminium	H	
RP62 BW	Yes	-	Butt	Timber/Aluminium	H	
RP62 LGBK	Yes	-	Butt	Timber/Aluminium	H	
RP62s	Yes	Used in conjunction with larger RP62 series (as above)	Butt	Timber/Aluminium	H	

0195P DTAC TACTILE INDICATORS AND STAIR EDGINGS

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide DTAC tactile indicators, stair nosing and edging, threshold transition strips, urban edge protectors and handrail tactile indicators, as documented.

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1.2 COMPANY CONTACTS

DTAC technical contacts

Website: www.dtac.com.au/contact.

1.3 CROSS REFERENCES

General

Requirement: Conform to the following:

- *0171 General requirements*.
- *0242b Landscape* – fences and barriers
- 0271 Pavement base and subbase
- 0279 Paving – on pedestals

1.4 STANDARDS

General

Tactile indicators: To AS/NZS 1428.4.1 (2009).

Stair edging: To the NCC cited AS 1428.1 (2009).

1.5 MANUFACTURER'S DOCUMENTS

Technical manuals

DTAC Tactile ground surface indicators (TGSI):

- Warning tactiles: dtac.com.au/product-category/warning-tactiles.
- Directional tactiles: dtac.com.au/product-category/directional-tactiles.
- Integrated tactiles: dtac.com.au/product-category/integrated-tactiles.
- Carpet tactile systems: dtac.com.au/product-category/carpet-tactile-systems.

DTAC PEMKO® Stair treads nosing and edging, threshold transitions and edging strips:

- Stair nosing and edging: dtac.com.au/product-category/stair-nosing-edging.
- Thresholds and transition strips: dtac.com.au/product-category/thresholds-transition-strips.

DTAC Urban edge protectors: www.dtac.com.au/product-category/urban-edge-protectors.

DTAC Handrail tactile indicators (HRTI): www.dtac.com.au/product-category/handrail-tactile-indicators.

1.6 SUBMISSIONS

Products and materials

Type tests: Submit test results to PRODUCTS, **GENERAL**, **Tests** for the following:

- Slip resistance of tactile indicators and edgings.
- Luminance reflectance of tactile indicators and edgings.

Tests

Completion tests: Submit results of the following:

- Slip resistance.
- Luminance contrast.

Warranties

Requirement: Submit warranties to **COMPLETION**, **Warranties**.

1.7 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the completed substrate ready for tactile indicators, and nosing and edging installation.

2 PRODUCTS

2.1 GENERAL

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Product substitution

Other products: Conform to **SUBSTITUTIONS** in *0171 General requirements*.

Tests

Slip resistance of tactile indicators and edgings: To AS 4586 (2013).

Luminance reflectance of tactile indicators and edgings: To AS/NZS 1428.4.1 (2009) Appendix E and the NCC cited AS 1428.1 (2009) Appendix B.

2.2 DTAC TACTILE INDICATORS, STAIR NOSING AND EDGING, THRESHOLD AND TRANSITION STRIPS, URBAN EDGE PROTECTORS AND HANDRAIL TACTILE INDICATORS

Warning tactile products

Classic: Tactile indicators with a concentric circle design machined or injection moulded on the horizontal face and a smooth outer edge.

Terraced: Tactile indicators with a concentric circle design machined or injection moulded on the horizontal face and a terraced slip-resistant outer edge.

Ecotac® Classic: Tactile indicators with a cupped underside, a concentric circle design machined on the horizontal face and a smooth outer edge.

Ecotac® Terraced: Tactile indicators with a cupped underside, a concentric circle design machined on the horizontal face and a terraced slip-resistant outer edge.

Directional tactile products

Ecotac® Classic: Tactile indicator with a cupped underside, a grooved design machined on the horizontal face and a smooth outer edge.

Ecotac® Terraced: Tactile indicator with a cupped underside, a grooved design machined on the horizontal face and a terraced slip-resistant outer edge.

Classic: UV stabilised thermoplastic urethane (TPU) injection moulded tactile with an undulating groove design on the horizontal face and a smooth outer edge.

Integrated tactile products

Classic: An integrated Type 316 stainless steel plate with Classic tactile indicators on the horizontal face.

Classic Black Top: An integrated Type 316 stainless steel plate with Classic Black tactile indicators on the horizontal face.

Ultimat® Tactile: An integrated UV stabilised thermoplastic urethane (TPU) injection moulded tactile with Classic tactile indicators on the horizontal face.

Ultimat Duo® Tactile: An integrated UV stabilised thermoplastic urethane (TPU) injection moulded tactile with contrasting coloured Classic tactile indicators on the horizontal face.

Carpet tactile systems

Classic (Low/High Pile): Tactile indicators with a concentric circle design machined on the horizontal face, a smooth outer edge and a female thread stud to affix to the carpet plate.

Terraced (Low/High Pile): Tactile indicators with a concentric circle design machined on the horizontal face, a terraced slip-resistant outer edge and a female thread stud to affix to the carpet plate.

Ecotac® Classic (High Pile): Tactile indicators with a cupped underside, a concentric circle design machined on the horizontal face, a smooth outer edge and an extended shaft. This product does not require steel carpet plates.

Stair nosing and edging products

PEMKO® Corduroy edging: Extruded aluminium sections with a continuous corduroy pattern.

PEMKO® Pinstripe edging: Extruded smooth, blunt edged aluminium sections with an intermittent high and low profile.

PEMKO® Pleat edging: Extruded smooth, aluminium sections with an intermittent continuous corduroy pattern.

PEMKO® Stitch edging: Extruded aluminium sections with a continuous stitch pattern.

PEMKO® Suede edging: Extruded anodised aluminium sections with a continuous band of silicon carbide.

PEMKO® Urban edging: Continuous band of silicon carbide inserted into anodised aluminium extrusions.

PEMKO® Rugged edging: Continuous band of fibre glass reinforced plastic extrusion.

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Thresholds and transition strips

PEMKO® Threshold plates: Extruded aluminium sections, many featuring a ribbed profile and integrated gasket sills.

Urban edge protectors

Round button: 35 mm diameter urban edge protector featuring round edge.

Bevelled button: 35 mm diameter urban edge protector featuring bevelled edge.

Thin bar: 5 mm thick x 15 mm wide x 110 mm long.

Thick bar: 10 mm thick x 15 mm wide x 110 mm long.

Handrail tactile indicators

Handrail button: Machined domed Type 316 stainless steel button.

3 EXECUTION

3.1 GENERAL

Substrate preparation and installation of DTAC products

Requirement: To DTAC's recommendations and fitting instructions.

Location: As documented.

Classic and Terraced tactile and directional indicators:

- Stone, masonry, timber or vinyl substrates: Drill and pressure fit.
- Carpet or carpet tile substrates: Drill and screw.

Handrail tactile indicators: Drill and glue to substrate.

Ultimat® and Ultimat Duo® Tactile: Direct stick to substrate (excluding asphalt/bitumen) with DTAC tactile adhesive.

Urban edge protectors:

- Stone, masonry, timber or vinyl substrates: Drill and glue.
- Vitrified porcelain, ceramics, glass or metal substrates: Diamond core drill and glue.

Fixing DTAC PEMKO® stair nosing and edging, threshold and transition products

PEMKO® Corduroy, Pinstripe, Pleat, Stitch, Suede, Threshold plates:

- Stone, masonry, timber or vinyl substrates: Adhesive fix.
- Vitrified porcelain, ceramics, glass or metal substrates: Adhesive fix.
- Carpet or carpet tile substrates: Screw-fix or adhesive fix.

Urban edge protectors and Rugged stair nosing: Screw-fix with optional adhesive.

3.2 TESTING

Completion tests

Slip resistance of completed installation: To AS 4663 (2013).

Luminance contrast testing of completed installation: Submit evidence of conformity to AS/NZS 1428.4.1 (2009) Appendix E and the NCC cited AS 1428.1 (2009) Appendix B.

3.3 COMPLETION

Warranties

Type:

- Supplier's warranty: Warranty to cover manufacturing defects and defects with products and materials delivered to site (Supply Only).
- Supplier's and Installer's interlocking warranty: Interlocking warranty to cover manufacturing defects and defects with products and materials delivered to site, including their application or installation (Supply & Install only).

Period: 2 years.

4 SELECTIONS

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4.1 DTAC TACTILE INDICATORS

Stainless steel

Location: As documented.

Polyresin classic black

Location: As documented. Ensure luminance testing compliance to AS/NZS 1428.4

4.2 DTAC EDGING

Urban

Application:Stair nosing to BCA requirements. Multiple applications could be Type 1 or Type 2 as a project specific identifier for reference in a Finishes schedule or a Room data sheet. Coordinate codes with those that appear on drawings

Size: Angle H35 x W75 x T3 BCA Compliant

Colour: Mill Finished

0195P TACTILE SYSTEMS TGSI AND STAIR NOSING

1 GENERAL

1.1 RESPONSIBILITIES

General
Requirement: Provide TACTILE SYSTEMS tactile indicators and stair nosing, as documented.

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1.2 COMPANY CONTACTS

TACTILE SYSTEMS technical contacts
Website: www.tactilesystems.com.au/contact

1.3 CROSS REFERENCES

General
Requirement: Conform to the following:
- *0171 General requirements*.

1.4 STANDARDS

General
Tactile indicators: To AS/NZS 1428.4.1 (2009).
Stair nosing: To the NCC cited AS 1428.1 (2009).

1.5 MANUFACTURER'S DOCUMENTS

Technical manuals
Tactile ground surface indicators:
- Discrete: www.tactilesystems.com.au/product-category/tactile-indicators/discrete-tactiles
- Integrated: www.tactilesystems.com.au/product-category/tactile-indicators/integrated-tactiles

Stair nosing: www.tactilesystems.com.au/product-category/stair-nosing-tread-tape

1.6 SUBMISSIONS

Products and materials
Type tests: Submit test results to PRODUCTS, **GENERAL**, **Tests** for the following:
- Slip resistance of tactile indicators and nosing.
- Luminance reflectance of tactile indicators and nosing.

Warranties
Requirement: Submit warranties to **COMPLETION**, **Warranties**.

1.7 INTERPRETATION

Definitions
General: For the purposes of this worksection, the definitions given in AS/NZS 1428.4.1 (2009) apply.

1.8 INSPECTION

Notice
Inspection: Give notice so that inspection may be made of the completed substrate ready for tactile indicators and nosing.

2 PRODUCTS

2.1 GENERAL

Product substitution
Other products: Conform to **SUBSTITUTIONS** in *0171 General requirements*.

Tests
Slip resistance of tactile indicators and nosing: To AS 4586 (2013).

Luminance reflectance of tactile indicators and edgings: To AS/NZS 1428.4.1 (2009) Appendix E and the NCC cited AS 1428.1 (2009) Appendix B.

2.2 TACTILE SYSTEMS TACTILE INDICATORS

Discrete tactiles

Description: Warning or directional TGSIs made from individual truncated cones or strips on stems.

Stainless steel warning:

- Material: Type 316 stainless steel with concentric ring design and smooth sides.
- Product tag: WDSS-13S-TSA.
- Slip rating to AS 4586 (2013): P5.

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Stainless steel warning with carborundum:

- Material: Type 316 stainless steel with black carborundum infill.
- Product tag: WDSC-13S-TSA.
- Slip rating to AS 4586 (2013): P5.

Brass warning:

- Material: Non-corrosive solid brass.
- Product tag: WDBR-13S-TSA.
- Slip rating to AS 4586 (2013): P5.

Brass warning with carborundum:

- Material: Non-corrosive solid brass with black carborundum infill.
- Product tag: WDBC-13S-TSA.
- Slip rating to AS 4586 (2013): P5.

Stainless steel warning with polyurethane:

- Material: Type 316 stainless steel with high grade polyurethane insert.
- Product tag: WDSP-13S-TSA.
- Slip rating to AS 4586 (2013): P4.

Polyurethane single stem warning:

- Material: UV stabilised polyurethane with textured top surface and smooth sides.
- Product tag: WDPL-20S-TSA.
- Slip rating to AS 4586 (2013): P5.

Polyurethane single stem ring type warning:

- Material: UV stabilised polyurethane with concentric ring top surface and smooth sides.
- Product tag: WDPL-20S-10R-TSA.
- Slip rating to AS 4586 (2013): P5.

Stainless steel directional:

- Material: Type 316 stainless steel with smooth sides.
- Product tag: DDSS-13S-TSA.
- Slip rating to AS 4586 (2013): P3.

Stainless steel directional with carborundum:

- Material: Type 316 stainless steel with black carborundum infill.
- Product tag: DDSC-13S-TSA.
- Slip rating to AS 4586 (2013): P5.

Polyurethane single stem directional:

- Material: UV stabilised polyurethane.
- Product tag: DDPL-20S-TSA.
- Slip rating to AS 4586 (2013): P5.

Warning complete carpet system:

- Material: 600 x 300 mm base plate with welded threads to accommodate screw fixed discrete warning TGSI's.

- Product tag: WDSS-BR-60X30-CS.
- Slip rating to AS 4586 (2013): P5.

Integrated tactiles

Description: Warning or directional TGSIs made from a single plate or paver with integrated truncated cones or strips.

Future-Tech warning:

- Material: 600 x 300 mm glass fibre reinforced UV stabilised compound based on unsaturated polyester with integrated truncated cones and bevelled edges.
- Product tag: WIFT-30X60-TSA.
- Slip rating to AS 4586 (2013): P5.

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Polyurethane warning mat:

- Material: 300 x 300 mm UV stabilised polyurethane with integrated truncated cones.
- Product tag: WIPL-30X30-TSA.
- Slip rating to AS 4586 (2013): P5.

Stainless steel warning plate:

- Material: 600 x 300 x 3 mm Type 316 stainless steel plate with welded truncated cones.
- Product tag: WISS-60X30-TSA.
- Slip rating to AS 4586 (2013): P5.

Stainless steel warning plate with carborundum infill:

- Material: 600 x 300 x 3 mm Type 316 stainless steel plate with welded truncated cones with black carborundum infill.
- Product tag: WISC-60X30-TSA-BLK.
- Slip rating to AS 4586 (2013): P5.

Stainless steel warning plate with polyurethane infill:

- Material: 600 x 300 x 3 mm Type 316 stainless steel plate with welded truncated cones with black polyurethane infill.
- Product tag: WISP-60X30-TSA-BLK.
- Slip rating to AS 4586 (2013): P4.

Brass warning plate:

- Material: 600 x 300 x 3 mm brass plate with welded truncated cones.
- Product tag: WIBR-60X30-TSA-BR.
- Slip rating to AS 4586 (2013): P5.

Ceramic warning tile:

- Material: 300 x 300 x 10 mm ceramic tile with integrated truncated cones.
- Product tag: WICE-30X30-TSA.
- Slip rating to AS 4586 (2013): P5.

Warning paver:

- Material: 300 x 300 stain resistant concrete paver with integrated truncated cones.
- Product tag (40 mm depth): WIPV-30X30X40-TSA.
- Product tag (60 mm depth): WIPV-30X30X60-TSA.
- Slip rating to AS 4586 (2013): P5.

Future-Tech directional:

- Material: 600 x 300 mm glass fibre reinforced UV stabilised compound based on unsaturated polyester with integrated strips and bevelled edges.
- Product tag: DIFT-30X60-TSA.
- Slip rating to AS 4586 (2013): P5.

Polyurethane directional mat:

- Material: 300 x 300 mm UV stabilised polyurethane with integrated strips.
- Product tag: DIPL-30X30-TSA.

- Slip rating to AS 4586 (2013): P5.

Ceramic directional tile:

- Material: 300 x 300 x 10 mm ceramic tile with integrated strips.
- Product tag: DICE-30X30-TSA.
- Slip rating to AS 4586 (2013): P5.

Directional paver:

- Material: 300 x 300 stain resistant concrete paver with integrated strips.
- Product tag (40 mm depth): DIPV-30X30X40-TSA.
- Product tag (60 mm depth): DIPV-30X30X60-TSA.
- Slip rating to AS 4586 (2013): P5.

Safety Line tiles: Yellow slip resistant tile/paver for transport infrastructure stations.

- Material:
  - 200 x 100 x 10 mm ceramic tile.
  - 200 x 100 x 40 mm concrete paver.
- Product tag (ceramic): WISLC-200x100x10-TSA-YEL.
- Product tag (concrete): WISLP-200x100x40-TSA-YEL.
- Slip rating to AS 4586 (2013): P5.

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2.3 TACTILE SYSTEMS STAIR NOSING

Classic series

Description: Range of anodised aluminium profiled stair nosing suitable for indoor and outdoor applications.

Classic series 2: Surface mounted nosing with range of inserts.

- Product tag: CS2-75X10.
- Slip rating to AS 4586 (2013): P5.

Classic series 2 Recess: Recessed nosing with range of inserts.

- Product tag: CS2-R-69X10.
- Slip rating to AS 4586 (2013): P5.

Classic series 3: Surface mounted bullnose nosing with range of inserts

- Product tag: CS3-75X30.
- Slip rating to AS 4586 (2013): P5.

Classic series Carpet: Stair nosing with a range of inserts for use with carpet.

- Product tag: CSC-75X10.
- Slip rating to AS 4586 (2013): P5.

Select series

Description: Range of anodised aluminium profiled stair nosing with a carborundum infill, suitable for indoor and outdoor applications.

Select series 1: Surface mounted nosing with range of carborundum infills.

- Product tag: SC1-75X10.
- Slip rating to AS 4586 (2013): P5.

Select series 1 Recess: Recessed clear anodised nosing with range of carborundum infills.

- Product tag: SR1-55X10.
- Slip rating to AS 4586 (2013): P5.

Select series 2: Recessed nosing with range of carborundum infills.

- Product tag: SR2-55X10.
- Slip rating to AS 4586 (2013): P5.

Select series 3: Recessed nosing with 3 strips of black carborundum infill.

- Product tag: SR3-50X5.
- Slip rating to AS 4586 (2013): P5.

Select series 4: Surface mounted nosing with 4 strips of carborundum infill.
- Product tag: SC4-75X10.
- Slip rating to AS 4586 (2013): P5.

Select series 5: Recessed nosing with 5 strips of black carborundum infill.
- Product tag: SR5-75X10X5.
- Slip rating to AS 4586 (2013): P5.

Elite series

Description: Range of hard-wearing aluminium profiled stair nosing with no insert or infill.

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Elite series 1: 57.5 mm wide surface mounted nosing.
- Product tag: ES1-57X10.
- Slip rating to AS 4586 (2013): P5.

Elite series 1 Recess: 50 mm wide recessed nosing.
- Product tag: ER1-50X10.
- Slip rating to AS 4586 (2013): P5.

Elite series 2: 75 mm wide surface mounted nosing.
- Product tag: ES2-75X10.
- Slip rating to AS 4586 (2013): P5.

Elite series 2 Recess: 60 mm wide recessed nosing plate.
- Product tag: ER2-60X2.
- Slip rating to AS 4586 (2013): P5.

Elite series Carpet: Stair nosing for use with carpet.
- Product tag: ESC-50X10.
- Slip rating to AS 4586 (2013): P5.

Safeguard series

Description: Fibre reinforced polymer stair nosing suitable for indoor and outdoor applications.

Safeguard: 70 mm wide surface mounted nosing.
- Product tag: SGN-70X10.
- Slip rating to AS 4586 (2013): P5.

Safeguard strip: 60 mm wide nosing strip that can be recessed or surface mounted.
- Product tag: SGN-60.
- Slip rating to AS 4586 (2013): P5.

Safeguard carb insert: 60 mm wide insert for stair nosing.
- Product tag: CSCI-60X2.
- Slip rating to AS 4586 (2013): P5.

3 EXECUTION

3.1 GENERAL

Substrate preparation and installation of TACTILE SYSTEMS products

Requirement: To TACTILE SYSTEMS‘ recommendations and fitting instructions, and as follows:
- Discrete tactiles:
  - General: Drill, apply adhesive (if required) and pressure fit.
  - Flat back tactiles: Adhesive fix.
  - Warning complete carpet system: Screw fix TGSI’s through carpet to threads on concealed backing plate.
  - Timber installations: Use stainless steel tactiles with screw-fit option.
- Integrated tactiles:
  - Future-Tech: Apply construction adhesive and fix with eight stainless steel hammer fixings.
  - Paver and ceramic TGSI’s: Install flush with adjacent paving.

. Polyurethane: Butyl adhesive backing for ‘peel & stick’ installation.
. Stainless steel and brass: Install flush with the base surface.

3.2 COMPLETION

Warranties
Type: Manufacturer warranty.
Period: As follows:
- Stainless steel and brass TGSIs: 10 years.
- Future Tech TGSIs, ceramic TGSIs and concrete pavers: 5 years.
- Polyurethane TGSIs: 2 years.
- Stair nosing: 2 years.

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4 SELECTIONS

4.1 TACTILE SYSTEMS TGSI

Discrete tactile indicator schedule
Builder to nominate for Architect review/approval

	DT1	DT2	DT3
Product code			

Integrated tactile indicator schedule

	IT1	IT2	IT3
Product code			

4.2 TACTILE SYSTEMS NOSING

Classic series nosing schedule
Builder to nominate for Architect review/approval

	CS1	CS2	CS3
Product code			

Select series nosing schedule

	SS1	SS2	SS3
Product code			

Elite series nosing schedule

	ES1	ES2	ES3
Product code			

Safeguard series nosing schedule

	SG1	SG2	SG3
Product code			

0222 EARTHWORK

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide earthworks to the levels, dimensions and tolerances, as documented.

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1.2 DESIGN

General

Designer: [complete/delete]

Geotechnical and environmental reports provided: [complete/delete]

Requirements

General: To DESIGN in *0171 General requirements*.

Responsibility: [complete/delete]

Design of footing or pier depths: [complete/delete]

Authority requirements: [complete/delete]

1.3 CROSS REFERENCES

General

Requirement: Conform to the following:

- *0171 General requirements*.
- *0172 Environmental management*.

1.4 STANDARDS

General

Earthworks: Conform to the recommendations of those parts of AS 3798 (2007) that are referenced in this worksection.

Description and classification of soils: To AS 1726 (2017).

1.5 INTERPRETATION

Abbreviations

General: For the purposes of this worksection, the following abbreviations apply:

- GITA: Geotechnical inspection and testing authority.
- OMC: Optimum moisture content.

Definitions

General: For the purposes of this worksection, the definitions given in AS 3798 (2007) and the following apply:

- Bad ground: Ground unsuitable for the works, including fill liable to subsidence, ground containing cavities, faults or fissures, ground contaminated by harmful substances and ground that is or becomes, soft, wet or unstable.
- Rock: Monolithic material with volume greater than 0.3 m^3 that cannot be removed until broken up by rippers or percussion tools.
- Site topsoil: Natural soil, excavated from the site, that contains organic matter, supports plant life, conforms generally to the fine-to-medium texture classification to AS 4419 (2018) and is free from the following:
  - Stones more than 25 mm diameter.
  - Clay lumps more than 50 mm diameter.
  - Weeds and tree roots.
  - Sticks and rubbish.
  - Material toxic to plants.

- Subgrade: The trimmed or prepared earth material on which the pavement, footing or slab is constructed. Generally taken to relate to the upper line of the earth material.
- Zone of influence: A foundation zone bounded by planes extending downward and outward from the bottom edge of a footing, slab or pavement and defining the extent of foundation material having influence on the stability or support of the footings, slab or pavement.

1.6 TOLERANCES

General

Finish: Finish the surface to the required level, grade and shape within the following tolerances:

- Under building slabs and load bearing elements: +0, -25 mm.
- Pavement subgrades: +0, -40 mm.
- Batters: No steeper than the slope shown on the drawings. Make sure flatter slopes do not impact on boundaries or required clearances to buildings, pavements or landscaping.
- Other ground surfaces: ±50 mm, provided the area remains free draining and matches adjacent construction if required. Provide smoothness as normally produced by a scraper blade.

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1.7 SUBMISSIONS

Design documentation

Calculations: Submit calculations by a professional engineer showing the stability and safety of proposed excavations and temporary supports, including supports required for adjacent structures.

Execution details

Report: Submit a time-based schedule detailing the methods and equipment proposed for the earthworks, including the following:

- Dewatering and groundwater control and disposal of surface water.
- Excavation methods, stages, clearances, batters and temporary supports.
- Stockpiles and borrow pits.
- Placing and compaction methods and stages.

Geotechnical site investigations: Provide a geotechnical report supporting the excavation methods proposed.

Disposal location: Submit details of the location and evidence of compliance with the appropriate authority requirements for the disposal of material requiring removal from site.

Temporary shoring: Submit a proposal for any temporary shoring required, including the progressive removal.

Proof rolling: Submit details of proposed method and equipment.

Records of measurement: Submit a certified copy of the agreed records of measurement.

Site records: Submit the following to AS 3798 (2007) clause 3.4 and Appendix B:

- Geotechnical site visit record.
- Earthworks summary report or daily geotechnical reports.

Products and materials

Imported fill: Submit certification from a GITA or test results of the imported fill as evidence of conformity with the contract, including the source.

Tests

Requirement: Submit test results of the following:

- Compaction control.

1.8 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following:

- Items to be measured as listed in **RECORDS OF MEASUREMENT**.
- Areas to be cleared and/or stripped of topsoil.
- Areas stripped of topsoil.
- Excavation completed to contract levels or founding material.
- Proof rolling of the subgrade.

- Proof rolled subgrade before placing fill.
- Filling and compaction completed to contract levels.
- Stockpiled topsoil before spreading.

2 PRODUCTS

2.1 FILL MATERIALS

General

Suitable material: To AS 3798 (2007) clause 4.4 including inorganic, non-perishable material suitably graded and capable of compaction to the documented density.

Unsuitable materials: Do not use fill defined as unsuitable by AS 3798 (2007) clause 4.3.

Sulfur content: Do not provide material with sulfur content exceeding 0.5% within 500 mm of concrete and cement bound elements (for example masonry) unless the elements are protected by impermeable membranes or equivalent means.

Re-use of excavated material: Only re-use suitable material.

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Stockpiles

General: Segregate earth and rock material and stockpile for re-use in backfilling operations.

Location: Do not stockpile excavated material against tree trunks, buildings or fences. Do not obstruct the free flow of water along drainage channels.

2.2 BORROW OR IMPORTED FILL

General

Requirement: Use only when suitable material obtained from site excavations are insufficient for completing the documented earthworks.

- Suitable material: To AS 3798 (2007) clause 4.4.

Material conforming to the following: Refer to the Geotechnical Report and Structural/Civil documentation

Borrow pits:

- Locate more than 3000 mm from any fence line, boundary, edge of excavation or embankment.
- Strip and stockpile topsoil.
- Provide erosion protection during winning operations of material and make sure drainage is maintained.
- On completion of winning operations, grade abrupt changes of slope, respread topsoil and apply and maintain hydroseeded grassing.

2.3 GEOTEXTILE

General

Material: UV stabilised, permeable, polymeric, woven or non-woven textile material used in contact with soil/rock material.

Identification and marking: To AS 3705 (2012).

3 EXECUTION

3.1 SITE PREPARATION

Erosion and sedimentation control

Requirement: To *0172 Environmental management*.

3.2 GEOTECHNICAL

As found site conditions

General: If the following are encountered, give notice and obtain instructions before carrying out any further work in the affected area:

- Bad ground.
- Discrepancy in expected conditions.
- Rock.

- Springs, seepages.
- Topsoil more than 100 mm deep.

Inspection and testing

Level of inspection and testing:

- Level 1 GITA required to AS 3798 clause 8.2.
- Level 2 GTA required to AS 3798 clause 8.3.

Frequency of testing: To AS 3798 (2007) Table 8.1.

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3.3 RECORDS OF MEASUREMENT

Excavation and backfilling

Agreed quantities: If a schedule of rates applies, provisional quantities are documented or there are variations to the contract levels or dimensions of excavations, do not backfill or place permanent works in the excavation until the following have been agreed and recorded:

- Depths of excavations in relation to the datum.
- Final plan dimensions of excavations.
- Quantities of excavations in rock.

Method of measurement: By a registered surveyor.

Rock

Level and class: If rock is measured for payment purposes, either as extra over excavation of material other than rock or for adjustment of provisional measurements, do not remove the rock until the commencing levels and classes of rock have been determined.

3.4 REMOVAL OF TOPSOIL

General

Extent: Areas of cut or fill and areas to be occupied by structures, pavements and embankments.

Maximum depth: 200 mm.

Disposal: Remove topsoil unsuitable for re-use from the site to AS 3798 (2007) clause 6.1.8.

Topsoil stockpiles

General: Stockpile site topsoil intended for re-use.

Stockpile maximum height: 1.5 m.

Identification: Mark and label stockpiles of different soil types.

Vegetation: Do not burn off or remove plant growth that occurs during storage.

Protection: Conform to the following:

- Provide drainage and erosion protection.
- Do not allow traffic on stockpiles.
- If a stockpile is to remain for more than four weeks, sow with temporary grass.
- Protect the topsoil stockpiles from contamination by other excavated material, weeds and building debris.

3.5 EXCAVATION

Extent

Site surface: Excavate the site to the levels and profiles required for the documented structures, pavements, filling and landscaping. Make allowance for compaction, settlement or heaving.

Footings, pits, wells and shafts: Excavate to the required sizes and depths. Confirm the foundation conditions meet the design bearing capacity.

Bearing surfaces

Requirement: Provide even plane bearing surfaces for loadbearing elements including footings. Step to accommodate level changes, as documented. If supporting masonry, make the steps appropriate to the courses.

Rock

General: Do not use explosives.

Existing footings
Requirement: If excavation is required within the zone of influence of an existing footing, provide supports to the footing sufficient to prevent damage arising from the works. Use methods including temporary shoring or underpinning.

Existing services
Location: Before starting earthworks, locate and mark existing underground services in the areas that will be affected by the earthworks operations including clearing, excavating and trenching.

Utility services: Contact BEFORE YOU DIG AUSTRALIA to identify location of underground utility services pipes and cables.

Excavation: Do not excavate by machine within 1000 mm of existing services.

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Proof rolling
Extent: Proof roll excavations for pavements, filling and non-spanning slabs on ground to determine the presence of bad ground.

Proof rolling method and equipment: To AS 3798 (2007) clause 5.5.

Requirement: If excessive settlement, rebound or heaving is encountered, provide test pits or trenching to determine the extent of bad ground.

Subgrade replacement: Excavate the full extent and depth of bad ground. Remove and replace with selected fill. Place and compact to **PLACING FILL** to achieve the required capacity and levels.

Disposal of excess excavated material
General: If not required or unsuitable for fill, remove from site.

Standard: To AS 3798 (2007) clause 6.1.8.

3.6 REINSTATEMENT

Deterioration of bearing surfaces
Requirement: If the bearing surface deteriorates, excavate to a sound surface before placing the loadbearing element.

Subgrades affected by moisture
Requirement: If, due to high moisture content, the subgrade cannot support construction equipment or the overlying pavement cannot be compacted, perform one or more of the following:

- Allow the subgrade to dry until it provides support for equipment and allows compaction.
- Scarify the subgrade to a depth of 150 mm, work as necessary to accelerate drying, and recompact when the moisture content is satisfactory.
- Excavate the wet material and move to spoil stockpile and backfill excavated areas.

Over excavation
Requirement: If excavation exceeds the required depths, reinstate to the correct depths, levels and bearing capacity.

Zone of influence: Within the zone of influence of footings, beams or other structural elements, use concrete of strength equal to the structural element, minimum 15 MPa. Make sure that remedial concrete does not create differential bearing conditions.

Below slabs or pavements: Rectify the over excavation as follows:

- Generally: Provide selected fill compacted to the documented density.
- Less than 100 mm: Do not backfill. Increase the thickness of the layer above.

Subsoil drains: Backfill over excavation of subsoil drains using coarse filter material conforming to AS/NZS 3500.3 (2021) clause 2.13.1.

3.7 SUPPORTING EXCAVATIONS

Removal of supports
General: Remove temporary supports progressively as backfilling proceeds.

Voids
General: If voids occur outside sheeting or sheet piling, fill and compact voids to a dry density similar to that of the surrounding material.

3.8 ADJACENT STRUCTURES

Temporary supports

General: If required, provide supports to adjacent structures, sufficient to prevent damage arising from the works.

Lateral supports: Provide lateral support with shoring.

Vertical supports: If required, provide vertical support with piling or underpinning or both.

Permanent supports

General: If permanent supports for adjacent structures are required and are not documented, give notice and obtain instructions.

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Encroachments

General: If encroachments from adjacent structures are encountered and are not documented, give notice and obtain instructions.

Zone of influence

Refer Structural Engineer's Drawings and to be determined on site.

Angle from horizontal: Maximum 30 degrees for granular material, 45 degrees for stiff clay.

3.9 ROCK BOLTING

General

Requirement: For temporary or permanent support of rock faces, provide proprietary high strength steel bars or cables anchored into holes drilled in the rock and tensioned against plates bearing on the rock face. Schedule the installation to conform to systematic bolting or calculated relief, as documented.

Standard: To AS 4678 (2002).

Protection

General: Protect permanent rock bolts by grouting the drilled hole with cement grout after tensioning the rock bolt. Protect the bearing plate and the exposed portion of rock bolt and anchorage with a protective coating or by embedment in concrete.

3.10 GEOTEXTILE

General

Preparation: Trim the ground to a smooth surface free from cavities and projecting rocks.

Installation: Lay the fabric flat, not stretched tight and secure with anchor pins. Overlap joints 300 mm minimum.

3.11 PREPARATION FOR FILLING

Preparation

Stripping: Prepare the ground surface before placing fill (including topsoil fill), ground slabs or load bearing elements to AS 3798 (2007) clause 6.1.5. Remove loose material, debris, organic matter and material that inhibits or prevents satisfactory placement of fill layers.

Foundation preparation: To AS 3798 (2007) clause 6.1.7.

Compaction: Compact the ground exposed after stripping or excavation, to a minimum depth of 150 mm, to the minimum relative compaction in AS 3798 (2007) Table 5.1.

Ground treatment or improvement methods:

- Scarify method: Loosen exposed excavation by scarifying to a minimum of 150 mm, moisture-condition and compact to AS 3798 (2007) Section 5.
- Impact roller and impact compaction: Use an approved method.

Slope preparation: If fill is placed on a surface steeper than 4:1 (horizontal:vertical), bench the surface to form a key for the fill. As each layer of fill is placed, cut the existing ground surface progressively to form a series of horizontal steps more than 1 m in width and more than 100 mm deep. Recompact the excavated material as part of the filling. Shape to provide free drainage.

Under earth mounds

General: Cultivate the ground to a depth of 200 mm before mound formation.

Under slabs, paving and embankments

General: If required, loosen the ground to a depth of more than 200 mm and adjust the moisture content before compaction to a density consistent with subsequent filling.

Rock ledges
General: Remove overhanging rock ledges.

3.12 PLACING FILL

General
Extent: Place fill to the documented dimensions, levels, grades and cross-sections so that the surface is always self-draining.

Layers: Place fill in near-horizontal layers of uniform thickness no greater than 150 mm after compaction, deposited systematically across the fill area.

Edges: At junctions of fill and existing surfaces, do not feather the edges.

Mix: Place fill in a uniform mixture.

Previous fill: Before placing subsequent fill layers, make sure that previously accepted layers still conform to requirements, including moisture content.

Protection: Protect the works from damage due to compaction operations. If required, limit the size of compaction equipment or compact by hand.

Protective covering to membranes: Do not disturb or damage during backfilling.

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Placing at structures
Fill adjacent structures and trenches: To AS 3798 (2007) clause 6.2.6.

Requirement: Place and compact fill in layers simultaneously on both sides of structures, culverts and pipelines to avoid differential loading. Commence compacting each layer at the structure and proceed away from structure.

Over the top of structures: Carefully place first layers of fill.

Retaining walls: Do not place fill against concrete retaining walls until the concrete has been in place for 28 days unless the structure is supported by struts.

Compaction
General: Compact the subgrade and each layer of fill to the required depth and density, as a systematic construction operation. Shape surface to provide drainage and prevent ponding.

Maximum rock and lump size in layer after compaction: To AS 3798 (2007) clause 6.2.2.

Fill batter faces: Either compact separately or overfill and cut back. Form roughened surfaces to the faces.

Minimum relative compaction: To AS 3798 (2007) Table 5.1.

3.13 PLACING TOPSOIL

Stockpiled topsoil
Cultivation: Rip subgrade to a depth of 100 mm or to the depth of rippable subgrade if less. Cultivate around services and tree roots by hand. Trim to allow for the required topsoil depth.

Herbicide: Apply before placing topsoil.

Herbicide product: Refer to Landscape Architects documentation

Placing: Spread and grade evenly.

Compaction: Lightly compact topsoil so that the finished surface is smooth, free from lumps of soil, at the required level, ready for cultivation and planting.

Edges: Finish topsoil flush with abutting kerbs, mowing strips and paved surfaces. Feather edges into adjoining undisturbed ground.

Disposal of excess topsoil
On-site: Dispose of surplus topsoil remaining on site by spreading evenly over the areas already placed.

Off-site: Remove excess topsoil from the site and dispose of legally.

3.14 FILL MOISTURE CONTROL

General
Moisture content: Determine in conformance with AS 1289.5.1.1 (2017) or AS 1289.5.2.1 (2017), as appropriate. Adjust the moisture content of fill to ±2% OMC during compaction as required to achieve the documented density.

3.15 TESTING

Site tests

Compaction control tests: To AS 1289.5.4.1 (2007) or AS 1289.5.7.1 (2006).

Test frequency: To AS 3798 (2007) Table 8.1.

3.16 COMPLETION

Geotechnical report

Inspection and testing report to AS 3798 (2007):

- Level 1 GITA required to AS 3798 clause 8.2.
- Level 2 GTA required to AS 3798 clause 8.3.

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Grading

External areas: Grade to give falls away from buildings, minimum 1:100.

Subfloor areas: Grade the ground surface under suspended floors to drain ground or surface water away from buildings without ponding.

Site restoration

Requirement: If variation of existing ground surfaces is not required as part of the works, restore surfaces to the condition existing at the commencement of the contract.

0242B LANDSCAPE - FENCES AND BARRIERS

1 GENERAL

1.1 RESPONSIBILITIES

General
Requirement: Provide fences and barrier systems, as documented.

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Performance
Requirements:
- Complete for their function.
- Conforming to the detail and location drawings.
- Firmly fixed in position.

1.2 CROSS REFERENCES

General
Requirement: Conform to the following:
- *0171 General requirements*.
- *Landscape Architect's Drawings*

1.3 SUBMISSIONS

Samples
Requirement: Submit samples to PRODUCTS, **GENERAL**, **Samples**.
Submit samples as follows:
- Flush steel edge
- Raised steel edge
- Precast concrete edge

Shop drawings
Custom-built items: Submit shop drawings to a scale that best describes the details, showing methods of construction, assembly and installation, with dimensions and tolerances.

Warranties
Requirement: Submit warranties to **COMPLETION**, **Warranties**.

1.4 INSPECTION

Notice
Inspection: Give notice so that inspection may be made of the following:
- Boundary survey location.
- Set-out before construction.
- Foundation conditions after excavation.
- Completion of installation.

2 PRODUCTS

2.1 GENERAL

Samples
Requirement: Provide samples as follows: [complete/delete]

Storage and handling
General: Deliver, unload and store components and accessories in unbroken manufacturer's packaging. Inspect upon delivery for the required quantity and quality.

2.2 TIMBER

Durability
Durability class to AS 5604 (2022) Section 6

Posts and rails
Hardwood: To AS 2082 (2007).
Softwood: To AS 2858 (2023).
Pickets and palings
Hardwood: To AS 2796.1 (1999) Section 8.
- Grade to AS 2796.2 (2006): Select.

Softwood: To AS 4785.1 (2002) Section 7.
Seasoned cypress pine: To AS 1810 (1995) Section 5.
Preservative treatment
Timber type: Provide only timbers with preservative treatment to the documented hazard class.
Cut surfaces: Provide supplementary preservative treatment to all cut and damaged surfaces.
CCA treated timber: If proposed to be used, provide details.

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2.3 STEEL

Steel tubes
Posts, rails, stays and pickets: To AS/NZS 1163 (2016).
- Grade: C350L0.

Post and rail finish: Hot-dip galvanized.
Fencing wire
Chain link, cable wire, tie wire and barbed wire: To AS 2423 (2002).

2.4 CONCRETE

General
Standard: To AS 1379 (2007).
Exposure classification: To AS 3600 (2018) Table 4.3.

2.5 COMPONENTS

Steel panel fencing
Steel framing: Zinc-coated or aluminium/zinc alloy coated steel to AS 1397 (2021).
Steel sheeting: Prepainted to AS/NZS 2728 (2013).
Timber fencing
General: Conform to the timber members as documented.
Gates
General: As documented.
Barriers for swimming pools
Design, construction and performance: To the NCC cited AS 1926.1 (2012).
Location of barriers for private swimming pools: To AS 1926.2 (2007).

2.6 GEOTEXTILES

General
Type: Polymeric fabric formed from a plastic yarn composed of at least 85% by weight of propylene, ethylene, amide or vinyledenechloride and containing stabilisers or inhibitors to make the filaments resistant to deterioration due to ultraviolet light.
Identification and marking: To AS 3705.
Protection
General: Provide heavy duty protective covering. Store clear of the ground and out of direct sunlight. During installation do not expose the filter fabric to sunlight for more than 14 days.

2.7 EDGING

Log edges
Concrete
Standard: To AS 1379 – Grade N20.
Profile to: to Landscape Architects Details

Concrete kerb

Standard: To AS 1379 – Grade N20.

Profile to: to Landscape Architects Details

Steel

Product: to Landscape Architects Details

Size and profile: Profile to: to Landscape Architects Details

Finish: Hot-dip galvanized / powder coated to Landscape Architect Details

Brick

Brick type: to Landscape Architects Details

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3 EXECUTION

3.1 CONSTRUCTION GENERALLY

Set-out

General: Set out the fence line and mark the positions of posts, gates and bracing panels.

Property boundaries: Confirm by survey.

Clearing

Fence line: Except for trees or shrubs to be retained, clear vegetation within 1 m of the fence alignment. Grub out the stumps and roots of removed trees and shrubs, and trim the grass to ground level. Do not remove the topsoil.

Excavation

Posts: Excavate post holes so that they have vertical sides and a firm base. Spread surplus material on the principal's side of the fence.

Earth footings

Base: Place 100 mm of gravel in the footing base under posts.

Compaction: Backfill with earth around posts, compacting firmly by hand or machine in 150 mm deep layers.

Concrete footings

In ground: Place mass concrete around posts to protect posts from waterlogged conditions and finish the top with a 25 mm fall from the post to the footing edge.

On slabs: Provide welded and drilled post base flanges for fixing with masonry anchors to the concrete.

Erection

Line and level: Erect posts vertically. Set heights to follow the contours of natural ground.

3.2 GATES

Hardware

General: Provide the following:

- Drop bolt and ferrule to each leaf of double gates.
- Latch to one leaf of double gates.
- Provision for locking by padlock.
- Hinges with smooth operation and adjustment for future sagging.

Hand access

Requirement: If required, provide hand holes to give access from outside to reach locking provision.

3.3 TIMBER FENCING

Radiata pine picket fencing

General: As documented.

Radiata pine paling fencing

General: As documented.

Hardwood paling fencing
General: As documented.

Installation
General: Mortice posts, taper splice rails and nail twice in mortices. Set pickets and palings clear of the ground.

Picket fence: Nail twice to each rail.

Plain paling fence: Provide 2 rails for fences up to 1800 mm high and locate 200 mm from the tops and bottoms of the palings. Close butt palings and nail twice to each rail.

Lap and cap paling fence: Provide 2 rails for fences up to 1800 mm high and locate 200 mm from the bottoms of the palings and abutting the tops of palings. Close butt larger palings and nail twice to each rail. Fix smaller palings over joints and nail twice to each rail. Nail capping to the top rail.

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Timber gates
Ledges and braces: Match fence rails.

3.4 STEEL FENCING

Steel picket fencing
Requirement: As documented.

Steel picket fencing installation
General: Fit tightly fitting caps to steel posts. Attach panels to posts with fixing clips and galvanized M8 x 75 mm hexagon head bolts before concreting footing.

Steel panel fencing
Requirement: As documented.

Protection: Make sure bottom rails have drain holes or clearance to posts and are at least 50 mm clear of the ground.

Refer to Landscape Architect's documentation Design, construction and performance: To AS 1926.1.

3.5 CHAIN LINK FABRIC FENCING

Tennis court fencing – private/residential
Requirement: As documented.

Standard: To AS 1725.3 (2010).

Gate frames: To AS 1725.3 (2010) Appendix D.

Bracing stays and backstays: To AS 1725.3 (2010) Appendix E.

Base plates: To AS 1725.1 (2010) Appendix F.

3.6 WELDED MESH FENCING

Welded mesh fencing
Requirement: As documented.

Footing type: Concrete.

Installation
General: Fit tightly fittings caps to steel posts. Attach panels to posts with fixing clips and galvanized M8 x 75 mm hexagon head bolts before concreting footing.

3.7 SWIMMING POOL BARRIERS

Pool barriers
Requirement: As documented.

Installation
Construction and performance: To the NCC cited AS 1926.1 (2012) and AS 1926.2 (2007).

Installation: Provide complete with accessories.

3.8 TEMPORARY LANDSCAPE FENCING

Fence dimensions
Height: 1200 mm.

Maximum post spacing: 5000 mm.

Component sizes

Corner and gate posts: Hardwood or preservative-treated softwood, 250 mm diameter.

Intermediate posts: Star picket.

Gate: Provide a suitable hinged gate with a gate latch.

Wire: Top, intermediate and bottom rows of 3.2 mm plain galvanized steel wire. Thread the top wire through pieces of plastic tube and through corner posts.

Removal

Completion: Remove the fence at the end of the planting establishment period.

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3.9 COMPLETION

Cleaning

Requirement: Remove excess debris, metal swarf and unused materials. Clean all visible metal surfaces with soft clean cloth or brush and clean water or approved cleanser, finishing with a clean cloth. Do not use abrasive or alkaline materials.

Powder coated aluminium architectural applications: Clean completed assembly to AS 3715 (2002) Appendix C.

Powder coated metal, other than aluminium, architectural applications: Clean completed assembly to AS 4506 (2024) Appendix E.

Protection: Remove protective coatings using methods required by the manufacturer after completion.

0271 PAVEMENT BASE AND SUBBASE

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide base and subbase courses as documented.

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Performance

Surface level: Provide a finished surface level that is free draining and evenly graded between level points.

1.2 CROSS REFERENCES

General

Requirement: Conform to the following:

- *0171 General requirements*.
- *0222 Earthwork*.

1.3 INTERPRETATION

Definitions

General: For the purposes of this worksection, the following definitions apply:

- Base: One or more layers of material, forming the uppermost structural element of a pavement and on which the surfacing may be placed.
- Subbase: Material laid on the subgrade below the base either for the purpose of making up additional pavement thickness required, to prevent intrusion of the subgrade into the base or to provide a working platform. Usually designated as Dense graded base (DGS), NGS 40 mm gravel, CRS, CCS or RCMS.

1.4 TOLERANCES

Surface level

Subbase: +10 mm, -25 mm.

Base: +10 mm, -5 mm.

Base abutting gutters: ±5 mm from the level of the lip of the gutter, minus the design thickness of the wearing course.

Surface deviation

Base: ≤ 5 mm from a 3 m straightedge laid on the surface.

1.5 SUBMISSIONS

Execution details

General: Submit details of the proposed work methods and equipment for each pathway and roadworks operation, including the following:

- Staging of the work, access and traffic control methods.
- Disposal of surface water, control of erosion, contamination and sedimentation of the site, surrounding areas and drainage systems.

Compaction: If a layer is proposed to exceed 200 mm in thickness, submit evidence that the proposed compaction equipment can achieve the required density throughout the layer.

Products and materials

Source of material: Submit the supplier name, material type (crushed rock, natural gravel, recycled concrete aggregate) and source quarry or recycling site.

Conformance: Submit type test results for each material listed in the **Base material properties and test methods table** and **Subbase material properties and test methods table** as evidence of material conformance.

Alternative materials: If proposed, submit type test results for the relevant properties listed in the **Base material properties and test methods table** and **Subbase material properties and test methods table** as evidence of material conformance.

Tests

Compaction tests: Submit results of compaction testing to **TESTING**, **Site tests**.

1.6 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following:

- Prepared subgrade.
- Proof rolling of subbase before spreading of base.
- Proof rolling of base before sealing.

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2 PRODUCTS

2.1 BASE AND SUBBASE MATERIAL

Granular material

Requirement: Provide unbound granular materials, including blends of two or more different materials, which when compacted develop structural stability and are uniform in grading and physical characteristics.

Crushed rock

Requirement: Provide crushed rock as follows:

- Base: 20 mm nominal.
- Subbase: 40 mm nominal.

Recycled materials

Requirement: Provide recycled materials as follows:

- Base and subbase: Conform to the **Limits on use of recycled and manufactured materials as constituent materials table** and the **Undesirable material properties table**.

Natural gravel

Requirement: Provide unbound natural gravel materials as follows:

- Base: 20 mm nominal.
- Subbase: 40 mm nominal.

Subbase material properties and test methods table

Property and test method	**Differentiating criteria**	**Material requirements**	
		Crushed rock	**Natural gravel**
Particle size distribution or grading (% passing through sieve) to AS 1289.3.6.1 (2009)	**Sieve size (mm)**	—	—
	53.0	100	100
	37.5	90 - 100	95 - 100
	26.5	74 - 96	80 - 97
	19.0	62 - 86	—
	13.2	—	—
	9.5	42 - 66	48 - 85
	4.75	28 - 50	35 - 73
	2.36	20 - 39	25 - 58
	0.425	8 - 21	10 - 33
	0.075	3 - 11	3 - 21
Liquid limit (w_L) to AS 1289.3.1.1 (2009)	—	max 25%	max 25%
Plasticity index (I_P) to AS 1289.3.3.1 (2009)	—	max 12%	max 12%
	Rainfall	—	—

Property and test method	**Differentiating criteria**	**Material requirements**	
		Crushed rock	**Natural gravel**
Linear shrinkage (*LS*) to AS 1289.3.4.1 (2008)	Areas with annual rainfall > 500 mm	max 4.5%	max 4.5%
	Areas with annual rainfall < 500 mm	max 6.0%	max 6.0%
Maximum dry compressive strength on fraction passing 19 mm sieve (only applies if plasticity index is less than 1) to AS 1141.52 (2019)	—	min 1.0 MPa	min 1.0 MPa
Particle shape by proportional calliper - % misshapen (2:1) to AS 1141.14 (2007)	—	max 35%	—
Aggregate wet strength[a] to AS 1141.22 (2019)	—	min 50 kN	—
Wet/dry strength variation[a] (dry - wet)/dry to AS 1141.22 (2019)	—	max 40%	—
Los Angeles value to AS 1141.23 (2021)	—	max 40%	—
4 day soaked CBR (98% modified compaction) to AS 1289.6.1.1 (2014)	—	min 30%	min 30%
a. Use the fraction with the highest wet/dry strength variation as the value for determining conformance. Test the fraction 19.0 to 9.5 mm. For blended materials, also test the fraction 9.5 to 4.75 mm. Test any other fraction if there is risk of failing.			

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Limits on use of recycled and manufactured materials as constituent materials table

Recycled material	**Unbound or modified base and subbase**	**Bound base and subbase**
Iron and steel slag	100%	100%
Crushed concrete[a]	100%	100%
Brick	20%	10%
RAP	40%	40%
Fly ash[b]	10%	10%
Furnace bottom ash	10%	10%
Crushed glass fines	10%	10%
Notes:		
a. For pavements using high percentages of crushed concrete, take into account the amount of available cement that will rehydrate if subjected to moisture to create rigid or semi-rigid pavement and result in subsequent shrinkage cracking. b. For pavements using fly ash, take into account the possibility of hydration and binding if subjected to moisture to create rigid or semi-rigid pavement and result in subsequent shrinkage cracking.		

Undesirable material properties table

Property and test method	**Differentiating criteria**	**Material requirements**		
		Crushed rock	**Recycled material**	**Natural gravel**
Undesirable constituent materials (% retained on a 4.75 mm sieve) to TfNSW TS 02799.51 (2012)	**Material type**	—	—	—
	Type I - Metal, glass, stone, ceramics and slag	—	max 2.0 %	—

Property and test method	Differentiating criteria	Material requirements		
		Crushed rock	**Recycled material**	**Natural gravel**
	Type II - Plaster, clay lumps and other friable material	—	max 0.5%	—
	Type III - Rubber, plastic, paper, cloth, paint, wood and other vegetable matter	—	max 0.1%	—

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Base material properties and test methods table

Property and test method	Differentiating criteria	Material requirements		
		Crushed rock	**Recycled material**	**Natural gravel**
Particle size distribution or grading (% passing through sieve) AS 1289.3.6.1 (2009)	**Sieve size (mm)**	—	—	—
	26.5	100	100	100
	19.0	95 - 100	95 - 100	93 - 100
	13.2	77 - 93	78 - 92	—
	9.5	63 - 83	63 - 83	71 - 87
	4.75	44 - 64	44 - 64	47 - 70
	2.36	29 - 49	30 - 48	35 - 56
	0.425	13 - 23	13 - 21	14 - 32
	0.075	5 - 11	5 - 9	6 - 20
Liquid limit (w_L) to AS 1289.3.1.1 (2009)	—	max 25%	max 30%	max 25%
Plasticity index (I_P) to AS 1289.3.3.1 (2009)	**Rainfall**	—	—	—
	All areas	—	—	—
	Areas with annual rainfall > 500 mm	max 6%	max 6%	max 6%
	Areas with annual rainfall < 500 mm	max 10%	max 10%	max 10%
Linear shrinkage (*LS*) to AS 1289.3.4.1 (2008)	**Rainfall**	—	—	—
	All areas	—	—	—
	Areas with annual rainfall > 500 mm	max 2.0%	max 2.0%	max 2.0%
	Areas with annual rainfall < 500 mm	max 4.0%	max 4.0%	max 4.0%
For materials with plasticity index less than 1: Maximum dry compressive strength to AS 1141.52 (2019)	—	min 1.7 MPa	min 1.7 MPa	min 1.7 MPa
Particle shape by proportional caliper (% misshapen for 2:1 caliper ratio) to AS 1141.14 (2007)	—	max 35%	max 35%	—

Property and test method	Differentiating criteria	Material requirements		
		Crushed rock	Recycled material	Natural gravel
Aggregate wet strength[a] to AS 1141.22 (2019)	—	min 80 kN	min 80 kN	—
Wet/dry strength variation[a] to AS 1141.22 (2019)	—	max 35%	max 35%	—
Los Angeles value (% loss or abrasion) to AS 1141.23 (2021)	—	max 35%	max 40%	—
4 day soaked CBR (98% modified compaction) to AS 1289.6.1.1 (2014)	—	min 80%	min 80%	min 80%
Unconfined compressive strength to AS 5101.4 (2008)	—	max 1.0 MPa	max 1.0 MPa	—
NOTES: a. Use the fraction with the highest wet/dry strength variation as the value for determining conformance. Test the fraction 19.0 to 9.5 mm. For blended materials, also test the fraction 9.5 to 4.75 mm. Test any other fraction if there is risk of failing.				

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Tests

Material property testing: Conform to the **Base material properties and test methods table** and the **Subbase material properties and test methods table**.

Frequency of material property tests: Not less than the following:

- Particle size distribution: 1 per 1000 t (or part of).
- Liquid limit: 1 per 1000 t (or part of).
- Plasticity index: 1 per 1000 t (or part of).
- Linear shrinkage: 1 per 1000 t (or part of).
- Foreign materials content: 1 per 1000 t (or part of).
- Maximum dry compressive strength: 1 per 5000 t (or part of).
- Particle shape: 1 per 1000 t (or part of).
- Los Angeles value: 1 per 1000 t (or part of).
- Aggregate wet strength: 1 per 5000 t (or part of).
- Wet/dry strength variation: 1 per 5000 t (or part of).

3 EXECUTION

3.1 SUBGRADE PREPARATION

General

Requirement: Prepare the subgrade to *0222 Earthwork*.

3.2 PLACING BASE AND SUBBASE

General

Weak surfaces: Do not place material on a surface that is weakened by moisture and is unable to support, without damage, the construction plant required to perform the works.

Spreading: Spread material in uniform layers without segregation.

Moisture content: Maintain wet mixed materials at the required moisture content before and during spreading. Add water to dry mixed materials through fine sprays to the entire surface of the layer after spreading, to bring the material to the required moisture content.

Compacted layer thickness: 200 mm maximum and 100 mm minimum. Provide layers of equal thickness in multilayer courses.

Joints

General: Plan spreading and delivery to minimise the number of joints. Offset joints in successive layers by a minimum of 300 mm.

Start of shift: Remix last 2 m of previous days' work for continuity of compaction.

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Final trimming

General: Trim and grade the base course to produce a tight even surface with no loose stones or slurry of fines.

3.3 BASE AND SUBBASE COMPACTION

General

Construction operation: Compact each layer of fill to the required depth and density, as a systematic construction operation.

Unstable areas: If unstable areas develop during rolling or are identified by proof rolling, open up, dry back and recompact, to the requirements of this worksection. If dry back is not possible, remove for the full depth of layer, dispose of and replace with fresh material.

Minimum relative compaction table

Item description	Minimum dry density ratio (modified compaction) to AS 1289.5.2.1 (2017)
Subbase	95%
Base	98%

Compaction requirements

General: Apply uniform compactive effort over the whole area to be compacted, until the required density is achieved or until failure is acknowledged. If failure is acknowledged, conform to **Rectification**.

Equipment: Use rollers appropriate to the materials and compaction requirements documented.

Moisture content

General: During spreading and compaction, maintain material moisture content within the range of -2% to +1% from the optimum moisture content (modified compaction).

Spraying: Use water spraying equipment to distribute water uniformly, in controlled quantities, over uniform lane widths.

Dry back: Allow materials to dry to 60 to 80% of the optimum moisture content before applying the seal or wearing course.

Rectification

General: If a section of the pavement material fails to meet the required density or moisture content after compaction, remove the non-conforming material, dispose of off-site or rectify for re-use, replace with fresh material, re-compact and test.

Level corrections

General: Rectify incorrect levels as follows:

- High areas: If the area can be rectified by further trimming to produce a uniform, hard surface by cutting without filling, trim so that the rectified area conforms to **TOLERANCES**.
- Low areas and high areas not rectifiable by further trimming: Remove layers to a minimum depth of 75 mm and replace with new material and re-compact.

3.4 TESTING

Site tests

Compaction control tests: To AS 1289.5.4.1 (2007) and AS 1289.5.4.2 (2007).

Frequency of compaction control tests: Not less than the following (whichever requires the most tests):

- 1 test per layer per 100 lineal metres for two-lane roads.

- 1 test per layer per 2000 m^2 for car parks.
- 3 tests per layer.
- 3 tests per visit.

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0279 PAVING - ON PEDESTALS

1 GENERAL

1.1 RESPONSIBILITIES

General
Requirement: Provide paving, as documented.

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Performance
Requirements:

- Consistent in colour and finish.
- Resistant to expected loads in use.
- Pavers capable of spanning between pedestal supports when subjected to imposed loads.
- Resistant to any wind uplift forces.
- Set out with joints accurately aligned in both directions.
- Within documented level tolerances.

1.2 CROSS REFERENCES

General
Requirement: Conform to the following:

- *0171 General requirements*.

1.3 INTERPRETATION

Definitions
General: For the purposes of this worksection, the following definitions apply:

- Absolute level tolerance: Maximum deviation from design levels.
- Lippage: Height deviation between adjacent units.
- Pavers: Units made from concrete, clay, stone and/or other inorganic raw materials, generally over 20 mm thick, used as coverings for horizontal surfaces.
- Pedestal: The structure directly supporting the pavers, including head, base, column, any adjustment and any locking devices.
- Relative level tolerance: Maximum deviation from a 3 m straightedge laid on the surface.

1.4 TOLERANCES

Completed paving
Level tolerance:

- Absolute: ±8 mm.
- Relative: 8 mm.

Lippage: Less than 2 mm.

1.5 SUBMISSIONS

Execution details
Margins: If it appears that an alternative set out, spacing widths between pavers or minor variations in overall dimensions will avoid cut pavers, submit a proposal.

Operation and maintenance manuals
Requirement: Submit manual to **COMPLETION**, **Operation and maintenance manuals**.

Products and materials
Pavers: Submit evidence from paving manufacturer of paver suitability for installation on pedestals, being supported only on the corners of the paver.

Type tests: Submit test results of the following:

- Slip resistance:
  . Concrete and clay pavers: To **CONCRETE AND CLAY PAVERS**, **Tests**.

. Stone pavers: To **STONE PAVERS**, **Tests**.
- Accelerated wear:
  . Concrete and clay pavers: To **CONCRETE AND CLAY PAVERS**, **Tests**.
  . Stone pavers: To **STONE PAVERS**, **Tests**.

Samples
Requirement: Submit samples to PRODUCTS, **GENERAL**, **Samples**.

Shop drawings
General: Submit shop drawings to a scale that best describes the detail, showing the following:
- Paver size.
- Any required paver reinforcement.
- Pattern.
- Grid layout.
- Pedestal locations.
- Pedestal heights.
- Starting point.
- Finished levels.

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Substrate acceptance
Requirement: Submit evidence of the installer's acceptance of the substrate before commencing installation.

Warranties
Requirement: Submit warranties to **COMPLETION**, **Warranties**.

1.6 INSPECTION

Notice
Inspection: Give notice so that inspection may be made of the following:
- Substrate immediately before installing pedestals.
- Set-out of grids for placement of pedestals.
- Installation of any bracing to pedestals.
- Completed paving.

2 PRODUCTS

2.1 GENERAL

Samples
Pavers: Provide labelled samples of pavers, showing the range of variation in colour and finish.

Pedestals: Provide a sample of each component of the pedestal support system.

Storage and handling
Pedestals: Deliver and store in the manufacturer's original sealed packaging in a dry environment. Inspect for damage upon delivery.

2.2 PEDESTAL SYSTEM

Description
Description: Proprietary system to support pavers.

Wind uplift protection: As per façade/wind consultant's recommendations

2.3 CONCRETE AND CLAY PAVERS

General
Standard: To AS/NZS 4455.2 (2010).

Properties
Requirement: To AS/NZS 4455.2 (2010) Table 2.8.

Application to AS/NZS 4455.2 (2010) Table 2.8

Salt attack resistance grade to AS/NZS 4455.2 (2010) Table 2.7

Tests
Slip resistance: To AS 4586 (2013).

Accelerated wear: Tested for slip resistance after being subjected to accelerated wear conditioning, as evidence of the permanence of slip resistance.

2.4 STONE PAVERS

Natural stone
Description: Natural stone pavers of uniform quality and sound. Reject stone pavers with any of the following defects liable to affect strength and durability:

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- Vents.
- Cracks.
- Fissures.
- Seams.
- Porous inclusions.
- Foreign material.
- Loose surface material.
- Discolouration.

Matching: Select for optimum matching of colour and pattern.

Split flagging thickness: Minimum 50 mm, maximum 75 mm.

Face size: Use smaller sizes for pathways and larger sizes for open areas and maintain traditional stone flagging appearance.

Cast stone
Description: Stone manufactured from selected aggregates and cement.

Other pavers
Requirement: Provide sound pavers of uniform quality, as documented.

Tests
Slip resistance: To AS 4586 (2013).

Accelerated wear: Tested for slip resistance after being subjected to accelerated wear conditioning, as evidence of the permanence of slip resistance.

2.5 OTHER MATERIALS

Tactile ground surface indicators
Standard: To AS/NZS 1428.4.1 (2009).

3 EXECUTION

3.1 PREPARATION

Substrates
Drying and shrinkage: Before installing any waterproof membrane or locating pedestals, allow at least the following times to elapse (for curing and initial shrinkage) for these substrates:

- Concrete slabs: 28 days.
- Toppings on slabs: A further 21 days.

Preparation: Before starting the installation of pedestals, make sure substrates are as follows:

- Broom clean and free from any oil, deposit, finish or projection that may impair the performance of the pedestal system or any waterproofing membrane that has been installed.
- Complete, including the installation of any documented waterproofing membrane, drainage mat, insulation or protection board.
- Sloped to provide positive and adequate drainage.

Extent of protection: If protection to any documented waterproof membrane is only required under each pedestal, extend protection a minimum of 25 mm beyond the edge of each pedestal base.

Compressive strength of insulation placed beneath a pedestal: Sufficient to support the loads transmitted through the pedestal upon completion.

Perimeter

Containment: Provide adequate restraint to all assemblies of insulation, protection board, drainage mat, pedestals and pavers to the perimeter of the paving area.

Fixtures

General: Before paving make sure that fixtures interrupting the surface are accurately positioned in their designed or optimum locations relative to the paving layout. Allow for movement between paving and fixtures.

3.2 INSTALLATION

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Set-out

Level: Establish and mark the support system level (finished paving elevation less the paver thickness) around the perimeter of the paving area.

Grid: Establish a grid on the substrate from the set-out point. The grid will reflect the joint lines in the completed paving. Use grid lines to check paver layout during installation.

Expansion joints: Do not locate pedestals directly over expansion joints in the substrate. Locate pedestals on one side or the other of any expansion joint in the substrate.

Margins: Provide whole or purpose-made pavers at margins where practicable, otherwise set out to give equal margins of cut pavers. If margins less than half paver width are unavoidable, locate the cut pavers where they are least conspicuous.

Pedestal installation

General: Install pedestals to the manufacturer's recommendations in complete rows, starting at one side of the perimeter, installing pavers and adjusting to the correct level as each subsequent row of pedestals are installed.

Location: Locate a pedestal at each intersection of grid lines.

Perimeter edge: Locate pedestal on grid line that meets perimeter, as close to the perimeter edge as possible.

Irregular cut pavers: Locate pedestals so any irregular shaped cut pavers are supported on or as close as possible to, each corner of the paver.

Pedestal height adjustment

General: For adjustable height pedestals, set the pedestal to the required height before placing pavers onto pedestal. After placing pavers make fine vertical adjustments, as required.

Compensation for substrate slope

General: If required to install paving at a different slope to that of the substrate, compensate for the substrate slope to the manufacturer's recommendations.

Variations

General: If necessary, distribute variations in hue, colour or pattern uniformly, by mixing pavers or paving batches before laying.

Thickness: Accommodate variations in paver thickness by placing shims under a paver corner on top of the pedestal head, to the manufacturer's recommendations.

3.3 COMPLETION

Spare pavers

General: Supply spare matching pavers of each type for future replacement purposes. Store the spare materials on site.

Quantity: At least 1% of the quantity installed.

Cleaning

General: Leave pavements clean on completion.

Operation and maintenance manuals

Requirement: Prepare a manual that includes details on the care and maintenance of the paving and pedestals, including procedures for future height adjustment to maintain installation tolerances and for maintaining the slip-resistance classification stating the expected life of the slip-resistance classification.

Warranties

Installation: As per manufacturer's recommendation

Pavers: See manufacturer's warranty

Pedestals: See manufacturer's warranty

4 SELECTIONS

4.1 PRODUCT

Pedestal schedule

	PD1	PD2	PD3
Manufacturer			
Type			
Material			
Model number			
Height (mm)			
Lockable			
Bracing material			
UV resistance			

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Paving schedule

	Pv1	Pv2	Pv3
Product			
Work size			
Material			
Colour			
Surface finish			
Stone: Supplier			
Stone: Quarry			
Stone: Grade			
Slip resistance classification			

Tactile ground surface indicators schedule

	A	B	C
Product			
Type			
Edge protector			
Material			
Colour			

0310 CONCRETE - COMBINED

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide cast in situ reinforced concrete, as documented.

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Performance

Requirements:

- Conforming to the design details and performance criteria.
- Satisfying quality and inspection requirements.
- Compatible with documented applied finishes.

1.2 DESIGN

General

Formwork: The design of formwork, other than permanent composite form systems, is the contractor's responsibility. Allow for dimensional changes, deflections and cambers resulting from the following:

- Imposed actions.
- Concrete shrinkage and creep.
- Temperature changes.
- The application of prestressing forces (if any).

Structural design: To AS 3600 (2018).

Post-tensioned concrete: To AS 3600 (2018).

Concrete structures retaining liquids: To AS 3735 (2001).

Requirements

General: To DESIGN in *0171 General requirements*.

1.3 CROSS REFERENCES

General

Requirement: Conform to the following:

- *0171 General requirements*.

1.4 STANDARDS

General

Formwork design and construction: To AS 3610.1 (2018) and AS 3610.2 (Int) (2023).

Plywood formwork: To AS 6669 (2016).

Composite steel-concrete construction, including profiled steel sheeting and shear connectors: To AS/NZS 2327 (2017).

Reinforced concrete construction: To AS 3600 (2018).

Specification and supply of concrete: To AS 1379 (2007).

Concrete structures for retaining liquids: To AS 3735 (2001).

Residential ground slabs and footings: To AS 2870 (2011).

Post-tensioned concrete: To AS 3600 (2018).

Strand, bar and wire: To AS 4672.1 (2007).

Design, installation and testing of post-installed and cast-in fastenings: To AS 5216 (2021).

Formed surfaces: To AS 3610.1 (2018).

1.5 INTERPRETATION

Definitions

General: For the purposes of this worksection, the definitions given in AS/NZS 1314 (2003), AS 1379 (2007), AS 3600 (2018), AS 3610.1 (2018) and the following apply:

- Ambient temperature: The air temperature at the time of mixing and placing of concrete.
- Anti-burst reinforcement: Reinforcement cage surrounding anchorages to control the tensile bursting stresses.
- Early age strength: A mean compressive strength at 7 days exceeding the values shown in AS 1379 (2007) Table 1.2.
- Green concrete: Concrete that has recently set but has not achieved any design strength.
- Sample: A portion of material taken for assessment, representative of the larger quantity of material from which it was taken.
- Specimen: A portion of a sample that is submitted for testing.
- Weather – cold: Ambient shade temperature less than 10°C.
- Weather – hot: Ambient shade temperature greater than 30°C.

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1.6 TOLERANCES

Formwork

Plumb of elements more than 8 m high: 1:1000.

Plumb of elements not more than 8 m high: To AS 3610.1 (2018).

Position: Construct formwork so that finished concrete conforms to AS 3600 (2018) clause 17.5, AS 3610.1 (2018) clause 3.3 and as documented.

Reinforcement

Fabrication: To AS 3600 (2018) clause 17.2.

Reinforcement and tendon position: To AS 3600 (2018) clause 17.5.3.

Formed surfaces

Form face deflections: To AS 3610.1 (2018) Table 3.3.4.1.

Straight elements: To AS 3610.1 (2018) Table 3.3.5.1.

Unformed surfaces

Flatness: To the **Flatness tolerance class table**, using a straightedge placed anywhere on the surface in any direction, for the documented class of finish.

Flatness tolerance class table

Class	Measurement	Maximum deviation (mm)
A	2 m straightedge	4
B	3 m straightedge	6
C	600 mm straightedge	6

1.7 SUBMISSIONS

Certification

Formwork design certification: For all formwork other than permanent composite form systems, submit certification by a professional engineer experienced in formwork design verifying conformance of the design.

Formwork execution certification: Submit certification by a professional engineer experienced in formwork design and construction, verifying conformance of the completed formwork, including the suitability of the formwork for the documented surface finish class.

Design documentation

Formwork calculations: Submit calculations by a professional engineer experienced in formwork design to show that allowable concrete stresses will not be exceeded and if proposed, formwork designed for the following:

- Formwork procedures or loadings that differ from those documented.
- Props above a floor that do not coincide with the props below.
- Undocumented formwork shoring or stripping procedures.
- Loadings from stacked materials.

Post-tensioned calculations: Submit the following:

- Calculations of tendon jacking forces, theoretical extensions and losses for each stressing stage and at final stressing, before stressing operations begin.

- Expected loss of prestress due to friction in the jack and anchorage, and along the tendon including the friction curvature coefficient and the angular deviation due to wobble effects.
- Expected draw-in during anchorage.

Execution details

Moveable formwork: Provide the following details on the formwork drawings:

- Table form and climbing formwork: Proposed method and sequence of moving the formwork to provide concrete of the documented quality and surface finish.
- Continuously climbing formwork (Slipform): The average rate of movement.

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Reshoring: Submit details of any proposed reshoring.

Reinforcement: Submit the following:

- General: Details of any proposed changes to documented reinforcement.
- Damaged galvanizing: Details of proposed repair to AS/NZS 4680 (2006) Section 8.
- Mechanical bar splices: Details and test certificates for each size and type of bar to be spliced.
- Provision for concrete placement: Details of spacing or cover to reinforcement that does not conform to AS 3600 (2018).
- Splicing: Details of any proposed changes to documented requirements.
- Welding: Details of any proposed welding of reinforcement to AS/NZS 1554.3 (2014).

Post-tensioning: Submit the following:

- Details of the proposed post-tensioning system tested and certified to AS/NZS 1314 (2003).
- Safe work method statement (SWMS) including the name and contact details of the subcontractor.
- Details of proposed gauging, stressing and grouting equipment including current calibration certificates.

Concrete: Submit proposals for mixing, placing, finishing and curing concrete including the following:

- Changes to the concrete mix.
- Changes to documented joint locations.
- Curing and protection methods.
- Cutting or displacing reinforcement, or cutting or coring hardened concrete.
- Handling, placement, compaction and finishing methods and equipment, including pumping.
- Placement under water.
- Sequence and times for concrete placement, and construction joint locations. Include any proposed sequential placement of slab segments.
- Site storage, mixing and transport methods and equipment, if applicable.
- Temperature control methods to suit hot or cold atmospheric conditions during concrete placement.
- Sawn joints: Submit details of proposed methods, timing and sequence of sawing joints.

Loading: Submit details of proposed construction systems, loads and procedures, including propping, re-shoring and any proposals for early application of superimposed loads.

Formwork removal: Submit formwork removal procedures.

Emergency construction joints: If emergency construction joints are required, submit a report on the action taken.

Surface repairs: If surface repairs are required, submit proposed methods.

Products and materials

Void formers: Submit a certificate from the manufacturer as evidence of conformity to the requirements of PRODUCTS, **FORMWORK**, **Void formers**.

Post-tensioning: Submit the following:

- Grout: Proposed grout mix (including grading, proportions, compressive strength, shrinkage and additives if any).
- Epoxy grout: If required, proposed formulation.

Concrete product conformity: Submit evidence of conformity, as appropriate, as follows:

- Certification by a JASANZ accredited third party.
- Test report describing tests and giving results that demonstrate that the product conforms.

Concrete mixes: Submit details, for each grade and type of concrete including any proposed use of special-purpose cement types.

Pre-mixed supply delivery dockets: For each batch, submit a docket listing the information required by AS 1379 (2007), and the following:

- Special-class performance concrete: Documented performance and type of cement binder.
- Special-class prescription concrete: Details of mix, additives, and type of cement binder.
- Fibre reinforcement type and dosage.
- Method of placement and climate conditions during pour.
- Name of concrete delivery supervisor.
- Project assessment carried out each day.
- The concrete element or part of the works for which the concrete was ordered, and where it was placed.
- The total amount of water added at the plant and the maximum amount permitted to be added at the site.

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Curing compounds: Submit details of any proposed curing compounds, including the following:

- Dosage rates.
- Evidence of compatibility with concrete, and with applied finishes including toppings and render, if any, including methods of obtaining the required adhesion.
- For visually important surfaces, evidence that an acceptable final surface colour will be obtained.

Admixtures: Submit details of any proposed admixtures, including the following:

- Brand name.
- Place of manufacture.
- Basic chemical composition.

Type tests: Submit test results for the following:

- Reinforcement strength and ductility: To **REINFORCEMENT**, **Tests**.
- Post-tensioning:
  - Anchorage, anchorage assemblies and couplings: To **POST-TENSIONING**, **Tests**.
  - Steel strand, wire and bar: To **POST-TENSIONING**, **Tests**.
- Liquid membrane-forming curing compounds: To **MISCELLANEOUS**, **Curing compounds**.

Records

Post-tensioning: Submit the following:

- Tendon installation record.
- Post-tensioning stressing schedule.
- Post-tensioning grouting record.

Site extensions: Submit the site extensions to **POST-TENSIONING**, **Stressing** on the same day as measured for review and approval by a professional engineer.

Samples

Requirement: Submit samples to PRODUCTS, **GENERAL**, **Samples**.

Shop drawings

Formwork: Submit shop drawings including details of proposed forms, falsework, form liners, bolt positions, release agents and, where applicable, re-use of formwork.

Post-tensioned drawings: Submit shop drawings showing the following:

- Concrete profiles.
- Reinforcement.
- Profiles, sizes and details of tendons, tendon numbers, anchorages, ducts, duct formers, splicing, sheathing, end block reinforcement and other associated components.
- Stressing requirements including sequence of stressing, jacking forces and the basis of assumed loss calculations.
- Number, size and position of grout openings, vents and drain holes in the ducts.

Cores, fixings and embedded items: Submit the proposed locations, clearances and cover and show any proposed repositioning of reinforcement.

Subcontractors
Pre-mixed supply: Submit names and contact details of proposed pre-mixed concrete suppliers and alternative source of supply in the event of breakdown of pre-mixed or site mixed supply.

Tests
Requirement: Submit test results of the following:
- Concrete:
  . Early age compressive strength.
  . Other concrete properties, as documented.
- Grout:
  . Fluidity.
  . Bleeding.
  . Early expansion.
  . Compressive strength.
- Slip resistance test of completed installations.

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1.8 INSPECTION

Notice
Inspection: Give notice so that inspection may be made of the following:
- Used forms, after cleaning and before re-use.
- Base or subgrade before covering.
- Membrane or film underlay installed on the base or subgrade.
- Completed formwork with all dust and debris removed from forms and reinforcement, tendons, cores, fixings and embedded items fixed in place before placing concrete.
- Concealed surfaces or elements before covering.
- Commencement of concrete placement and compaction.
- Finishing and curing of concrete.
- Evaluation of the off-form finishes.
- Evaluation of surface finish.

2 PRODUCTS

2.1 GENERAL

Samples
Requirement: Provide samples, as follows:
- Sample blocks of coloured concrete produced using the proposed mix and casting method before casting final concrete, as follows:
  . Number: 4.
  . Size (nominal): 300 x 300 x 50 mm.
- Duct-forming material.

2.2 FORMWORK

General
Form face, linings and release agents: Compatible with documented concrete surface finish and any proposed applied finishes to concrete.

Lost formwork: Free of timber or chlorides and not to impair the structural performance of the concrete members.

Void formers
Requirement: Material capable of maintaining rigidity and shape until the concrete has set, capable of withstanding construction loads and non-collapsible on absorption of moisture.

Profiled steel sheeting composite forms
Material: Hot-dipped zinc-coated sheet steel to AS 1397 (2021).

Minimum steel grade: G550.

Accessories: Use materials and corrosion protection compatible with the profiled steel sheeting.

Plywood forms

Material: To AS 6669 (2016).

Grade: Use appropriate grade for the documented design dimensions, loading and surface quality.

Joints: Seal the joints consistent with the documented surface finish class.

Tolerances: To AS 3610.1 (2018) Section 3.

2.3 REINFORCEMENT

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Fibre reinforcement

Steel fibres: To AS 3600 (2018) clause 16.7.1.

Synthetic fibres: To EN 14889-2 (2006).

Storage: Store in a dry environment. Do not stack.

Steel reinforcement

Standard: To AS/NZS 4671 (2019).

Bars: Profile, strength grade and ductility class: [complete/delete]

Welded mesh: Profile, strength grade, configuration, ductility class: [complete/delete]

Fabrication tolerances: To AS 3600 (2018) clause 17.2.2.

Surface condition: Provide surfaces conforming to the following:

- Free of loose or flaking mill scale and rust.
- Clean from oil, grease, mud or other material that would reduce the bond between the reinforcement and concrete.

Storage: Store reinforcement above the surface of the ground and protect from damage and deterioration by exposure.

Protective coating

Standard: To AS 3600 (2018) clause 17.2.1.2.

Requirement: For concrete elements containing protective coated reinforcement, provide the same coating type to all that element's reinforcement and embedded ferrous metal items, including tie wires, stools, spacers, stirrups, plates and ferrules, and protect other embedded metals with a suitable coating.

Epoxy coating: High-build, high solids, chemically resistant coating to AS/NZS 3750.14 (1997).

- Thickness: 200 µm minimum.

Galvanizing: To AS/NZS 4680 (2006), and as follows:

- Sequence: If fabricating after galvanizing, repair damaged galvanizing and coat cut ends.
- Zinc-coating (minimum): 600 g/m^2.

Tie wire

General: Annealed steel 1.25 mm diameter (minimum).

External and corrosive applications: Galvanized.

Supports

Standard: To AS/NZS 2425 (2015).

Tests

Reinforcement strength and ductility: Provide type test reports as evidence of conformity to AS 3600 (2018) Table 3.2.1 for each reinforcement type.

2.4 POST-TENSIONING

Grout properties

Standard: To AS 3600 (2018) clause 17.1.8.

Fluidity: Efflux times as follows:

- Immediately after mixing: 15 to 20 seconds.
- At the end of grouting or 45 minutes after mixing, whichever occurs first: Within ±3 seconds of the efflux time recorded immediately after mixing.

Maximum bleed: 0.5% final bleeding.

Maximum early expansion: 0.5% at 3 hours.

Maximum shrinkage: 1% by volume after 24 hours.

Maximum water:cement ratio: 0.4 (by mass).

Compressive strength: 32 MPa at 7 days.

Grout materials

Fine aggregates: Maximum nominal aggregate size of 1 mm. Do not use aggregates for post-tensioning grout when the cross-sectional area of the duct is less than 5 times the cross-sectional area of the tendon.

Cement: To AS 3972 (2010), free from calcium chloride and less than two months old.

Admixtures: To AS 1478.1 (2000). Include an anti-bleed additive.

Fly ash: To AS/NZS 3582.1 (2016), proportioned according to obtain early strength requirements.

Water: To AS 1379 (2007). Clean, free from oil, acid, alkali, organic or vegetable matter and including not more than 500 mg/L of chloride ions.

Epoxy grout type: Commercial epoxy formulation of compressive strength exceeding 40 MPa.

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Ducts

Robustness: Provide ducts with sufficient strength to retain their shape, resist damage during construction, and prevent deterioration or electrolytic action due to cement paste or water from the concrete entering the duct.

Wall thickness: To allow for abrasion during stressing of the tendon.

Size: To allow feeding of tendons and grouting.

Tendon material

Prestressing steel: Provide the following:

- Type and grade of strand, wire or bar, to AS 4672.1 (2007).
- Testing to AS/NZS 4672.2 (2007).

Strand type: 7 wire, stress relieved, high tensile steel.

Quality: Make sure tendons are not galvanized, have no nicks, pitting, indents, damage or foreign matter such as mud and dirt. Inspect at delivery and store the prestressing steel on supports clear of the ground.

Straightening of tendons: Not permitted. Supply tendons in coils large enough to self-straighten.

High tensile steel bars: Inspect individually and reject any bars with surface imperfections.

Anchorages, anchorage assemblies and couplings

General: To AS/NZS 1314 (2003).

Anchor plates: Hot-dip galvanized to AS/NZS 4680 (2006).

Tests

Prestressing strand, wire and bar:

- Provide test certificates for every delivery of strand, bar or wire.
- Standard: To AS/NZS 4672.2 (2007).

Anchorages:

- Stressing anchorage efficiency: To AS/NZS 1314 (2003) Appendix C.
- Non-stressing anchorage efficiency: To AS/NZS 1314 (2003) Appendix D.

Anchorage assemblies and couplings:

- Gripping efficiency: To AS/NZS 1314 (2003) Appendix B.
- Non-stressing anchorage efficiency: To AS/NZS 1314 (2003) Appendix D.

2.5 CONCRETE

General

Stockpile: If uniform, consistent colour is documented, stockpile sand, cement and aggregates.

Properties

Concrete mix and supply: Conform to the following:

- Normal-class: To AS 1379 (2007) clause 1.5.3.
  - . Properties: As documented.
- Special-class: To AS 1379 (2007) clause 1.5.4.

. Performance properties: As documented.
. Prescription properties: As documented.

Aggregates
Standard: To AS 2758.1 (2014).

Storage: Store in silos or on a hardstand located away from surface and ground water runoff. Allow for free drainage of rainwater and prevent contamination and intermixing of aggregates.

Cement
Standard: To AS 3972 (2010).

Age: Less than 6 months old.

Storage: Store cement bags in a dry, under cover and above ground environment.

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Supplementary cementitious materials:
- Fly ash: To AS/NZS 3582.1 (2016).
- Slag: To AS 3582.2 (2016).
- Amorphous silica: To AS/NZS 3582.3 (2016).
- Manufactured pozzolans: To AS 3582.4 (2022).

Water
Standard: To AS 1379 (2007) clause 2.4.

Requirement: Clean, free from oil, acid, alkali, organic or vegetable matter and not more than 500 mg/L of chloride ions.

Concrete colour
Standard: To AS 3610.1 (2018).

Chemical admixtures
Standard: To AS 1478.1 (2000), used to manufacturer's recommendations and free from chlorides, and other substances detrimental to concrete or reinforcing steel.

Early strength
Post-tensioned concrete:
- Initial stressing stage: TBC
- Final stressing stage: TBC

2.6 MISCELLANEOUS

Polymeric film underlay
Vapour barriers and damp-proofing membranes: To AS 2870 (2011) clause 5.3.3.

Curing compounds
Liquid membrane-forming compounds: To AS 3799 (1998).

Type tests: Provide certified test results for water retention to AS 3799 (1998) Appendix B for liquid membrane-forming compounds.

Joint fillers and sealants
Jointing materials: Provide jointing materials compatible with each other, and non-staining to concrete in visible locations.

Foamed materials (in compressible fillers): Closed cell or impregnated, not water absorbing.

Surface modifiers
Hardeners, sealants and protectors: Proprietary products conforming to the manufacturer's recommendations.

Slip resistance treatment: Proprietary products conforming to the manufacturer's recommendations.

3 EXECUTION

3.1 POLYMERIC FILM UNDERLAY

Location
Vapour barrier: Under slabs on ground, including integral ground beams and footings.

Damp-proofing membrane: Areas prone to rising damp or salt attack.

Base preparation
Requirement: Conform to base type, as follows:
- Concrete working base: Remove projections above the plane surface, and any loose material.
- Graded prepared subgrade: Blind with sand to create a smooth surface free from hard projections. Lightly wet the sand just before laying the underlay.

Installation
Standard: To AS 2870 (2011) clause 5.3.3.

Requirement: Lay underlay over the base, as follows:
- Lap joints at least 200 mm and seal the laps and penetrations with waterproof adhesive tape.
- Face the laps away from the direction of concrete pour.
- Continue up vertical faces past the damp-proof course where applicable, and tape fix at the top.
- Patch or seal punctures or tears before placing concrete.
- Cut back as required after concrete has gained strength and formwork has been removed.

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3.2 FORMWORK

General
Requirement: As documented.

Bolt holes
Formwork tie bolts left in the concrete: Position to achieve minimum 50 mm concrete cover to bolt.

Corners
Work above ground: Bevel with a chamfer at re-entrant angles, and a fillet at corners.

Face of bevel: 25 mm.

Embedments
Fixing: Fix embedments through formwork to prevent movement, or loss of slurry or concrete, during concrete placement.

Joints
Requirement: Provide joints that prevent loss of grout.

Openings
Vertical forms: Provide openings or removable panels for inspection and cleaning, at the base of columns, walls and deep beams.

Access: For thin walls and columns, provide access panels for placing concrete.

Release agents
Application: Before placing reinforcement, apply a release agent to form face and linings. Spread the coating uniformly in a thin film and remove any surplus before placing concrete.

Staining: If oil or grease is used, make sure that surfaces to be exposed will not be stained or discoloured.

Unlined timber forms: Thoroughly wet timber before oiling.

Climbing formwork
Provision for inspection: Provide access below the movable formwork, from which surface treatment and inspection may be carried out.

Profiled steel sheeting composite formwork
Fixing: If sheeting cannot be fixed to structural steel supports with puddle welds, or with welded shear studs, provide details of proposed fixings.

Steel linings
Rust: Clean off any rust and apply rust inhibiting agent before re-use.

Visually important surfaces
Surface finish classes 1, 2 or 3: Set out the formwork to give a regular arrangement of panels, joints, bolt holes, and similar visible elements in the formed surface.

Void formers
Protection: Keep void formers dry until use, install on a firm level surface and place reinforcement and concrete with minimum delay.

3.3 REINFORCEMENT

General

Fixing: To AS 3600 (2018) clause 17.2.5 and as documented.

Dowels

Fixing: If a dowel has an unpainted half, embed that half in the concrete placed first.

Tolerances:

- Alignment: 1:100.
- Location: ± half the diameter of the dowel.

Grade: 250N.

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Cover

Generally: As documented, to AS 3600 (2018) clause 4.10.

Structures for retaining liquids: As documented, to AS 3735 (2001) clause 4.4.

Residential ground slabs and footings: As documented, to AS 2870 (2011).

Supports

Concrete, metal or plastic supports: Provide as follows:

- Able to withstand construction and traffic loads.
- With a protective coating if they are ferrous metal, located within the concrete cover zone, or are used with galvanized or zinc-coated reinforcement.

Spacing:

- Bars: ≤ 60 bar diameters.
- Mesh: ≤ 600 mm.

Supports over membranes: Prevent damage to waterproofing membranes or vapour barriers. If appropriate, place a metal or plastic plate under each support.

Projecting reinforcement

Protection: If starter or other bars extend beyond reinforcement mats or cages, through formwork or from cast concrete, provide a plastic protective cap to each bar until it is cast into later work.

Bending

Restriction: Use only bars with bends as documented.

Site bending: If required to bend or straighten bars on site, conform to AS 3600 (2018) clause 17.2.3.2. Do not use heat, and only use methods that will not damage the steel and its structural properties.

Protective coatings: Repair coatings damaged by cutting or bending.

Tying

Requirement: Secure the reinforcement against displacement at intersections with wire ties or clips. Bend the ends of wire ties to prevent the ties projecting into the concrete cover.

Beams: Tie stirrups to bars in each corner of each stirrup. Fix other longitudinal bars to stirrups at 1 m maximum intervals.

Bundled bars: If required, tie bundled bars in closest possible contact. Provide tie wire at least 2.5 mm diameter and spaced not more than 24 times the diameter of the smallest bar in the bundle.

Columns: Secure longitudinal column reinforcement to all fitments (or helical reinforcement) at every intersection.

Mats: For bar reinforcement in the form of a mat, secure each bar at alternate intersections.

Splices

Requirement: Provide splices, as documented.

Welding: Do not weld reinforcement less than 3 bar diameters in length from any part of a bar that has been bent or re-straightened.

Fibre-reinforced concrete

Steel fibres: To AS 3600 (2018) Section 16.

Synthetic fibres: To EN 14889-2 (2006).

3.4 POST-TENSIONING

General

Protection: Protect post-tensioning tendons, anchorages, ducts, supports and grout from damage or contaminants, including from swarf, loose grease, oil and paint.

Tolerances: To AS 3600 (2018) clause 17.5.3.

Concrete cover: As documented.

Anchorages, ducts and tendons: To AS 3600 (2018) clause 17.3.

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Ducts

Placement: Locate and secure to positions, as documented.

Supports: Support and fix at regular intervals. Protect from collapse and other damage.

Sheathing: If ducts are formed with sheaths, provide sheathing material capable of transferring the tendon stresses to the body of the concrete.

Sequence: Assemble tendons on site by installing strand, bar or wire within the duct before concreting.

Damage: If damaged, repair ducts as follows:

- Small holes: Waterproof adhesive tape.
- Larger holes: Metal strips wrapped around the duct, with 100 mm overlap and sealed by a waterproof adhesive tape.

Crossover points: If ducts running in opposite directions clash, consult the professional engineer. Do not relocate ducts without approval.

Anchorages

Anti-burst reinforcement: As documented.

Tendons

Conformance: Provide tendons, as documented.

Care: Do not weld tendons. Do not expose tendons to sparks, ground current or excessive temperatures. Cut to length using mechanical means.

Grout fittings and ducts: Protect from collapse and other damage. Prevent ingress from concrete slurry.

Protection: Make sure tendons are not displaced by heavy and prolonged vibration, the pressure of the concrete being placed, workmen or construction traffic.

Slab marking: If there is possibility for future slab penetrations, mark the tendon locations, either on the slab surface or the soffit.

Tendon installation record: Provide details of the following:

- Date.
- Strand source.
- Coil number.
- Heat or cast number.
- Anchorage, duct and wedge batch numbers.
- Operator and supervisor names.
- Locations products are installed.
- Drawing number and revision.

Grout openings

Provision: Provide grout openings, vents and drain holes as documented, including at each end, and at high points except where the tendon curvature is small and the tendon is relatively level.

Gauges and jacks

General: To AS 1349 (1986).

Accuracy: Use equipment capable of establishing loads within 3% accuracy.

Calibration period: Calibrate gauges and jacks at intervals not exceeding 100 operations or 6 months, whichever is earlier, or if any inaccuracy in the gauges is suspected.

Sets: Calibrate and use jacks and gauges as a set.

Stressing

Requirement: To the approved SWMS.

Tensioning: To AS 3600 (2018) clause 17.3.4.5.

Stressing procedure: Carry out stressing after early age test results indicate concrete has attained the required strength.

Stressing stages: As documented.

Marking: Mark strands after wedges are installed and before initial stress.

Slip: Check markings whilst stressing to make sure there is no slip of strands.

Non-conformance: If the difference between theoretical and measured extensions is greater than 10%, provide an explanation of the cause.

Cutting tendons: Do not cut tendons until the actual extensions are approved.

Re-stress or de-stress: Adjust stress in tendons if necessary, after the theoretical and site extensions have been compared.

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Post-tensioning stressing schedule: Provide a stressing schedule, including the following information.

- Date.
- Early age concrete compressive strength results.
- Operator and supervisor names.
- Equipment calibration date, including the identification number of dynamometers, gauges, pumps and jacks.
- Tendon identification.
- Initial and final stressing force (or pressure).
- Theoretical and actual extensions for each stressing stage.
- Non-conformance including tendon breakage.
- Drawing number and revision.

Grouting

Grout mixing and preparation: To AS 3600 (2018) clause 17.1.8.2 or to the manufacturer's recommendations for prebagged grout. Use grout as soon as possible and within 45 minutes of adding cement to mixing water.

Ambient air temperature: Do not grout, if the surrounding air temperature is lower or expected to be lower than 5°C.

Timing: Grout tendons as soon as practicable after stressing and within the time limits applicable to the atmospheric corrosivity category, as documented:

- C1 or C2: Three weeks.
- C3: Two weeks.
- C4: One week.
- C5 or CX: Seek specialist advice.

Exterior and interior corrosivity categories: To **CORROSION RESISTANCE**, **Atmospheric corrosivity category** in *0171 General requirements*.

Equipment: Do not use manually powered grouting machines.

Procedure: Prevent damage to grout vents and fittings during grouting. Completely fill the duct during grouting. Inject grout into voids between tendons, ducts and anchorages, until grout flows from vents without air bubbles. Close vents as they fill, progressively in the direction of flow. If there is a blockage or interruption, completely flush grout from the duct using water.

Grout caps: Provide at each anchorage and seal for grouting and venting operations.

Post-tensioning grouting record: For each duct grouted, provide the following:

- Date and time.
- Composition of the grout (water:cement ratio, admixtures) and batch numbers.
- Ambient temperature.
- Operator and supervisor names.
- Duct and tendon identification.
- Grout properties.
- Details of grouting interruptions including pumping or supply interruptions, blockages or loss of grout.

Protection

Grout ducts: Do not subject grouted ducts to shock, vibration, construction traffic or similar loads until 24 hours after completion of grouting.

Permanent protection

Tendons and anchorages: On completion of stressing and grouting, permanently protect anchorage and tendons. Provide at least 40 mm of cover over the cut tendons when the recesses are concreted. Keep anchorages free of foreign matter (rust, grease, oil, paint).

3.5 CONCRETE SUPPLY

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Elapsed delivery time

General: Make sure that the elapsed time between the wetting of the mix and the discharge of the mix at the site is in conformance with the **Elapsed delivery time table**. Do not discharge at ambient temperature below 10°C or above 30°C unless approved heating or cooling measures are taken to deliver concrete within the range 5°C to 35°C.

Elapsed delivery time table

Concrete temperature at time of discharge (°C)	Maximum elapsed time (minutes)
5 – 24	120
24 – 27	90
27 – 30	60
30 – 35	45

Pre-mixed supply

Addition of water: To AS 1379 (2007) clause 4.2.3.

Transport method: Select to prevent segregation, loss of material and contamination of the environment, and not to adversely affect placing or compaction.

Site mixed supply

Emergencies: If mixing by hand, provide details.

Plant: Mix concrete in a plant located on the construction site.

3.6 TESTING

General

Reports and records of test results: To the relevant parts of the AS 1012 series. Keep results on site.

Assessment process of test results

Standard: To AS 1379 (2007).

Method of assessment: Project assessment.

Sampling

Sampling method: To AS 1012.1 (2014).

Sampling locations: To AS 1012.1 (2014) and the following:

- Slump and spread tests: On site, at the point of discharge from the agitator.
- Compressive strength tests: Spread the site sampling evenly throughout the pour.

Sampling frequency: To AS 1379 (2007) Sections 5 and 6 and the following:

- Slump and spread tests: Take at least one sample from each batch.
- Compressive strength tests: To the **Project assessment strength grade sampling table**.

Project assessment strength grade sampling table

Number of batches for each type and grade of concrete per day	Minimum number of samples per batch: Columns and load bearing wall elements	Minimum number of samples per day: Other elements
1	1	1
2-5	1	2
6-10	1	3
11-20	1	4
each additional 10	1	1 additional

Making and curing of specimens

General: To AS 1012.8.1 (2014), AS 1012.8.2 (2014) and AS 1012.8.4 (2015).

Test methods

General: To the relevant parts of the AS 1012 series.

Compressive strength: To AS 1012.9 (2014).

Flexural strength: To AS 1012.11 (2000).

Acceptance criteria:

- Concrete properties: As documented.
- Early age compressive strength: As documented.

Drying shrinkage at 56 days: To AS 1012.13 (2015).

Other concrete properties: As documented.

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Early age concrete compressive strength for post-tensioning

Sampling frequency: For each post-tensioned element, take at least 3 samples for testing at the age of each intended stage of stressing plus at least 3 reserve samples. Take at least one sample every 2 batches.

Sampling locations: Distribute sampling locations randomly, include anchorage areas and the final concrete placement area. Reference the structural element from which the sample is taken.

Making and curing of specimens: To AS 1012.8.1 (2014) and the following:

- Site cure all test cylinders for early age testing.
- For slab samples, maintain exposure to the same weather and temperature by curing the samples on the adjacent deck.
- Retain test cylinders on site until the morning of the test.

Grout properties

Fluidity: To ASTM C939/C939M (2022) for each grout batch.

Bleeding and early expansion: To ASTM C940 (2022), modified to simulate the wicking of strands and tested once every 20 m^3.

Compressive strength: To AS 1478.2 (2005) at a frequency of 3 cubes per grouting session.

Liquid retaining structures

Testing for liquid tightness: To AS 3735 (2001) Section 7.

Slip resistance tests

Slip resistance of completed installation: To AS 4663 (2013).

3.7 CORES, FIXINGS AND EMBEDDED ITEMS

General

Requirement: Install fasteners to manufacturer's recommendations and the assumptions of AS 5216 (2021) Appendix G.

Adjoining elements

Fixings: Provide fixings for adjoining elements. If required, provide temporary support to the adjoining elements during concreting, to prevent movement.

Protection

General: Protect embedded and projecting items against damage.

Compatibility: Provide inserts, fixings and embedded items that are compatible with each other, with the reinforcement and with the documented concrete mix and surface finish.

Corrosion protection: In external or exposed locations, galvanize anchor bolts and embedded fixings as follows:

- All threaded products: To AS/NZS 1214 (2016).
- All non-threaded products: To AS/NZS 4680 (2006).

Grease: Grease threads that will project from the concrete.

Structural integrity

Position: Fix cores and embedded items to prevent movement during concrete placement. In locating cores, fixings and embedded items, displace but do not cut reinforcement, and maintain documented cover to reinforcement.

Isolation: Isolate embedded items to prevent water tracking to concrete that provides minimum cover to reinforcement.

Tolerances

General: Maximum deviation from correct positions:

- Anchor bolt groups for structural steel: To AS/NZS 5131 (2016) Appendix F.
- Cores and embedded items generally: 10 mm.
- Other fixing bolts: 3 mm.

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3.8 CONCRETE WORKING BASE

Finish

Membrane support: Wood float finish or equivalent.

Installation

General: Lay over the base or subgrade and screed to the required level.

Surface flatness tolerance

Maximum deviation: 6 mm from a 3 m straightedge.

3.9 PLACING AND COMPACTION

Preparation

Cleaning: Before placing concrete, remove free water, dust, debris and stains from the form face and the formed space.

Placing

Horizontal transport:

- Use suitable conveyors, clean chutes, troughs, hoppers or pipes.
- Minimise jolting and vibration of concrete whilst transporting around site.
- Discharge vertically in a controlled manner into forms or further distribution equipment.

Methods: Avoid segregation and loss of concrete, and minimise plastic settlement. Maintain a nominally vertical and plastic concrete edge during placement.

Horizontal elements: Place concrete in layers not more than 300 mm thick. Compact the following layer into previous layer before previous layer has taken initial set.

Vertical elements: Limit the free fall of concrete to maximum of 2 m.

Fibre-reinforced concrete: For pumped concrete, use a 100 to 150 mm mesh screen on the pump hopper to catch fibre balls.

Reinforcement: Maintain the documented concrete cover to reinforcement.

Compaction

Methods: Use immersion and screed vibrators accompanied by hand methods as appropriate to remove entrapped air and to fully compact the mix.

Vibrators: Do not allow vibrators to contact set concrete, reinforcement or items embedded in concrete including pipes and conduits. Do not use vibrators to move concrete along the formwork. Avoid causing segregation by over-vibration.

Placing records

Logbook: Keep on site and make available for inspection a logbook recording each placement of concrete, including the following:

- Date.
- Specified grade and source of concrete.
- Slump measurements.
- The portion of work.
- Volume placed.

Rain

Protection: During placement and before setting, protect the surface from damage.

Time between adjacent placements
Minimum time delay: As documented.

Placing in cold weather
Cement: Do not use high alumina cement.

Temperature limits: Maintain the following:

- Freshly mixed concrete: ≥ 5°C.
- Forms and reinforcement before and during placing: ≥ 5°C.
- Water: Maximum 60°C when placed in the mixer.

High early strength cement: If deteriorating weather conditions are predicted, use high early strength cement.

Temperature control: Heat the concrete materials, other than cement, to the minimum temperature necessary so that the temperature of the placed concrete is ≥ 5°C.

Admixtures: Do not use calcium chloride, salts, chemicals or other material in the mix to lower the freezing point of the concrete.

Frozen materials: Do not allow frozen materials or materials containing ice to enter the mixer, and keep forms, materials, and equipment coming in contact with the concrete free of frost and ice.

Freezing: Prevent concrete from freezing.

Placing in hot weather
Requirement: Prevent premature stiffening of the fresh mix and reduce water absorption and evaporation losses.

Evaporation control barriers: Erect barriers to protect freshly placed concrete from drying winds.

Evaporation rate limit: ≤ 0.50 kg/m^2/h.

Temperature control: Select one or more of the following methods to make sure the temperature of the concrete mix does not exceed 35°C:

- Cool the concrete using liquid nitrogen injection before placing.
- Cover horizontal transport containers.
- Forms and reinforcement before and during placing: ≤ 35°C.
- Spray the coarse aggregate using cold water before mixing.
- Use chilled mixing water.

Placing under water
General: Do not place under water unless conditions prevent dewatering.

3.10 JOINTS

Construction joints
Location: Do not relocate or eliminate construction joints, or form undocumented construction joints. If emergency construction joints are made necessary by unforeseen interruptions to the concrete pour, prepare a report on the action taken.

Finish: Butt join the surfaces of adjoining pours. In visually important surfaces, make the joint straight and true, and free from blemishes impermissible for its surface finish class.

Joint preparation: Scabble hardened concrete joint surface to a minimum 3 mm amplitude. Do not damage projecting reinforcing steel. Remove loose or soft material, foreign matter and laitance. Dampen the surface just before placing the fresh concrete and coat with a neat cement slurry.

Expansion and isolation joints
Expansion joint dowels: Make sure the location and alignment of installed dowels match the documented requirements. Make sure dowels are not displaced during concrete placement.

Bond breaking: Provide back-up materials for sealants, including backing rods, which do not adhere to the sealant.

Preparation: Before filling, dry and clean the joint surfaces, and prime.

Joint filling: Fill with jointing materials as documented. Finish visible jointing material neatly, flush with adjoining surfaces.

Watertightness: Apply the jointing material so that joints subject to ingress of water are made watertight.

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Slip joints

General: Provide slip joints, as documented.

Requirement: If concrete slabs are supported on masonry, provide proprietary slip joints.

Slab-on-grade control joints

General: Provide control joints, as documented.

Tooled and sawn joints: Form joints within the concrete surface with either a grooving tool or a mechanical circular saw.

Timing: Form joints as early as possible after placement of concrete. Make sure the concrete has hardened sufficiently to prevent dislodging aggregate.

Joint width: 3 to 5 mm wide.

Joint depth: A minimum of (0.25 - 0.33) x depth of the concrete.

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3.11 SURFACE MODIFIERS

General

Application: Apply to clean surfaces, to the manufacturer's recommendations.

3.12 FORMED SURFACES

General

Surface finish: To AS 3610.1 (2018) Table 3.3.3.1 and as documented.

Damage: Do not strip formwork prematurely if damage to the concrete may be caused.

Curing

Requirement: If formwork is stripped before the minimum curing period for the concrete has elapsed, continue curing the exposed faces as soon as the stripping is completed, and within an hour of exposure.

Evaluation of formed surfaces

General: If evaluation of a formed surface is required, complete the evaluation before surface treatment.

Finishing methods

Requirement: If soffits of horizontal concrete elements or faces of vertical concrete elements are to have a finish other than an off-form finish, provide finishes as documented.

Form removal: If vertical face formwork needs to be removed for finishing methods while the concrete is green, make sure the concrete has sufficiently set to prevent slump.

Blasted finishes:

- Abrasive: Blast the cured surface using hard, sharp graded abrasive particles until the coarse aggregate is in uniform relief.
- Light abrasive: Blast the cured surface using hard, sharp graded abrasive particles to provide a uniform matt finish without exposing the coarse aggregate.

Bush hammered finish: Remove the minimum matrix using bush hammering to expose the coarse aggregate, recessing the matrix no deeper than half the aggregate size, to give a uniform texture.

Exposed aggregate finish: While the concrete is green, wet the surface and scrub with stiff fibre or wire brushes, flushing continuously with clean water, until the aggregate is uniformly exposed. Do not use acid etching. Rinse the surface with water.

Floated finishes:

- Sand floated finish: While the concrete is green, wet the surface and rub using a wood float. Rub fine sand into the surface until a uniform colour and texture is produced.
- Grout floated finish: While the concrete is green, dampen the surface and spread a slurry, using hessian pads or sponge rubber floats. Remove surplus slurry and work until a uniform colour and texture is produced.

Smooth rubbed finish: While the concrete is green, wet the surface and rub using a carborundum or similar abrasive brick until a uniform colour and texture is produced.

3.13 UNFORMED SURFACES

General

Surface finish: As documented.

Finished levels: Strike off, screed and level slab surfaces to finished levels and to the flatness tolerance class documented.

Finishing methods – primary finish

Machine float finish:

- After levelling, consolidate the surface using a machine float.
- Cut and fill and refloat immediately to a uniform, smooth, granular texture.
- Hand float in locations inaccessible to the machine float.

Steel trowel finish: After machine floating, finish as follows:

- Use power or hand steel trowels to produce a smooth surface relatively free from defects.
- When the surface has hardened sufficiently, re-trowel to produce the final consolidated finish free of trowel marks and uniform in texture and appearance.

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Burnished finish: Continue steel trowelling until the concrete surface attains a polished or glossy finish, uniform in texture and appearance, and free of trowel marks and defects.

Wood float finish: After machine floating, use wood or plastic hand floats to produce the final consolidated finish free of float marks and uniform in texture and appearance.

Broom finish: After machine floating and steel trowelling use a broom or hessian belt drawn across the surface to produce a coarse even-textured transverse-scored surface.

Scored or scratched finish: After screeding, use a stiff brush or rake drawn across the surface before final set to produce a coarse scored texture.

Sponge finish: After machine floating and steel trowelling, use a damp sponge to wipe the surface to produce an even textured sand finish.

Exposed aggregate finish: After floating and when concrete has stiffened, wet the surface and scrub with stiff fibre or wire brushes, flushing continuously with clean water, until the aggregate is uniformly exposed. Rinse the surface with water.

Finishing methods – supplementary finish

Abrasive blast: After steel trowelling, abrasive blast the cured surface to provide texture or to form patterns without exposing the coarse aggregate, using hard, sharp graded abrasive particles.

Coloured applied finish: After machine floating, apply a proprietary liquid or dry shake material to the manufacturer's recommendations and trowel to achieve the required appearance.

Stamped and coloured pattern finish: Provide a proprietary finishing system.

Polished finish: After steel trowelling, grind the cured surface of the concrete.

3.14 CURING

General

Requirements: Take into account the average ambient temperature at site over the relevant period affecting the curing and adopt procedures to make sure of the following:

- Curing: Cure continuously from completion of finishing, when the concrete has set sufficiently not to be damaged by the curing process.
- Minimum curing period: Total cumulative number of days or fractions of days, during which the air temperature in contact with the concrete is above 10°C, conforms to AS 3600 (2018) clause 17.1.5 and the following, unless accelerated curing is adopted:
  - Fully enclosed internal surfaces/Early age strength concrete: 3 days.
  - Other concrete surfaces: 7 days.
- End of curing period: Prevent rapid drying out at the end of the curing period.
- Protection: Maintain at a reasonably constant temperature with minimum moisture loss, during the curing period.

Curing method: [complete/delete]

Curing compounds

Liquid membrane-forming compounds: Provide a uniform continuous flexible coating without visible breaks or pinholes, which remains unbroken for at least the required curing period after application.

Substrates: Do not use wax-based or chlorinated rubber-based curing compounds on surfaces forming substrates to applied finishes, concrete toppings and cement-based render.

Self-levelling toppings: If also used as curing compounds, conform to AS 3799 (1998).

Visually important surfaces: Apply curing compounds to produce uniform colour on adjacent surfaces.

Water curing

Method: Select a method of ponding or continuous sprinkling that does not damage the concrete surface during the required curing period.

Wet hessian curing

Method: Place wet hessian sheets/bags over concrete surface. Keep hessian wet during the required curing period by regularly sprinkling with water. Protect from wind and traffic.

Impermeable sheet curing

Method: Place impermeable sheets, to ASTM C171 (2020), over concrete surface. Anchor down and tape joints in material to retain concrete moisture. Keep the concrete surface covered for the required curing period.

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Cold weather curing

Temperature: Maintain concrete surface temperatures above 5°C for the duration of the curing period.

Hot weather curing

Requirement: If the concrete temperature exceeds 25°C, or the ambient shade temperature exceeds 30°C, protect from drying winds and sun by using an evaporative retarder until curing has commenced.

3.15 COMPLETION

Early loading

Prohibition: Prepare proposals for the application of any superimposed load (including backfilling), to any part of what will become a load bearing structure, within 21 days of placing concrete. Do not apply superimposed loads unless it can be demonstrated that 95% of the design strength of the concrete has been achieved.

Formwork removal

Extent: Remove formwork, other than permanent forms and trapped forms, including formwork in concealed locations.

Timing: Do not disturb formwork until concrete has reached sufficient hardness to withstand formwork movements and removal without damage.

Stripping:

- General: To AS 3600 (2018) where it is more stringent than AS 3610.1 (2018) and AS 3610.2 (Int) (2023).
- Vertical formwork: To AS 3610.1 (2018) Appendix C Table C2.
- Multi-storey work: Remove formwork without disturbing props supporting succeeding floors.
- Post-tensioned concrete: Remove formwork supporting post-tensioned concrete members to AS 3600 (2018) clause 17.6.2.7.

Removable bolts: Remove tie bolts without damaging the concrete.

Bolt hole filling: Provide material with durability and colour matching the concrete.

Recessed filling: Fill or plug the hole to 6 mm below the finished surface.

Curing: If formwork is stripped before the minimum curing period for the concrete has elapsed, continue curing the exposed faces as soon as the stripping is completed, within an hour of exposure.

Protection

General: Protect the concrete from damage due to construction loads, physical and thermal shock, and excessive vibration, particularly during the curing period.

Surface protection: Protect finished concrete surfaces and applied finishes from damage.

4 SELECTIONS

4.1 SCHEDULES

Formwork dimensional deviation schedule

Dimension or measurement	Location or element	Deviation (mm)

Dimension or measurement	Location or element	Deviation (mm)

Steel fibre reinforcement schedule

	A	B	C
Product			
Dosage (kg/m^3)			
Shape			
Tensile strength (MPa)			
Type/Group			
Diameter (mm)			
Length (mm)			
Aspect ratio			
Coating			

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Tendon schedule

Structural element	Tendon material	Tendon size (mm)

Concrete properties schedule – performance

	A	B	C
Normal and special-class			
Air entrainment – air volume (%)			
Maximum aggregate size (mm)			
Slump (mm)			
Strength grade/characteristic compressive strength f'$_c$ (MPa)			
Special-class			
Bleed rate (mL/mm^2)			
Cement type			
Spread (mm)			
Density of hardened concrete (kg/m^3)			
Density of plastic concrete (kg/m^3)			
Early age strength (MPa)			
Flexural strength (MPa)			
Indirect tensile strength (MPa)			
Water:cement ratio maximum			
Drying shrinkage			
Duration of air drying			

Concrete properties schedule – prescription

	A	B	C
Aggregate water absorption, maximum (%)			
Admixtures: Proportions			
Admixtures: Types			
Coarse aggregate: Proportions			

	A	B	C
Coarse aggregate: Size (mm)			
Coarse aggregate: Types			
Coarse aggregate: Colour			
Fine aggregate: Proportions			
Fine aggregate: Types			
Minimum cement content (kg/m^3)			
Mix type			
Water:cement ratio, maximum			

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Tests schedule

Property	Test method	Test/sampling frequency
Bleeding	AS 1012.6 (2014)	
Density of hardened concrete	AS 1012.12.1 (1998) or AS 1012.12.2 (1998)	
Density of plastic concrete	AS 1012.5 (2014)	
Indirect tensile strength	AS 1012.10 (2000)	
Modulus of rupture (flexural strength)	AS 1012.11 (2000)	

Compressive strength control tests schedule

Concrete element	28 day strength (MPa)	Transfer strength (MPa)	Transfer strength age (days)	Early strength (MPa)	Early strength age (days)

Special-class concrete testing schedule

Mix designation	Test	Compliance criteria	Frequency of special testing

Minimum time delay schedule

Between (pour locations)	Minimum period between adjacent pours (days)
Adjacent pours abutting horizontal construction joints in walls or columns	
Adjacent pours abutting vertical construction joints in walls	
Columns and slabs	
Floor slab construction joints	
Pour strips and adjacent concrete	
Retaining wall construction joints	

Test panels schedule

Application	Incorporated features	Panel size

Formed surface finishes schedule

	A	B	C
Surface finish class to AS 3610.1 (2018)			
Formwork lining type			
Bolt hole filling			
Evaluation			
Surface finishing method			
Abrasive particle type			

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Surface finish class schedule

	Class 1	Class 2	Class 3
Colour control			
Critical faces of elements			
Distance between face steps (mm)			
Form face span and direction of span			
Repairs	Not permitted		
Liner details, pattern and accuracy			
Surface pattern details and accuracy			
Surface treatment pattern			
Tie rod pattern			

Unformed surface finishes schedule

	A	B	C
Flatness tolerance class			
Primary finish			
Supplementary finish			
Slip resistance treatment			
Slip resistance classification			
Surface modifier			

0321 PRECAST CONCRETE

1 GENERAL

1.1 RESPONSIBILITIES

General

Responsibility: Provide precast concrete elements, as documented.

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Performance

Requirement: Conform to the following:

- Designed and certified by a professional engineer.
- Designed to conform to the documented performance requirements.
- Designed for handling, transport and erection.
- Fabricated in conformance with the shop drawings.
- Undamaged by handling and installation.
- Certified by a professional engineer after erection.
- Ensure the first precast unit of each type of finished installed on Site and accepted by the Superintendent, representing the acceptable level of finish

1.2 DESIGN

General

In-service structural design: To AS 3600 (2018) and BCA (2022) B1D2.

Erection design: To AS 3850.2 (2024).

Design of post-installed and cast-in fastenings: To AS 5216 (2021).

External wall panels and connections: To BCA (2022) C2D12.

Requirements

General: To DESIGN in *0171 General requirements*.

Performance requirements: [complete/delete]

Authority requirements: [complete/delete]

Structural performance requirements: Conform to the following:

- Refer to Precast Concrete Schedule
- Ensure all interfaces are fully coordinated prior to commencement

1.3 CROSS REFERENCES

General

Requirement: Conform to the following:

- *0171 General requirements*.

1.4 STANDARDS

General

Precast elements: Conform to AS 3600 (2018) and NP PCH (2009) (Precast concrete handbook).

Materials, components and equipment for manufacture: To AS 3850.1 (2024).

Planning, design, construction, casting, transportation, erection and installation: To AS 3850.1 (2024).

Precast flooring systems: To AS 3600 (2018).

Installation and testing of post-installed and cast-in fastenings: To AS 5216 (2021).

1.5 INTERPRETATION

Definitions

General: For the purposes of this worksection, the definitions given in AS 3850.1 (2024) and the following apply:

- Precast concrete: Concrete building elements, cast in moulds and cured away from the final structural position, and then transported, lifted and fixed into position.

1.6 TOLERANCES

General

Reinforcement and tendon position: To AS 3600 (2018) clause 17.5.3.

Manufacturing, installation, fixings and embedded items tolerance for precast elements: To AS 3610.1 (2018) Table 3.3.6.2 and AS 3850.2 (2024) clause 2.11.

Formed surfaces finish quality: To AS 3610.1 (2018) Table 3.3.3.1.

1.7 SUBMISSIONS

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Certification

Design: Submit independent certification by a professional engineer of conformance of the design to project criteria.

Manufacture: Submit certification from the precast manufacturer of conformance to the documented design.

Design documentation

Calculations: Submit structural performance calculations.

Execution details

Element casting: Submit element casting checklist.

Manufacturer's details: Submit name, contact details and credentials of proposed manufacturer of precast elements.

Safe work method statement (SWMS): Prepare and submit a SWMS for the precast erection specific to the project.

Erection documentation: Submit details of lifting device locations and rigging systems, including marking plans and shop drawings.

Early lifting: If it is proposed to lift the precast elements by their designated lifting points before 28 day strength has been achieved, submit evidence to demonstrate that the element has adequate strength to carry its own weight without damage or residual cracking or deflection on removal of the lifting device.

Lifting and handling equipment: Submit details and specification of proposed equipment along with qualifications and training of the operating personnel in the form of a qualification register.

Products and materials

Protective coating details: Submit proposals for protective coatings to exposed metallic components to AS 2312.1 (2014) or AS/NZS 2312.2 (2014) with regard to site-specific corrosivity zoning.

Colour: Provide details of method of achieving the selected colour including details of the type and colour of the cement, sand and aggregates as well as any colouring oxide pigments or stain.

Proprietary inserts: Submit proprietary documentation for any lifting, bracing or fixing inserts. Include make, type and working load limit.

Non-proprietary inserts: Submit certificate from a professional engineer certifying the working load limit.

Welding of cast-in inserts: Submit written permission from insert manufacturer to proposed welding of cast-in inserts, to AS 3850.1 (2024) clause 2.5.1.

Concrete mix: Submit concrete mix details including the proportions and source of the constituents, admixtures, release agents and curing compounds.

Steel fibre reinforcement: Submit a current Declaration of Performance as evidence of conformity to ISO 13270 (2013) or EN 14889-1 (2006).

Type tests: Submit test results for the following:

- Reinforcement strength and ductility: To **REINFORCEMENT**, **Tests**.
- Prestressing steel: To **REINFORCEMENT**, **Tests**.
- Lifting, bracing and fixing inserts: To **CAST-IN ITEMS**, **Tests**.
- Bearing pads: To **MISCELLANEOUS**, **Bearing pads**.

Samples

Requirement: Submit samples to PRODUCTS, **GENERAL**, **Samples**.

Shop drawings

Precast concrete drawings: Submit shop drawings to AS 3850.2 (2024) clause 2.10, of architectural and structural precast concrete elements showing the design, manufacture, assembly, transport and installation details, including the following:

- Project title and manufacturer's name.
- Marking plans and elevations referenced to the building grids and floors to locate each precast element.
- Shape or profile drawings (submit these before fabrication of moulds and tooling).
- Concrete mix and type of cement if special-class concrete is used.
- Locations, sizes, details, materials, ductility and stress grades of tendons and reinforcement.
- Locations, sizes, details, materials, corrosion protection and grades of cast-in ferrules, locating plates and angles, cut outs and openings, bolts, anchors and lifting devices.
- Cast-in services.
- Site fitments.
- Details of all joints, caulking, baffles and waterproofing.
- Surface finish class and surface treatment, if applicable.
- Curing and protection methods.
- Mass and centre of gravity of each precast element.
- Calculated maximum loading on lifting and bracing inserts and attachments.
- Equipment and methods for handling, transport and installation, including lifting inserts and pick-up points.
- Evidence of load capacity of lifting and bracing inserts and attachments in the form of test reports or calculations.
- Specification of plugs for sealing recesses of cast-in fixings.

Structural performance: Submit test results of prior testing for static load tests.

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1.8 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following:

- Formwork dimensions and stability.
- Edge details and penetrations before casting of element.
- Connection materials and inserts in place before casting of element.
- Reinforcement and/or prestressing strands in place before casting of element.
- Concreting.
- First precast element of each type at the earliest possible time before and immediately after stripping.
- Stripping and storage.
- Site erection including fixings and any in situ topping.
- Installed temporary bracing.
- Final structure before removal of temporary bracing, including joints visible for inspection.

2 PRODUCTS

2.1 GENERAL

Samples

Requirement: Provide samples of each surface finish, showing the range of variation in texture and colour. Surface finish: Submit samples for texture and colour. Contract Sample size: A 600mm x 600mm samples of each type of precast concrete finish using proposed formwork, concrete mix, oxide admix and surface treatments as applicable. Sample panels: Construct a Sample Panel of Class2A precast concrete finish, nominally 1800mm long x 1800mm high, including arris treatment at edges, applied finish as specified and demonstrating the proposed finish and colour control to both sides.

2.2 CONCRETE

General

Standard: To AS 3600 (2018) and AS 1379 (2007).

Stockpile: If uniform, consistent colour is documented, stockpile sand, cement and aggregates.

Aggregates

Standard: To AS 2758.1 (2014).

Storage: Store in silos or on a hardstand located away from surface and ground water runoff. Allow for free drainage of rainwater and prevent contamination and intermixing of aggregates.

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Cement

Standard: To AS 3972 (2010).

Age: Less than 6 months old.

Storage: Store cement bags in a dry, under cover and above ground environment.

Supplementary cementitious materials:

- Fly ash: To AS/NZS 3582.1 (2016).
- Slag: To AS 3582.2 (2016).
- Amorphous silica: To AS/NZS 3582.3 (2016).
- Manufactured pozzolans: To AS 3582.4 (2022).

Water

Standard: To AS 1379 (2007) clause 2.4.

Requirement: Clean, free from oil, acid, alkali, organic or vegetable matter and not more than 500 mg/L of chloride ions.

Chemical admixtures

Standard: To AS 1478.1 (2000), used to manufacturer's recommendations and free from chlorides, and other substances detrimental to concrete or reinforcing steel.

Concrete colour

Standard: To AS 3610.1 (2018).

Pigments (oxides): As follows:

- Chemically inert.
- Alkaline resistant.
- Insoluble.
- Light-fast.

2.3 PRECAST CONCRETE PROPERTIES

General

Concrete: To AS 3600 (2018).

Testing: To the AS 1012 series.

Durability

Concrete cover: To AS 3600 (2018) clause 4.10.

Fire-resistance level (FRL): Refer Architectural Drawings and Fire Engineer’s Report

Strength

Characteristic compressive strength: As per structural engineer’s recommendations

Flexural strength required at lifting to AS 3850

Finishes

Off-form surface finish to AS 3610.1: Class 2 formwork surface finish

Colour: Class 2A Standard Grey Cement concrete with a tonal range in accordance with 3610 and to the acceptance of the Superintendent.

Surface finish: Clear

Applied finishes: As indicated on the Design Drawings. Refer Master Schedule.

2.4 REINFORCEMENT

Fibre reinforcement

Steel fibres: To AS 3600 (2018) clause 16.7.1.

Synthetic fibres: To EN 14889-2 (2006).

Storage: Store in a dry environment. Do not stack.

Steel reinforcement

Standard: To AS/NZS 4671 (2019).

Fabrication tolerances: To AS 3600 (2018) clause 17.2.2.

Surface condition: Provide surfaces conforming to the following:

- Free of loose or flaking mill scale and rust.
- Clean from oil, grease, mud or other material that would reduce the bond between the reinforcement and concrete.

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Storage: Store reinforcement above the surface of the ground and protect from damage and from deterioration by exposure.

Structural welding: To AS/NZS 1554.3 (2014).

Corrosion protection: To AS 3600 (2018) clause 17.2.1.2.

Prestressing steel

Standard: To AS 4672.1 (2007).

Strand type: 7 wire, stress relieved, high tensile steel.

Quality: Make sure strands are not galvanized, have no nicks, pitting, indents, damage or foreign matter such as mud and dirt. Inspect at delivery and store the prestressing steel on supports clear of the ground.

Construction requirements: To AS 3600 (2018) Section 17.

Welding: Do not weld prestressing strands.

Tie wire

General: Annealed steel 1.25 mm diameter (minimum).

External and corrosive applications: Galvanized.

Supports

Standard: To AS/NZS 2425 (2015).

Tests

Prestressing steel: To AS/NZS 4672.2 (2007).

Reinforcement strength and ductility: Provide type test reports as evidence of conformity to AS 3600 (2018) Table 3.2.1 for each reinforcement type.

2.5 GROUT

General

Grout material requirements: To AS 3600 (2018) clause 17.1.

Grout tube: Corrugated thin walled galvanized tube or similar, sized to provide erection tolerance and clearance for grout flow.

2.6 CAST-IN ITEMS

Lifting, bracing and fixing inserts

Requirement: Conform to the following:

- Fixing inserts: To AS 3850.1 (2024) clause 2.5.
- Lifting and bracing inserts: To AS 3850.1 (2024) clause 2.5 and AS 3850.2 (2024).

Compatibility: Provide cast-in items that are compatible with each other, the reinforcement and the documented concrete finish.

Corrosion protection: In external or exposed locations, provide hot-dipped galvanized anchor bolts and embedded fixings, as follows:

- Minimum coating mass of 600 g/m^2.
- Threaded products: To AS/NZS 1214 (2016).
- Non-threaded products: To AS/NZS 4680 (2006).

Ferrules: Provide ferrules anchored behind the reinforcing, as documented.

Dowel bars: Provide dowel bars loose, cast in or screwed into a ferrule or coupler and projecting from the precast element. Alternatively, where dowels are cast into and project from in situ concrete, provide a mating sleeve with grout tube.

Grout tube: Provide grout tubes as documented, cast into either in situ concrete or the precast element into which a dowel bar will be grouted.

Cast-in plates and bolts: Provide purpose-made steel brackets with bars, bolts or studs welded to them, as documented. If proprietary inserts are welded, conform to manufacturer's written permission.

Welding of connections: To AS/NZS 1554.1 (2014).

Restraint brackets: Provide all restraint brackets for the precast elements, as documented or as required.

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Lifting and bracing inserts: Conform to the following:

- Cast in.
- Provide proprietary lifting devices with published load data designed specifically for lifting concrete elements.
- Provide bracing inserts or strongbacks designed by a professional engineer.
- Do not use deformed bars or stressing tendons as lifting loops.
- Do not place lifting attachments, holes and other temporary fixings for handling purposes on faces visible upon completion.
- Clearly mark all lifting points and the positions for temporary bearing for storage and transport.

Sealing: Recess lifting attachments such as bracing ferrules, or other types of cast-in fixings, and provide plugs for sealing

Tests

Lift, bracing and fixing inserts: To AS 3850.1 (2024) Appendix A.

2.7 MISCELLANEOUS

Curing compounds and release agents

Liquid membrane-forming compounds: To AS 3799 (1998).

Release agent: Compatible with the curing compound.

Bearing pads

Selections and testing: To AS 5100.4 (2017).

Levelling pads and shims

Requirements: To AS 3850.1 (2024) clause 2.8.

Flashings

Standard: To AS/NZS 2904 (1995).

Sealants

Compression-seals: Polyethylene or polyurethane foam strip.

2.8 PRECAST ELEMENTS

Finishes

Off-form surface finish to AS 3610.1: Class 2 formwork surface finish

Colour: Class 2A Standard Grey Cement concrete with a tonal range in accordance with 3610 and to the acceptance of the Superintendent.

Surface finish: Clear

Applied finishes: As indicated on the Design Drawings. Refer Master Schedule.

Protective coatings: [complete/delete]

Marking

Precast element identification: Located so as not to be visible in the completed structure and to remain legible until the element is fixed in place. Include the following:

- Plank thickness (mm).
- Number of strands.

- Strand diameter (mm).
- Concrete cover (mm).
- Date of casting.
- Orientation of the element.
- On precast elements other than those manufactured as a standard product, indicate their location within the structure, in conformance with the marking plan.
- Mass of the element.

Conformance

Tolerances: To AS 3850.2 (2024) clause 2.11.

Assessment: Set aside for inspection any element having damage such as cracking, deformation or spalling, or exhibiting lack of adequate concrete cover.

Rejection: Reject any precast elements not conforming to the documented tolerances and design requirements.

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3 EXECUTION

3.1 PREPARATION

Pre-installation

Requirement: Conform to AS 3850.2 (2024) clause 4.4.2.

Storage

Support points: Support elements at designated support points during storage.

Prevent damage: Protect from warping, twisting, crushing, cracking, staining, discolouration and other damage until precast elements have been installed.

3.2 INSTALLATION

General

Requirement: To the approved SWMS.

Lifting and handling

Requirement: To AS 3850.2 (2024).

Site cranes: To AS 2550.1 (2011).

Site conditions: Make sure the wind and temperature conditions allow for safe handling and fixing, and are consistent with the structural capability and geometry of the element.

Precautions: Use handling methods that do not overstress, warp or damage the elements.

Lifting: Only lift or support members at specified points. Do not use the fixing devices for lifting or hoisting unless they have also been designed for this purpose and confirmed as such by a professional engineer.

Proprietary systems: Use in conformance with manufacturer's specifications and recommendations.

Temporary bracing and propping: To AS 3850.2 (2024) Section 5.

Fixing

Fixing: Fix the precast elements securely and accurately in their final position.

Welding: Do not site weld lifting, bracing or fixing inserts.

Bed joint: Provide non-shrink grout to the base of the precast elements, as documented.

Ancillaries: Provide components and materials, including fasteners, braces, shims, jointing strips, sealant, flashings, grout and mortar, bearing pads or strips, ties and dowels, clips and fixings necessary for the installation of the elements.

Flooring systems

Shear keys: Grout with mix proportion (sand:cement) 3:1.

Preparation: Immediately before in situ topping, wet surface of plank without pooling.

Topping minimum grade: N32 to AS 1379 (2007).

Surfaces bonded to in situ concrete

Requirement: Prepare all surfaces required to bond with in situ concrete, as documented, to achieve a shear plane surface coefficient in conformance with AS 3600 (2018) Table 8.4.3.

3.3 COMPLETION

General

Removal of temporary bracing or propping: Obtain written instructions from a professional engineer at the completion of installation before removing temporary supports.

Requirement: Remove, seal and rectify temporary attachments after erection.

Conformance

Tolerances: To AS 3850.2 (2024) Table 2.11(D).

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4 SELECTIONS

4.1 SCHEDULE

Prototypes schedule

Element type	Number of prototypes

0331 BRICK AND BLOCK CONSTRUCTION

1 GENERAL

1.1 RESPONSIBILITIES

General
Requirement: Provide brick and block construction, as documented.

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1.2 CROSS REFERENCES

General
Requirement: Conform to the following:
- *0171 General requirements*.

1.3 STANDARDS

General
Materials and construction: To AS 3700 (2018).

1.4 INTERPRETATION

Definitions
General: For the purposes of this worksection, the definitions in AS 3700 (2018) clause 1.5.2, AS/NZS 4455.1 (2008) clause 1.4 and the following apply:
- Facework: Masonry intended to be exposed in a wall.
- Special mortar: Mortar with compositions not covered in AS 3700 (2018) Table 11.1.

1.5 TOLERANCES

General
Requirement: To AS 3700 (2018) clause 12.5 and Table 12.1.

1.6 SUBMISSIONS

Fire performance
Fire-resistance level: Submit evidence of conformity to **FIRE PERFORMANCE**, **Fire-resistance of building elements**.

Products and materials
Type tests: Submit test results of the following:
- Characteristic unconfined compressive strength of masonry unit: To **MATERIALS**, **Masonry units**.

Samples
Requirement: Submit samples to PRODUCTS, **GENERAL**, **Samples**.

Tests
Site tests: Submit results for special mortar and masonry as follows:
- Characteristic compressive strength.
- Characteristic flexural tensile strength.
- Scratch index for mortar joints.

Warranties
Requirement: Submit warranties to **COMPLETION**, **Warranties**.

1.7 INSPECTION

Notice
Inspection: Give notice so that inspection may be made of the following:
- Set-out.
- Structural steelwork, including bolts and shelf angles, in position.
- Unit type, colour and texture.
- Bottoms of cavities, after cleaning out.

- Bottoms of core holes, before grouting.
- Reinforcement type and diameter.
- Positioning of reinforcement before grouting.
- Control joints, ready for insertion of joint filler.
- Damp-proof courses, in position.
- Flashings, in position.
- Lintels, in position.

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2 PRODUCTS

2.1 GENERAL

Samples
Requirement: Provide samples, as follows:

- Each type of face unit, showing the range of variation available, including colour, texture, surface irregularities, defective arrises, and shape.
  . Number of each type: 6.
- 2 kg sample of each type of sand required to be of a particular colour, grade or source.
- Each type of sealant, showing the finished colour.
  . Quantity: Minimum two of each colour.

Wall ties: Provide samples

Sample panel: Provide a sample panel for each type of facework, including face or pointing mortar and a finished vertical control joint in a suitable location.

- Size: Minimum 1200 mm high x 1190 mm or closest unit module long.

2.2 FIRE PERFORMANCE

Fire-resistance of building elements
Fire-resistance level: Tested to AS 1530.4 (2014).

2.3 DURABILITY

General
Exposure locations: To AS 3700 (2018) clause 5.4.

2.4 MATERIALS

Masonry units
Selections: As documented.

Standard: To AS/NZS 4455.1 (2008) and AS/NZS 4455.3 (2008).

Salt attack resistance grade: To AS 3700 (2018) Table 5.1.

Characteristic unconfined compressive strength: To AS/NZS 4456.4 (2003).

Minimum age of clay bricks: 7 days.

Mortar materials
Mortar class: To AS 3700 (2018) Table 5.1.

Cement: To AS 3972 (2010).

White cement: With not more than 1% iron salts content.

Lime: To AS 1672.1 (1997).

Sand: Fine aggregate with a low clay content, free from efflorescing salts and deleterious matter, selected for colour and grading.

Water: Clean and free from any deleterious matter.

Admixtures: To AS 3700 (2018) clause 11.4.2.4.

Pigment: To EN 12878 (2014), and as follows:

- Integral pigment mix proportion: Not more than 10% by weight of cement.

Masonry cement mortar mix proportions table (cement:lime:sand), by volume

Mortar class to AS 3700 (2018)	Clay	Concrete	Calcium silicate	Water thickener
M3	1:0:4	1:0:4	N/A	Yes
M4	1:0:3	N/A	N/A	Yes

Cement (GP/GB) mortar mix proportions table (cement:lime:sand), by volume

Mortar class to AS 3700 (2018)	Clay	Concrete	Calcium silicate	Water thickener
M2	1:2:9	N/A	N/A	No
M3	1:1:6	1:1:6	N/A	Optional
M3	1:0:5	1:0:5	1:0:5	Yes
M4	1:0.5:4.5	1:0.5:4.5	N/A	Optional
M4	1:0:4	1:0:4	1:0:4	Yes
M4	1:0-0.25:3	1:0-0.25:3	N/A	Optional

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Grout

Standard: To AS 3700 (2018) clause 11.7.

Maximum aggregate size: 12 mm.

Minimum cement content: 300 kg/m^3.

Characteristic compressive strength: Minimum 12 MPa.

Nominal slump: 200 mm.

2.5 BUILT-IN COMPONENTS

General

Durability class of built-in components: To AS 3700 (2018) Table 5.1.

Steel lintels

Angles and flats: To AS/NZS 3679.1 (2016).

Cold-formed proprietary lintels: Designed to AS/NZS 4600 (2018).

Corrosion protection: To AS 2699.3 (2020).

Cutting: Do not cut after galvanizing.

Reinforcement

Standard: To AS/NZS 4671 (2019).

Corrosion protection: To AS 3700 (2018) clause 5.9.

Minimum cover: To AS 3700 (2018) Table 5.1.

Wall ties

Standard: To AS 2699.1 (2020).

Type: A.

Corrosion protection: To AS 2699.1 (2020).

Connectors and accessories

Standard: To AS 2699.2 (2020).

Corrosion protection: To AS 2699.2 (2020).

Durability classification to AS 2699.2 (2020)

Flashings and damp-proof courses

Standard: To AS/NZS 2904 (1995).

Weepholes

Weephole formers/guards: As documented.

Slip joints

Standard: To AS 3700 (2018) clause 4.14.

Air vents

Blockwork: Select from the following:

- Concrete framed: Bronze wire mesh in concrete frame, 390 x 190 mm.
- Vent blocks: Purpose-made vent blocks.

Brickwork: Select from the following:

- Concrete framed: Bronze wire mesh in concrete frame, 455 x 160 mm.
- Cut brick: Two cut bricks laid vertically and evenly spaced in a 230 mm wide x two course high opening, backed with bronze wire mesh built in.
- Terracotta: Perforated, 230 x 160 mm.

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3 EXECUTION

3.1 GENERAL

Mortar mixing

General: Measure volumes accurately to the documented proportions. Machine mix for at least six minutes. If the initial set of the cement has taken place, discard the mortar. Do not retemper.

Storage and handling

Masonry units: Store above the surface of the ground and cover to prevent entry of rainwater and contaminants. Locate away from surface and ground water runoff.

Mortar materials: Protect from contamination and as follows:

- Sand: Store away from surface and ground water runoff and allow for free drainage of rainwater.
- Cement and lime: Store bags in a dry, under cover and above ground environment.

Bond

Type: Stretcher bond.

Building in

Embedded items: Build in wall ties and accessories as the construction proceeds. If not practicable to obtain the required embedment within the mortar joint in cored or hollow masonry units, fill appropriate cores with grout or mortar.

Steel door frames: Fill the backs of jambs and heads solid with mortar as the work proceeds.

Minimum clearance for timber frame shrinkage

General: In timber framed masonry veneer construction, provide clearances to allow for long-term shrinkage of timber including at windows, doors, thresholds, at the underside of eaves where the masonry and soffit meet and as follows:

- Single storey (slab on ground): 10 mm.
- Two storey (slab at ground floor): 32 mm
- Additional clearance: Accommodate additional shrinkage of unseasoned floor timbers.

Monolithic structural action

Construction at different rates or times: If two or more adjoining sections of masonry, including intersecting walls, are constructed at different rates or times, rake back or tie the intersections between those sections to obtain monolithic structural action in the completed work.

Header units: Except in stretcher bond facework, provide masonry header units, to AS 3700 (2018) clause 4.11.2 and as follows:

- Spacing: 600 mm maximum.
- Location: Provide header units in the following locations:
  - At engaged piers.
  - At engagement of diaphragms with the leaves in diaphragm walls.
  - At intersections of flanges with shear walls.
  - At intersections with supporting walls and buttresses.
  - Between leaves in solid masonry construction.

Joining to existing

General: Provide a control joint where joining to existing structures. Do not tooth new masonry into existing work unless approved by a professional engineer.

Mortar joints
General: Set out masonry with joints of uniform width and minimum cutting of masonry units.
Solid and cored units: Lay on a full bed of mortar. Fill perpends solid. Cut mortar flush.
Hollow units: Face-shell bedded. Fill perpends solid. Cut mortar flush.
Joint thickness: 10 mm.
Finish: Conform to the following:
- Externally: Tool to give a dense water-shedding finish.
- Internally: If wall is to be plastered, do not rake more than 10 mm to give a key.

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Rate of construction
General: Regulate the rate of construction to eliminate joint deformation, slumping or instability.

Rods
Set-out: Construct masonry to the following rods:
- 75 mm high units: 7 courses to 600 mm.
- 90 mm high units: 6 courses to 600 mm.
- 190 mm high units: 3 courses to 600 mm.

Temporary support
General: If the final stability of the masonry is dependent on construction of (structural) elements after the masonry is completed, provide proposals for temporary support or bracing.

3.2 FACEWORK

Cleaning
General: Clean progressively as the work proceeds to remove mortar smears, stains and discolouration. Do not erode joints if using pressure spraying.

Colour mixing
Distribution: In facework, distribute the colour range of units evenly to prevent colour concentrations and banding.

Below ground
Facework: Commence facework at least one full course for blockwork, or two full courses for brickwork, below the adjacent finished surface level.

Double face walls
Selection: Select face units for uniform width and double-face qualities in single-leaf masonry with facework both sides.
Preferred face: Before starting, obtain approval of the preferred wall face, and favour that face should a compromise be unavoidable.

Perpends
General: If other than vertically aligned perpends in alternate courses are proposed, provide details.

Sills and thresholds
General: Solidly bed sills and thresholds and lay them with the top surfaces draining away from the building.
Minimum size of cut unit: Three quarters full width.

3.3 SUBFLOOR WORK

Access openings
General: In internal walls, provide door-width openings beneath doorways to give access to underfloor areas.

Air vents
Minimum subfloor openings and ground clearance: To BCA (2022) F1D8.
Cavity walls: Provide matching vents in the internal leaves located as near as practicable to the vents in the external leaves.
Location: Below damp-proof course to internal and external walls.

Underpinning
Requirement: Install underpinning, without causing damage to the building.

Grouting: Pack dry mix M4 mortar between the top of the underpinning and the underside of the existing structure at the completion of each panel of underpinning.

3.4 CAVITY WORK

Cavity clearance

General: Keep cavities clear at all times.

Cavity fill

General: Fill the cavity with mortar to one course above the adjacent finished (ground) level. Fall the top surface towards the outer leaf.

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Cavity width

General: Minimum 40 mm for cavity masonry walls and masonry veneer walls, in conformance with AS 3700 (2018) clause 4.7.1.

Openings

Jambs of external openings: Do not close the cavity.

Wall ties, connectors and accessories

Protection: Install to prevent water passing across the cavity.

3.5 DAMP-PROOF COURSES

Location

General: Locate damp-proof courses, as follows:

- Timber floors: In the first course below the level of the underside of ground floor timbers in internal walls and inner leaves of cavity walls.
- Cavity walls built off slabs on ground: In the bottom course of the outer leaf, continuous horizontally across the cavity and up the inner face bedded in mortar, turned 30 mm into the inner leaf one course above. Project 10 mm beyond the external slab edge and turn down at 45°.
- Internal walls built off slabs on ground: In the first course above floor level.
- Masonry veneer construction built off slabs on ground: In the bottom course of the outer leaf, continuous horizontally across the cavity. Fasten to the inner frame 75 mm above floor level.
- Walls adjoining infill floor slabs on membranes: In the course above the underside of the slab in internal walls and inner leaves of cavity walls. Project 40 mm and dress down over the membrane turned up against the wall.

Height: Not less than:

- 150 mm above the adjacent finished ground level.
- 75 mm above the finished paved or concrete areas that slope away from the wall.
- 50 mm above the finished paved or concreted areas that slope away from the wall and are protected from the direct effect of the weather.

Installation

General: Lay in long lengths. Sandwich damp-proof courses between mortar.

Joints: Locate away from weepholes.

Junctions: Preserve continuity of damp-proofing at junctions of damp-proof courses and waterproof membranes.

Laps: Lap full width at angles and intersections and at least 150 mm at joints.

Lap sealing: Seal with a bituminous adhesive and sealing compound.

Steps: Step as necessary, but not exceeding two courses per step for brickwork and one course per step for blockwork.

3.6 FLASHINGS

Location

General: Locate flashings, as follows:

- Floors: Full width of outer leaf immediately above slab or shelf angle, continuous across cavity and up the inner face bedded in mortar, turned 30 mm into the inner leaf two courses above for brick and one course above for block. If the slab supports the outer skin and is not rebated, bed the flashing in a suitable sealant.

- Under sills: 30 mm into the outer leaf bed joint one course below the sill, extending up across the cavity and under the sill in the inner leaf or the frame for masonry veneer. Extend at least 150 mm beyond the reveals or each side of the opening.
- Over lintels to openings in cavity walls: Full width of outer leaf immediately above the lintel, continuous across cavity, turned 30 mm into the inner leaf two courses above for brick and one course above for block or turned up at least 150 mm against the inner frame and fastened to it. Extend at least 150 mm beyond the lintels.
- At abutments with structural frames or supports: Vertically flash in the cavity using 150 mm wide material, wedged and grouted into a groove in the frame opposite the cavity.
- At jambs: Vertically flash jamb, extending 75 mm into the cavity, interleaved with the sill and head flashing at each end. Fix to jambs.
- At roof abutments with cavity walls: Cavity flash immediately above the roof and over-flash the roof apron flashing.

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Installation

General: Sandwich flashings between mortar except where on lintels or shelf angles. Bed flashings, sills and copings in one operation to maximise adhesion.

Laps: If required, lap full width at angles and intersections and at least 150 mm at joints.

Lap sealing: Seal with a bituminous adhesive and sealing compound.

Pointing: Point up joints around flashings, filling voids.

Steps: Step as necessary, but not exceeding two courses per step for brickwork and one course per step for blockwork.

Weepholes

Requirement: Locate weepholes to external leaves of cavity walls as follows:

- Generally:
  - . Spacing: 1200 mm maximum.
  - . In the course above damp-proof courses, flashing and cavity fill.
  - . At the bottom of unfilled cavities.
- Openings exceeding 1200 mm: Provide weepholes above the opening at maximum 1200 mm centres and at both ends of the opening in the following situations:
  - . If there is no roof overhang directly above the opening.
  - . If the roof overhang does not extend more than three times the distance between the top of the opening and the roof soffit.

Form: Open perpends or proprietary weephole former.

Weephole guards: Provide mesh insect barrier.

3.7 WALL TIES

Location

General: Space wall ties in conformance with AS 3700 (2018) clause 4.10 and at the following locations:

- Not more than 600 mm in each direction.
- Within 300 mm from the line of horizontal or vertical lateral supports, control joints or the perimeter of openings.

Installation

Embedment: At least 50 mm into mortar. Provide at least 15 mm of mortar cover to any exposed surface.

Fixing of masonry veneer ties:

- To timber frames: Screw fix to outer or side face of timber frames with fasteners to AS 3566.1 (2002).
- To concrete: Masonry anchors.
- To steel frames: Screw fix to outer or side face of steel members with fasteners to AS 3566.1 (2002).

3.8 CONTROL JOINTS

General

Location and spacing: Provide control joints to AS 3700 (2018) clause 4.8.

Control joint filling

Filler material: Provide compatible sealant and bond breaking backing materials that are non-staining to masonry. Do not use bituminous materials with absorbent masonry units.

- Bond breaking materials: Non-adhesive to sealant, or faced with a non-adhering material.
- Foamed materials: Closed cell or impregnated, not water-absorbing.

Installation: Clean the joints thoroughly and insert an easily compressible backing material before filling with a gun-applied flexible sealant.

Sealant joint depth to width ratio (depth:width): 1:2.

Minimum sealant depth: 6 mm.

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Fire-resisting control joints

General: If a control joint is located in an element of construction required to have a fire-resistance level (FRL), construct the control joint with fire-stopping materials that maintain the FRL of the element.

Fire-stopping: To AS 4072.1 (2005).

3.9 BRICKWORK AND BLOCKWORK DUCT RISERS

General

Location: Build a one-piece corrosion-resistant metal tray to the masonry duct risers at roof level to shed water from the duct above roof flashing level.

Installation

General: Cut an opening for the riser. Turn tray edges up 25 mm around the opening, 13 mm clear of the walls. Externally turn the tray up 100 mm under the stepped flashing and down 100 mm over the apron flashing. Lap and solder joints.

Weepholes

General: Provide two weepholes through the masonry duct riser walls on opposite sides immediately above the tray.

3.10 BED JOINT REINFORCEMENT

Location

Stack bonded masonry: Conform to AS 3700 (2018) clause 4.12 and the following:

- Spaced vertically at centres not exceeding six times the thickness of the stack bonded leaf.
- In the first bed joint above or below an unrestrained horizontal edge of the masonry.
- One bed joint minimum, within 300 mm above or below a horizontal line of lateral support.

Installation

General: Lap 450 mm at splices. Fold and bend at corners so that the longitudinal wires are continuous. Stop 50 mm short of control joints. Extend 450 mm beyond each side of openings.

Reinforcement

Material: Galvanized welded wire mesh.

Width: Equal to the width of the leaf, less 15 mm cover from each exposed surface of the mortar joint.

3.11 REINFORCED AND GROUTED BLOCKWORK

Reinforcement

Cover: Maintain cover to vertical and horizontal steel reinforcement using plastic clips or wheels, as appropriate.

Vertical reinforcement: Tie vertical steel reinforcement to the starter bars through cleanout holes in each reinforced hollow masonry unit and fix in position at the top of the wall with plastic clips.

Horizontal: Lay horizontal steel reinforcement in contact with rebated webs. Hold in position using plastic clips if vertical steel is subsequently positioned to wall construction.

Cleaning core holes

General: Provide purpose-made cleanout blocks or machine cut a cleaning hole at the base of each grouted core.

Location: Locate on the side of the wall that is to be rendered or otherwise concealed.

Cleaning: Rod cores to dislodge mortar fins protruding from the blocks and mortar droppings from reinforcement. Remove through the cleanout blocks.

Grouting

Commencement: Do not commence until grout spaces have been cleaned out and the mortar joints have attained sufficient strength to resist blow-outs.

Height of lift: Limit the height of individual lifts in any pour to make sure that the grout can be thoroughly compacted to fill all voids.

Compaction: Compact by vibration or by rodding.

Topping up: On the completion of the last lift, top up the grout after 10 minutes and within 30 minutes, and vibrate or rod to mix with the previous pour.

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3.12 LINTELS

Location

General: Install one lintel to each wall leaf, as documented.

Installation

General: Do not cut on site. Keep lintels 10 mm clear of heads of frames.

Steel lintels: Pack mortar between any vertical component and supported masonry units. For angles, install the long leg vertically.

Minimum bearing each end:

- Span not more than 1000 mm: 100 mm.
- Span more than 1000 mm and not more than 3000 mm: 150 mm.
- Span more than 3000 mm: To structural drawings.

Propping: Provide temporary props to lintels to prevent deflection or rotation.

- Minimum propping period: 7 days.

3.13 CONNECTORS AND ACCESSORIES

Slip joints

General: Install slip joints to top of all unreinforced masonry walls supporting concrete slabs and other concrete elements.

Protection: Keep the slip joints in place and protect from displacement.

Flexible masonry ties

General: Install stabilising ties at control joints and abutting structural elements, including columns, beams and slab soffits.

Locations and details: As documented.

3.14 ARCHES

Arch voussoirs

General: Cut units using a masonry saw.

Shapes and dimensions

General: Form arches using solid or cored masonry units.

3.15 BAGGING

Preparation

General: Cut joints flush before bagging.

Dry bagging

Application: Apply laying mortar to the surface using a hessian bag or similar. Flush up irregularities, but leave a minimum amount of mortar on the surface.

Textured bagging

Application: Apply laying mortar to the surface using a sponge float. Flush up irregularities, but leave approximately 2 mm of mortar on the surface. When initial set is reached, texture using a hand bristle brush.

3.16 TESTING

Special mortar

Durability: Scratch index test to AS 3700 (2018) Appendix E.

Compressive strength: To AS 3700 (2018) Appendix C.

Flexural strength: To AS 3700 (2018) Appendix D.

Special masonry

Sampling and testing: To AS 3700 (2018) clause 12.7.

Performance: As documented.

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3.17 COMPLETION

Warranties

Type: Manufacturer's warranty to be provided

0383 DECKING, SHEET AND PANEL FLOORING

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide decking, sheet and panel flooring, as documented.

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1.2 CROSS REFERENCES

General

Requirement: Conform to the following:

- *0171 General requirements*.

1.3 STANDARDS

General

Timber flooring and decking: To AS 1684.2 (2021), AS 1684.3 (2021) or the NCC cited AS 1684.4 (2010), as appropriate.

1.4 INTERPRETATION

Definitions

General: For the purposes of this worksection, the following definitions apply:

- Butt joints (flooring): Floor units cross cut square with plain ends for joining over battens or joists.
- Decking: Intermittently supported external flooring with drainage gaps between boards.
- Flooring - fitted: Flooring fitted between the walls of each room i.e. not platform floors.
- Flooring - intermittently-supported: Flooring that is supported by, and spans across joists or battens.
- Flooring - sprung: A subfloor structure engineered to absorb shocks, usually fixed on resilient pads, typically finished with a decorative flooring material.
- Platform flooring: Flooring laid over the whole of the joisted floor structure before the erection of external and internal wall frames.
- Subfloor: The structure that supports the flooring.

1.5 TOLERANCES

Decking

Maximum vertical deviation for adjacent boards: 3 mm.

Minimum gap between edges of seasoned boards: 4 mm.

Maximum gap between boards:

- Boards not more than 150 mm wide: 6 mm.
- Boards more than 150 mm wide: 10 mm.

Sheet flooring

Maximum deviation from a 3 m straightedge laid in any direction on the floor surface: 3 mm.

AAC panel flooring

Maximum gap between adjoining panels, excluding control and articulation joints: 5 mm.

1.6 SUBMISSIONS

Certification

Requirement: Submit one of the following, as evidence of conformity to documented requirements for grading, species and board size:

- Supplier's certificate, which may be included on an invoice, delivery docket or packet label.
- Report by an independent inspecting authority.

Moisture content: Submit documentation noting moisture content of timber products.

Fire performance
Fire-resistance level: Submit evidence of conformity to **FIRE PERFORMANCE**, **Fire-resistance of building elements**.

Operation and maintenance manuals
Requirement: Submit manual to **COMPLETION**, **Operation and maintenance manuals**.

Products and materials
Type tests: Submit test results of the following:

- Slip resistance of decking: To **DECKING**, **Tests**.

Samples
Requirement: Submit samples to PRODUCTS, **GENERAL**, **Samples**.

Subcontractors
General: Submit names and contact details of proposed suppliers and installers.

Evidence of experience: Provide proof of experience

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Warranties
Requirement: Submit warranties to **COMPLETION**, **Warranties**.

1.7 INSPECTION

Notice
Inspection: Give notice so that inspection may be made of the following:

- Subfloor before laying decking, sheet or panel flooring.
- Completion of installation.

2 PRODUCTS

2.1 GENERAL

Samples
Requirement: Provide samples of each timber or synthetic decking type, showing the range of variation in colour and figure.

Storage and handling
Timber decking: Deliver to site and store on dry ground on level bearers 150 mm high, block stacked, banded and protected against the weather.

Plywood and particleboard sheet flooring: Deliver to site and store on dry ground on level bearers 150 mm high, laid flat and protected against the weather.

AAC panels: Deliver to site and store on dry ground on level bearers 150 mm high and protected against the weather. Conform to manufacturer guidelines for stacking and storage orientation (laid flat/on edge).

2.2 FIRE PERFORMANCE

Fire-resistance of building elements
Fire-resistance level (FRL) of AAC panels: Tested to AS 1530.4 (2014).

2.3 DECKING

Recycled timber decking
Standard: To FWPA PN06.1039 (2008).

Grade to FWPA PN06.1039 (2008) Section 5.1:

New timber decking
Standard:

- Preservative-treated softwood to AS 4785.1 (2002) Section 4.
  - Grade to AS 4785.2 (2002): As documented.
- Hardwood to AS 2796.1 (1999) Section 4.
  - Grade to AS 2796.2 (2006): As documented.

Durability:

- Natural durability classification to AS 5604 (2022): Class 2 minimum.

- Preservative treatment to AS/NZS 1604.1 (2021) Table F.1: H3 minimum.
- Identification:
  - Mark preservative-treated decking timber to AS/NZS 1604.1 (2021).

Arrises: Chamfered or round.

Composite decking

General: Proprietary composite decking boards, as documented.

Compressed fibre cement decking

Standard: To AS/NZS 2908.2 (2000).

Category: Minimum 4.

Classification:

- Exterior use: Type A.
- Interior use: Type B.

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Tests

Slip resistance: To AS 4586 (2013).

2.4 SHEET FLOORING

Plywood

Standard: To AS/NZS 2269.0 (2012).

Plywood formaldehyde emission class to AS/NZS 2269.0 (2012): Class E_1.

Surface grade: CD.

Bond: Type A to AS/NZS 2754.1 (2016).

Durability:

- Preservative treatment to AS/NZS 1604.1 (2021) Table F.1:
  - Indoors above ground: H2 minimum.
  - Outdoors above ground: H3 minimum.
- Identification: Mark preservative-treated plywood to AS/NZS 1604.1 (2021).

Particleboard

Particleboard flooring: To AS/NZS 1860.1 (2017), Class 1.

Particleboard formaldehyde emission Class to AS/NZS 1860.1 (2017): Class E1.

Identification: Mark particleboard flooring to AS/NZS 1860.1 (2017).

Product certification scheme

Identification: Identify timber products using branding or certification.

- Branding: Brand plywood and particleboard under the authority of a recognised product certification scheme to *0185 Timber products, finishes and treatment*, as applicable to the product. Locate the brand mark on faces or edges that will be concealed.
- Certification: Provide certification from a recognised product certification scheme to *0185 Timber products, finishes and treatment* as appropriate to the product.

Compressed fibre cement sheet

Standard: To AS/NZS 2908.2 (2000).

Category: Minimum 4.

Classification: Type: A.

2.5 SPRUNG FLOORS

General

System: Proprietary system of plywood on an interwoven batten frame or other resilient frame.

Components

Framing and sheeting: To the manufacturer's recommendations.

Flooring: As documented.

Moisture protection: To the manufacturer's recommendations.

Resilient pads: Closed cell pads.

Skirting: Vermin-proof.

Accessories
Ramped threshold gradients: 1 in 8 maximum.

Floor fittings: As documented.

2.6 AUTOCLAVED AERATED CONCRETE (AAC) PANELS

General
Requirement: Lightweight concrete floor panels manufactured from a proprietary mixture of sand, lime and cement with a gas-forming additive, and with internal welded steel reinforcing mesh, cured in an autoclave.

Standard: To AS 5146.1 (2015).

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Accessories
Requirement: Accessories to the manufacturer's recommendations for the AAC panel system, including the following:

- Construction adhesive.
- AAC thin bed adhesive for panel joints.
- MP bugle head and hex head screws. Conform to AS 5146.3 (2018) Table 2.13.3
- Fire-resisting and acoustic rated sealants.

2.7 OTHER MATERIALS

Tactile ground surface indicators
Standard: To AS/NZS 1428.4.1 (2009).

3 EXECUTION

3.1 PREPARATION

Subfloors
General: Make sure support members are in full lengths without splicing.

Flatness: Less than 3 mm deviation of the substrate under a 3 m straightedge laid in any direction with no abrupt variations greater than 1 mm over 250 mm.

Timber decking on steel joists
General: Screw fix seasoned battens to the steel joists so that their top surfaces are aligned.

- Batten size: Minimum 35 mm thick.
- Spacing of fasteners: Less than 600 mm.

3.2 FIXING DECKING

Timber decking
Standard: To AS 1684.2 (2021), AS 1684.3 (2021) or the NCC cited AS 1684.4 (2010) as appropriate.

Installation: Lay in long lengths with the ends of each board firmly butted to the next and firmly in contact with the joists. Stagger the end joints and locate them centrally over joists.

Minimum number of spans across supports: 3.

Nailing:

- General: Make sure the boards are in contact with the joists at the time of nailing, particularly where boards are machine nailed. If nails are to be less than 10 mm from ends of boards, predrill nail holes 0 to 1 mm undersize.
- Top nailing: Double nail at each bearing with hot-dip galvanized or stainless steel nails driven flush. Offset nails at intermediate fixings or skew nail 10° in opposite directions.

Sealing: Apply one coat of water repellent preservative and one coat of finish coat to top surface of joists and all surfaces of boards before fixing.

Compressed fibre cement decking
General: To manufacturer’s recommendations.

Installation: Lay the sheets parallel or at right angles to the joists. Locate end joints centrally over joists. Provide noggings or trimmers joists, cut between and fixed to joists to support the edges of sheets.

Minimum number of spans across support: 2.

Fixing: Predrill screw holes with 1 mm clearance over screw diameter and countersink. Fix with corrosion-resistant countersunk screws. Apply sealant to screw hole and screw before fixing and stop screw head with sealant, finished slightly below the surface after fixing.

Spacing of fasteners:

- Sheet edge and intermediate: Less than 450 mm.
- Corners and sheet edges: At least 12 mm from sheet edges and 50 mm from corners.

Joints: Provide butt joints 5 mm wide. Insert compressible closed cell polyethylene foam backing rod and fill the joint with a flexible sealant.

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Composite decking

Installation: To manufacturer's recommendations.

3.3 FIXING SHEET FLOORING

Particleboard flooring

Installation: To AS 1860.2 (2006).

Plywood flooring

Installation: To AS 1684.2 (2021), AS 1684.3 (2021) or the NCC cited AS 1684.4 (2010), as appropriate.

Compressed fibre cement flooring

General: To manufacturer's recommendations.

Installation: Lay the length of the sheets at right angles to the joists. Stagger the end joints and locate centrally over joists. Apply adhesive to edges of sheets and firmly butt join together.

Minimum number of spans across supports: 2.

Fixing: Predrill screw holes with 1 mm clearance over screw diameter and countersink. Fix with corrosion-resistant countersunk screws.

Spacing of fasteners:

- Sheet edge and intermediate: Less than 450 mm.
- Corners and sheet edges: At least 12 mm from sheet edges and 50 mm from corners.

Wet area flooring: Stop screw heads with sealant.

3.4 FIXING SPRUNG FLOORS

General

Method: To the manufacturer's recommendations.

Control and expansion joints: To the manufacturer's recommendations.

3.5 AAC PANEL FLOORING

Standard

General: To AS 5146.3 (2018).

Subfloor

Requirement: Conform to AS 5146.3 (2018) Table 3.4 for maximum joist spacing.

Cutting

General: Do not cut panels, except in documented locations.

Cut edges: Protect exposed reinforcing with anti-corrosion agent to manufacturer's recommendations.

AAC panel installation

Requirement: Install panels to manufacturer's recommendations and as follows:

- Minimum end bearing length: Greater of 60 mm or span/80.
- Minimum edge bearing length: 60 mm.
- Apply construction adhesive between the panels and the joists and screw fix the panels to the joists. Conform to AS 5146.3 (2018) Section 6.
- Progressively apply AAC adhesive to joints between adjacent panels.
- Fit panels snugly together to fully bed adhesive.

Control joints

Requirement: Provide minimum 10 mm wide control joints as follows:

- Spaced at maximum 8 m centres in floors up to 100 mm thick.

- Where AAC panels abut adjacent building elements.

Slip joints

General: Provide slip joints to allow for differential movement as documented.

Sealant

Locations: Install fire-resisting and acoustic sealant as documented and as follows:

- At all control joints.
- At services penetrations.

3.6 COMPLETION

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Rectification

General: Correct any defects to joints, remove any excess joint adhesive, and leave the floor panel installation complete, clean and ready for the installation of finishes.

Operation and maintenance manuals

Requirement: Prepare a manual that includes details for the care and maintenance of the decking, sheet and panel flooring, including manufacturer's published instructions.

Warranties

Type: Provide Manufacturer’s Warranty

0411B WATERPROOFING - EXTERNAL AND TANKING

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide external waterproofing and tanking systems to substrates, as documented.

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Performance

Requirements:

- Graded to falls to dispose of stormwater without ponding above the depth of lapped seams.
- Able to accommodate anticipated building movements.
- Able to accommodate its own shrinkage over the warranty life of the roofing system.
- Able to resist water under hydrostatic pressure.
- Fit for purpose.
  - Remains intact and waterproof under the local ambient climatic conditions.
  - Accommodates the full range of building movements including shrinkage, structural, thermal and differential movements.
  - Accommodate permanent and transient loads without performance compromise.
  - Provides adequate means of dealing with vapour pressure, condensation, movement due to long term curing of the lowshrinkage waterproof concrete substrates, corrosion and thermal movement.
  - Supports applied finishes which may include landscaped overburden, asphalt road paving, tile/ stone paving and concrete paving without impairment of performance.
  - Is certified that it will not produce any migration of pthalates, phenyls, aromatics nor plasticizer compounds into the drainage water or the soil.
  - Is certified that it is compatible with fertilizer components and solubles for landscape areas.
  - Is certified that the membrane material and all site laps and joints have complete resistance to intrusion by aggressive plant roots for landscape areas.
  - Is certified that the hydration and vapour pressure from substrates will not debond the membrane.
  - Has all junctions, seams and joints homogeneous.
  - Has curing time constraints which do not interfere with the programme for following trades.
  - Where exposed: is stable to naturally occurring radiation including UV, is incombustible and non-flammable.
  - Is suitable for surface finishes including landscaped overburden, garden, trees, plants, soil, paving, and hot mix asphalt.
  - Can be repaired to same standard as undamaged installation.
  - Where required to be trafficable, it is abrasion, impact, puncture and slip resistant to the degree necessary for the relevant traffic load.
  - Where exposed to aggressive chemicals is suitably resistant to the relevant risk.
  - Will maintain waterproofing integrity at all large and small penetrations at all separation, joints, expansion and contraction joints, control and isolation joints, internal and external angles, at all terminations.
  - Has a current Australian Building Product and Systems Certification Scheme certificate where required by standard.

1.2 CROSS REFERENCES

General

Requirement: Conform to the following:

- *0171 General requirements*.
- *Section 0310 Concrete – combined*
- *Architectural Drawings and Schedules*
- *Structural engineer's documentation*

- *Hydraulic Engineer's Documentation*
- *Landscape Architect's Documentation*
- *Water proofing consultant report*
- *BCA Report*

1.3 STANDARDS

Below ground waterproofing
Membrane design and installation: To BS 8102 (2022).

External waterproofing
Membrane materials: To AS 4654.1 (2012).

Membrane design and installation: To AS 4654.2 (2012).

Stormwater drainage
Standard: To AS/NZS 3500.3 (2021).

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1.4 INTERPRETATION

Abbreviations
General: For the purposes of this worksection, the following abbreviations apply:

- APP: Atactic polypropylene.
- SBS: Styrene butadiene styrene.

Definitions
General: For the purposes of this worksection, the definitions given in AS 4654.1 (2012) and AS 4654.2 (2012) and the following apply:

- Bitumen: A viscous material from the distillation of crude oil comprising complex hydrocarbons, which is soluble in carbon disulfide, softens when it is heated, is waterproof and has good powers of adhesion. It is produced as a refined by-product of oil.
  - . APP bitumen: Bitumen modified with atactic (meaning non-crystalline or amorphous) polypropylene wax to form a plastomeric sheet. The membrane is reinforced with fibreglass or non-woven polyester (NWP).
  - . SBS bitumen: Bitumen modified with styrene-butadiene-styrene, a thermoplastic rubber that undergoes a phase inversion at elevated temperature and converts to an elastomeric material. The membrane is reinforced with fibreglass or non-woven polyester (NWP).
- Bond breaker: A system preventing a membrane bonding to the substrate, bedding or lining.
- Double detail joint: A joint formed by turning up and bonding the horizontal membrane to a vertical substrate and adding an overflashing of membrane material bonded to the vertical substrate and folded over and bonded to the horizontal membrane. In certain situations the double detail can be achieved by bonding an angle profile of membrane material to the junction before laying the membrane.
- Liquid applied: A water-based formulation that cures to form an elastomeric membrane.
- Polyurethane: Water or solvent-based formulations that moisture cure to form an elastic rubber membrane.
- PVC membrane: Flexible plastic sheet membrane (vinyl).
- Slip sheet: A sheet used to isolate the membrane system from the supporting substrate or from the topping or mortar bedding. The most common material is polyethylene.
- Substrate: The surface to which a material or product is applied.
- Waterproofing system: Combinations of membranes, flashings, drainage and accessories that form waterproof barriers and that may be:
  - . Loose-laid.
  - . Bonded to substrates.

1.5 SUBMISSIONS

Operation and maintenance manuals
Requirement: Submit manual to **COMPLETION**, **Operation and maintenance manuals**.

Records
General: Submit photographic records to EXECUTION, **GENERAL**, **Reporting**.

Flood tests: Submit photographic records to **TESTING**, **Flood tests**.

Subcontractors

General: Submit names and contact details of proposed suppliers and installers as recommended by the manufacturer.

Evidence of experience: Provide proof of experience

Substrate acceptance

Requirement: Submit evidence of installer's acceptance of the flooring substrate before starting installation.

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Tests

Site tests: Submit test results of the following:

- Substrate moisture content to **TESTING**, **Substrate moisture tests**.
- Flood test, including results of retesting after rectification, to **TESTING**, **Flood tests**.
- Slip resistance of completed installation to **TESTING**, **Slip resistance tests**.

Warranties

Requirement: Submit warranties to **COMPLETION**, **Warranties**.

Shop drawings

Submit fully detailed shop drawings showing:

- Sump and outlet details, falls, substrate details
- Junctions with vertical surfaces and upstands.
- Junctions at perimeters.
- Drainage details. - Control joints.
- Flashings. - Penetrations. - Corners.
- Terminations and connections.
- All relevant junction details to the building fabric.
- All relevant accessories.

The subcontractor shall furnish shop drawings in sufficient time and with such detail and accuracy so that the Architect can review relevant information for adherence to the architectural design intent and other relevant matters in advance of the actual execution of the work. Standard details approved by the manufacturer as appropriate for the project may be submitted for approval.

Execution records

Placing records: Photographically record the application of membranes and label with the following information:

- Date. - Portion of work.
- Substrate preparation.
- Weather during application and curing.
- Protection provided from traffic and weather.

Samples

Prior to ordering materials submit samples and product data of all specified materials including:

- Membrane systems.
- Primers.
- Adhesives.
- Caulking.
- Sealants.
- Protective sheeting.
- Accessories.

Samples of each selected material to be submitted mounted on a single display board. Ordering of waterproofing materials may not commence until samples and prototypes have been approved. For elastomeric spray-on waterproofing membranes provide dated elongation test results by independent NATA approved testing laboratory for samples taken on site.

Certification

Certification and test certificates shall be provided by the Subcontractor stating that the materials and form of installation proposed, comply with the latest Building Code requirements and the following:

- Design: The Subcontractor must obtain from the membrane manufacturer written certificate, scheduling the following design/performance criteria including:
- Specification for use
- Compliance with Manufacturer's Project Specific Specification
- Acceptance of substrate
- Compatibility of thermal and movement joints with the Waterproofing System and accessories.
- Materials: The Subcontractor must obtain a certificate from the Manufacturer certifying the manufacture and fabrication comply with the specified / performance criteria.
- Testing: The Subcontractor shall provide completed ITP with required sign offs by all parties and certificates for testing as specified in this specification worksection.
- For two part elastomeric spray-on waterproofing membranes provide elongation test results from samples taken on site.
- Installation: The Subcontractor must provide a certificate from the Manufacturer certifying that the installed Waterproofing System include fixing methods, materials and sizes are as per above and certified design. This certification must confirm the installation complies with the product's project and site specific specifications.

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1.6 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following:

- Substrates prepared and ready for installation of the waterproofing and tanking systems.
- Secondary layers prepared and ready for subsequent layers.
- Membranes after installation and before concealment.
- Underflashings after installation and before installation of overflashings.
- After flood testing, if applicable.

2 PRODUCTS

2.1 GENERAL

Storage and handling

General: Store and handle to the manufacturer's recommendations and as follows:

- Protect materials from damage.
- Each waterproofing system shall be complete with all the necessary components, including primers, membranes, top coatings, geotextile fabric, drainage cells, flashings, overflashings, cappings, base angles, raglets

2.2 MEMBRANES

Membrane system

Requirement: Proprietary membrane system suitable for the intended external waterproofing.

- Certificate: A current BRANZ Appraisal Certificate.

Tanking system

Requirement: Proprietary membrane system suitable for the intended below ground tanking.

2.3 ACCESSORIES

Internal roof outlets

General: Proprietary funnel shaped sump cast into the roof slab, set flush with membrane, with a removable grating and provision for sealing the membrane into the base of the outlet.

Material: To Hydraulic Engineers requirements.

Grating: Domed

Bond breakers
Requirement: Compatible with the extensibility class of the membrane to be used.
Material: Purpose-made bond breaker tapes and closed cell foam backing rods or fillets of sealant.
Flashings
Requirement: Flexible waterproof flashings compatible with the waterproof membrane system.
Liquid membrane reinforcement
Requirement: Flexible fabric compatible with the waterproof membrane system.
Sealants
Requirement: Waterproof, flexible, mould-resistant and compatible with the waterproofing system.
Adhesives
Requirement: Waterproof and compatible with the waterproofing system.
Control joint covers
Corners, crossovers, tees and bends: Factory mitred, welded and provided with 50 mm legs
End closures: Factory folded and sealed to match joint cover profile.
Fixing hobs: Concrete or timber.

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2.4 THERMAL INSULATION

Insulation boards
Description: 70mm rigid insulation wrapped in geotextile fabric (30mm Styrofoam Floormate-X where specified on architectural documentation) finished with gravel layer.

2.5 PROTECTION

Protection board
Description: Protection board shall be 3mm polyethylene Colorscope's 'Impact' protection board.
Joints: Joints of sheets shall be butt jointed and sealed with a 50mm wide black polythene pressure sensitive tape such as BEAR No. 500 as manufactured by Nortons Pty Limited. Application of protection board shall be followed by subsequent work within a suitable period of time to prevent deterioration due to ultra-violet exposure or site conditions. To manufacturer’s specification

2.6 SLIP SHEETS

Sheet material
Description: 1 layer of 130 g/m2 geotextile sheet

2.7 DRAINAGE CELL PANELS

Walls
Material: [complete/delete]
Cell panel protection: [complete/delete]
Filter: [complete/delete]
Location:[complete/delete]
Planter bases
Product: Elmich Versicell 20mm or approved alternative
Filter: Geotextile Fabric
Location: Planter boxes. Refer to Design Drawings.
Concrete Roofs
Product: Elmich Versicell 20mm or approved alternative
Filter: Geotextile Fabric
Protection: 70mm rigid insulation wrapped in geotextile fabric (30mm Styrofoam Floormate-X where specified on architectural documentation) finished with gravel layer.
Location: Awnings, Gravel Roofs. Refer to Design Drawings.

3 EXECUTION

3.1 GENERAL

Reporting

General: Make progressive photographic records of the waterproofing installation. Label photographs with the date, location and weather.

Timing: Record at the following stages:

- After substrate preparation.
- After primer application.
- After membrane installation.
- After protection from traffic provided.

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Liquid applied membranes:

- Record wet film thickness once every 10 m^2 and compare to the manufacturer's requirements.
- On completion of every 100 m^2 of each coat, compare the amount of membrane used with the manufacturer's application rate and record the result.

3.2 PREPARATION

Substrates

General: Prepare substrates as follows:

- Clean and remove any deposit or finish that may impair adhesion of membranes.
- Remove excessive projections.
- Fill voids and hollows in concrete substrates with a concrete mix not stronger than the substrate.
- Fill cracks in substrates wider than 1.5 mm with a filler compatible with the membrane system.
- Remove all traces of a concrete curing compound if used.

Concrete substrates: Cure for more than 28 days.

Moisture content

Requirement: Verify that the moisture content of the substrate is compatible with the water vapour transmission rate of the membrane system by testing to **TESTING**, **Substrate moisture tests**.

Falls

Requirement: Verify that falls in substrates are greater than 1:100.

Joints and fillets

Internal corners:

- Liquid applied membranes: Provide 15 x 15 mm 45° fillets.
- Sheet membranes: Provide 40 x 40 mm 45° fillets.

Fillet material: Cement or plastic.

External corners: Round or arris edges.

Control joints: Prepare all substrate joints to suit the membrane system.

Priming

Compatibility: If required, prime the substrates with compatible primers for adhesion of the membrane system.

3.3 INSTALLATION

Ambient conditions

Requirement: Do not install in conditions outside the manufacturer's recommendations.

Protection

Damage: Protect membrane from damage during installation and for the period after installation until the membrane achieves its service characteristics that resist damage.

Drains

General: Prevent moisture from tracking under the membranes at drainage locations.

Drains and cages: Provide removable grates or cages to prevent blockage from debris. If the finished surface is above the level of the membrane, provide a slotted extension piece to bring the grate up to the level of the finished surface.

Overflows: Apply a bond breaker to the perimeter of the overflow outlet at its junction with the surface to which the membrane will be fixed. Turn the membranes into the overflow to prevent moisture from tracking behind the membrane.

Sheet membrane joints

Orientation of laps: Lap sheets on the upslope side of the roof fall over sheets on the downslope side.

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End laps generally: Stagger end lap joints.

Bituminous sheet membranes:

- Side laps: ≥ 75 mm.
- End laps: ≥ 150 mm.
- Method: Heat welded.

Synthetic rubber membranes:

- Factory-vulcanized laps: ≥ 40 mm.
- Field side laps: ≥ 50 mm.
- Field end laps: ≥ 100 mm.

PVC membranes:

- Factory-welded laps: ≥ 40 mm.
- Field-welded laps:
  - If used over insulation boards: ≥ 100 mm.
  - Other instances: ≥ 75 mm.

Movement and control joints

General: Install membranes to accommodate control joints in the substructure.

Bond breakers: Size to allow the membrane to accommodate movement.

Joint backing gutter: Fix a formed metal gutter to one side of the soffit directly below the joint and fall to a suitable disposal or drainage point.

Control joint covers: Install after fixing hobs and membranes.

Backing rod: Closed cell polyethylene foam with 25% - 50% compression

Sealant: To suit membrane system.

Joint backing gutter: Fix a formed stainless steel gutter to one side of the soffit directly below the joint and fall to a suitable disposal or drainage point.

Membrane terminations

Membrane upturns: Provide upturns above the maximum water level expected from the exposure conditions of rainfall intensity and wind, as follows:

- Height: To AS 4654.2 (2012) Table A1.
- Anchoring: Secure sheet membranes along the top edge.
- Edge protection: Protect edges of the membrane.

Waterproofing above vertical upward terminations: Waterproof the structure above the termination to prevent moisture entry behind the membrane using cavity flashings, capping, waterproof membranes or waterproof coatings.

Vertical upward terminations:

- Liquid applied membranes: Terminate under an overflashing, or provide an overflashing of liquid applied membrane.
- Sheet membranes: Terminate under an overflashing, or provide a pressure seal overflashing or an overflashing fixed into a cast-in reglet.

Membrane downturns: Provide downturns for sheet membrane systems as follows:

- Roofs or similar structures: Extend minimum 100 mm from the junction of the structure.
- Balconies with a fully bonded membrane: Terminate at the drip groove.

Vertical downward terminations:

- Liquid applied membranes: Extend membrane to the underside of a horizontal return.

- Sheet membranes: Provide a pressure seal overflashing.

Horizontal terminations: Do not provide. Use vertical terminations.

Membrane penetrations

Vertical penetrations: Provide overflashing fixed to the substrate for vertical penetrations including pipes, ducts and vents.

Horizontal penetrations: Provide SBS bitumen flange to seal the membrane to rigid PVC-U conduits and pipes without burning the PVC-U. Do not use high density polyethylene (HDPE), polypropylene (PP) pipes or flexible PVC conduit.

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Membrane at balcony doors and windows

Requirement: Install membrane before fixing door or window frames.

Upturn height above external finished floor level: To AS 4654.2 (2012) Table A1.

Hobless and flush thresholds: Install membrane before fixing door or window frames. Provide a continuous grated drain abutting the external face of the door or window sill.

Membrane around skylights and hatches

Requirement: Install membranes to upstands before the installation of the skylight or hatch.

Upturn height above roof surface: To AS 4654.2 (2012) Table A1.

Membrane at parapets

Requirement: Terminate membrane upturns under parapet flashing or capping with at least 75 mm overlap. Do not top fix parapet cappings. Seal heads of fasteners against capping.

Membrane at gutters

Requirement: Terminate membrane over a corrosion-resistant metal angle fixed to the gutter support substrate with the vertical leg of the angle turned down into the gutter at least 35 mm.

Membrane at post supports

Post supports fixed before membrane:

- Fix post support to substrate with countersunk fasteners and seal the perimeter of the base plate to the substrate.
- Lay out membrane sheets to minimise cuts around the post support vertical member.
- Dress the membrane closely around the post support and seal the edge of the penetration to the vertical member.
- Fix an overflashing so that any joint is staggered as much as possible relative to joints in the base membrane, and overlap at least 150 mm beyond the perimeter of the base plate.

Post supports fixed after membrane:

- Fix post support to substrate with countersunk fasteners over a waterproof resilient gasket cut to match the shape of the base plate, and seal the perimeter of the base plate to the membrane.
- Dress the overflashing closely around the post support and seal the edge of the penetration to the vertical member.
- Fix an overflashing and overlap at least 150 mm beyond the perimeter of the base plate.

Membrane to planter boxes

Membrane: Extend root-resistant membrane at least 100 mm vertically above the soil or fill level and secure.

Drainage: Grade the base of the planter to adequately sized drainage outlets and terminate the membrane in the outlets.

Drainage riser: Install a riser with drainage slots that extend from the membrane level to the top of the drainage cell. Extend the riser above the soil fill level and finish with a screw cap to provide access for drain clearing.

Protection board: Provide protection board to the full extent of the membrane including areas between soil level and the underside of flashings and cappings.

Drainage cell: Provide geo-filter fabric wrapped drainage cell to the base of the planter and turn geo-filter fabric up drainage riser at least 100 mm above drainage slots.

Cappings and flashings: Provide capping to the tops of planter walls to protect the membrane. Extend the capping to overlap the top of the protection board on the inside face of the planter wall. Where planter walls abut other walls, provide a flashing over the top of the membrane.

Membrane to below ground structures

Membrane: Externally apply membrane to all walls and return to horizontal surfaces to prevent water tracking around structure at joints and corners.

Reinforcement: Provide reinforcement to the membrane at junctions, corners and over joints to the manufacturer's recommendations.

Protection board: Provide protection board to the full extent of the membrane.

Drainage cell: Provide geo-filter fabric wrapped drainage cell to vertical surfaces of the structure.

Curing of liquid membrane systems

General: To the manufacturer's recommendations.

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Overlaying finishes on membranes

Compatibility: If a membrane is to be overlaid with another system such as tiles, pavers, ballast, insulation or soil, provide an overlaying system that is compatible with and will not cause damage to the membrane.

Bonded or partially bonded membranes: If the topping or bedding mortar is to be bonded to the membrane, provide sufficient control joints in the topping or bedding mortar to reduce the movement over the membrane.

Slip sheet: If the topping or bedding mortar is structurally sufficient to not require bonding to the substrate, lay a double slip sheet over the membrane to separate it from the topping or bedding mortar.

Paint coatings: If maintenance pathways are indicated by a paving paint, use a paving paint that is compatible with the membrane.

3.4 TESTING

Substrate moisture tests

Moisture content of concrete substrate: Test substrate in-slab relative humidity to ASTM F2170 (2019). Perform three tests for the first 100 m^2 of subfloor area and an additional test for each additional 100 m^2.

Moisture content of timber, plywood and particleboard substrate: Test substrate to AS/NZS 2098.1 (2006) for plywood substrates or to AS/NZS 1080.1 (2012) for timber and particleboard substrates.

Flood tests

Requirement: Perform a flood test before the installation of surface finishes.

Moisture content measurement method: To **Substrate moisture tests**.

Set-up:

- Measure the wall/floor junction of adjacent spaces and of the slab soffit below for dryness.
- Record the result for each area.
- Dam the access openings and seal drainage outlets.
- Provide temporary overflows of the same capacity as the outlets.
- Fill space with clean water as follows:
  - Minimum water level: 25 mm.
  - Maximum water level: 100 mm.
  - Minimum dimension below perimeter flashings: 25 mm.
- Test duration: Minimum 24 hours and maximum 72 hours.

Records:

- Make photographic records of the flooded areas and adjacent areas.
- Label photographs with the date and location.

Evaluation:

- Visual test: Drain the water. After 2 hours, visually inspect the wall/floor junction of adjacent spaces and of the slab soffit below for water or moisture.
- Moisture meter test: If there is no visual evidence of water, test the same areas for dryness using a moisture meter, and compare the results to the measurements taken before flooding.

Conformance:

- Evidence of water from the visual test: Failure.
- Test results indicating an increase in moisture after flooding: Failure.
- Failure: If required, remedy defects and retest.

Slip resistance tests

Slip resistance of completed installation: To AS 4663 (2013).

3.5 COMPLETION

Reinstatement

Extent: Repair or replace faulty or damaged work. If the work cannot be repaired satisfactorily, replace the whole area affected.

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Operation and maintenance manuals

Requirement: Prepare a manual that includes the manufacturer's maintenance recommendations, including the following:

- Preventive maintenance procedures.
- Instructions and procedures for the repair of the membrane.

Warranties

Waterproofing: Cover materials and workmanship in the terms of the warranty in the form of interlocking warranties from the supplier and the applicator.

- Form: Against failure of materials and execution under normal environment and use conditions.
- Period: As offered by the supplier.

0431 CLADDING - COMBINED

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide external wall cladding and associated work, as documented.

- Ensures all interfaces are fully coordinated prior to commencement, and with respect to all associate components including metal flashings and cappings, rainwater goods, insulation and roof access hatch.

Provide high-density prefinished fibre cement cladding and associated work which is as follows:

- Satisfies the product performance requirements.

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Corrosion resistance

Material: To the manufacturer's recommendations for distance from marine influence.

1.2 CROSS REFERENCES

General

Requirement: Conform to the following:

- *0171 General requirements*.
- *Architectural Drawings and Schedule*
- *BCA Report*
- *Structural Engineer's Documentation*
- *Façade Engineer's report*
- *Acoustic report*

1.3 INTERPRETATION

Abbreviations

General: For the purposes of this worksection, the following abbreviations apply:

- AAC: Autoclaved aerated concrete.
- ACP: Aluminium composite panel.
- CCA: Copper chrome arsenate.
- CFC: Compressed fibre cement.
- EIFS: Exterior insulation and finish system.
- EPS: Expanded polystyrene.
- EPS-FR: Expanded polystyrene-fire retardant.
- FC: Fibre cement.
- GRP: Glass fibre reinforced polyester.
- LOSP: Light organic solvent preservative.
- MRF: Mineral fibre.
- PF: Phenolic foam.
- PIR: Rigid polyisocyanurate foam.
- PUR: Rigid polyurethane foam.
- XPS: Extruded polystyrene.

1.4 TOLERANCES

Permitted deviations

Flat sheet and panel cladding: To the manufacturer's recommendations.

Insulated panel systems: To the manufacturer's recommendations.

Plank and weatherboard cladding: 5 mm from a 1.8 m straightedge or to manufacturer's recommendations.

Profiled metal sheet cladding: To AS 1562.1 (2018) clause 4.2.3.

Structural steelwork for wall cladding: ±5 mm between bearing planes of adjacent supports.

1.5 SUBMISSIONS

Fire performance

Combustibility: Submit evidence of conformity to **FIRE PERFORMANCE**, **Combustibility**.

Fire hazard properties: Submit evidence of conformity to **FIRE PERFORMANCE**, **Fire hazard properties**.

Fire-resistance level: Submit evidence of conformity to **FIRE PERFORMANCE**, **Fire-resistance of building elements**.

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Operation and maintenance manuals

Requirement: Submit manual to **COMPLETION**, **Operation and maintenance manuals**.

Products and materials

Thermal insulation performance: Submit evidence of performance to AS/NZS 4859.1 (2018) and AS/NZS 4859.2 (2018).

Type tests: Submit test results for the following:

- Facade: To PRODUCTS, **GENERAL**, **Tests**.

Samples

Requirement: Submit samples to PRODUCTS, **GENERAL**, **Samples**.

Shop drawings

General: Submit shop drawings to a scale that best describes the detail, showing the following:

- Dimensioned elevations of all elements.
- Details of construction, connections and all support systems.
- Dimensions of all typical elements and of any special sizes and shapes.
- Provision for the exclusion and/or drainage of moisture.
- Jointing details and method of fixing between individual elements and between this installation and adjacent work, including adjustment.
- Sealant types and full size sections of all sealant-filled joints and backing rods.
- Provision for thermal movement.
- Provision for movement under seismic and wind loads.
- Sequence of installation.
- Coordination requirements with other work.
- Schedule of materials, finishes, componentry, hardware and fittings.

Subcontractors

General: Submit names and contact details of proposed suppliers and installers.

Evidence of experience: Provide evidence of experience

Seamed sheet metal cladding: Submit evidence of experience with non-ferrous cladding installation.

Warranties

Requirement: Submit warranties to **COMPLETION**, **Warranties**.

1.6 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following:

- Workshop assemblies before delivery to the site.
- Framing, pliable membranes and insulation before covering up or concealing.
- Arrange to inspect the following with the Superintendent with a minimum of two working days' notice:
- Complete framing with sarking, vapour barrier, and insulation in place prior to being covered up or concealed
- Cladding in place prior to any caulking or flushing over of joints, as applicable, or application of surface finishes
-

Samples

Submit Contract samples of the following:

- 300mm x 300mm samples of each type of cladding
- Colour samples of all finish types 300mm x 300mm minimum size
- 300mm length of each custom profiled extrusion, flashings, and capping
- Samples of waterproofing, visible accessories, and fixing types

Prototypes

Provide the following prototype:

- Construct a Prototype Panel, nominally 2000mm x 2000mm, including edges, trimming, waterproofing layers, flashings, fixings, and associated accessories, incorporating vertical and horizontal joints.
- Typical section of cladding details, including all expressed slab edges, hobs, balustrade, fixed aluminium rods and sections, as documented on the Architectural Drawing: A-450-001 Façade details, FD01 Balcony, FD02 Living Area and FD04 Balcony.

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2 PRODUCTS

2.1 GENERAL

Samples

Requirement: Provide samples of the cladding material showing the range of variation available.

Storage and handling

Requirement: Store and handle materials to the manufacturer's recommendations and the following:

- Protect materials including edges and surfaces from damage.
- Keep dry and unexposed to weather.
- Do not drag sheets or panels across each other or over other materials.
- AAC panels: Stack on edge, support off the ground and level to avoid sagging and damage to ends, edges and surfaces.
- Composite panels: Store unpacked panels by size in racks and protect from scratching, warping or bending.
- Sheeting: Stack flat and off the ground on at least 3 evenly placed bearers.
- Store metal materials away from uncured concrete and masonry on a level base.
- Do not store metal materials in contact with other materials that may cause staining, denting or other surface damage.
- Use gloves when handling precoated metal cladding material.

Components

Cladding support: Provide components, as documented.

Fasteners and ties: Type, size, corrosion resistance class and spacing to the cladding manufacturer's recommendations.

Flashings: To AS/NZS 2904 (1995).

Tests

Insulated panel systems:

- Water penetration: To AS/NZS 4284 (2008).
- Structural testing: To AS/NZS 4284 (2008).
- Resistance to wind pressures:
  - Non-cyclonic wind regions: To AS 4040.2 (1992).
  - Cyclonic wind regions: To AS 4040.3 (2018).

Profiled or seamed sheet metal:

- Resistance to wind pressures:
  - Non-cyclonic wind regions: To AS 4040.2 (1992).
  - Cyclonic wind regions: To AS 4040.3 (2018).

Other cladding:

- Water penetration: To AS/NZS 4284 (2008).
- Structural testing: To AS/NZS 4284 (2008).
- Resistance to wind pressures:
  - Non-cyclonic wind regions: To AS 4040.2 (1992).
  - Cyclonic wind regions: To AS 4040.3 (2018).
- Resistance to impact: To AS/NZS 4040.5 (1996).

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2.2 FIRE PERFORMANCE

Combustibility

Cladding: Tested to the NCC cited AS 1530.1 (1994).

Fire hazard properties

Group number: To AS 5637.1 (2015).

Bonded laminated materials: Tested to AS/NZS 1530.3 (1999). Fire hazard indices, as follows:

- Spread-of-Flame Index: 0.
- Smoke-Developed Index: ≤ 3.

Insulation materials: Tested to AS/NZS 1530.3 (1999). Fire hazard indices as follows:

- Spread-of-Flame Index: ≤ 9.
- Smoke-Developed Index: ≤ 8 if Spread-of-Flame Index is more than 5.

Fire-resistance of building elements

Fire-resistance level: Tested to AS 1530.4 (2014).

Fire-stops

Requirement: If fire-stops and smoke flashings are placed between inner faces of the cladding and building elements (such as beam, slab or column faces), install and seal to meet fire test requirements.

Product: Builder to provide specification for Fire engineer approval

2.3 AUTOCLAVED AERATED CONCRETE (AAC) PANELS

General

Requirement: Proprietary AAC panels.

Standard: To AS 5146.1 (2015).

Joint adhesive: Proprietary adhesive to the manufacturer's recommendations.

Sealant: Flexible sealant to the manufacturer's recommendations.

2.4 ALUMINIUM WEATHERBOARDS

General

Requirement: Proprietary prefinished aluminium weatherboards.

Standard: To AS/NZS 1734 (1997).

Finishes

Anodising: To AS 1231 (2000).

- Thickness: 15 to 20 µm.

2.5 COMPOSITE PANELS

General

Requirement: Proprietary panels comprising prefinished skins continuously laminated over a panel core, as documented.

Panel joints and control joints: Integral.

Flexible sealant: Non-staining to the manufacturer's recommendations.

Aluminium composite panels (ACPs)

Product identification: Permanent labelling to SA TS 5344 (2019).

2.6 COMPRESSED FIBRE CEMENT (CFC) SHEETS

General

Requirement: Proprietary compressed fibre cement sheets.

Standard: To AS/NZS 2908.2 (2000) and the following:

- Type A Category 5.

Finish: Smooth and even with factory sealed edges, free of imperfections such as chips.

Edge profile: Square.

Sealant and bond breaking tape: To the manufacturer's recommendations.

- Provide a proprietary system of high density, compressed fibre cement (CFC) panel cladding system Arrangement: Set out in even panels with joints coinciding with framing. Refer to Façade Set Out Schedule for panel sizes and joint locations as indicated. Finish: Prefinished as nominated: Refer to Master Schedule. Width x length (mm): Refer Façade Set Out Schedule. Minimum panel size 2500mm x 1220mm. Sheet thickness: 8mm Air Cavity Gap: 35mm Panel Fixings: Exposed Face fixing, Colour matched UNI Rivet to framing to manufacturer's requirements

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2.7 EXTERIOR INSULATION AND FINISH SYSTEM (EIFS)

General

Requirement: Proprietary system comprising rigid insulation panels, fixed to a subframe and finished on one or both sides with a cementitious base coat and finish coat.

Insulation

Standard: To AS/NZS 4859.1 (2018):

- Rigid cellular foam insulation (EPS and XPS): To AS/NZS 4859.1 (2018) Section 8.

Insulation blowing agents

Restricted agents: Conform to PRODUCTS AND MATERIALS, **GENERAL**, **Prohibited materials** in *0171 General requirements*.

2.8 FIBRE CEMENT (FC) PLANKS

General

Requirement: Proprietary single faced fibre cement building planks.

Standard: To AS/NZS 2908.2 (2000) and the following:

- Type A Category 3.

Corners: Preformed metal joining pieces.

2.9 FIBRE CEMENT (FC) SHEETS

General

Requirement: Proprietary single faced fibre cement sheets.

Standard: To AS/NZS 2908.2 (2000) and the following:

- Type A Category 3.

Finish: Smooth and even, free of imperfections such as chips.

Sealant and bond breaking tape: To the manufacturer's recommendations.

2.10 HARDBOARD PLANKS

General

Requirement: Proprietary wet process fibreboard planks.

Standard: To AS/NZS 1859.4 (2018).

Classification: Exterior.

Plank thickness: 9.5 mm.

External corners: Preformed metal joining pieces.

Internal corners: Scribed.

2.11 INSULATED PANEL SYSTEMS

General

Description: Proprietary panels comprising prefinished metal skin factory-bonded to both faces of an insulating core, as documented.

Panel joints and control joints: Integral.

Insulation core

Standard: To AS/NZS 4859.1 (2018):

- Rigid cellular foam insulation (EPS, PF, PIR, PUR and XPS): To AS/NZS 4859.1 (2018) Section 8.

Insulation blowing agents

Restricted agents: Conform to PRODUCTS AND MATERIALS, **GENERAL**, **Prohibited materials** in *0171 General requirements*.

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Internal and external skins

Factory pre-coating: Polyester to a dry film thickness of 25 µm.

Profile: Internal and external panel profiles as documented.

System accessories

Requirement: Proprietary insulated cladding system accessories colour matched to panels, as documented.

Sealants

Materials: Non-staining and to the manufacturer's recommendations.

2.12 PLASTIC SHEETS

General

Requirement: Proprietary plastic sheets.

Unplasticised polyvinyl chloride (PVC-U) sheet: To AS 4256.4 (2006).

Glass fibre reinforced polyester (GRP) sheet: To AS 4256.3 (2006).

Polycarbonate: To AS 4256.5 (2006).

2.13 PLYWOOD SHEETS

General

Requirement: Proprietary plywood sheets.

Standard: To AS/NZS 2271 (2004).

Bond: Type A.

Presealed plywood: Sides and edges presealed with a machine applied sealer.

Visible surfaces with a clear finish: Veneer quality A.

Other visible surfaces: Veneer quality B.

Hidden surfaces: Veneer quality C or D.

Identification: Sheets labelled under the authority of a recognised certification scheme to *0185 Timber products, finishes and treatment*.

Fasteners

LOSP treated timber and non-corrosive timber cladding: Hot-dip galvanized steel.

CCA treated timber and corrosive timber cladding (including western red cedar or redwood): Stainless steel Type 316 or silicon bronze.

2.14 PROFILED SHEET METAL

General

Requirement: Proprietary profiled sheet metal cladding.

Design and installation: To AS 1562.1 (2018).

2.15 SEAMED SHEET METAL

General

Description: Sheet metal roll formed into pan profiles, laid with seamed joints on a breathable waterproof membrane on flush finished, continuous plywood sheeting or to manufacturer's recommendations.

Plywood sheeting

Standard: To AS/NZS 2269.0 (2012):

- Surface grade: D.
- Bond: Type A.
- Formaldehyde emission class: E_1.

Thickness: 15 mm.

Identification: Sheets labelled under the authority of a recognised certification scheme to *0185 Timber products, finishes and treatment.*

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Underlayer

Requirement: Breathable waterproof membrane to internal face of cavity when cladding including a plywood or FC substrate, is installed as a vented cavity or rainscreen system. Minimum 40 mm ventilation gap between substrate and framing.

Separation layer

Requirement: Breathable waterproof membrane between cladding material and substrate.

Accessories

Solder (tin/lead): 40/60 soft solder.

Flux: Z-04-S.

Sealant: 100% neutral cure non-acid based silicone rubber to match cladding.

Fasteners: Provide starter clips, fixing clips and fastenings as recommended by the cladding system supplier.

2.16 TERRACOTTA PANELS AND TILES

General

Requirement: Proprietary cladding system comprising prefinished, fired, extruded clay panels and mechanical fixing system.

Finish: Smooth or profiled factory finish, free of imperfections such as chips.

Edge profile:

- Vertical: Square.
- Horizontal: Tongue and groove.

Suspension rails: Proprietary aluminium, galvanized steel or stainless steel extrusions.

Accessories: Proprietary powder coated aluminium profiles to the manufacturer's recommendations.

2.17 TIMBER WEATHERBOARDS

General

Hardwood: To AS 2796.1 (1999).

- Grade: To AS 2796.2 (2006).

Seasoned cypress pine: To AS 1810 (1995).

Softwood: To AS 4785.1 (2002).

- Grade: To AS 4785.2 (2002).

Fasteners

LOSP treated timber and non-corrosive timber cladding: Hot-dip galvanized steel.

CCA treated timber and corrosive timber cladding (including western red cedar or redwood): Stainless steel Type 316 or silicon bronze.

Hardwood cladding: Bullet head and plain shank nails, if the cladding is painted and nails are punched and stopped.

Softwood cladding: Flat head and plain shank nails, if cladding is painted.

CCA treated softwood cladding: Deformed shank (ring or annular) flat head nails.

Unpainted cladding/framing joints: Do not use machine driven T head nails.

2.2 METAL CLADDING

Interlocking Aluminium Panel Cladding

General: Provide a proprietary system of Premium, deemed non-combustible interlocking aluminium panel cladding system Aluminum shall be T5 Grade in 6060/6063 Alloy Arrangement: Set out in even panels. Design wind pressure (Pa): to AS/NZS 1170.2 or AS 4055 Irregularities: Provide interlocking cladding panels without irregularities such as oil canning, waves, buckles and other imperfections when viewed at any position but not less than at an angle of 15 degrees to the true plane of the panel, with natural lighting of incident of not less than the same angle. Expansion and Contraction: The cladding shall be so fabricated and erected as to provide for all expansion and contraction of the components. Finish: Prefinished Powder coated by Manufacturer, Refer to Master Schedule. Total dry-film thickness of the polyester powder coat shall be 60-90 microns minimum. The coated surface shall comply strictly with 2604 Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminium Extrusions and Panels. Weather Proofing: The system should meet the weatherproofing clause FP1.4 of the NCC for a positive serviceable static wind pressure of up to 1500pa for weather resistance. Fire Testing: Non-combustible to AS1530.1. Ignitability Index:11, Spread of flame Index: 0, Heat Evolved Index: 0, Smoke Developed Index: 3 to AS1530.3 (Powder Coat). Mechanical Properties: Tensile strength – 150MPa

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3 EXECUTION

3.1 GENERAL

Preparation

Substrates or framing: Before fixing cladding, check the alignment of substrates or framing and adjust if required.

Flexible underlay: Check that the underlay or insulation is restrained.

Cladding: Make sure the cladding is clean and free of dust and loose particles.

Installation

Requirement: Install cladding as follows:

- Fix sheeting firmly against framing to the manufacturer's recommendations.
- Plumb, level, straight and to documented tolerances.
- Fixed or anchored to the building structure in conformance with the wind action loading recommendations.
- Isolated from any building loads, including loads caused by structural deflection or shortening.
- Allow for thermal movement.

Cladding layout: Cut/fabricate and install cladding to suit the layout as documented.

Protection: Protect surfaces and finishes, including the retention of protective coatings during installation.

Proprietary systems or products

Requirement: Use panels and components from a single proprietary system and install to the manufacturer's recommendations.

Accessories and trim

Requirement: Provide accessories and trim required to complete the installation.

Corner flashing for profiled and seamed metal sheets: Finish off corners with purpose-made folded flashing strips.

Metal separation

Requirement: Prevent direct contact between incompatible metals, and between green hardwood or chemically treated timber and aluminium or coated steel, by either of the following methods:

- Apply an anti-corrosion, low moisture transmission coating to contact surfaces.
- Insert a separation layer.

Incompatible metal fixings: Do not use.

Horizontal cladding

Horizontal cladding surface:

- Minimum slope: 1:15.
- Staining: Slope away from visible vertical facade areas to prevent staining.

Defective and damaged parts

Defective components: Do not install component parts that are defective, including warped, bowed, dented, chipped, scratched, abraded or broken members.

Damaged parts: Remove and replace damaged parts during installation.

3.2 AAC PANEL CLADDING

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Installation

Standard: To AS 5146.3 (2018).

Joint adhesive: Apply to vertical and horizontal joints. Remove excess adhesive from the face after panels are butted together.

Sealant: Caulk control joints, gaps between panels and infill or penetration framing with flexible sealant.

Vertical joints: Finish flush.

Cracking: For render finishes, minimise cracking at joints to the manufacturer's recommendations.

3.3 COMPOSITE PANEL CLADDING

General

Fabrication: Factory fabricate panels and elements wherever possible.

Installation: To the manufacturer's recommendations.

Joints

Requirement: Rigidly secure joints other than movement joints. Fabricate joints to the manufacturer's recommendations.

Arrangement: Set out in even panels with joints coinciding with framing.

Control joints: To coincide with structural movement joints and as documented.

Fixing

Requirement: Mechanically fix panels to supporting frame and to the manufacturer's recommendations.

3.4 CFC SHEET CLADDING

Joints

Control joint:

- Locate between the panel and fixing system and the supporting structure, as documented.
- Sheet edges: Square cut.
- Sealant: Do not apply finish coating over joint sealants.

Prefinished metal backing/jointing strip: Fix proprietary backing strip to the rear face of the panel with proprietary closed cell self-adhering foam and horizontal gasket.

- Seal the joint with a 3 mm epoxy fillet.

Vertical joints: Vertical gasket or prefinished jointing strip to framing member.

Arrangement: Set out in even panels with joints coinciding with framing.

Fixing

General: Screw fix to proprietary framing supports at centres to the manufacturer's recommendations.

Concealed fixings:

- Predrill oversized holes.
- Countersink so that the top of the screw is 2 to 3 mm below the surface.
- Finish: Stop screw heads with epoxy filler. Smooth and level upon application and sand flush after curing.

3.5 EIFS CLADDING

Joints

Requirement: Close butt. Make sure joints are supported and finished level.

Control joint: To coincide with structural movement joints and as documented.

- Sealant: Do not apply finish coating over joint sealants.

Installation

Trim: Install PVC-U around windows, along bottom of walls and at external corners.

Junctions: Make sure junctions are effectively sealed when installing PVC-U or other rigid window flashings.

Saddle and back flashings: Install before fixing the panels.

Parapet and cap flashings: Complete as soon as practicable after finishing the system.

Finishing

Preparation: Remove any oxidisation from polystyrene before plastering.

Base coat reinforcement: Embed alkali resistant fibreglass reinforcing mesh into the wet base coat.

Render and texture finish: Apply render and texture finish coats to the manufacturer's recommendations.

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3.6 FC SHEET CLADDING

Joints

Control joints:

- Locate between the panel and fixing system and the supporting structure, as documented.
- Sheet edges: Square cut.
- Sealant: Do not apply finish coating over joint sealants.

Arrangement: Set out in even panels with joints coinciding with framing.

Fixing

General: Corrosion-resistant nails or screws to the manufacturer's recommendations.

Eaves and soffit lining:

- Maximum fixing spacing: 150 mm centres.
- Maximum soffit bearer spacing: 450 mm centres.

3.7 INSULATED PANEL SYSTEMS

Site cut panels

Requirement:

- Provide accurate, true lines with no distortion.
- Cut with a suitable metal cutting circular type saw and treat exposed edges with a proprietary edge protection lacquer.
- Cut openings to the minimum size necessary.

Penetrations larger than 300 x 300 mm: Provide additional structural support.

Swarf: Remove swarf and any foreign matter immediately from the external surface of panels.

Joints

Control joints: To coincide with structural movement joints and as documented.

Fixing

Requirement: Mechanically fix panels to supporting frame and to the manufacturer's recommendations.

3.8 PLASTIC SHEET CLADDING

Installation

Standard: To AS 1562.3 (2006).

3.9 PLYWOOD SHEET CLADDING

Preparation

Requirement: Cut sheets to suit the layout, as documented.

Cut edges: Seal before fixing and install facing upwards.

Bottom edges: Prime or pre-coat before fixing.

Installation

Layout for sheets with shiplap joints: Start at a corner and install shiplap joints facing away from the prevailing weather.

Labels: Install panels so that any certification scheme labels are concealed.

Joints

Movement allowances:

- Between sheets: 2 mm minimum gap. Apply elastomeric sealant.
- Between the bottom of sheets and flashings: 5 mm gap.

Control joints: To coincide with structural movement joints and as documented.

Fixing

Timber frames: 12 mm thick sheets:

- Nails: 40 x 2.5 mm.
- Screws: No. 8 x 40 mm.

Steel frames: 12 mm thick sheets:

- 1.5 mm steel: 10 gauge to 16 thread pitch x 45 mm screws.
- 2.8 mm steel: 10 gauge to 16 thread pitch x 45 mm screws.

Nail fixing centres:

- Edges: At 150 mm centres and not less than 9 mm from sheet edge.
- Intermediate framing: At 300 mm centres.
- Sheet corners: Not less than 50 mm from corner on vertical edges.

Finish: Flush with surface. Do not punch.

Shiplap joint top lap: Do not nail.

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3.10 PROFILED SHEET METAL CLADDING

General

Installation: To AS 1562.1 (2018).

Ground clearance: Maintain documented clearance.

Cutting sheets: Wherever possible, factory cut to length. Do not use an abrasion disc.

Accessories: Provide material with the same finish as cladding sheets.

Swarf: Remove swarf and other debris as soon as it is deposited.

Fixing

Fixing start location: Note the elevation that will allow fixing to proceed from leeward to the windward of prevailing wind. Refer to Manufacturer’s recommendations

Joints

Expansion joints: As a minimum, expansion joints should be provided every 35 m in sheet length for walls with concealed fixings and 24 m in sheet length for walls with exposed fixings. Refer to manufacturer's recommendation.

3.11 SEAMED SHEET METAL CLADDING

Plywood sheeting

Installation: Lay the length of the sheets at right angles to the supports.

End joints: Stagger the end joints and locate centrally over framing members.

Edge support: If panels are not tongue and grooved, provide noggings or trimmer joists to support the edges.

Fixing: 300 mm centres to each support:

- Timber: Adhesive and nail.
- Steel: Metallic-coated self-drilling/tapping screws with the heads finishing below the surface.

Control joints: 12 mm gap at abutting building elements.

Fabrication

Requirement: Factory fabricate pans.

Installation: To AS 1562.1 (2018).

Ground clearance: Maintain documented clearance.

Cutting sheets: Wherever possible, factory cut to length. Do not use an abrasion disc.

Accessories: Provide material with the same finish as cladding sheets.

Minimum bending radius: 1.75 mm.

Swarf: Remove swarf and other debris as soon as it is deposited.

Fixing

Requirement: Fix pans to the sheeting with concealed clips at 250 mm maximum centres or to manufacturer's recommendations.

Seams

Walls: Single angle standing seams.

3.12 TERRACOTTA PANELS AND TILES

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Installation

Set-out: Confirm set-out before starting the installation. Minimise cut panels and tiles.

Substrate: Install proprietary suspension rails to manufacturer's details over pliable membrane. Use fasteners conforming to wind load requirements.

Panels and tiles: Install to manufacturer's recommendations.

Trim: Install proprietary trim and flashings.

3.13 TIMBER WEATHERBOARD CLADDING

Preparation

Preservative treatment: For cladding with a natural or stained finish, prefinish the boards by dipping or brushing with water repellent preservative.

Compatibility: Make sure preservative is compatible with the documented pigmented stain finish.

Cut surfaces: Treat freshly cut surfaces with water repellent preservative before fixing.

Installation

Single lengths: If installed vertically, use single lengths. If installed horizontally, use single lengths whenever possible.

Edge finish to lowest board: Cut the bottom edge of the lowest board to slope inwards and upwards at an angle of 15°.

Fixing

Fixings at supports:

- Seasoned milled weatherboards: 2.
- Unseasoned hardwood, sawn weatherboards, or secret nailed profiles: 1.
- Do not fix through the overlap of adjacent weatherboards.

Nailheads: Treat visible nailheads as follows:

- Stained or clear finishes: Drive flush with weatherboard surface.
- Opaque finishes: Punch below the weatherboard surface and fill flush with putty after the surface has been primed.

Joints

Overlapping joints: Lap boards at least 30 mm.

End grain joints: Install boards so that butt joints are in compression. Fix all board ends to support framing. Stagger joints vertically.

Internal and external corners: Butt against a stop bead that projects at least the thickness of the cladding.

Timber boards abutting masonry: Leave a gap between boards and masonry to prevent moisture uptake.

3.14 COMPLETION

Fasteners

Requirement: Adjust for weathertightness without distortion of external panel face.

Reinstatement

Extent: Repair or replace damage to the cladding. If the work cannot be repaired satisfactorily, replace the whole area affected.

Damage to prepainted finish: Replace panels with scratches in the prepainted finish.

Cleaning

Requirement: Remove excess debris, metal swarf, solder, sealants and unused materials.

Exposed metal surfaces: Clean surfaces of substances that interfere with uniform weathering or oxidisation.

Protection: Remove protective coatings using methods required by the manufacturer after completion.

Panels: Clean surfaces with soft, clean cloths and clean water to the manufacturer's recommendations.

Operation and maintenance manuals

Requirement: Prepare a manual that includes the manufacturer's published use, care and maintenance requirements.

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Warranties

Type: Provide Warranties –

- Manufacturer's warranty: Warranty to cover manufacturing defects and defects with products and materials delivered to site.
- Manufacturer and applicator's/installer's interlocking warranty: Interlocking warranty to cover manufacturing defects and defects with products and materials delivered to site, including their application or installation.
- Supplier's warranty: Warranty to defects in materials delivered to site.

4 SELECTIONS

4.1 PERFORMANCE

Cladding performance schedule

	A	B	C
Combustibility			
Fire hazard property: Group number			
Fire hazard property: Spread-of-Flame Index			
Fire hazard property: Smoke-Developed Index			
Fire-resistance level (FRL)			
R-Value (m^2.K/W)			
Acoustic characteristic			
Solar absorptance			
Light Reflectance Value (LRV)			

4.2 PRODUCT

Cladding support schedule

	A	B	C
Product			
Material			
Vertical members			
Horizontal members			
Spacing: Vertical members			
Spacing: Horizontal members			

AAC panel cladding schedule

	A	B	C
Product			

	A	B	C
Fixing system			
Thickness (mm)			
Length (mm)			
Width (mm)			
Edge profile			
Coating system			
Panel orientation			
Trim			
Control joint width (mm)			
Flashings and cappings			
Fasteners			

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Aluminium weatherboard cladding schedule

	A	B	C
Product			
Fixing system			
Mounting			
Profile			
Profile depth (mm)			
Length (mm)			
Finish			
Colour			
Trim			
Flashings and cappings			
Fasteners			

Composite panel cladding schedule

	A	B	C
Product			
Fixing system			
Thickness (mm)			
Length (mm)			
Width (mm)			
Skin material			
Skin thickness (mm)			
Core material			
Surface finish			
Colour			
Panel edge treatment			
Panel joint			
Trim			
Control joint width (mm)			
Flashings and cappings			
Fasteners			

CFC sheet cladding schedule

	A	B	C
Product			
Fixing system			
Thickness (mm)			
Length (mm)			
Width (mm)			
Finish			
Colour			
Joints			
Panel edge treatment			
Corners			
Soffit lining perforations			
Trim			
Control joint width (mm)			
Flashings and cappings			
Fasteners			

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EIFS cladding schedule

	A	B	C
Product			
Fixing system			
Thickness (mm)			
Length (mm)			
Width (mm)			
Core material			
Base coat			
Finish coat			
Colour			
Trim			
Control joint width (mm)			
Flashings and cappings			
Fasteners			

FC plank cladding schedule

	A	B	C
Product			
Fixing system			
Thickness (mm)			
Texture			
Width (mm)			
Length (mm)			
Joints			
Finish			
Trim			
Flashings and cappings			
Fasteners			

FC sheet cladding schedule

	A	B	C
Product			
Fixing system			
Thickness (mm)			
Length (mm)			
Width (mm)			
Finish			
Colour			
Joints			
Edge profile			
Panel edge treatment			
Corners			
Soffit lining perforations			
Trim			
Control joint width (mm)			
Flashings and cappings			
Fasteners			

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Hardboard plank cladding schedule

	A	B	C
Product			
Fixing system			
Bending strength			
Texture			
Width (mm)			
Length (mm)			
Joints			
Finish			
Trim			
Flashings and cappings			
Fasteners			

Insulated panel system schedule

	A	B	C
Product			
Panel core			
Panel thickness (mm)			
Panel skin material: External			
Panel skin material: Internal			
Panel skin thickness (mm): External			
Panel skin thickness (mm): Internal			
Panel skin profile			
Panel finish and colour: External			
Panel finish and colour: Internal			
Control joint width (mm)			
Trim			

	A	B	C
Fasteners			
Flashings and cappings			

Plastic sheet cladding schedule

	A	B	C
Product			
Material			
Thickness (mm)			
Length (mm)			
Width (mm)			
Class or grade			
Type			
Translucency			
Colour			
Impact resistance			
Ignitability			
Trim			
Flashings and cappings			
Fasteners			

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Plywood sheet cladding schedule

	A	B	C
Product			
Fixing system			
Thickness (mm)			
Length (mm)			
Width (mm)			
Veneer species			
Finish			
Coating			
Colour			
Joints			
Corners			
Fixing start location			
Trim			
Control joint width			
Flashings and cappings			
Fasteners			

Profiled sheet metal cladding schedule

	A	B	C
Product			
Fixing system			
Profile			
Material type			
Thickness (mm)			

	A	B	C
Colour			
Trim			
Flashings and cappings			
Fasteners			

Seamed sheet metal cladding schedule

	A	B	C
Product			
Fixing system			
Material			
Minimum thickness (mm)			
Seam spacing (mm)			
Colour			
Finish			
Trim			
Flashings and cappings			
Fasteners			

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Terracotta cladding schedule

	A	B	C
Product			
Fixing system			
Thickness (mm)			
Length (mm)			
Width (mm)			
Edge profile			
Finish			
Panel orientation layout			
Trim			
Joint width			
Flashings and cappings			
Suspension rails			
Fasteners			

Timber weatherboard cladding schedule

	A	B	C
Timber species			
Fixing system			
Grade			
Profile			
Width (mm)			
Joints			
Finish			
Preservative			
Trim			
Flashings and cappings			

	A	B	C
Fasteners			

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0451B WINDOWS AND GLAZED DOORS

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide windows and glazed doors, as documented.

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1.2 CROSS REFERENCES

General

Requirement: Conform to the following:

- *0171 General requirements*.
- *Architectural Drawings and Schedules*
- *Glazing Schedule*
- *BCA Report*
- *Section J Report*
- *BASIX assessment and certification*
- *Fire engineer solutions report*
- *Accessibility report*

Manufacturer's documents

- Manufacturer's and supplier's documents related to this worksection are: - Access Hardware

1.3 STANDARDS

General

Selection and installation: To AS 2047 (2014).

Building classification: Refer to BCA Report

Glazing

Glass type and thickness: To AS 1288 (2021), if no glass type or thickness is nominated.

Materials and installation: To AS 1288 (2021).

Quality requirements for cut-to-size and processed glass: To AS/NZS 4667 (2000).

1.4 SUBMISSIONS

Certification

Windows and glazed doors: Submit evidence of conformity to AS 2047 (2014).

Sealant compatibility: Submit statements from all parties to the installation certifying the compatibility of sealants and glazing systems to all substrates.

Toughened glass: For each batch of glass, submit certification from the manufacturer of heat soaking.

Fire performance

Fire-resistance level: Submit evidence of conformity to **FIRE PERFORMANCE**, **Fire-resistance of building elements**.

Operation and maintenance manuals

Requirement: Submit manual to **COMPLETION**, **Operation and maintenance manuals**.

Products and materials

Safety glazing materials: Submit evidence of conformity to AS 2208 (2023).

Type tests: Submit test results of the following:

- Acoustic performance of windows and doors: To PRODUCTS, **GENERAL**, **Acoustic performance**.
- Protection of openable windows: To PRODUCTS, **GENERAL**, **Protection of openable windows**.

Samples

Requirement: Submit samples to PRODUCTS, **GENERAL**, **Samples**.

Shop drawings
General: Submit shop drawings, to a scale that best describes the detail, showing the following:
- Full size sections of members.
- Hardware, fittings and accessories including fixing details.
- Junctions and trim to adjoining surfaces.
- Layout (sectional plan and elevation) of the window assembly.
- Methods of assembly.
- Methods of installation, including fixing, caulking and flashing.
- Provision for vertical and horizontal expansion.
- Make allowance to design and certify structural integrity, nominating any changes in mullions etc.
- Method of glazing, including the following:
  . Rebate depth.
  . Edge restraint.
  . Clearances and tolerances.
  . Glazing gaskets and sealant beads.

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Subcontractors
General: Submit names and contact details of proposed manufacturers and installers.
Warranties
Requirement: Submit warranties to **COMPLETION**, **Warranties**.
Prototypes
- Provide a section of work not less than 2000mm x 2000mm in the proposed materials and finishes. Incorporate at least one example of each component in the system, including attachments to the structure, flashing, caulking, sealing, glazing, operating hardware, locks and keys.
- Typical section of window section, including all expressed aluminium reveal, casing and awning

1.5 INSPECTION

Notice
Inspection: Give notice so that inspection may be made of the following:
- Openings prepared to receive windows.
- Fabricated window assemblies at the factory ready for delivery to the site.
- Fabricated window assemblies delivered to the site, before installation.
- Commencement of window installation.

2 PRODUCTS

2.1 GENERAL

Samples
Requirement: Provide samples labelled with the series code reference and date of manufacture.
Window and door framing: Provide samples of the following:
- Prefinished production materials showing the limits of the range of variation in the documented colour.
- Joints made by proposed techniques.
- Sections for frames, sashes and slats.

Glazing: Provide samples of glazing materials, each at least 200 x 200 mm, showing the visual properties and range of variation, if any, for each of the following:
- Tinted or coloured glass or plastics glazing.
- Surface modified or surface coated glass.
- Patterned or obscured glass or plastics glazing.
- Wired glass.
- Mirror glass.

Hardware and accessories: Provide samples of the following:

- Window manufacturer's standard hardware and accessories including locks, latches, handles, catches, sash operators, anchor brackets and attachments, masonry anchors and weatherseals (pile or extruded).
- Generic hardware: Provide samples of generic hardware not documented as proprietary items.

Storage and handling

Storage: Store in a clean, dry area unaffected by weather, to the manufacturer's recommendations. Protect from building materials and loose debris such as wet plaster, mortar, paint and welding splatter.

Handling: Handle frames to the manufacturer's recommendations and as follows:

- Stack upright, off the ground and against a flat, vertical surface.
- Carry in the vertical position with sashes locked.
- Do not rack frames out of square.
- Do not remove any bands and corner bracing until after installation.

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Acoustic performance

Windows and doors: Rating to the NCC cited AS/NZS ISO 717.1 (2004), as documented.

Protection of openable windows

Fall prevention: To BCA (2022) D3D29.

Marking

Window assemblies: To AS 2047 (2014) Section 8.

2.2 FIRE PERFORMANCE

Fire-resistance of building elements

Fire-resistance level: Tested to AS 1530.4 (2014).

2.3 FRAMES

Aluminium frames

Standard: To AS 2047 (2014) clause 3.1.

Construction: Assembled from aluminium sections, including accessories such as pile strips, fixing ties or brackets and cavity flashings, with provision for fixing documented hardware and seals.

Subsill: If the frame includes a subsill, provide a self-draining section.

Steel frames

Standard: To AS 2047 (2014) clause 3.4.

Construction: Continuously welded from metallic-coated steel sheet sections, including accessories such as buffers, fixing ties or brackets, and cavity flashing. Provision for fixing documented hardware, seals and electronic security assemblies, and prefinished with a protective coating.

Metallic coating class to AS 1397 (2021) interior: ZF100.

Metallic coating class to AS 1397 (2021) exterior

Finish: Grind the welds smooth, cold galvanize the welded joints and shop prime.

Timber frames

Standard: To AS 2047 (2014) clause 3.2.

Hardwood: To AS 2796.1 (1999):

- Grade: Select.

Softwood: To AS 4785.1 (2002):

- Grade: Select.

Construction: Assembled from timber sections, with provision for fixing documented hardware including rebates for seals.

PVC-U frames

Standard: To AS 2047 (2014) clause 3.3.

2.4 GLAZING

Performance

Glass: Free from defects that detract from appearance or interfere with performance under normal conditions of use.

Plastics glazing: Free from surface abrasions and resistant to yellowing or other colour change. Capable of maintaining physical properties including strength and impact resistance for its design life.

Heat soaking

Requirement: Heat soak glass to AS 1288 (2021) clause 3.8.

Standard: To EN 14179-1 (2016).

Marking: To EN 14179-1 (2016) or certified by the manufacturer to AS 1288 (2021) clause 3.8.2.

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Safety glazing materials

Standard: To AS 2208 (2023).

Type: Grade A.

Marking: To AS 1288 (2021) clause 5.23.

Heat-strengthened glass

Standard: To ASTM C1048 (2018).

Insulating glass units (IGUs)

Requirement: Provide insulating glass units, as documented.

Manufacture, testing and installation: To AS 4666 (2012).

2.5 GLAZING MATERIALS

General

Requirement: Putty, glazing compounds, sealants, gaskets, glazing tapes, spacing strips, spacing tapes, spacers, setting blocks and compression wedges appropriate for the conditions of application and required performance.

Jointing materials

Requirement: Jointing and pointing materials that are compatible with each other and the contact surfaces, and non-staining to finished surfaces to manufacturer's recommendations. Do not provide bituminous materials on absorbent surfaces.

Elastomeric sealants

Sealing compounds (polyurethane, polysulfide, acrylic): To ASTM C920 (2018) or ISO 11600 (2002).

Sealing compounds (silicone): To ASTM C920 (2018) or ISO 11600 (2002).

Sealing compounds (butyl): To ASTM C1311 (2022).

Elastomeric sealants schedule

Sealant type	Material	Location or function

Primer

Compatibility: Apply the manufacturer's recommended primer to the surfaces in contact with sealant materials.

Control joints

Depth of elastomeric sealant: One half the joint width or 6 mm, whichever is the greater.

Foamed materials (in compressible fillers and backing rods): Closed cell or impregnated types that do not absorb water.

Bond breaking: Provide backing rods, and other back-up materials for sealants, that do not adhere to the sealant.

2.6 SCREENS

General

Requirement: Provide screens, as documented.

Fixed screens

General: Fixed screens fitted to the window frames with a clipping device that allows for removal for cleaning.

Hinged screens

General: Screens hinged at the top to give access to opening sash.

Retractable screens

General: Proprietary retractable screens, comprising aluminium frames and fibreglass mesh, fitted between the guide channels incorporated in the frames, and a retraction system including tension spring, bearings, positive self-locking device and elastomeric sealing strip at sill.

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Sliding screens

General: Screens that are part of the window frame, with matching aluminium head guide, sill runner and frame stile sections.

Hardware: Nylon slide runners and finger pull handle. Provide pile strip closers against sash if necessary to close gaps.

Aluminium framed screens

General: Aluminium extruded or folded box frame sections with mesh fixing channel, mitred, staked and screwed at corners. If necessary to adapt to window opening gear, provide an extended frame section.

Mesh: Bead the mesh into the frame channel with a continuous resilient gasket, so that the mesh is taut and free of distortion.

2.7 SECURITY WINDOW SCREENS

General

Requirement: Proprietary metal security screens, or operable screen and frames, fixed to the building structure with tamper resistant fastenings.

Standard: To AS 5039.1 (2023).

2.8 ALUMINIUM FRAME FINISHES

Powder coatings

Product: F-300 Powdercoat Aluminium

Colour: Dulux Electro Dark Bronze Flat

Code: 9068184K

Thickness: Final thickness to suit application and environmental conditions

Anodised

Standard: To AS 1231 (2000).

Thickness:

- Internal: 15 µm.
- External: 20 µm.
- Colour: To match F-300 Powdercoat Aluminium

2.9 OTHER MATERIAL FRAME FINISHES

Finish

Standard: To AS 2047 (2014) clause 3.4.1.4.

2.10 ANCILLARY COMPONENTS AND FITTINGS

Trim

General: Provide trim, shadow angles and architraves, as documented.

Extruded gaskets and seals

General: Provide seals, as documented.

Materials: Non-cellular (solid) elastomeric seals as follows:

- Rubber products: Neoprene, ethylene propylene diene monomer (EPDM) or silicone rubber.
- Flexible polyvinyl chloride (PVC): E type compounds, colourfastness grade B.

Flashings
General: Corrosion-resistant, compatible with the other materials in the installation, and coated with a non-staining compound if necessary.

Standard: To AS/NZS 2904 (1995).

Nylon brush seals
General: Dense nylon bristles locked into holding strips and fixed in a groove in the edge of the door or in purpose-made anodised aluminium holders fixed to the door or frame to the manufacturer's recommendations.

Pile weatherstrips
General: Provide weatherstrips, as documented.

Standard: To AAMA 701/702 (2023).

Material: Pile and backing or equivalent polypropylene, low friction silicone treated, ultraviolet stabilised, fixed to the frame to the manufacturer's recommendations.

Finned type: A pile weatherseal with a central polypropylene fin bonded into the centre of the backing rod and raised above the pile level.

Weather bars
General: Provide corrosion-resistant weather bars or threshold plates for hinged external doors, located under the centres of closed doors or to manufacturer’s recommendations.

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2.11 HARDWARE

Hardware documented generically
General: Provide hardware of sufficient strength and quality to perform its function, appropriate to the intended conditions of use, compatible with associated hardware, and fabricated with fixed parts firmly joined.

Window locks and latches
Standard: To AS 4145.2 (2008).

Window catches: Provide 2 catches per sash to manually latched awning or hopper sashes over 1000 mm wide.

Sash balances
Requirement: Match the spring strength of the balances to the sash weight they support.

Sash operators
Requirement: Provide sash operators, as documented.

3 EXECUTION

3.1 GLAZING PROCESSING

General
Processing: Perform required processes on glazing, including cutting, obscuring, silvering and bending. Form necessary holes, including for fixings, equipment, access openings and speaking holes. Process exposed glass edges to a finish not inferior to ground arrised.

3.2 INSTALLATION

General
Requirement: Install windows and glazed doors as follows:

- Plumb, level, straight and true within building tolerances.
- Fixed or anchored to the building structure in conformance with the wind action loading requirements.
- Isolated from any building loads, including loads caused by structural deflection or shortening.
- Allow for thermal movement.

Glazing
Requirement: Install the glass as follows:

- Permanently fix in place each piece of glass to withstand the normal loadings and ambient conditions at its location without distortion or damage to glazing materials.
- No transfer of building movements to the glazing.

- Watertight and airtight for external glazing.

Temporary marking: Use a method that does not damage the glazing. Remove marking only after certification and acceptance of the installation.

Toughened glass: Do not cut, drill, edgework or permanently mark after toughening. Use installation methods that prevent the glass making direct contact with metals or other non-resilient materials.

Frameless installations: Join the vertical edges of adjacent glass panels with silicone jointing compound.

Heat-absorbing glass: In locations exposed to direct sunlight, provide wheel cut edges free from damage or blemishes, with minimum feather.

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Preglazing

Window assemblies and glazed doors: Supply inclusive of glazing, shop preglazed.

Site glazing

Minimum dimensional requirements. Conform to the following:

- Edge clearance (mm): [complete/delete]
- Edge cover (mm): [complete/delete]
- Front clearance (mm): [complete/delete]
- Back clearance (mm): [complete/delete]

Vision panels: Install to allow removal from: [complete/delete]

External timber framed glazing: Glaze with putty.

Weatherproofing

Flashing and weatherings: Install flashings, weather bars, threshold plates, drips, storm moulds, joint sealant and pointing to prevent water penetrating the building between the window frame and the building structure under the prevailing service conditions, including normal structural movement of the building.

Fixing

Packing: Pack behind fixing points with durable full width packing.

Fasteners: Conceal fasteners.

Fasteners and fastener spacing: Conform to the recommendations of the manufacturer.

Prepared masonry openings: If fixing of timber windows to prepared anchorages needs fastening from the frame face, sink the fastener heads below the surface and fill the depression flush with a material compatible with the surface finish.

Joints

General: Make accurately fitted tight joints so that fasteners or fixing devices such as pins, screws, adhesives and pressure indentations are not visible on exposed surfaces.

Sealants:

- If priming is recommended, prime surfaces in contact with jointing materials.
- If frames are powder coated, apply a neutral cure sealant.

Operation

General: Make sure moving parts operate freely and smoothly, without binding or sticking, at correct tensions or operating forces and are lubricated.

Protection

Removal: Remove temporary protection measures from the following:

- Contact mating surfaces before joining up.
- Exposed surfaces before completion of the works.

Seals

General: Provide the fixings, rebates, grooves, and clearances required for installation and operation of the seals. Allow seals unwound from coils to settle before use. Install proprietary seals to manufacturer's recommendations and adjust correctly.

Trim

General: Provide mouldings, architraves, reveal linings, and other internal trim using materials and finishes matching the window frames. Install to make neat and clean junctions between frames and the adjoining building surfaces.

3.3 SECURITY WINDOW SCREENS

General

Installation: To AS 5039.2 (2024).

3.4 HARDWARE

Fasteners

Materials: Use materials compatible with the item being fixed and of sufficient strength, size and quality to perform their function.

- Concealed fasteners: Provide a corrosion-resistant finish.
- Exposed fasteners: Match exposed fasteners to the material being fixed.

Support: Provide appropriate back support (for example lock stiles, blocking, wall noggings and backing plates) for hardware fasteners.

- Hollow metal sections: Provide backing plates drilled and tapped for screw fixing, or provide rivet nuts with machine thread screws. Do not use self-tapping screws or pop rivets.

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Proprietary window systems

Requirement: Provide the standard hardware and internal fixing points for personnel safety harness attachment, if required by and conforming to the governing regulations.

Operation

General: Make sure working parts are accurately fitted to smooth close bearings, without binding or sticking, free from rattle or excessive play, lubricated if appropriate.

Opening force performance: To the NCC cited AS 1428.1 (2009).

Supply

Delivery: Deliver window hardware items, ready for installation, in individual complete sets for each window set, as follows:

- Clearly labelled with the intended location.
- In a separate dust and moisture proof package.
- Including the necessary templates, fixings and fixing instructions.

3.5 COMPLETION

Hardware

Adjustment: Leave the hardware with working parts in working order, and clean, undamaged, properly adjusted, and lubricated if appropriate.

Repair of finish

Polyester or fluoropolymer coatings: Contact supplier for approval to apply touch up products, otherwise replace damaged material.

Cleaning

Method: Clean with soft clean cloths and clean water, finishing with a clean squeegee. Do not use abrasive, acidic or alkaline materials.

Extent: All frames and glass surfaces internally and externally.

Operation and maintenance manuals

Requirement: Prepare a manual that includes the following:

- Window and glazed door manufacturer’s published recommendations for operation, care and maintenance.
- Hardware manufacturer’s published recommendations for use, care and maintenance.

Warranties

Types:

- Manufacturer’s warranty
- Applicator/installer’s warranty
- Supplier’s warranty

4 SELECTIONS

4.1 PERFORMANCE

- *Refer Architectural Window Schedules*
- *Refer Façade Engineer's façade report*
- *Refer Façade / Wind consultant's Wind report*
- *Refer Manufacturer's specifications*
- *Refer BASIX report*

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Window and glazed door performance schedule

	A	B	C
Total system U-Value (W/m^2.K)			
Total system SHGC			
Airborne sound insulation			
Visible transmittance (T_{vis})			
Reflectance (%)			
WERS Energy rating%: Heating			
WERS Energy rating%: Cooling			
AGWA Glass Compliance Certificate			
AGWA Window Compliance Certificate			
Water penetration resistance (Pa)			
Fire-resistance level (FRL)			
Ultimate limit state (ULS) wind pressure (Pa)			
Serviceability limit state (SLS) wind pressure (Pa)			
Openable (free) area (m^2)			

Window locks and latches performance schedule

	A	B	C
Durability (D)			
Key security (K)			
Cylinder security (S_c)			
Physical security of locks (S)			
Physical security of locksets (S_L)			
Corrosion classification (C)			
Classification to AS 4145.1 (2008)			

4.2 WINDOWS AND GLAZED DOORS

Window and glazed door schedule

	A	B	C
Product name			
Proprietary suite			
Suite description			
Generic description			
Frame: Material			

	A	B	C
Frame: Finish			
Frame: Colour			
Frame: Gloss level			
Thermal break			
Screen: Frame material			
Screen: Frame finish			
Screen: Mesh type			
Glazing			
Permanent ventilation			
Safety markings			
Hardware			

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4.3 SCREENS

Screen schedule

	A	B	C
Product			
Type			
Frame: Material			
Frame: Finish			
Frame: Colour			
Frame: Gloss level			
Mesh type			

4.4 SECURITY WINDOW SCREENS

Security window screen schedule

	A	B	C
Product			
Type to AS 5039.1 (2023)			
Material			
Finish			
Colour			
Gloss level			
Hinges: Material			
Hinge: Fixing			
Hardware			

4.5 GLAZING

Glass schedule

	A	B	C
Glass type			
Glass thickness (mm)			
Body tint colour			
Interlayer colour			
Surface coating: Description			
Surface coating: Colour			

	A	B	C
Reflective coating: Colour			
Reflective coating: % reflectance			
Surface pattern			
Surface processing: Method			
Surface processing: Pattern			
Surface processing: Colour			
Edge processing			
Number of edges processed			
Fire-resistance level (FRL)			
Safety markings			

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Special glasses schedule

	A	B	C
Mirrored			
Patterned			
Acid etched			
Sandblasted			

Plastics glazing schedule

	A	B	C
Polycarbonate sheet: Type			
Polycarbonate sheet: Abrasion resistance			
Polycarbonate sheet: Fire hazard properties			
Acrylic sheet			
Reinforced polyester sheet: Type			
Reinforced polyester sheet: Surface treatment			
Reinforced polyester sheet: Mass/unit area			

Insulating glass units (IGUs) schedule

	A	B	C
Product			
Outer pane: Glass type			
Outer pane: Thickness (mm)			
Outer pane: Colour/coating type			
Inner pane: Glass type			
Inner pane: Thickness (mm)			
Inner pane: Colour/coating type			
Spacer width (mm)			
Gas filling: Type			

4.6 ANCILLARY COMPONENTS AND FITTINGS

Trim schedule

	A	B	C
Product			
Trim			
Door architrave			
Window architrave			

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Window and glazed door seal schedule

	A	B	C
Product			
Function			
Carrier material and finish			
Seal insert type and material			
Complementary seal			

Pile weatherstrips schedule

	A	B	C
Product			
Material			

Weather bars schedule

	A	B	C
Product			
Material			

4.7 WINDOW HARDWARE

Window hardware schedule

	A	B	C
Hinges			
Sash balances			
Stays			
Sash lift and pulls			
Sash operator			
Sash operator remote controller			
Locks, catches and bolts			

0454B OVERHEAD DOORS

1 GENERAL

1.1 RESPONSIBILITIES

General
Requirement: Provide overhead doors, as documented.

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1.2 CROSS REFERENCES

General
Requirement: Conform to the following:
- *0171 General requirements*.
- *Architectural Drawings and Schedules*
- *BCA Report*
- *Accessibility Report*

1.3 STANDARDS

General
Garage doors and other large access doors: To AS/NZS 4505 (2012).
Fire-resistant roller shutters: To AS 1905.2 (2005).
Design wind pressure: To AS/NZS 1170.2 (2021).
Bushfire shutters: To AS 3959 (2018).

1.4 SUBMISSIONS

Certification
Fire-resistant roller shutters: Submit evidence of compliance of installation to AS 1905.2 (2005).
Drivers for openers: Submit evidence of compliance and suitability to AS/NZS 60335.1 (2022) and AS/NZS 60335.2.103 (2016).

Operation and maintenance manuals
Requirement: Submit manual to **COMPLETION**, **Operation and maintenance manuals**.

Products and materials
Type tests: Submit test results of the following to PRODUCTS, **GENERAL**, **Tests**:
- Fire-resistance level.
- Bushfire resistance.
- Acoustic performance.

Warranties
Requirement: Submit warranties to **COMPLETION**, **Warranties**.

1.5 INSPECTION

Notice
Inspection: Give notice so that inspection may be made of the following:
- Framing or structure to receive tracks and motor.
- Tracks and guides installed before doors or shutters are hung.

2 PRODUCTS

2.1 GENERAL

Door assembly
Requirement: Proprietary system complete with the manufacturer's operating system, hardware and accessories as documented.

Marking and labelling
Garage doors and other large access doors: To AS/NZS 4505 (2012) Section 8.

Fire-resistant roller shutters: To AS 1905.2 (2005) Section 6.

Tests

Type tests: Complete as follows:

- Fire-resistance level: To AS 1530.4 (2014).
- Bushfire resistance: To AS 1530.8.1 (2018) and AS 1530.8.2 (2018).
- Acoustic performance: Tested to AS 1191 (2002) and rated to the NCC cited AS/NZS ISO 717.1 (2004).

2.2 SECTIONAL OVERHEAD DOORS

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Panels

Requirement: Materials and finishes, as documented.

Bottom panel: Adapted for sloping floors or threshold and fitted with a compressible PVC or neoprene seal strip.

Side tracks

Material: Roll formed galvanized steel.

Reinforcing: If required to carry door loads without distortion, reinforce horizontal track sections with a galvanized rolled steel channel.

Counterbalancing

General: Counterbalance the door by an adjustable torsion spring system connected to the door by cables of galvanized steel multi-strand wire rope, or by an equivalent system.

2.3 RIGID OVERHEAD DOORS

Panels

Requirement: Materials and finishes, as documented.

Rigid door frame: Braced frame capable of resisting the structural design actions without distortion when the door is in both closed and open positions.

2.4 ROLLING CURTAIN AND ROLLING SHUTTER DOORS

General

Requirement: Materials and finishes, as documented.

Curtain

Rolling curtain: Continuous roll formed profiled steel.

Rolling shutter: Individual horizontal interlocking slats with interlocking hinges.

Rolling grille: Articulated curtain formed of horizontal members spaced apart and connected by vertical links.

Bottom rail

Requirement: Provide a stiffening member as follows:

- Interlocking with the bottom edge or lowest part of the curtain.
- Extending between the inner faces of the vertical guides.
- Formed or adapted as required for sloping floors or threshold.
- Adapted to house a locking device, if required.

Wind locks

General: Provide wind lock end clips and guides to retain the curtain in wide openings or under extreme wind conditions.

Drum

Maximum drum deflection: 1/360th of the span.

Springs: Helical torsion springs housed in the drum and arranged to counterbalance the curtain weight without exceeding the safe working stress of the spring material.

Wickets

General: Provide doors with metal frame and facings to match the curtain, and manufacturer's standard lockset and furniture.

2.5 FIRE-RESISTANT ROLLER SHUTTERS

General

Requirement: Materials and finishes, as documented, to AS 1905.2 (2005).

Fire-resistance level

Requirement: As documented. Tested to AS 1530.4 (2014).

Bushfire shutters

Requirement: To AS 3959 (2018) clause 3.7.

Curtain

Fire-resistant rolling curtain: Continuous roll formed profiled steel tested to a fire-resistance level.

Fire-resistant roller shutter: Roll formed galvanized interlocking steel slats, each slat fitted with steel end caps and tested to a fire-resistance level.

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Bottom rail

Requirement: Provide a stiffening member as follows:

- Interlocking with the bottom edge or lowest part of the curtain.
- Extending between the inner faces of the vertical guides.
- Formed or adapted as required for sloping floors or threshold.
- Adapted to house a locking device, if required.

Wind locks

General: Provide wind lock end clips and guides to retain the curtain in wide openings or under extreme wind conditions.

Drum

Maximum drum deflection: 1/360th of the span.

Springs: Helical torsion springs housed in the drum and arranged to counterbalance the curtain weight without exceeding the safe working stress of the spring material.

2.6 OPERATION

General

Operation method: As documented.

Manual operation

General: Install so that the force required to operate the door manually does not exceed 220 N.

Manual method: Provide a manual door operating system incorporating the following, as documented:

- Hand stick (for high openings): By a boat hook type pole supplied with the installation.
- Chain: By pulling on a chain passing over a sprocket on the drum, with reduction gears if necessary.
- Crank handle: By a removable crank handle inserted into a gearbox mounted above the opening.
- Lockable handle: From inside and outside, attached to the door panel.

Motorised operation

General: Provide a motorised door operating system incorporating the following, as documented:

- An electric motor with limit switches, and of adequate capacity to operate the specified door smoothly and without strain.
- Overload cutout.
- Automatic safety system to stop and reverse door if obstructed while closing, or stop door if obstructed while opening.
- Optional photocell or IR beam safety device.
- Integrated light fixture, automatically switched on when opener is activated, and switched off by timer.
- Manual release handle to disengage door from drive mechanism in the event of a power failure.
- Operation by battery-powered radio remote controller, supplied as part of the system.
- Additional operation by push-button or key switch, located 1500 mm above floor level.

Wicket door: If a wicket is fitted to the shutter, provide a limit switch device to prevent motor operation until wicket and the frame are hinged clear of the curtain.

Accessories

General: Incorporate the following accessories, as documented:

- Light fixture, automatically switched on when opener is activated, and switched off by timer.
- Radio remote transmitter.
- Push-button or key switch.
- Internet connectivity.
- Obstruction detection – for motor reversal.
- Reversing starters.
- Warning systems – speakers, flashing lights or traffic lights.
- Wall controls.
- Uninterrupted Power Supply (UPS).
- Switches and timers.

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3 EXECUTION

3.1 INSTALLATION

General

Requirement: Install overhead doors in conformance with the manufacturer's recommendations and as documented.

Preparation

Substrate: Before start of installation, check the alignment of substrates or framing and adjust if required.

Clearances: Check openings accommodate support brackets and door guides with the required clearances.

Frames, guides and tracks

Requirement: Install as follows:

- Plumb, level, straight, true, and within tolerances and clearances recommended by the manufacturer.
- Fixed or anchored to the building structure using mechanical fixings suitable for the substrate and the imposed loads.
- Isolated from any building loads, including loads caused by structural deflection or shortening.

3.2 COMPLETION

Operation

General: Make sure moving parts operate freely and smoothly, without binding or sticking, at correct tensions or operating forces and that they are lubricated if appropriate.

Safety: Make sure all safety features are operating.

Remote control devices: Make sure devices are programmed and operating.

Protection

Temporary coating: On or before the date for practical completion of the works, or before joining up to other surfaces, remove all traces of temporary coatings used for protection.

Operation and maintenance manuals

Requirement: Prepare a manual that includes the manufacturer's published instructions for operation, care and maintenance.

Warranties

Type:

Manufacturer's Warranty

Installer's Warranty

Supplier's Warranty

4 SELECTIONS

4.1 PERFORMANCE

Overhead door performance schedule

	A	B	C
Classification to AS/NZS 4505 (2012)			
Ultimate wind pressure rating			
Wind-borne debris impact rating			
Fire-resistance level (FRL)			
Bushfire attack level (BAL) to AS 3959 (2018)			
Airborne sound insulation			

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4.2 PRODUCT

Sectional overhead door schedule

	SO1	SO2	SO3
Product			
Action			
Panels: Size (mm)			
Panels: Material			
Panels: Finish			
Panels: Colour			
Panels: Frame			
Panels: Thickness (mm)			
Panels: Perforations			
Panels: Windows			
Side tracks: Thickness (mm)			
Side tracks: Wheel hangers and hinges			
Side tracks: Wheel rollers			
Vertical guides: Material			
Vertical guides: Size			
Vertical guides: Finish			
Operation method			
Manual operation: Type			
Motorised operation: Motor type			
Motorised operation: Motor force (N)			
Motorised operation: Drive type			
Motorised operation: Speed of curtain travel (mm/sec)			
Motorised operation: Number of remote controllers required			
Motorised operation: Memory register			
Safety features			
Light: Type			
Light: Operation			
Hardware: Item			
Hardware: Material			

	SO1	SO2	SO3
Hardware: Finish			

Rigid overhead door schedule

	TO1	TO2	TO3
Product			
Tilting mechanism			
Jambs: Metal			
Jambs: Size (mm)			
Jambs: Fixing			
Rigid door frame: Material			
Rigid door frame: Windows			
Rigid door cladding: Material			
Rigid door cladding: Finish			
Rigid door cladding: Thickness			
Vertical guides: Material			
Vertical guides: Size (mm)			
Vertical guides: Finish			
Vertical guides: Fixing method			
Mullions: Type			
Mullions: Method of removal			
Operation method			
Manual operation: Type			
Motorised operation: Motor type			
Motorised operation: Motor force			
Motorised operation: Drive type			
Motorised operation: Speed of curtain travel (mm/sec)			
Motorised operation: Number of remote controllers required			
Motorised operation: Memory register			
Safety features			
Light: Type			
Light: Operation			
Hardware: Item			
Hardware: Material			
Hardware: Finish			

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Rolling curtain and rolling shutter door schedule

	RO1	RO2	RO3
Type			
Product			
Curtain: Type			
Curtain: Material			
Curtain: BMT (mm)			
Curtain: Finish			
Curtain: End material			
Curtain: Slat size			

	RO1	RO2	RO3
Perforations: Size			
Perforations: Pattern			
Bottom rail: Form			
Bottom rail: Material			
Bottom rail: Size			
Bottom rail: Finish			
Vertical guides: Material			
Vertical guides: Size (mm)			
Vertical guides: Finish			
Vertical guides: Fixing method			
Mullions: Type			
Mullions: Method of removal			
Drum: Material			
Drum: Size (mm)			
Drum brackets: Materials			
Drum brackets: Finish			
Drum brackets: Fixing			
Operation method			
Manual operation: Type			
Motorised operation: Motor type			
Motorised operation: Motor force			
Motorised operation: Speed of curtain travel (mm/sec)			
Motorised operation: Number of remote controllers required			
Motorised operation: Memory register			
Motorised operation: Activator			
Safety features			
Light: Type			
Light: Operation			
Hardware: Item			
Hardware: Material			
Hardware: Finish			
Accessories			
Wicket: Size of opening (mm)			

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Fire-resistant roller shutter schedule

	FS1	FS2	FS3
Fire-resistance level (FRL)			
Bushfire attack level (BAL) to AS 3959 (2018)			
Product			
Slat thickness (BMT)			
Finish: Curtain slats			
Finish: Slat end pieces			
Finish: Vertical guides			
Finish: Bottom rail			

	FS1	FS2	FS3
Finish: Barrel mechanism			
Finish: Hauling chains			
Normal operating mechanism			
Hardware: Item			
Hardware: Material			
Hardware: Finish			
Sensing device			

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0455 DOOR HARDWARE

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide door hardware, as documented.

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1.2 CROSS REFERENCES

General

Requirement: Conform to the following:

- *0171 General requirements*.

1.3 INTERPRETATION

Abbreviations

General: For the purposes of this worksection, the abbreviations given in AS 4145.1 (2008) Appendix D apply.

Definitions

General: For the purposes of this worksection, the general definitions given in AS 4145.1 (2008) Section 2 and Appendix E apply.

1.4 SUBMISSIONS

Execution details

Door-by-door schedule: Submit a door-by-door hardware schedule.

- Information sources: This worksection and the contract drawings.

Re-use of recovered hardware: Submit a proposal describing the standard of cleaning, repair and testing of recovered items and the location where each is to be re-used.

Key control system:

- New works: Submit details of the proprietary key control security system proposed by the lock manufacturer for locks required to accept a group key (master, grandmaster).
- Alterations and additions: Submit details to extend the existing key control security system for locks required to accept a group key.

Operation and maintenance manuals

Requirement: Submit manual to **COMPLETION**, **Operation and maintenance manuals**.

Records

Door hardware schedule: Submit a schedule, prepared by the door hardware supplier, showing changes to the contract door hardware schedule resulting from the following:

- Approval of a hardware sample.
- Acceptance of an equivalent to a specified proprietary item.
- A contract variation to a door hardware requirement.

Key coding system: Submit the lock manufacturer's record of the key coding system showing each lock type, number and type of key supplied, key number for re-ordering, and name of supplier.

Samples

Requirement: Submit samples to PRODUCTS, **GENERAL**, **Samples**.

Particular samples required: For each door hardware item

Shop Drawings

Submit shop drawings showing details of each assembly, component, and connection and information relevant to fabrication, surface treatment and installation for automatic door operators and door closers.

Subcontractors

Automatic door operators: Submit names and contact details of proposed manufacturer and installer.

Pressure floor mat: Submit names and contact details of proposed manufacturer and installer.

Warranties
Requirement: Submit warranties to **COMPLETION**, **Warranties**.

2 PRODUCTS

2.1 GENERAL

Samples
Generic items: Provide samples of hardware items offered as meeting the description of items not specified as proprietary items.

Reconditioned items: Provide samples of hardware items offered as meeting the standard of cleaning, repair and testing of recovered items.

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Supply
Delivery: Deliver door hardware items, ready for installation, in individual complete sets for each door, as follows:

- Clearly labelled to show the intended location.
- In a separate dust and moisture proof package.
- Including the necessary templates, accessories fixings and fixing instructions.

Hardware specified generically: Hardware of the required strength and quality to perform its function, appropriate to the intended conditions of use, suitable for use with associated hardware, and fabricated with fixed parts firmly joined.

Storage and handling
General: Store and handle to protect materials from damage, to the manufacturer's recommendations.

2.2 LOCKS AND LATCHES

Standard
General: To AS 4145.2 (2008).

Padlocks
Standard: To AS 4145.4 (2002).

Lock and latch classification
Rating systems: To AS 4145.1 (2008) Section 3.

Performance requirements: To AS 4145.2 (2008) Section 3.

2.3 HINGES

Butt hinge materials
Timber doors in timber or steel frames:

- Material: 316 Stainless Steel, Bronze

Aluminium framed doors or timber doors in aluminium frames:

- Material: 316 Stainless Steel
- - Product: Refer to Door Hardware Schedule

Doors fitted with closers: Provide low friction ball bearing hinges.

Fire-resisting doors: To AS 1905.1 (2015).

Power transfer hinges: Provide hinges that allow wires to be transferred unbroken between the door and frame.

Lift-off doors: If toilet cubicles require lift-off doors, provide lift-off hinges and allow for door panel with sufficient clearance at the head to allow door removal.

Timber solid core doors
Number of hinges: Determine the number of hinges required based on the nominated door leaf size and weight only. For other door leaf sizes or for doors with applied finishes, use the weight of the door to determine the number of hinges required. For a door leaf over 80 kg, use pivot hinges.

Size of hinges: Determine the size of the hinge based on the door leaf thickness:

- 35 to 43 mm: 100 x 75 mm butt hinges with a minimum thickness of 2.5 mm.
- 44 to 55 mm: 100 x 100 mm butt hinges with a minimum thickness of 2.5 mm.
- > 55 mm: As documented.

Hinge pin: Supply fixed pins to hinges of doors opening out or designated as a security doors. For all other doors, provide loose pins.

Wide throw: If necessary, provide wide throw hinges to achieve the required door swings in the presence of obstacles such as nibs, deep reveals and architraves.

Hinges for timber doors table

Nominal door leaf size (L x W x T) (mm)	Maximum door leaf weight (kg)	Number of hinges
2040 x 400 x 35	19	2
2040 x 600 x 35	29	2
2040 x 720 x 35	35	3
2040 x 820 x 35	39	3
2040 x 920 x 35	44	3
2040 x 1020 x 35	49	4
2040 x 720 x 40	37	3
2040 x 820 x 40	42	3
2040 x 920 x 40	48	3
2040 x 1020 x 40	52	4
2040 x 720 x 50	45	3
2040 x 820 x 50	50	3
2040 x 920 x 50	57	3
2040 x 1020 x 50	68	4
2400 x 720 x 40	50	4
2400 x 820 x 40	52	4
2400 x 920 x 40	55	4
2400 x 1020 x 40	60	4
2400 x 1220 x 50	72	5
2040 x 920 x 70	88	Pivot hinges

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Aluminium doors

Application: Aluminium hinges for aluminium doors, or for doors of other materials in aluminium frames of a weight of 40 kg or less.

Hinges for aluminium doors table

Nominal hinge size (L x W x T) (mm)	Maximum door leaf weight (kg)	Knuckles (minimum)	Screws/hinge leaf (minimum)
100 x 70 x 3	30	3	3
100 x 80 x 3.5	50	5	4
130 x 50 x 3.4	75	Interfold	3
Length (L) is the dimension along the knuckles, not including hinge tips, if any, and width (W) is the dimension across both hinge leaves when opened flat.			

2.4 SLIDING DOOR HARDWARE

General

Requirement: Provide sliding door tracks and guides, as documented.

2.5 ANCILLARIES

Bolts

General: Barrel bolts, flush bolts and tower bolts with keepers, including lock plates, staples, ferrules or floor sockets.

Door seals

Acoustic applications: Tested to AS 1191 (2002) or EN ISO 10140-2 (2021) and rated to the NCC cited AS/NZS ISO 717.1 (2004).

Weather and energy saving seals: To AS 4420.1 (2016) Sections 5 and 6, and AS 2047 (2014).

Extruded gaskets and seals

General: Provide seals, as documented.

Materials: Non-cellular (solid) elastomeric seals as follows:

- Rubber products: Neoprene, ethylene propylene diene monomer (EPDM) or silicone rubber.
- Flexible polyvinyl chloride (PVC): E type compounds, colourfastness grade B.

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Mortar guards

General: For steel door frame installations, provide mortar guards designed to allow the full extension of the lock tongue or similar devices and the correct operation of the locking mechanism.

Nylon brush seals

General: Dense nylon bristles locked into holding strips and fixed in a groove in the edge of the door or in purpose-made anodised aluminium holders fixed to the door or frame to the manufacturer's recommendations.

Pile weatherstrips

General: Polypropylene or equivalent pile and backing, low friction silicone treated, ultraviolet stabilised, fixed to the door or frame to the manufacturer's recommendations.

Standard: To AAMA 701/702 (2023).

Rebated doors

General: For mortice locks or latches to rebated doors, provide purpose-made rebated pattern items.

Strike plates

General: Use strike plates supplied with the locks or latches. Do not provide universal strike plates.

Weather bars

General: Provide corrosion-resistant weather bars or threshold plates under hinged external doors, located under the centres of closed doors or to manufacturer’s recommendations.

Document here or in the **Door seal schedule**, or refer to a detail. Weather bars and threshold plates are used at the junction between sill and door leaf or in place of a sill. Weather bars have been traditionally associated with purpose-made joinery. If sill profiles or proprietary profiles do not allow for the inclusion of a weather bar, document a proprietary seal or threshold section. As a secondary role, the weather bar can serve to protect the sill rebate from damage in high traffic areas.

2.6 DOOR CONTROLLERS

Standard

General: To AS 4145.5 (2011).

Performance

Requirement: Door controllers, pivots, floor or overhead door closers, and automatic door operators, suitable for the door type, size, weight, sliding action and swings required and the operating conditions, including wind and air conditioning pressure.

Automatic door operators

General: Complete automatic door operators for opening and closing doors, including door hanging (hinges, pivots or sliding gear) and electrical connection to distribution board.

Installation: Provide necessary recesses and core-holes, grout in components if required, and repair any damage. Provide cover plates for access to units in door heads, frames or transoms.

Automatic adjustable function: If the door opening angle or width is manually set below the maximum possible, under conditions of continuous traffic the doors must automatically creep to full opening, returning to reduced opening on the next cycle.

Radio remote door controllers: Provide a device, comprising a radio receiver and separate transmitter, for activating a motorised door operator so as to open and close the door by remote radio signal.

Key switch: If there is no separate access to the enclosure, provide a key switch mounted externally for opening and closing the door from outside the enclosure without the transmitter. Provide two keys.

Light: Provide an internal light that turns on for not less than 2 minutes before switching off automatically.

Receiver: House within a wall unit incorporating a push-button switch permanently illuminated. Mount within the enclosure and connect to power.

Transmitter: Portable battery-powered unit sending a coded signal effective up to not less than 12 m from the receiver.

Pressure floor mats: Automatic door activating system consisting of a mat that, when deflected by foot pressure, operates a switch that activates the door or doors.

Closers

Hinged and pivot doors:

- Fire-resisting doors: Closers tested and certified for use as components of fire-resisting door assemblies:
  . Standard: To AS 1905.1 (2015).

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2.7 ELECTRONIC CONTROL DEVICES

General

Requirement: Electric strikes, electric locks, drop bolts and/or similar devices to suit door construction and hardware.

Electromagnetic hold-open devices: To AS 1905.1 (2015) and the NCC cited AS 1670.1 (2018).

Glass doors: Tumbler, drop bolts or magnetic holders.

Double leaf doors (solid frame): Electric strike or lock on the inactive leaf, connected to the door frame by concealed flexible wiring.

Activation

Activation device: Keypads, card readers or other activation devices located next to entry points.

External: Weatherproof (IP56) hoods or housings for external units.

Mounting height: 900 to 1100 mm from floor level and not less than 500 mm from internal corners.

2.8 PANIC EXIT DEVICES

General

Standard: To EN 1125 (2008).

Requirements:

- Field sizable.
- Keyed dogging.

2.9 KEYING

Keying requirements

Standard: To AS 4145.1 (2008) for keying security.

Requirement: Provide door hardware and keys, as documented.

Temporary construction keys and cylinders

Requirement: Provide one of the following:

- Loan cylinder: Install for construction locks and replace at practical completion.
- Construction keyed master key cylinder: Keep up-to-date records of keys issued including recipient's name, company and contact details, date issued and date returned.

Delivery of keys

Great grandmaster, grandmaster and master keys: Arrange for delivery direct to the principal.

Locks keyed to differ and locks keyed alike: Check the quantity against key records, and deliver keys to the contract administrator at practical completion.

Group keying

Keying system: As documented.

Existing system extension: Obtain the details of existing group or master key systems of the system to be extended.

Future extensions: Provide master and grandmaster group keying systems capable of accommodating future extensions.

Proprietary keying control security system: Provide for cylinder or pin-tumbler locks that accept a group key (e.g. master key, maison key).

Stamping: Stamp keys and lock cylinders to show the key codes and/or door number as scheduled.

Identification

Labelling: Supply each key with a purpose-made plastic or stamped metal label legibly marked to identify the key, attached to the key by a metal ring.

Key material

Lever locks: Malleable cast iron or mild steel.

Pin tumbler locks: Nickel alloy, not brass.

Number of keys table

Key code	Key type	Minimum number of keys
GGMK	Great grandmaster keys	2
GMK	Grandmaster keys	2
MK	Master keys	2 per code group
KD	Locks keyed to differ	2 per lock
KA	Locks keyed alike:	
	-2 locks in code group	4
	-3 to 10 locks in code group	6
	-11 to 40 locks in code group	10
	-41 and over locks in code group	1 per 4 locks or part thereof

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3 EXECUTION

3.1 INSTALLATION

General

General: The hardware supplier/installer shall be a current member of the Locksmiths Guild of Australia Inc, hold licences where required by Commonwealth or State law, and shall ensure that their employees maintain the high professional standards expected of the craft of locksmithing.

Handing: Before supply, verify on site, the correct handing of hardware items.

Operation: Make sure working parts are accurately fitted to smooth close bearings, without binding or sticking, free from rattle or excessive play, lubricated if appropriate.

Mounting height

Door hardware locations from finished floor level to centre line of hardware shall be as follows, unless noted otherwise on the Hardware Scchdule; Levers handles and knobs: 1000mm Push plate/pull handle: 1070mm Cylinder escutcheon: 1064mm Kick plate: To top of plate 600mm

Locks

Cylinders: Fix vertically and with consistent key alignment.

Door stops

Fixing: Fix on the floor, skirting or wall, as appropriate, to prevent the door or door furniture striking the wall or other surface.

Fasteners

Materials: Provide materials compatible with the item being fixed, and of sufficient strength, size and quality to perform their function, and as follows:

- Concealed fasteners: Provide a corrosion-resistant finish to concealed fasteners.
- Exposed fasteners: Match exposed fasteners to the material being fixed.

Security: Locate exposed fasteners to lock furniture on the inside faces of external doors and on the inside faces of internal doors to lockable rooms.

Support:

- Hardware fasteners: Provide appropriate back support, such as lock stiles, blocking, wall noggings and backing plates.
- Hollow metal sections: Provide backing plates drilled and tapped for screw fixing, or provide rivet nuts with machine thread screws. Do not use self-tapping screws or pop rivets.

Floor springs
General: Form a recess in the floor slab for the floor spring box, securely fix and grout the box in place so that the cover plate is flush with the finished floor.

Hinges
Metal frames: Fix hinges using metal thread screws. Do not weld hinges to frames.

Timber doorsets: Install butt hinges in housings equal in depth to the thickness of the hinge leaf (except for hinges designed for mounting without housing), and fix with countersunk screws.

Seals
General: Provide the fixings, rebates, grooves, and clearances required for installation and operation of the seals. Allow seals unwound from coils to settle before use. Install proprietary seals to manufacturer's recommendations and adjust correctly.

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3.2 COMPLETION

Adjustment
General: Leave the hardware properly adjusted with working parts in working order, and clean, undamaged, properly adjusted, and lubricated if appropriate.

Opening force performance: To the NCC cited AS 1428.1 (2009).

Automatic door operators: Maintain and adjust the system throughout the defects liability period.

Keys
Contractor's keys: Immediately before practical completion, replace or reset cylinders to which the contractor has had key access during construction to exclude the contractor's keys.

For locks keyed to differ and locks keyed alike, verify quantities against key records, and deliver to Superintendent at Practical Completion. Key codes: Submit the lock manufacturer's record of the key coding system showing each lock type, number and type of key supplied, key number for re-ordering, and name of supplier

Operation and maintenance manuals
Requirement: Prepare a manual that includes the manufacturer's published recommendations for use, care and maintenance of the hardware provided.

Automatic door operators: Include the installer's proposal for continuing maintenance after completion on an annual renewal basis.

Warranties
Type: Supply and installation

Period: 10 years minimum period

4 SELECTIONS

4.1 ROOM-BY-ROOM

General door hardware requirements schedule
Builder to provide preferred manufacturer

Lock and latch classification

Rating systems: To AS 4145.1 Section 3

Performance requirements: To AS 4145.2 Section 3.

Refer Architectural Documentation

- Plans, Elevations, Sections
- - Door Schedule
- - Joinery Schedule
- - Window Schedule

	D1	D2	D3
Manufacturer			
Finish			
Lever/rose furniture series			

	D1	D2	D3
Lever/plate furniture series: Standard width			
Lever/plate furniture series: Narrow stile			
Push plates and pull handles on plates series			
Entrance handles			
Door stop series			

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Door hardware selection schedule

	Room group 1	Room group 2	Room group 3
Room type			
Interior or exterior door			
Door leaf/frame type			
Fire-resistance level (FRL)			
Hinges			
Sliding track			
Automatic door operator type			
Closer type			
Closer classification			
Door seal type			
Electronic control device			
Lock furniture type			
Lock function			
Keying code			
Durability rating (D)			
Keying security (K)			
Cylinder security (S_C)			
Physical security of locks (S)			
Physical security of locksets (S_L)			
Corrosion classification (C)			
Classification to AS 4145.1 (2008)			
Notes			

4.2 DOOR-BY-DOOR

Common door hardware properties schedule

	D1	D2	D3
Manufacturer			
Door furniture series			
Door furniture type			
Backset			
Entrance handles			
Finish			

Door hardware schedule

	D1	D2	D3
Room name			

	D1	D2	D3
Door hand			
Lock or latch function			
Hinges			
Sliding track			
Door bolt			
Panic exit device			
Automatic door controller			
Door closer			
Door seal type			
Electronic control device			
Entrance handles			
Handles, plates, pulls			
Door stop			
Coat hook			
Door protection			

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4.3 PADLOCKS

Padlock schedule

	Room or space group 1	Room or space group 2	Room or space group 3
Room or space type			
Security			
Keying security			
Durability			
Corrosion resistance			

4.4 KEYING

Key codes schedule

	D1	D2	D3
Door stamping			
Room name			
Level/Area			
Lock type			
Cylinder type			
Cam type			
Key code/No.: Qty			
Key code/No.: Qty			
Key code/No.: Qty			
Comments			

Key head colour schedule

Key code/No.	Key head colour

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0511B LINING

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide internal lining systems, as documented.

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Performance

Requirement: Provide lining system with a surface that is:

- Resistant to impacts expected in use.
- Resistant to moisture encountered under expected environmental conditions.
- Free of irregularities.
- A suitable substrate for the nominated final finish.

1.2 CROSS REFERENCES

General

Requirement: Conform to the following:

- *0171 General requirements*.
- Painting
- Architectural Drawings and Schedules
- BCA Report
- Fire Engineered Solutions Report

1.3 INTERPRETATION

Abbreviations

General: For the purposes of this worksection, the following abbreviation applies:

- MDF: Medium density fibreboard.

Definitions

General: For the purposes of this worksection, the definitions given in AS/NZS 4491 (1997) and the following apply:

- Decorative overlaid wood panels: Particleboard or fibreboard with a bonded decorative finishing surface such as thermosetting resin (low pressure melamine), PVC film, paper foils or wood veneer.
- Dry process fibreboard: Panel material with a nominal thickness of 1.5 mm or greater, manufactured from lignocellulosic fibres (derived from wood or other materials) with application of heat and pressure, the bond of which is derived from a synthetic adhesive added to the fibres and the panels are manufactured with a forming moisture content less than 20%.
- Fibre cement sheet linings: Treated cellulose fibre in a matrix of cement and sand autoclaved sheet, sealed on one side.
- High pressure decorative laminates (HPDL):
  - Panels consisting of core layers impregnated with phenolic and/or aminoplastic resins and a surface layer(s) impregnated with aminoplastic resins (mainly melamine resins).
  - Sheets consisting of a decorative face and layers of fibrous sheet material (e.g. paper) impregnated with thermosetting resins and bonded together under heat and pressure of at least 5 MPa.
- Wet process fibreboard: Panel material with a nominated thickness of 1.5 mm or greater, manufactured from lignocellulosic fibres (derived from wood or other materials) with application of heat and/or pressure, the bond of which is derived from the felting of the fibres and the panels are manufactured with a forming moisture content greater than 20%.

1.4 TOLERANCES

Permitted deviations

Bearing surface of finished framing:

- Gypsum lining: To AS/NZS 2589 (2017) clause 4.2.2.
- Other lining: 4 mm from a 1.8 m straightedge.

1.5 SUBMISSIONS

Fire performance
Fire hazard properties: Submit evidence of conformity to **FIRE PERFORMANCE**, **Fire hazard properties**.

Warranties
Requirement: Submit warranties to **COMPLETION**, **Warranties**.

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1.6 INSPECTION

Notice
Inspection: Give notice so that inspection may be made of the following:
- Substrate or framing before installation of linings.
- Finished surface of installation before applying:
  - Sealer.
  - Finish coatings or decorative papers.

2 PRODUCTS

2.1 GENERAL

Storage and handling
Requirement: Store lining stacked in pallets horizontally on a smooth, level surface. Prevent distortion or moisture ingress.

Timber or fibreboard panels: Store off the ground in a well-ventilated area.

Handling: Do not drag sheets across each other or across other materials. Protect edges, corners and surface from damage.

Certification
Timber based products: Label panels under the authority of a recognised certification scheme to *0185 Timber products, finishes and treatment*, as applicable to the product. Locate the label on faces or edges that will be concealed in the works.

2.2 FIRE PERFORMANCE

Fire hazard properties
Group number: To AS 5637.1 (2015).

2.3 PLASTERBOARD

General
Standard: To AS/NZS 2588 (2018).

Location: Refer to Architectural Drawings and Wall Types Schedule

Grade: Refer to Wall Types Schedule for requirements including acoustic performance, moisture resistance, and fire resistance

Thickness (mm): 13mm, or as otherwise nominated in the Architectural Drawings. Where 13mm thick plasterboard is specified, stud/furring spacings shall be at 600mm maximum centres.

Sheet width (mm): 1350mm unless noted otherwise

Sheet length (mm): 3600mm unless noted otherwise

Edge finish: Recessed edge unless noted otherwise

2.4 FIBRE CEMENT

General

Standard: To AS/NZS 2908.2 (2000).

Wall and ceiling linings: Type B Category 2.

Minimum thickness: 4.5 mm.

Location/Type/Thickness: Refer to Architectural Drawings and Wall Types Schedule

Finish: Applied paint finish. Refer to Master Schedule

Fixing: Fixing methods and batten spacings to be determined in accordance with the Site's wind classification rating and the manufacturer's written instructions.

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2.5 TONGUE AND GROOVE BOARDS

Hardwood

Standard: To AS 2796.1 (1999).

Seasoned cypress pine

Standard: To AS 1810 (1995).

Softwood

Standard: To AS 4785.1 (2002).

2.6 PLYWOOD AND BLOCKBOARD

General

General interior use: To AS/NZS 2270 (2006).

General exterior use and areas requiring moisture resistance: To AS/NZS 2271 (2004).

Visible surfaces with a clear finish: Veneer quality A.

Other visible surfaces: Veneer quality B.

Back/face veneer: Veneer quality C or D.

Preservative treatment: Moisture resistance. For joinery, refer to joinery schedule

Presealed plywood: Plywood pre-sealed both sides and edges with a machine applied sealer.

Plywood formaldehyde emission class to AS/NZS 2270 (2006) and AS/NZS 2271 (2004)

2.7 PARTICLEBOARD

General

Standard: To AS 1859.1 (2017).

Particleboard formaldehyde emission class to AS 1859.1 (2017)

2.8 ADHESIVES, SEALANTS AND FASTENERS

Adhesives

Wallboards: Gunnable synthetic rubber/resin based mastic contact adhesive formulated for bonding flooring and wallboards to a variety of substrates.

Sealants

Fire-resisting sealant: Non-hardening sealant, compatible with the materials to be sealed and having a fire-resistance rating equal to that of the building element it seals.

Acoustic sealant: Non-hardening sealant compatible with the materials to be sealed.

Fasteners

Steel nails: Hot-dip galvanized.

Furring Channels

Standard: To AS 1397

Furring Channels 28mm: Rondo part no.129, 28mm furring channel

Furring Channels clips: Rondo part no.237, furring channel anchor clip

Furring Channels 38mm: Rondo, 38mm

Furring Channels to Column Linings: Rondo part no. 333, 13mm furring channel

Masonry Anchors: Ramset Dynabolts, M6 thread minimum 50mm long

3 EXECUTION

3.1 CONSTRUCTION GENERALLY

Conditions

Requirement: Do not start lining work until the building or installation area is enclosed and weathertight, and all wet trades have been completed.

Preparation

Requirement: Before fixing linings, check and adjust the alignment of substrates or framing, if necessary.

Substrate: Make sure substrates are plumb, level, in true alignment and to the lining manufacturer's recommendations.

Timber, steel framing and battened masonry: To AS/NZS 2589 (2017) clause 4.2.

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Pre-conditioning

General: Acclimatise timber panels in the in-service conditions for 2 to 3 weeks before installing.

Battens

General: Fix at each crossing with structural framing members, to solid walls or ceiling support. Provide wall plugs in solid substrates.

Ceiling linings

General: Do not install until the timber roof structure has been fully loaded for at least 14 days.

Accessories and trim

General: Provide accessories and trim as necessary to complete the installation.

Adhesives

General: Provide adhesive types appropriate for the purpose and apply them so they transmit the loads imposed without causing discolouration of the finished surfaces.

Fire-resisting and acoustic rated installations

Sealing: Apply sealant to the manufacturer's recommendations and as follows:

- Around services pipes and penetrations.
- Electrical outlets and recessed lights: Line back and sides of fixture with plasterboard and seal around fixture junction with sealant.
- Around perimeter of lining panels: Provide continuous runs of sealant.

3.2 PLASTERBOARD

Installation

Gypsum plasterboard and fibre reinforced gypsum lining: To AS/NZS 2589 (2017).

Level of finish and jointing: To AS/NZS 2589 (2017) clause 3.1.

Supports

General: Install timber battens or proprietary cold-formed galvanized steel furring channels as follows:

- If framing member spacing exceed the recommended spacing.
- If direct fixing of plasterboard is not possible, due to the arrangement or alignment of the framing or substrate.
- If the lining is the substrate for tiled finishes.
- If required for penetrations for services, including mechanical grilles and lighting fixtures.
- If required to support fixtures.

Multiple sheet layers

Application: Fire-resisting and acoustic rated walls.

Joints: Fill and flush up all joints and fasteners in each layer and caulk up perimeters and penetrations before installing following layers. Stagger all sheet joints by minimum 200 mm.

Joints

Flush joints: Provide recessed edge sheets and finish flush using perforated paper reinforcing tape.

Butt joints: Make joints over framing members or provide back blocking.

External corner joints: Make joints over metallic-coated steel corner beads.

Dry joints: Provide square edged sheet and finish with a PVC-U joining section.

Control joints: Provide purpose-made metallic-coated control joint beads at not more than 12 m centres in walls and ceilings and to coincide with structural control joints.

Wet areas: Install additional supports, flashings, trim and sealants as required.

Joints in tiled areas: Do not apply a topping coat after bedding perforated paper tape in bedding compound.

3.3 FIBRE CEMENT

Installation

Joints and layout: Run sheets across the framing members. In flush jointed applications, stagger end joints in a brick pattern and locate them on framing members, away from the corners of large openings. Provide supports at edges and joints.

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Supports

General: Install timber battens or proprietary cold-formed galvanized steel furring channels as follows:

- If framing member spacing exceed the recommended spacing.
- If direct fixing of fibre cement is not possible, due to the arrangement or alignment of the framing or substrate.
- If the lining is the substrate for tiled finishes.
- If required for penetrations for services, including mechanical grilles and lighting fixtures.
- If required to support fixtures.

Fixing

Timber framed construction: Nail only or combine with adhesive.

Steel framed construction: Screw only or combine with adhesive.

Wall framing: Conform to the following:

- Do not fix to top and bottom plates or noggings.
- In tiled areas: Provide an extra row of noggings immediately above wall-to-floor flashings. Fix sheet at 150 mm centres to each stud and around the perimeter of the sheet.

Masonry wall construction: Conform to the following:

- Direct fixing: Adhesive fix to the masonry except where lining forms a substrate for tiled finish.
- Furring channels: Fix using screw and/or adhesive.

Ceilings: Fix using screw and/or adhesive to ceiling furring members. Do not fix sheets directly to the bottom chords of trusses.

- Ceiling battens: Fix at 600 mm maximum centres.

Wet areas: Do not use adhesive fixing alone.

Multiple sheet layers

Application: Fire-resisting and acoustic rated walls.

Joints: Fill and flush up all joints and fasteners in each layer and caulk up perimeters and penetrations before installing following layers. Stagger all sheet joints by minimum 200 mm.

Joints

Joint width:

- Butt joints: 1 to 2 mm.
- Expressed joints: 10 mm maximum.

Joint backing for expressed joints: Black self-adhesive polyurethane tape.

Flush joints: Provide recessed edge sheets and finish flush using perforated paper reinforcing tape.

External corner joints: Make joints over metallic-coated steel corner beads.

Dry joints: Provide square edged sheet and finish with a PVC-U joining section.

Control joints: Provide control joints to coincide with structural control joints and as follows:

- Walls:
  - Timber framing: ≤ 7.2 m centres.
  - Steel framing 0.55 to 0.75 mm BMT: ≤ 9 m centres.
  - Steel framing 0.8 to 1.6 mm BMT: ≤ 6 m centres.
- Ceilings: To divide into bays not larger than 10.8 x 7.2 m.

- Soffit linings: To divide into bays not larger than 4.2 x 4.2 m or 5.6 x 3.6 m.
- Control joint beads: Purpose-made metallic-coated.
- Support: Provide framing parallel to the joint on each side. Do not fix the lining to abutting building surfaces.

Wet areas: Provide additional supports, flashings, trim and sealants to manufacturer's recommendations.

Joints in tiled areas: Bed perforated paper tape in bedding compound. Do not apply a topping coat.

- Control joints:
  - Timber framing: Not more than 4.2 m centres and space to suit joints required in tiling.
  - Steel framing: Not more than 4.8 m centres and space to suit joints required in tiling.
- Internal corners: Reinforce with preformed angles to manufacturer's recommendations.

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3.4 TONGUE AND GROOVE BOARDS

Installation

General: Conform to the following:

- Horizontal installation: Provide single lengths of boards if possible.
- Vertical installation: Provide single lengths only.

Stained or clear finished boards: Select board to give a random pattern. At corners, return the same board to give a continuous grain pattern.

Fixing: Nail twice to each crossing, except for secret nailed profiles.

Secret nail fixing: Fix nail diagonally through the tongue only. Punch nails to maintain correct alignment of the next board.

Nailheads: Treat visible nailheads as follows:

- In stained or clear finishes: Drive flush.
- In opaque finishes: Punch below surface and fill flush with putty after the surface has been primed.

Corners and junctions: Allow for movement at all corners and junctions.

Joints

Requirement: Select board lengths to give minimum number of joints.

End grain joints: Install boards so that butt joints are in compression.

Internal corners: Scribe.

External corners: Mitre.

3.5 TIMBER PANEL LINING

General

Installation: Set out in even panels with joints coinciding with framing members. Fit and fix panels and trim plumb, level and in true alignment of face and grain.

Fixing:

- Plywood and hardboard: Wallboard adhesive or pin fixed to timber frame, screw fixed to steel frame. Punch pin heads just below surface.
- Laminated plastic: Wallboard adhesive.

Plywood

Expansion joints: Provide expansion joints as follows:

- Perimeter of linings and each panel joint: 2 to 3 mm gap.
- Interval: One of the following:
  - Maximum 3.6 m centres: 6 to 9 mm gap.
  - Maximum 4.8 m centres: 8 to 12 mm gap.

Areas with an expected high level of internal moisture: Provide a gap of 4 to 6 mm every 1.2 m.

3.6 TRIM AND ACCESSORIES

General

Requirement: Provide trim such as beads, mouldings and stops to make neat junctions between lining components, finishes and adjacent surfaces.

Proprietary items: Provide complete with installation accessories.

Timber and MDF trim: Fix using full length so that trim is secure and without movement. Where nail or screw fixings are used, make sure fastener finishes sufficiently below face of trim so that stopping piece finishes flush with the face.

Plasterboard cornices

Fixing: Mitre at corners and adhesive fix with cornice cement. Pin in place at cornice edges until adhesive sets, remove pins and fill holes.

Plaster cornices and roses

Fixing: Pin or prop in place and fix with wet gypsum plaster and scrim straps over framing members.

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Fire-resisting walls

Requirement: Seal to soffit with sealant with an equivalent fire-resistance level before fixing decorative cornices, if any.

Timber trim

Hardwood: AS 2796.1.

Cypress pine: AS 1810

- Proprietary items: 100mm x10mm to common areas or 90mm x 10mm to all internal apartments DAR Finger Jointed Pine fixed to bottom plates in stud walls and with wall plugs. Ensure top edge of skirting is chamfered to less than 10mm wide so it is not classes as a foothold below windows.

- Location: Timber skirtings to apartments and common areas. Refer to Architectural Drawings.
Softwood: To AS 4785.1.

- Grade: To AS 4785.2.

Trim to Sheet Lined Walls

Corner guards: External angles shall be reinforced with galvanised metal external cornerbead fixed to face of linings at 300mm centres or adhesive fixed. Blend finishing coats into sheet. Where installed under waterproof membrane to tiled walls, epoxy adhesive fix to wall linings

- Proprietary items: Rondo P32 Plasterlock corner bead. For high traffic areas, use Rondo P55

Free Ends:

Stopping beads: Where sheets are required to finish up to a free edge, the edge shall be formed against a galvanised stopping bead adhesive fixed to face of sheet. Blend finishing coat into sheet

- Proprietary items: Rondo P13 for 13mm sheet or Rondo P14 for 16mm sheet

- Location: Typical square set finish to lowered ceiling in Wet Areas and Hallway. Refer to Architectural Drawings.

Internal Angles:

Internal stud wall corner: Internal wall angles shall be stopped up flush and smooth. Reinforce at the front with a galvanised internal corner bead adhesive fixed to face of sheets.

- Proprietary items: Rondo PS17 Internal Corner Bead

Shadowline:

Shadowline trim: Where sheets are required to finish up to a shadowline, the edge of sheet shall be formed against a galvanised shadow line stopping bead adhesive fixed to face of sheet. Blend finishing into sheet.

- Proprietary items: Rondo P50 Shadowline Stopping Angle

- Location: Typical cornice to all habitable common areas. Refer to Architectural Drawings.

3.7 COMPLETION

General

Damaged or marked lining and components: Replace.

Exposed surfaces: Touch up shop applied finishes and restore damaged or marked areas.

Timber panels: If appearance is not uniform, replace panels.

Cleaning: Clean completed surfaces to remove irregularities and leave panels smooth and clean, to the manufacturer's recommendations. If required, sand with fine paper to remove irregularities and refinish panel surface.

- Debris and unused material: Remove from site.

Warranties
Type: Supply and install warranty

4 SELECTIONS

4.1 PERFORMANCE

Sheet lining performance schedule

	A	B	C
Product			
Fire hazard properties: Group number			
Airborne sound insulation			
Impact sound insulation			

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4.2 SHEET LININGS

Plasterboard schedule

	A	B	C
Location			
Grade			
Thickness (mm)			
Sheet length (mm)			
Sheet width (mm)			
Configuration			
Edge type			
Joint type			
Level of finish			
Battens: Size (mm)			
Battens: Spacing			

Fibre cement schedule

	A	B	C
Location			
Type and Category			
Thickness (mm)			
Sheet length (mm)			
Sheet width (mm)			
Configuration			
Joint type			
Battens: Size (mm)			
Battens: Spacing			

Tongue and groove boards schedule

	A	B	C
Location			
Timber species			
Grade			
Profile			
Thickness (mm)			

	A	B	C
Width (mm) coverage			
Orientation of boards			

Plywood and blockboard schedule

	A	B	C
Location			
Thickness (mm)			
Sheet length (mm)			
Sheet width (mm)			
Configuration			
Joint type			
Battens: Size (mm)			
Battens: Spacing			

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Particleboard schedule

	A	B	C
Location			
Classification			
Thickness (mm)			
Sheet length (mm)			
Sheet width (mm)			
Configuration			
Joint type			
Battens: Size (mm)			
Battens: Spacing			

4.3 TRIM

Trim schedule

	A	B	C
Re-entrant corners			
Salient angles			
Edge trim			
Plasterboard cornice			
Plaster cornice			
Plaster rose			

0531B SUSPENDED CEILINGS - COMBINED

1 GENERAL

1.1 RESPONSIBILITIES

General
Requirement: Provide suspended ceilings, as documented.

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1.2 CROSS REFERENCES

General
Requirement: Conform to the following:
- *0171 General requirements*.
- Painting
- Architectural Drawings and Schedules
- BASIX Assessment and Certificate

1.3 STANDARDS

General
Suspended ceilings: To AS/NZS 2785 (2020).

1.4 INTERPRETATION

Definitions
General: For the purposes of this worksection, the definitions given in AS/NZS 2785 (2020) and the following apply:
- Ceiling unit: Tile, panel, plank, strip or open grid supported within or to a suspended ceiling system.

1.5 TOLERANCES

Suspension system
Flatness, twist, winding and bow: 1.5 mm deviation from a 1.5 m straightedge placed in any position.
Deflection: To AS/NZS 2785 (2020) Table 2.4.5.
Setting out and levelling: To AS/NZS 2785 (2020) Appendix D.

Sheeted or flush ceiling suspension system
Suspension system bearing surface for flush lined ceiling: To AS/NZS 2589 (2017) Table 4.2.2.
Deflection: To AS/NZS 2589 (2017) Table 3.5.1.2.

1.6 SUBMISSIONS

Fire performance
Fire hazard properties: Submit evidence of conformity to **FIRE PERFORMANCE**, **Fire hazard properties**.
Fire-resistance level: Submit evidence of conformity to **FIRE PERFORMANCE**, **Fire-resistance of building elements**.

Products and materials
Type tests: Submit test results to PRODUCTS, **GENERAL**, **Tests** for the following:
- Weighted suspended ceiling normalised level difference.
- Weighted sound absorption coefficient.
- Weighted sound reduction index.

Shop drawings
Set-out drawings: Submit proposed set-out, indicating the grid module, type and ceiling unit layout, before installation. Coordinate with plenum services layouts, building structure and other factors affecting the layout.

Subcontractors
General: Submit names and contact details of proposed suppliers and installers.
Evidence of experience: [complete/delete]

1.7 INSPECTION

Notice
Inspection: Give notice so that inspection may be made of the following:
- The suspension system before the installation of ceiling units or lining.
- The ceiling assembly before the installation of fittings and site painting, if applicable.
- The completed ceiling.

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2 PRODUCTS

2.1 GENERAL

Storage and handling
Requirement: Store suspended ceiling components in a dry and secure area, and to the manufacturer's recommendations.

Tests
Weighted suspended ceiling normalised level difference: To the NCC cited AS/NZS ISO 717.1 (2004).
Weighted sound absorption coefficient: To AS ISO 11654 (2002), as tested to AS ISO 354 (2006).
Weighted sound reduction index: To the NCC cited AS/NZS ISO 717.1 (2004).

2.2 FIRE PERFORMANCE

Fire hazard properties
Group number: To AS 5637.1 (2015).

Fire-resistance of building elements
Fire-resistance level: Tested to AS 1530.4 (2014).

2.3 SUSPENSION SYSTEM

Ceiling suspension system
Consistency: Provide ceiling systems as complete proprietary systems, fabricated by one manufacturer, as documented.

Materials
Coated steel: To AS 1397 (2021).
Aluminium: To AS/NZS 1866 (1997).
Protective coatings for steel components: To AS/NZS 2785 (2020) Appendix F.
Protection against atmospheric corrosion: To AS 2312.1 (2014) and AS/NZS 2312.2 (2014).

2.4 CEILING UNITS

General
Ceiling units: As documented.

2.5 LININGS

Ceiling linings
General: As documented.

Plasterboard
Standard: To AS/NZS 2588 (2018).
Minimum thickness: 10 mm.

Fibre cement
Standard: To AS/NZS 2908.2 (2000).
Internal ceiling linings: Type B Category 2.
External ceiling linings: Type A Category 3.
Minimum thickness: 4.5 mm.

Sealants
Fire-resisting sealant: Non-hardening sealant compatible with the materials to be sealed and having a fire-resistance rating equal to that of the building element it seals.

Acoustic sealant: Non-hardening sealant compatible with the ceiling materials and rated to match the ceiling system's acoustic performance.

2.6 TRIM

General
Trim: Provide trim consistent with the materials and finishes of the ceiling system.

Accessories
General: Provide accessories as part of the proprietary ceiling system necessary to complete the installation.

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3 EXECUTION

3.1 GENERAL

Working environment
General: Do not start work before the building is enclosed, wet work is complete and dry, and all work above the ceiling, including services, is complete.

Protection
General: Protect existing work from damage during the installation.

Partitions
General: If partitions are attached to the underside of the ceiling systems, include the partition mass in the seismic mass of the ceiling.

Stability
General: Install the ceilings level and fix to prevent looseness or rattling of ceiling components under normal conditions.

Structure-borne sound
General: Provide a ceiling system that does not amplify structure-borne sound. Provide suitable proprietary products or systems for reducing contact vibrations between structure and ceiling.

Control of movement
Abutments: Install the ceiling to allow for differential movement at abutting surfaces.

Alignment: Align ceiling control joints with structural control joints. Do not bridge structural control joints.

Prefinishes
General: Repair damaged prefinishes by recoating.

Curtain recesses
General: Provide curtain recesses, including the following:

- Lining.
- Curtain track support.
- Accommodation for motors and cabling.

3.2 SUSPENSION SYSTEM

Ceiling grid
Set-out: Align ceiling unit joints and centrelines of visible suspension members with documented set-out points. If not documented, set out with equal margins.

Suspension system
General: Fix suspension system to the structural soffit.

Support members: Install support members as follows:

- Space as required by the loads on the system and the type of ceiling.
- Allow for the installation of services and accessories, including ductwork, light fittings and diffusers.
- Provide additional back support or suspension members for the fixing of services and accessories to prevent distortion, overloading or excessive vertical deflection.
- Allow for access for maintenance of services.

Failure: Provide a ceiling system that will not progressively fail with failure of any one suspension point.

Height adjustment: Provide height adjustment with a length adjustment device at each suspension point, permitting length variation of at least 50 mm.

Grid members: If required, notch grid members at the junction with the perimeter trim to make sure the ceiling units lay flat on the perimeter trim.

Restriction: Do not attach the suspension system to the lip or flange of purlins.

Services

Support: Conform to the following:

- If the service has not been designed to accept the ceiling load, do not fix suspension members to services.
- Where services obstruct the ceiling supports, provide bridging and suspension on each side of the services.
- Do not support services terminals on ceiling units.

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Bracing

General: Provide bracing to prevent lateral movement and to resist the imposed horizontal seismic force.

Bulkheads

General: Integrate bulkheads with the ceiling structure and brace to prevent lateral movement. If the ceiling is terminated at a bulkhead, provide for seismic requirements.

External suspended soffits

General: Support external suspended soffits on rigid members capable of carrying the loads from imposed actions. Install members to minimise any eccentricity, and carry the positive and negative loads from wind actions through to the supporting structure.

Fasteners

General: Provide concealed fasteners. If material supporting hangers is less than 3 mm thick, do not use screw fasteners.

3.3 CEILING UNITS

Installation

Fitting: Fit ceiling units accurately and neatly, without distortion.

Lock clips: If ceiling units are exposed to loads from wind actions or if required for security, insert lock clips at the junction of carrier rails and units.

Pattern and texture: Set out patterned or heavily textured materials with a consistent direction of pattern or texture.

Service penetrations

General: Provide openings for all services elements, including light fittings, ventilation outlets, detectors, sprinklers and loudspeakers. Where services pass through ceiling grid members, provide additional grid members and support.

Cut ceiling unit edges

General: Conceal or finish to match prefinished edges, including at openings for services elements.

3.4 PLASTERBOARD

Installation

Gypsum plasterboard and fibre-reinforced gypsum plaster: To AS/NZS 2589 (2017).

Level of finish and jointing: To AS/NZS 2589 (2017) clause 3.1.

Suspended flush ceilings: Fix using screws or screws and adhesive to ceiling members or support frame.

Multiple sheet layers

Application: Fire-resisting and acoustic rated ceilings.

Joints: Fill and flush up all joints and fixings in each layer and caulk up perimeters and penetrations before installing following layers. Stagger all sheet joints by minimum 200 mm.

Joints

Flush joints: Provide recessed edge sheets and finish flush using perforated paper reinforcing tape.

Butt joints: Make joints over framing members or otherwise provide back blocking.

External corner joints: Make joints over metallic-coated steel corner beads.

Control and movement joints: Align lining control joints with structural movement joints and as follows:

- Ceilings:
  - . Internal: At maximum 12 m centres.
  - . External: At maximum 6 m centres.
- Control joint beads: Purpose-made metallic-coated.
- Seismic joint: Purpose-made flexible joint and cover.
- Location: Position joints to intersect light fixtures, vents or air diffusers, as required.

Wet areas: Install additional supports, trim and sealants, as required.

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3.5 FIBRE CEMENT

Installation

General: Run sheets across the framing members. In flush jointed applications, stagger end joints in a brick pattern and locate them on framing members, away from the corners of large openings. Provide supports at edges and joints.

Suspended flush ceilings: Fix using screws or screws and adhesive to ceiling members or support frame.

Multiple sheet layers

Application: Fire-resisting and acoustic rated ceilings.

Joints: Fill and flush up all joints and fixings in each layer and caulk up perimeters and penetrations before installing following layers. Stagger all sheet joints by minimum 200 mm.

Joints

Flush joints: Provide recessed edge sheets and finish flush using perforated paper reinforcing tape.

External corner joints: Make joints over metallic-coated steel corner beads.

Dry joints: Provide square edged sheet and finish with a PVC-U joining section.

Non-set joints: Provide square edge joint with metal or socket strip backing.

Control and movement joints: Align lining control joints with structural movement joints to the manufacturer's recommendations and as follows:

- Control joint beads: Purpose-made metallic-coated.
- Seismic joint: Purpose-made flexible joint and cover.
- Support: Provide framing parallel to the joint on each side. Do not fix the lining to abutting building surfaces.
- Location: Position joints to intersect light fixtures, vents or air diffusers, as required.

Wet areas: Install additional supports, trim and sealants, as required.

Coordinate with the placement of lighting, signs, cable penetrations and access to mechanical and electrical systems and other equipment, including acoustic treatments and approved acoustic sealant where surface mounted lights and smoke detectors are required.

Ceiling Height: As nominated on the Architectural Drawings. Coordinate suspended ceilings with structural and service requirements and install to the manufacturer’s written instructions. Allow for the integration of all services

Material: Ceiling materials to have a diffuse reflectance not less than 30%

3.6 ACCESS PANELS

Finish

General: Match the access panels to the ceiling in appearance and performance.

Identification

General: Provide each access panel with an identification mark.

Non-demountable ceilings

General: Provide access panels supported and anchored to permit ready removal and refixing.

Reinforcement

General: Reinforce the back of the access panel to prevent warping and facilitate handling.

Acoustic

General: Install acoustically certified access panels to equal the acoustic performance of the element in which they are installed, typically that will required the use of Rw + Ctr 25 access panels in SOU's where waste/soil/stormwater pipework is located within the SOU. Where double layer ceilings are installed the access panel shall be rated at Rw+Ctr of 30. Access panels for waste piping shall not be located on the sides of risers facing habitable rooms (Refer to BCA requirements).

3.7 TRIM

General

Trim: Install trim at junctions with other building elements and surfaces, including walls, beams and penetrations, consistent with the materials and finishes of the ceiling system.

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Accessories

General: Install accessories as part of the proprietary ceiling system necessary to complete the installation.

3.8 COMPLETION

General

Exposed surfaces: Touch up shop applied finishes and restore damaged or marked areas.

Cleaning: Clean completed surfaces

Debris and unused material: Remove from site.

Spares

General: Provide spare matching ceiling components, as follows, and store the spare materials on site where directed:

- Supporting system: One spare supporting member (hanger or framework member) for every 100 members or part thereof of the same type installed in the ceiling.
- Ceiling units: One spare unit for every 50 units or part thereof installed in the ceiling.
- Accessories: One spare of each type for every 50 units or part thereof installed in the ceiling.

4 SELECTIONS

4.1 GENERAL

Suspended ceiling performance schedule

	A	B	C
Additional structural design actions			
Fire hazard properties: Group number			
Fire-resistance level (FRL)			
Weighted suspended ceiling normalised level difference ($D_{n,c,w}$)			
Weighted sound absorption coefficient (α_w)			
Weighted sound reduction index (R_w)			
Impact sound insulation			

4.2 SUSPENSION SYSTEM

Ceiling suspension system schedule

	A	B	C
Product			
Material			
Basic grid (L x B) (mm)			
Grid type			
Wall angle trim			
Finish/colour			

4.3 CEILING UNITS

Ceiling units schedule

	A	B	C
Product			
Type			
Material			
Size (mm)			
Thickness (mm)			
Pattern			
Colour			
Edge type			
Finish			

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4.4 LININGS

Sheet lining schedule

	A	B	C
Location			
Material			
Thickness (mm)			
Configuration			
Plasterboard: Grade			
Plasterboard: Level of finish to AS/NZS 2589 (2017)			
Control joint			
Access panels			

0551 JOINERY

1 GENERAL

1.1 RESPONSIBILITIES

General
Requirement: Provide joinery, as documented.

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1.2 CROSS REFERENCES

General
Requirement: Conform to the following:
- *0171 General requirements*.
- *0185 Timber products, finishes and treatment*.
- *Architectural joinery details* and schedules
- *Hydraulic documentation*
- *Access Report*

1.3 SUBMISSIONS

Certification
Requirement: Submit one of the following, as evidence of conformity to documented requirements for grading, species and board size:
- Supplier's certificate, which may be included on an invoice, delivery docket or packet label.
- Report by an independent inspecting authority.

Timbers for which certification is required: Where possible, timber that has a reduced environmental impact relataive to available alternatives shall be installed into the Works. The installed joinery shall conform to;

- Good Environmental Choice Australia (GECA) as recognised by the Green Building Council (GBCA)

Moisture content: Submit documentation noting moisture content of timber products.
- Timing: Before fabrication.

Operation and maintenance manuals
Requirement: Submit manual to **COMPLETION**, **Operation and maintenance manuals**.

Products and materials
Manufacturer's data: Submit manufacturer's product data.

Proprietary items: Submit the manufacturer's standard drawings and details showing:
- Methods of construction.
- Assembly and fixing, with dimensions and tolerances.

Samples
Requirement: Submit samples to PRODUCTS, **GENERAL**, **Samples**.

Shop drawings
General: Submit shop drawings to a scale that best describes the detail, showing the following:
- Overall dimensions.
- Materials, thicknesses and finishes of elements including doors, divisions, shelves and benches.
- Type of construction including mitre joints and junctions of members.
- Hardware type and location.
- Temporary bracing, if required.
- Procedures for shop and site assembly and fixing.
- Locations of benchtop joints.
- Stone benchtop layout including joint arrangement and penetrations.
- Locations of sanitary fixtures, stoves, ovens, sinks and other items to be installed in the units.
- Relationship of fixture to adjacent building elements.

- Details of fabrication involving other trades or components.
- Proposals for the break-up of large items as required for delivery to the site.
- Proposed method of joining the modules of large items.

Timing: Before fabrication.

Subcontractors

General: Submit names and contact details of proposed suppliers and installers.

Warranties

Requirement: Submit warranties to **COMPLETION**, **Warranties**.

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1.4 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following:

- Shop fabricated or assembled items ready for delivery to the site.
- Openings prepared to receive assemblies.
- Site erected assemblies on completion of erection, before covering up by cladding and encasing.
- Surfaces prepared for, and immediately before, site applied finishes.
- Completion of installation.

2 PRODUCTS

2.1 GENERAL

Samples

Requirement: Provide samples as follows:

- Boards: Two of each type, complete with finish and edge stripping.
- Joints: Two of each type.
- Typical hardware item: Two samples, showing each finish.
- Stone cladding: Provide three variants, two samples of each variant showing maximum variation.
- Timber veneer: Provide three variants, two samples of each variant showing maximum expected variation.
- Fabric: Two swatches of each type.
- Stainless steel items: Two of each type.
- Timber bench cupboard door: One sample, complete with hardware.
- Drawer front: One sample, complete with hardware.
- Timber stair, balustrade and handrail: One finished sample.

Clear finished timber: Provide samples as follows:

- Initial submission:
  - Veneered board: Three samples each 600 x 600 mm for each species.
  - Solid timber: Three samples each 40 x 19 x 600 mm for each species.
- Control sample: The approved selection from the initial submission.
- Finished sample: Cut the control sample in half and apply the finish to half the remaining area.

Storage and handling

Requirement: Deliver joinery units to site in unbroken wrapping or containers and store so that its moisture content is not adversely affected. Do not store in areas of wet plaster. Store in an adequately ventilated space away from heat and direct sunlight. Keep storage time to a minimum by delivering items only when required for installation.

2.2 JOINERY MATERIALS AND COMPONENTS

Certification

Timber based products: Label panels under the authority of a recognised certification scheme to *0185 Timber products, finishes and treatment*, as applicable to the product. Locate the brand on faces or edges that will be concealed in the works.

Visible work
Clear finished timber and veneer: Make sure all visible surfaces are free of branding, crayon or chalk marks and of blemishes caused by handling.

Joinery timber
Hardwood for trim: To AS 2796.1 (1999).

Hardwood for furniture: To AS 2796.3 (1999).

Hardwood grade: To AS 2796.3.

Seasoned cypress pine: To AS 1810 (1995).

Cypress pine grade: To AS 1810.

Softwood for trim: To AS 4785.1 (2002).

Softwood for furniture: To AS 4785.3 (2002).

Softwood grade: To AS 4785.3.

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Finished sizes of milled timbers: Not less than the documented dimensions unless qualified by a term such as nominal, out of or ex to which industry standards for finished sizes apply.

Plywood
Interior use generally: To AS/NZS 2270 (2006).

Interior use, exposed to moisture: To AS/NZS 2271 (2004).

Visible surface with a clear finish: Veneer quality A.

Other visible surfaces: Veneer quality B.

Plywood formaldehyde emission class to AS/NZS 2270 (2006) and AS/NZS 2271 (2004): [complete/delete]

Non-structural glued laminated timber
Application: [complete/delete]

Appearance: [complete/delete]

Wet process fibreboard (including hardboard)
Standard: To AS/NZS 1859.4 (2018).

Classification: High Moisture Resistance HMR

- Bending strength: L

Particleboard
Standard: To AS 1859.1 (2017).

Classification: High Moisture Resistance HMR

Particleboard formaldehyde emission class to AS 1859.1 (2017):

Melamine overlaid particleboard: Particleboard overlaid on both sides with low pressure melamine.

Dry process fibreboard (including medium density fibreboard)
Standard: To AS/NZS 1859.2 (2017).

Dry process fibreboard formaldehyde emission class to AS/NZS 1859.2 (2017)

Melamine overlaid medium density fibreboard: Medium density fibreboard (STD MDF) overlaid on both sides with low pressure melamine.

Decorative overlaid wood panels
Standard: To AS/NZS 1859.3 (2017).

High pressure decorative laminate (HPDL) sheets
Standard: To AS/NZS 2924.1 (2024).

Minimum thickness: Conform to the following:

- Horizontal surfaces fixed to a continuous substrate: 1.2 mm.
- Vertical surfaces fixed to a continuous substrate: 0.8 mm.
- Post formed laminate fixed to a continuous substrate: 0.8 mm.
- Vertical surfaces fixed intermittently, including to studs: 3.0 mm.
- Edge strips: 0.4 mm.

Stone facings
General: Provide stone slabs within the visual range of the approved samples.

Toughened glass panels
General: [complete/delete]

Vinyl benchtopping
General: Fully flexible homogeneous sheet.

Fixing: Spray adhesives to flat surfaces and double-stick contact adhesive method to curved surfaces.

Plastics and rubber
Material: [complete/delete]

Fixing: [complete/delete]

Splashbacks
Glass: Toughened safety glass to AS 2208 (2023).

Glass type: Bronze colourback glass, copper free.

Stainless steel: Type 304, No. 4 finish.

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2.3 VENEERS

Timber veneer
Requirement: Provide veneers in specified matching arrangement, flitch batched and falling within the visual range of the approved samples.

Veneer quality: To AS/NZS 2270 (2006).

Minimum grade:

- Select grade, veneer quality A, for visible surfaces to have clear finish or to have no coated finish.
- General purpose grade, veneer quality B, for other visible surfaces.

Application: - Apply veneers with edges tight butted, with no gaps or open defects. Set out veneers in aligned uniform symmetry. - Finished components shall be free from bow, twist, scratches, chipping, pimpling, depressions, glue spills, staining and other defects. Sand to a fine and smooth finish, and free from sanding marks. - Where timber veneer is used for benches and desktop, it shall have minimum 2 layers of veneer on top and to visible side surfaces Veneer timber species: Natural Oak Type of cut: Crown cut, unless nominated otherwise. Matching arrangement: Book matched, unless nominated otherwise. Edge strips: Double layer of veneer

Vinyl veneer
Type: Proprietary unbacked vinyl fabric factory-bonded to the designated surface.

2.4 JOINERY ASSEMBLIES

General
Standard: To AS 4386 (2018).

Product certification
Certification scheme: [complete/delete]

Plinths
Material: [complete/delete]

Thickness: 16 mm.

Fabrication: Form up with front and back members and full height cross members at not more than 900 mm centres.

Fasteners: Conceal with finish.

Installation: Scribe to floor and secure to wall to provide level platform for carcasses.

Carcasses
Material: Select from the following:

- Overlaid high moisture resistant particleboard

Thickness: 19mm

- Overlaid high moisture resistant medium density fibreboard.

Thickness: 18 mm.

Joints: Select from the following:

- Proprietary mechanical connections.
- Dowels and glue.

- Screws and glue.
- Proprietary joining plates and glue.

Adjustable shelves: Support on proprietary pins in holes bored at equal centres vertically.

- Spacing: 32 mm.

Finish: F705 White Melamine

Fasteners: Conceal with finish.

Installation: Secure to walls at not more than 600 mm centres.

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Drawer fronts and doors

Material: Select from the following:

- Melamine overlaid high moisture resistant particleboard.
- Melamine overlaid high moisture resistant medium density fibreboard.

Thickness: 16 mm / 18mm

Maximum door size: 2400 mm high, 900 mm wide, 1.5 m2 on face.

Drawer fronts: Rout for drawer bottoms.

Finish: F701.

Colour: Refer Master Schedule

F701A Timber Laminate

F701B Two-Pack Polyurethane

F701C Two-Pack Polyurethane

Drawer backs and sides

Material: Melamine overlaid high moisture resistant particleboard

Thickness: 16mm

Colour: F705 White Melamine

Installation: Mitre corners leaving outer skin of foil intact, finish with butt joints, glue to form carcass and screw to drawer front. Rout for drawer bottoms.

Drawer bottoms

Material: PVC film laminated hardboard.

PVC film faces: Top and Bottom

Thickness: 3 mm.

Colour: White to match F705

Drawer and door hardware

Hinge types: Concealed metal hinges with the following features:

- Adjustable for height, side and depth location of door.
- Self closing action. - Hold open function.
- Nickel plated.

Piano hinges: Chrome plated steel, extending full height of doors.

Slides: Metal runners and plastic rollers with the following features:

- 30 kg loading capacity.
- Closure retention.
- White thermoset powder coating or nickel plated.

Full height doors

Material: Melamine overlaid high moisture resistant medium density fibreboard

Thickness: 18mm

Finish: Two pack Polyurethane or Timber Laminate

Flaps and pull-out shelves

Material: [complete/delete]

Size: [complete/delete]

Thickness: [complete/delete]

Finish: [complete/delete]

2.5 WORKING SURFACES

Laminated benchtops

Material: N/A

Exposed edges: Conform to one of the following:

- Extend laminate over shaped nosing, finishing more than 50 mm back on underside. Splay outside corners at 45°.
- Provide solid timber profiled edge.

Installation: Scribe to walls. Fix to carcass at least twice per 600 mm length of benchtop.

Joint sealing: Fill joint with sealant matching finish and clamp with proprietary mechanical connectors.

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Stone benchtops

Material: Reconstituted Stone

- Type: F704 Caesarstone
- Thickness: 20mm

2.6 LABORATORY JOINERY

Benchtops

Joints: Minimise joints in fixed benchtops.

Splashbacks: Incorporate splashbacks to fixed benches where they abut walls.

Material: [complete/delete]

Finish: [complete/delete]

Edge profile: [complete/delete]

Bench framing

Requirement: Engineered to suit expected loads, including heavy items such as bio-hazard or laminar flow cabinets.

Height adjustment: Include adjustable feet in frames.

Material: N/A

Finish: N/A

Adjustable benches

Adjustable height range: N/A

Operation: N/A

Overhead bench shelving

Material: [complete/delete]

Finish: [complete/delete]

Under bench cabinets

Construction: To **JOINERY ASSEMBLIES**.

Lead lining: [complete/delete]

Sinks

Integration with benchtops: Form and integrate sinks and bowls into the benchtop surface material to avoid joints and crevices.

Type: [complete/delete]

Material: [complete/delete]

Service droppers

Type: Two-compartment segregated service droppers for reticulation of gases, power and data with removable access cover plates on two opposing faces.

Venting: Provide predrilled ventilation slots in droppers containing gas services.

Fixing: Suspend droppers in a secure manner, using the fixings and plates for alignment.

Bracing: Between the droppers, provide a removable arrangement of horizontal power and data reticulation duct, pre-slotted powder coated shelving bracing frame and shelves.

Material: TBC

Finish: TBC

Services

Power and data services: Nominate the spacing and number of outlets, e.g. 900 mm for a 1800 mm shelf module, 1200 mm for a 2400 mm shelf module.

Shelving location: Generally per dropper, two per frame to each side. Make sure uppermost shelf does not exceed recommended height of 1650 mm above floor.

Lighting: Electrical services: Provide task bench lighting.

2.7 OTHER MATERIALS

Tactile ground surface indicators

Tactile ground surface indicators to stairs: To AS/NZS 1428.4.1 (2009).

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3 EXECUTION

3.1 TOLERANCES

General

Requirement: Fabricate and install joinery items to substrates undamaged, plumb, level, straight and free of distortion.

Tolerances table

Property	Tolerance
Plumb and level	1:800
Offsets in flush adjoining surfaces	0.5 mm
Offsets in revealed adjoining surfaces	2 mm
Alignment of adjoining doors	0.5 mm
Difference in scribe thickness for joinery items centred between walls	2 mm
Doors centred in openings	0
Joints in finished surfaces	0

3.2 JOINERY

General

Joints: Provide materials in single lengths if possible. If joints are necessary, locate over supports.

Framing: Frame and trim where necessary for openings, including those required by other trades.

Concealed surfaces: Prime surfaces concealed by substrates.

Deficiencies: Examine joinery units for completeness and remedy deficiencies.

Substrate: Damp clean and vacuum substrate surfaces that will be permanently concealed.

Acclimatisation

General: Acclimatise the joinery items by stacking in the in-service conditions with air circulation to all surfaces after the following are complete:

- Air conditioning operational.
- Lighting operational.
- Site drainage and stormwater works are complete.
- Space fully enclosed and secure.
- Wet work complete and dry.

Accessories and trim

General: Provide accessories and trim necessary to complete the installation.

Fasteners

Visibility: Do not provide visible fasteners except in the following locations:

- Inside cupboards and drawer units.
- Inside open units, in which case provide proprietary caps to conceal fixings.

Visible fasteners: Where fasteners are unavoidable on visible joinery faces, sink the heads below the surface and fill the sinking flush with a material compatible with the surface finish. In surfaces that are

to have clear or tinted finish, provide matching wood plugs showing face (not end) grain. In surfaces that are to have melamine finish, provide proprietary screws and caps finished to match.

Fixing to substrate: Fix joinery units to substrates as follows:

- Floor mounted units: 600 mm centres maximum.
- Wall mounted units: To each nogging and/or stud stiffener.

Fasteners: Screws with washers into timber or steel framing, or masonry anchors.

Adhesives

General: Provide adhesives to transmit the loads imposed and for the rigidity of the assembly, without causing discolouration of finished surfaces.

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Finishing

Junctions with structure: Scribe plinths, benchtops, splashbacks, ends of cupboards, kickboards and returns to follow the line of structure.

Joints: Scribe internal and mitre external joints.

Edge strips: Finish exposed edges of sheets with edge strips that match sheet faces.

Matching: For surfaces that are to have clear or tinted finish, arrange adjacent pieces to match the grain and colour.

Hygiene requirements: For all parts of a food handling joinery unit, such as voids at the backs of the units, seal all carcass, wall/floor junctions, and cable and pipe entries with silicone beads for vermin-proofing. Apply water resistant sealants around all plumbing fixtures and make sure sealants are fit for purpose.

Benchtops

Installation: Fix to carcass at least twice per 600 mm length of benchtop.

Joint sealing: Fill joints with sealant matching the finish colour and clamp with proprietary mechanical connectors.

Edge sealing: Seal to walls and carcasses with a sealant that matches the finish colour.

Stone, porcelain or concrete benchtops: Avoid on-site cutting and mechanical processing of panels, if possible.

Glass splashbacks

Adhesive: Fix with non-acidic silicone adhesive. Apply at the rate recommended by the manufacturer.

Installation: Clean the back of the glass panel and apply walnuts of adhesive together with double-sided adhesive tape for temporary support, and affix directly to the substrate.

Labelling

General: Permanently mark each unit of furniture with the manufacturer's name, on an interior surface.

3.3 TIMBER STAIRS

Set-out

General: Before setting out the stair materials, verify exact dimensions between finished floor levels. Set out stair rod to give uniform risers and uniform treads respectively in each flight.

Fabrication

Closed strings: Trench for treads and risers.

Cut strings: Profile for treads and risers. Mitre riser ends.

Treads: Arris nosings to a pencil round. Return nosings at cut strings. Groove for riser tongue in closed rise stair. Set rise 19 mm back from nosing.

Nosing strip: To BCA (2022) D3D14 and BCA (2022) D3D15.

Top tread: Flush with finished floor, otherwise to match stair treads. Provide similar tread section as nosing to floor edges around stairwell.

Risers: Tongue to tread. Mitre to string in cut string stairs.

Installation

General: Glue joints in internal work. In closed rise stairs, wedge treads and risers to strings. Plant 2 glue blocks behind each tread to riser junction. Trim floors to carry ends of stairs and around stair well.

Stair bolts to open rise close string stairs: Provide 8 mm diameter mild steel stair bolts, one at each end and one at centre of flight, transversely between strings. Draw strings tight against ends of treads.

Fascia: Provide fascia of depth sufficient to overlap 19 mm below ceiling, fixed to floor joists hard up under nosing.

Trim: Provide beads and mouldings as necessary, including a scotia or similar planted under the tread nosing against the risers and cut strings, a bead between wall strings and wall, and a bead behind the fascia over the ceiling finish.

Soffit lining: Fix to 38 x 38 mm nailing battens notched and nailed to the underside of treads and risers of closed riser stairs at the centre of flights and at each side.

3.4 PROPRIETARY TIMBER CIRCULAR STAIR

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General

Requirement: Provide a proprietary spiral or geometric circular timber stair system assembled from prefabricated components, inclusive of balustrade, self-supporting between floors.

3.5 TIMBER BALUSTRADES

General

Requirement: Provide balustrading to stair and landing, consisting of newels, handrail, balusters and associated mouldings.

Newels

General: Halve and bolt to strings. Turn tops to detail.

Handrails

Installation: Install handrails on edge, stubbing tenon to newels.

Bullnose arrises: 13 mm radius.

Balusters

Installation: Stub tenon to handrail at top and to tread or floor at bottom.

Spacing: Evenly spaced at maximum 100 mm centres.

3.6 TRIM

General

Requirement: Provide trim, such as architraves, beads, mouldings, stops and skirtings, to make neat junctions to openings and between lining components, finishes and adjacent surfaces.

Fixing

Masonry walls: Screw with wall plugs at 600 mm centres maximum.

Stud walls: Nail to plate or framing at 600 mm centres maximum.

3.7 COMPLETION

Protection

Timber treads: Provide full timber or plywood casing.

Cleaning

Requirement: Remove all dust, marks and rubbish from all surfaces and internal spaces. Clean and polish all self-finished surfaces such as anodised and powder coated metals, sanitary ware, glass, tiles and laminates.

Temporary coatings: On or before completion of the works, or before joining up to other surfaces, remove all traces of temporary protective coatings.

Operation and maintenance manuals

Requirement: Prepare a manual that includes the manufacturer's published recommendations for service use.

Warranties

Type: Supply and installation Warranty

4 SELECTIONS

4.1 TIMBER STAIRS

Timber stair component schedule

Member	Timber species or group	Finished sizes (mm)	Finish
Carriages			
Closed string			
Cut string			
Beads			
Treads			
Risers			
Nosing			
Soffit lining			

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Proprietary timber circular stair schedule

	T1	T2	T3
Product			
Timber species or group			
Overall diameter (mm)			
Net width of flight (mm)			
Direction down			
Tread options			
Balustrade options			

Tactile ground surface indicators schedule

	A	B	C
Product			
Type			
Edge protector			
Material			
Colour			

4.2 TRIM

Trim schedule

	T1	T2	T3
Door architraves: Timber species or group			
Door architraves: Grade			
Door architraves: Size (height x thickness) (mm)			
Door architraves: Finish			
Door architraves: Profile			
Window architraves: Timber species or group			
Window architraves: Grade			
Window architraves: Size (height x thickness) (mm)			

	T1	T2	T3
Window architraves: Finish			
Window architraves: Profile			
Skirtings: Timber species or group			
Skirtings: Grade			
Skirtings: Size (height x thickness) (mm)			
Skirtings: Profile			
Skirtings: Finish			
Cornices: Timber species or group			
Cornices: Grade			
Cornices: Size (height x thickness) (mm)			
Cornices: Profile			
Cornices: Finish			
Picture rails: Timber species or group			
Picture rails: Grade			
Picture rails: Size (height x thickness) (mm)			
Picture rails: Profile			
Picture rails: Finish			
Dado rails: Timber species or group			
Dado rails: Grade			
Dado rails: Size (height x thickness) (mm)			
Dado rails: Profile			
Dado rails: Finish			
Chair rails: Timber species or group			
Chair rails: Grade			
Chair rails: Size (height x thickness) (mm)			
Chair rails: Profile			
Chair rails: Finish			

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0552B METALWORK - FABRICATED

1 GENERAL

1.1 RESPONSIBILITIES

General
Requirement: Provide metal fixtures, as documented.

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Performance
Requirement:
- Undamaged, plumb, level and straight.
- Free of surface defects or distortions.

1.2 CROSS REFERENCES

General
Requirement: Conform to the following:
- *0171 General requirements*.

1.3 STANDARDS

General
Structural design actions: To AS/NZS 1170.1 (2002).
Stairs and balustrades: To the NCC cited AS 1428.1 (2009).

1.4 TOLERANCES

General
Requirement: ±2 mm from design dimensions.

1.5 SUBMISSIONS

Design documentation
General: Engage a professional engineer and submit certification for the design and installation of:
- [complete/delete]

Operation and maintenance manuals
Requirement: Submit manual to **COMPLETION**, **Operation and maintenance manuals**.

Products and materials
Proprietary items: Submit the manufacturer's standard drawings and details showing:
- Methods of construction.
- Assembly and fixing, with dimensions and tolerances.

Stainless steel: For each batch of stainless steel supplied to the works, submit a certificate of conformance or test certificate, as documented.

Certification: Submit certification for the following:
- [complete/delete]

Stainless steel welding: Before fabrication commences, submit evidence of qualification of the welding procedure by testing to AS/NZS 1554.6 (2012) clause 4.7 or evidence of prequalification to AS/NZS 1554.6 (2012) clause 4.12.

Shop drawings
General: Submit shop drawings to a scale that best describes the detail, showing the following information:
- Overall and detail dimensions.
- Details of fabrication and components.
- Details of fabrication involving other trades or components.
- Information necessary for site assembly.
- Proposals for the break-up of large items as required for delivery to the site.

- Proposed method of joining the modules of large items.
- Details of steel type and grade.
- Location, type, size and categories of welds, bolts and bolt holes.
- Submit detailed shop drawings for fabrication and installation of major metalwork items. Show plans, elevations, detailed sections; indicate materials, finishes, fasteners, and anchorage and accessory items. Provide setting diagrams and full scale templates of blocking, anchorage, sleeves, and bolts installed by others.

Samples

- Provide a 300mm minimum length sample of all architectural metalwork in specified extrusions, finishes, and associated components, in the proposed type and grade. If there are options for mechanical finish, such as sand blasting and polishing, provide a sample of each type of specialist finishes
- Provide a 1000mm minimum length of balustrade and handrail type showing proposed fixings and quality of weld.
- - Provide a 1000mm x 1000mm sample of perforated panel in specified perforation opening, protective coatings, and radius.

Prototypes

- - Construct a typical section of perforated steel mesh to stud-framed wall, including steel circular hollow section spiral stairs, balustrades and associated fixings, as documented on the Architectural Drawing: A-450-001 Façade details, FD03 Forest Room, and A-541-001 Spiral Stairs.

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Subcontractors

General: Submit names and contact details of proposed suppliers, fabricators and installers.

Warranties

Requirement: Submit warranties to **COMPLETION**, **Warranties**.

1.6 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following:

- Arrival of materials on site or in workshop.
- Shop fabricated or assembled items ready for delivery to the site.
- Commencement of shop or site welding.
- Site erected assemblies on completion of erection, before covering up by cladding and encasing.
- Steel surfaces prepared for, and immediately before, site applied finishes.

2 PRODUCTS

2.1 GENERAL

Storage and handling

Requirement: Store and handle fabricated metalwork, as follows:

- Deliver to site in unbroken wrapping or packing.
- Store on a level base, away from uncured concrete and masonry and areas of wet plaster.
- Do not store in contact with other materials that may cause staining, denting or other surface damage.
- Use gloves if handling precoated finishes.
- Keep storage time to minimum by delivering items only when required for installation.

Marking

General: Provide suitable and sufficient marks or other means for identifying each member of site-erected assemblies, and for their correct setting out, location, erection and connection. Mark bolted connections to show the bolting category. Do not mark stainless steel by notching.

2.2 MATERIALS

Metals and components

Performance: Provide metals and components in quantity, lengths and cross-sections of strength and stiffness suited to their required function and as documented.

Stainless steel

Plate, sheet and strip: To ASTM A240/A240M (2024).

Bar: To ASTM A276/A276M (2024).

Tube: To ASTM A554 (2021).

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Aluminium

Plate sheet and strip: To AS/NZS 1734 (1997).

Bar, rod and wire: To AS/NZS 1865 (1997).

Tube: To AS/NZS 1867 (1997).

Aluminium alloys, composition and designation: To AS 2848.1 (1998).

Steel

Steel plate: To AS/NZS 3678 (2016).

Hot rolled bars and sections: AS/NZS 3679.1 (2016).

Welded sections: To AS/NZS 3679.2 (2016).

Fasteners

Performance: Provide fasteners to resist galvanic corrosion in materials of structural and mechanical strengths and corrosion resistance at least equal to that of the lowest resistant metal in the connection.

Materials: Provide fasteners as follows:

- To copper and copper alloys: Copper or copper-alloy fixing devices only.
- To aluminium and aluminium alloys: Aluminium alloy or non-magnetic stainless steel fixing devices only.
- To stainless steel: Appropriate stainless steel fixing devices only.

Chain Wire Storage Cage

Performance: To AS 1725. Galvanised chain wire mesh storage cage with lockable gates.

Frame: Fully welded 50mm diameter galvanised steel tube framing to cage and gate

Mesh: Galvanised chain wire mesh

Gates: Hinged gate

Bick Rack

Performance: To AS 2890.3 Proprietary bike rack system fixed to concrete slab

Type: Refer to Master Schedule

Fixing: Bolt fixings into concrete slab using dome head nuts and washers. Refer to Architectural Drawings for location.

Corner Guards

Type: FX10 Proprietary folded galvanised steel plate. Refer to Master Schedule for location and size. Installation: Surface mounted to suitable substrate with countersink bolts

Balustrades and Handrails

Performance: To AS 1428.1 and relevant NCC, including D2.16 Fixing: Refer to Architectural Drawings and Structural Engineer's Documentation Grade: 316 Stainless Steel Externally and Internal corrosive environments, 304 Stainless Steel to internal locations

Glass Balustrade

Performance: To AS 1288 Requirements. Clear laminated toughened safety. Refer Details Drawings.

Bollards

Type: FX09 Refer Master Schedule.

Proprietary circular hollow section stainless steel bollards, lockable and removable.

Fixing: Core-drilled and epoxy filled into concrete slab.

Stair Nosing

Performance: To AS/NZS 1428.4.1 Accessibility standards, AS/NZS 1428.1 Luminous contrast requirements, and NCC D2.14 slip rating.

Installation: Strictly to Manufacturer's Installation Guide to suit substrate

Letterbox

Performance: To comply with Australian Standards and Australia Post. Proprietary heavy duty architectural grade aluminium extrusion section with internal shelves and dividers.

Type: FX04 Refer Master Schedule for type, code, finish, and size.

Font: To Architect's Approval

Grated Trench Drain

Performance: To AS 1428.2 Ductile iron slotted grate. Refer Hydraulic Engineer's documentation, Landscape Architect's drawings, Architectural Drawings.

Type: Heavy duty drain with associated edge framing installed into poured in situ concrete slab drainage channel

Grade: 316 Stainless Steel unless nominated otherwise

Installation: As per the manufacturer's written instructions.

Aluminium Ceiling Battens

Type: F201 Refer Master Schedule for size and spacing. Proprietary aluminium block profile.

Installation: Direct fixed ceiling to underside of concrete soffit. Standard mounting track, joists, and top hat as required. Acoustic backing if applicable.

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2.3 OTHER MATERIALS

Tactile ground surface indicators

Tactile ground surface indicators to stairs: To AS/NZS 1428.4.1 (2009).

3 EXECUTION

3.1 CONSTRUCTION GENERALLY

Aluminium structures

Standard: To AS/NZS 1664.1 (1997) or AS/NZS 1664.2 (1997).

Metals

Incompatible metals: Separate using concealed layers of suitable materials in appropriate thicknesses.

Fabrication

Workshop: Fabricate and pre-assemble items in the workshop if practicable.

Edges and surfaces: Keep clean, neat and free from burrs and indentations. Remove sharp edges without excessive radiusing.

Tube bends: Form bends in tube without deforming the cross-section and the material thickness.

Colour finished work: Match colours of sheets, extrusions and heads of fasteners.

Thermal movement: Accommodate thermal movement in joints and fastenings.

Joints

General: Fit joints to an accuracy appropriate to the class of work. Finish visible joints made by cutting, drilling, welding, brazing or soldering using grinding, buffing or other methods appropriate to the class of work, before further treatment.

Self-finished metals: Free of surface colour variations, after jointing.

Joints: Fit accurately to a fine hairline.

Splicing

General: Provide structural members in single lengths.

3.2 WELDING AND BRAZING

Welding

Quality: Provide finished welds that are free of surface and internal cracks, welding slag, and porosity.

Corners and edges: Grind smooth sharp, marred or roughened corners and edges.

Rough surfaces: Deburr and grind smooth.

Site welds: Avoid site welding if possible. If required, locate site welds in positions for down hand welding.

Butt weld quality level: Not inferior to the appropriate level recommended in AS/NZS 1554.1 (2014) Section 6, AS/NZS 1554.6 (2012) Section 6 or AS/NZS 1665 (2004) Section 6, as appropriate.

Brazing

General: Make sure brazed joints have sufficient lap to provide a mechanically sound joint.

Butt joints: Do not use butt joints for joints subject to load. If butt joints are used, do not rely on the filler material only.

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3.3 STAINLESS STEEL FABRICATION

Welding stainless steel

Qualification of welders: To AS 1796 (2022).

Riveting

General: Use only to join stainless steel sheet or strip less than 1 mm thick. Drill (not punch) the rivet hole and drive the rivet cold. On completion, clean and passivate the riveted assembly.

Soldering

General: Do not solder stainless steel.

3.4 CUSTOM-BUILT STEEL STAIRS

General

Design and construction: To BCA (2022) D3.

Fabrication

Method: Welding.

Joints: Produce smooth unbroken surfaces at joints. Scribe the joints to all steel members. Make end-to-end joints over an internal sleeve.

Bends: Make changes of direction in rails by evenly curved pipe bends.

Free ends: Seal the free ends of pipes with fabricated or purpose-made end caps.

Fixing to structure

General: Provide fabricated predrilled or purpose-made brackets and bases, and attach the steel member to the building structure with fixings compatible with the substrate.

Proprietary items: Install to the manufacturer’s recommendations.

Galvanizing

General: If possible, complete fabrication before galvanizing; otherwise apply a zinc-rich primer to affected joint surfaces.

Other protective coatings

General: Apply other protective coatings as documented and to the manufacturer’s recommendations.

3.5 PROPRIETARY STAIR SYSTEMS

General

Design and construction: To BCA (2022) D3.

Straight flight stair assembly: A proprietary system, pre-assembled and fixed in place, comprising the following:

- Stair flights with treads and risers.
- Landings.
- Balustrade and handrail to stair flight and landings.
- Security gates where documented.

Circular stairs: A proprietary system, mechanically assembled and fixed in place, comprising the following:

- A central steel tube column.
- Prefabricated metal treads sleeved over and cantilevered from the column.
- Landings.
- Balustrade and handrail to stair and landings.
- Spacers, fixings and accessories necessary to complete the system.

3.6 RETRACTABLE CEILING ACCESS STAIRS

General

Retractable access stair: A proprietary system, pre-assembled and fixed in place, comprising the following:

- Retractable ladder.
- Infill frame and ceiling panel.
- Handrails, if required.

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3.7 BALUSTRADES

Fabrication

Method: Welding.

Joints: Produce smooth unbroken surfaces at joints. Scribe the joints between posts and rails. Make end-to-end joints over an internal sleeve.

Bends: Make changes of direction in rails by evenly curved pipe bends.

Free ends: Seal the free ends of pipes with fabricated or purpose-made end caps.

Fixing to structure

General: Provide fabricated predrilled or purpose-made brackets or post bases, and attach the piping to the building structure with fixings compatible with the substrate.

Proprietary items: Install to the manufacturer's recommendations.

Galvanizing

General: If possible, complete fabrication before galvanizing; otherwise apply a zinc-rich primer to affected joint surfaces.

Other protective coatings

General: Apply other protective coatings as documented and to the manufacturer's recommendations.

3.8 PROPRIETARY BALUSTRADES

General

Balustrades: A proprietary system, pre-assembled and fixed in place, comprising the following:

- Posts, rails and balusters.
- Infill frame and panels.
- Handrails, if required.

3.9 CORNER GUARDS

Guards

General: If projecting corners of the structure require protection from mechanical damage, provide metal corner guards as follows:

- Consisting of rolled angle sections or sections fabricated from metal sheet bent to the radius or angle of the corner.
- Fitting close to adjoining surface finishes.
- Solidly grouted up at the back as necessary to eliminate voids.
- Securely fixed by a method that does not cause distortion in the guard surface and consists of concealed built in lugs or flush countersunk head fixings into appropriate anchors.

3.10 OTHER CUSTOM-MADE ITEMS

General

Items: Fabricate as documented, pre-assemble and fix in place.

Fixing: Fix to the building structure as documented using fixings compatible with the materials.

3.11 COMPLETION

Cleaning

Temporary coatings: On or before completion of the works, or before joining up to other surfaces, remove all traces of coatings used as temporary protection.

Operation and maintenance manuals
Requirement: Prepare a manual that includes the manufacturer's published recommendations for service use.

Warranties
Type: Manufacturer, supply and installation warranties
Period: TBC

4 SELECTIONS

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4.1 CUSTOM-BUILT STEEL STAIRS

Custom-built steel stair components schedule

Member	Sizes (mm)	Finish
Stringers		
Treads/risers		
Landing frame		
Landing deck		
Handrail		
Balustrade		
Posts		
TGSI's		
Nosings		

4.2 PROPRIETARY STAIR SYSTEMS

Straight flight stair assembly schedule

	A	B	C
Product			
Material			
Finish			

Circular stair assembly schedule

	A	B	C
Product			
Diameter (mm)			
Height (mm)			
Finish			

4.3 RETRACTABLE CEILING ACCESS STAIRS

Retractable ceiling access stair assembly schedule

	A	B	C
Product			
Height (mm)			
Material			
Finish			
Ceiling access panel finish			

4.4 BALUSTRADES

Balustrade components schedule

Member	Sizes (mm)	Spacing	Material/Finish
Posts			
Handrail/top rail			
Bottom rail			
Balusters			
Infill panels: Frame			
Infill panels: Panel			

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Proprietary balustrade schedule

	A	B	C
Product			
Material			
Infill panels: Frame			
Infill panels: Panel			
Finish			

4.5 CORNER GUARDS

Corner guards schedule

	A	B	C
Material			
Finish			
Height (mm)			
Angle leg length (mm)			
Sheet thickness (mm)			
Corner radius (mm)			
Fixing			

4.6 OTHER CUSTOM-MADE ITEMS

Other custom-made items schedule

	A	B	C
Type			
Material			
Finish			

4.7 TACTILE GROUND SURFACE INDICATORS

Tactile ground surface indicators schedule

	A	B	C
Product			
Type			
Edge protector			
Material			
Colour			

0581B SIGNAGE

1 GENERAL

1.1 RESPONSIBILITIES

General
Requirement: Provide signage systems, as documented.

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Performance
Requirement: Provide signage as follows:

- Appropriately secured.
- Located within a clear line of vision.
- With characters and symbols contrasting with the background.
- With clean, well-defined edges or arrises, and free from blemishes.

1.2 CROSS REFERENCES

General
Requirement: Conform to the following:

- *0171 General requirements*.
- Consultant drawings and spec for Illuminated signage – general signs and statutory signs. - Signage Schedules
- Apartment Schedule for Apartment Number Signage
- BCA Report
- Fire Engineered Solutions Report
- Access Report for specific signage requirements and locations related to AS1428.1 requirements –
- Conditions of Consent
- Council approved Bicycle Wayfinding Drawings

1.3 STANDARDS

Signs
Safety signs - design and use: To AS 1319 (1994).

Signs and graphics for disability access: To the NCC cited AS 1428.1 (2009) and AS 1428.2 (1992).

Tactile wayfinding signs: To AS 1428.4.2 (2018).

Emergency escape lighting and exit signs: AS 2293

Design and use of Braille and tactile signage: To AS 1428.1 and AS 1428.4.2

Outline of Work: Statutory signage, Non-statutory signage, general signage, way finding signage, amenities signage, building name, apartment number signage.

1.4 SUBMISSIONS

Warranties
Requirement: Submit warranties to **COMPLETION**, **Warranties**.

2 PRODUCTS

2.1 MATERIALS

Standards
Aluminium:

- Plate for engraving: Alloy and temper designation 6063-0 to AS 2848.1 (1998).
- Casting: To AS 1874 (2000).
- Finishes:
  . Anodising: To AS 1231 (2000).

. Powder coating: To AS 3715 (2002) and AAMA 2604 (2022).

Stainless steel:

- External: Type 316. Mirror electropolish surface finish.
- Internal: Type 304. No. 4 brushed (general purpose polished) surface finish.

Plastics:

- PVC-U sheet: Semi-rigid sheet.
- Rigid cellular polystyrene: To AS 1366.3 (1992), class VH for cut-out shapes.

Brass and bronze: Plate, sheet and strip: To AS 1566 (1997).

- Finish: Patinated.

Glass type and thickness: To AS 1288 (2021).

Photoluminescent exit signs: To BCA (2022) E4D8(a)(ii).

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Adhesive

General: Proprietary solvent based contact adhesive compatible with the substrate and signage material.

2.2 SAMPLES

General: Submit appropriately sized samples showing each colour and finish of exposed graphics materials and accessories. If there is a range of colours and/or textures, submit samples showing the extremes and mean of the range.

Fabricated items: Submit each sign type nominated demonstrating proposed lettering/numbering, fonts and sizes. Fixing devices and techniques.

2.3 INSPECTION

General: Arrange to inspect with a minimum two working days' notice;

- Custom-built graphics fabricated and ready to be delivered to Site.
- Graphics items delivered to Site prior to installation
- Building locations or substrates prepared to receive graphics items before they are installed

3 EXECUTION

3.1 WORKMANSHIP

Production

General: Form signage and graphic items accurately with clean, well-defined edges or arises, free from blemishes.

Engraving to two-layer plastic laminate: Engrave lettering to expose the lower laminate.

Engraved and filled: Lettering precision cut and filled colouring material. Clean faces of all filling material.

Casting: Produce shapes free of pits, scale, blow holes or other defects, hand or machine-finished if necessary.

Laser cut lettering: Individual vinyl letters with self-adhesive backing.

Printed lettering: Lettering and graphic images screen/digitally printed on:

- Film with self-adhesive backing.
- Acrylic sheet.
- Aluminium plate.
- Stainless steel plate.

Large format digital printing: Lettering and graphic images screen printed film with self-adhesive backing.

Signwriting: Lettering and graphic images hand painted direct to the background by a tradesman with recognised qualifications and demonstrated skills.

Fabricated: Three dimensional, formed as follows:

- Laser cutting from solid material and hand finished as necessary.

- Moulding: Individual plastic hollow three dimensional characters and shapes formed by:
  . Injection moulding.
  . Vacuum forming.
- Built-up individual shapes by fabricating the faces and edges from separate pieces neatly and securely joined.

3.2 INSTALLATION

General
Requirement: Install signage and graphic items level and plumb, securely mounted, with concealed corrosion and theft-resistant fixings.

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Self-adhesive signs
Requirement: Fix free of bubbles and creases.

Aluminium and stainless steel signs
Pin fixing: Epoxy fix to substrate.

Illuminated signs
Electrical fittings: Provide a junction box for power connection, necessary lamps with proper mountings, protection and accessories including wiring transformers and insulators. Install signs and conceal cabling to *0921 Low voltage power systems*.

3.3 COMPLETION

Cleaning
General: Remove protective coverings, replace damaged signage and leave the work clean, polished, free from defects and in good condition.

Warranties
Type: [complete/delete]
Period: [complete/delete]

4 SELECTIONS

4.1 GENERAL SIGNS

Signage schedule
Refer 'Studio Johnston' Architectural specifications for Fire door and Smoke door signage

Sign No.	Sign type	Location	Message	Notes

Fixed signs schedule

	FS1	FS2	FS3
Location			
Message			
Material			
Finish/Colour			
Size (L x H x T) (mm)			
Mounting			
Fixing method			

Changeable letter systems schedule

	CL1	CL2	CL3
Location			
Message			

	CL1	CL2	CL3
Display board: Material			
Display board: Finish/Colour			
Display board: Size (L x H x T) (mm)			
Display board: Fixing method			
Display board: Frame			
Display board: Enclosure			
Display board: Locking system			
Characters: Material			
Characters: Finish/Colour			
Characters: Letter height and thickness (mm)			
Characters: Typeface			
Characters: Quantity			
Characters: Fixing method			

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Changeable plate systems schedule

	CP1	CP2	CP3
Location			
Message			
Sign plate holder: Material			
Sign plate holder: Finish/colour			
Sign plate holder: Size (L x H x T) (mm)			
Sign plate holder: Fixing method			
Sign plate: Material			
Sign plate: Finish/Colour			
Sign plate: Size (L x H x T) (mm)			
Sign plate: Fixing method			

External post and panel systems schedule

	EP1	EP2	EP3
Location			
Message			
Panels: Material			
Panels: Finish/Colour			
Panels: Size (L x H x T) (mm)			
Panels: Fixing method			
Supporting framework: Material			

Illuminated signs schedule

	IS1	IS2	IS3
Location			
Message			
Cabinet: Material			
Cabinet: Finish/Colour			
Cabinet: Size (L x H x T) (mm)			
Cabinet: Mounting			
Cabinet: Fixing method			

	IS1	IS2	IS3
Face panel: Material			
Face panel: Form			
Illumination: Type			
Illumination: Lamps			

Tactile wayfinding signs schedule

	TW1	TW2	TW3
Location			
Message			
Material			
Finish/Colour			
Size (L x H x T) (mm)			
Method of forming			
Finish			
Mounting			
Fixing method			

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4.2 STATUTORY SIGNS

Termite protection

Location	In or near meter box or similar
Message	Details of termite management system Indicate: - The method of protection - The date of installation - The life expectancy of a chemical barrier as listed on the appropriate authority's pesticides register label - The installer's recommendation for inspections
Sign type	Laminated page(s)
Conformance	BCA (2022) B1D4(i)(ii) AS 3660.1 (2014) Appendix A

Required fire door and required smoke door

Location	On or adjacent to the door, on the side of the door that faces a person seeking egress, and if the door is in the held open position, on either the wall adjacent the doorway or both sides of the door.
Message if auto door with auto hold open device	FIRE SAFETY DOOR – DO NOT OBSTRUCT
Message if self-closing door	DO NOT OBSTRUCT DO NOT KEEP OPEN FIRE SAFETY DOOR
Message if door discharging from a fire isolated exit	FIRE SAFETY DOOR – DO NOT OBSTRUCT
Letter height (minimum)	20 mm
Sign type	
Conformance	BCA (2022) D3D28

Non-required stair, ramp or escalator

Location	Outside the shaft near all doors opening to the shaft
Message	DO NOT USE THIS STAIRWAY IF THERE IS A FIRE (or) Do not use this stairway if there is a fire
Letter height (minimum)	20 mm (upper case) 16 mm (lower case)
Sign type	
Conformance	BCA (2022) Spec 14

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Exit signs, Class 2 or 3 buildings and Class 4 parts, in lieu of illuminated exit signs

Location	On, above or adjacent to every door described in BCA (2022) E4D5, BCA (2022) E4D6 and BCA (2022) E4D7.
Message	EXIT (with arrow in the direction of egress, if required)
Letter height (minimum)	25 mm
Sign type	
Conformance	BCA (2022) E4D5, BCA (2022) E4D6 and BCA (2022) E4D7

Braille and tactile exit signage

Location	To BCA (2022) Spec 15 for every door described in BCA (2022) E4D5
Message	Exit (and) Level (followed by the floor level number) (Braille and tactile signage)
Letter height (minimum)	BCA (2022) Spec 15
Mounting height	Braille and tactile signage between 1200 mm and 1600 mm above finished floor level
Sign type	
Conformance	BCA (2022) E4D5, BCA (2022) D4D7 and BCA (2022) Spec 15

Fire exit offence notice (NSW)

Location	In a conspicuous position adjacent to doors to fire-isolated stairs
Message	OFFENCE RELATING TO FIRE EXITS It is an offence under the *Environmental Planning and Assessment Act 1979 (NSW)* (a) to place anything in or near this fire exit that may obstruct persons moving to and from the exit, or (b) to interfere with or obstruct the operation of any fire doors, or (c) to remove, damage or otherwise interfere with this notice.
Letter height (minimum)	8 mm (title), 2.5 mm (remainder)
Sign type	
Conformance	*Environmental Planning and Assessment (Development Certification and Fire Safety) Regulation 2021 (NSW)* cl 108

Fire exit offence notice (ACT)

Location	In a conspicuous position adjacent to doors to fire-isolated stairs
Message	OFFENCES RELATING TO FIRE STAIRS Under the *Emergencies Act 2004 (ACT)* it is an offence to: 1. Place anything in this stairway or any associated passageway leading to the exterior of the building which may impede the free passage of persons; or 2. Interfere with or cause obstruction or impediment to the normal operation of fire doors providing access to this stairway; or 3. Remove, damage or otherwise interfere with this notice.
Letter height (minimum)	20 mm (title), 3 mm (remainder)
Sign type	Embossed or engraved and filled
Conformance	BCA (2022) Schedule 4 ACT

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Fire hose reels and fire hydrants

Location	Cupboard door or adjacent the FHR
Message	FIRE HYDRANT (and/or) FIRE HOSE REEL
Letter height (minimum)	50 mm
Sign type	Adhesive backed vinyl
Conformance	AS 2441 (2005) clause 10.4.4 AS 2419.1 (2021) clause 11.3.5

Fire hose reel – Location sign

Location	Above or adjacent the FHR if located in a recess, cavity or obscure location
Message	To AS 2441 (2005) Figure 10.1
Letter height (minimum)	16 mm
Mounting height (minimum)	2000 mm above finished floor level or at a height visible to a person approaching the fire hose reel location
Sign type	Adhesive backed vinyl
Conformance	AS 2441 (2005) clause 4.1

Fire brigade booster assembly cabinet – Location sign

Location	Cabinet doors
Message if fire hydrant booster is installed	FIRE HYDRANT BOOSTER ASSEMBLY
Message if fire hydrant booster and sprinkler booster are installed	FIRE HYDRANT BOOSTER AND SPRINKLER BOOSTER ASSEMBLY
Message if combined fire hydrant and sprinkler booster is installed	COMBINED FIRE HYDRANT AND SPRINKLER BOOSTER ASSEMBLY
Message if a feed fire hydrant is enclosed in the cabinet	(Symbol FH within a 100 mm circle of thickness and colour to match lettering)
Letter height (minimum)	50 mm
Sign type	Adhesive backed vinyl
Conformance	AS 2419.1 (2021) clause 11.3.1

	AS 2118.6 (2012) clause 2.2.3

Fire brigade booster assembly – Attack fire hydrant

Location	Behind or adjacent to attack fire hydrant
Message	ATTACK HYDRANT
Letter height (minimum)	25 mm
Sign type	
Conformance	AS 2419.1 (2021) clause 11.3.1

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Fire brigade booster assembly – Notice of pressure

Location	Within the cabinet or enclosure
Message	TEST PRESSURE: ‹› kPa BOOST PRESSURE: ‹› kPa
Letter height (minimum)	25 mm
Sign type	
Conformance	AS 2419.1 (2021) clause 11.3.4

Boosters in series with pumps

Location	Adjacent to the pressure gauge
Message	WARNING THIS BOOSTER IS CONNECTED IN SERIES (RELAY) WITH THE FIXED ON-SITE FIRE PUMPS WHICH MAY BE RUNNING. THIS GAUGE SHOWS THE DISCHARGE PRESSURE AT THE OUTLET OF THE FIXED ON-SITE PUMP
Letter height (minimum)	25 mm (title), 15 mm (remainder)
Sign type	
Conformance	AS 2419.1 (2021) clause 11.3.7.1

Block plan

Location	At booster assembly cabinet or enclosure, and in fire control room or pump room, if applicable.
Message	(Block plan to AS 2419.1 (2021) clause 11.5 or AS 2118.1 (2017) clause 8.3)
Letter height (minimum)	
Sign type	
Conformance	AS 2419.1 (2021) clause 11.5 AS 2118.1 (2017) clause 8.3

Portable fire extinguishers – Cabinet

Location	Cabinet
Message	FIRE EXTINGUISHER
Letter height (minimum)	32 mm
Sign type	Adhesive backed vinyl
Conformance	AS 2444 (2001) clause 3.6

Portable fire extinguishers – Location sign

Location	To AS 2444 (2001) clause 3.2 at every installed extinguisher nominated in BCA (2022) E1D14

Message	FIRE EXTINGUISHER (and prescribed graphic)
Letter height (minimum)	16 mm
Mounting height (minimum)	2000 mm above finished floor level
Sign type	Computer generated adhesive backed vinyl graphic
Conformance	AS 2444 (2001) clause 3.3

Fire blankets

Location	To AS 2444 (2001) clause 6.4 at every blanket location nominated in AS 2444 (2001) clause 6.3
Message	FIRE BLANKET (and prescribed graphic)
Letter height (minimum)	16 mm
Mounting height (minimum)	2000 mm above finished floor level
Sign type	Computer generated adhesive backed vinyl graphic
Conformance	AS 2444 (2001) clauses 6.3, 6.4 and Figure 6.1

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Regulatory car park signs – Low clearance

Location	Entry to overhead obstruction where clearance is: 3 m or less – car and light van use only 4.6 m – all other cases
Message	LOW CLEARANCE (measured minimum clearance rounded down to the nearest 0.1 m)
Sign type	AS/NZS 2890.1 (2004) R6-11 or R6-16
Conformance	AS/NZS 2890.1 (2004) clause 4.3.4

Regulatory car park signs – Stop and Give Way

Location	As required for traffic control
Message	Graphic nominated in AS/NZS 2890.1 (2004) clause 4.3.4(b)
Sign type	AS/NZS 2890.1 (2004) R1-1 (Stop), R1-2 (Give Way)
Conformance	AS/NZS 2890.1 (2004) clause 4.3.4

Regulatory car park signs – Speed limit

Location	As required for traffic control
Message	Graphic nominated in AS/NZS 2890.1 (2004) clause 4.3.4(c)
Sign type	AS/NZS 2890.1 (2004) R4-1
Conformance	AS/NZS 2890.1 (2004) clause 4.3.4

Regulatory car park signs – Hump warning

Location	As required for traffic control
Message	Graphic nominated in AS/NZS 2890.1 (2004) clause 4.3.4(d)
Sign type	AS/NZS 2890.1 (2004) W5-10
Conformance	AS/NZS 2890.1 (2004) clause 4.3.4

Regulatory car park signs – Steep grade warning

Location	As required for traffic control

Message	Graphic nominated in AS/NZS 2890.1 (2004) clause 4.3.4(e)
Sign type	AS/NZS 2890.1 (2004) W5-12 (Down), W5-13 (Up)
Conformance	AS/NZS 2890.1 (2004) clause 4.3.4

Regulatory car park signs – Accessible parking facilities

Location	Designated car space
Symbol	Graphic size and position nominated in the NCC cited AS/NZS 2890.6 (2009) clause 3.1, Figure 3.1. Space delineation and shared space markings to the NCC cited AS/NZS 2890.6 (2009) clause 3.2.
Sign type	Pavement marking paint.
Conformance	NCC cited AS/NZS 2890.6 (2009) clause 3.1

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Unisex accessible sanitary facilities

Location	To BCA (2022) Spec 15
Message	- Braille and tactile signage incorporating the international symbol of access. - Indicate suitability for left or right handed use.
Symbol size	AS 1428.2 (1992) clause 16, Table 1.
Letter height (minimum)	Braille: BCA (2022) Spec 15 Raised characters: Sans serif type font 20 mm.
Sign type	
Conformance	NCC cited AS 1428.1 (2009) clause 8.1 BCA (2022) D4D7

Ambulant sanitary facilities

Location	To BCA (2022) Spec 15
Message	Braille and tactile signage incorporating the male/ female ambulant symbol.
Symbol size	AS 1428.2 (1992) clause 16, Table 1.
Letter height (minimum)	Braille: BCA (2022) Spec 15 Raised characters: Sans serif type font 20 mm.
Sign type	
Conformance	NCC cited AS 1428.1 (2009) clause 8.1 BCA (2022) D4D7

Airlocks to sanitary facilities

Location	Entry doors to airlocks serving areas containing sanitary facilities
Message	Braille and tactile signage incorporating the symbols identifying each sanitary facility within
Symbol size	AS 1428.2 (1992) clause 16, Table 1
Letter height (minimum)	Braille: BCA (2022) Spec 15 Raised characters: Sans serif type font 20 mm
Sign type	
Conformance	NCC cited AS 1428.1 (2009) clause 8.1

Non-accessible sanitary facilities

Location	At each bank of sanitary facilities that are not provided with an accessible unisex sanitary facility
Message	- Braille and tactile signage incorporating the international symbol of access. - Indicate location of the nearest accessible unisex sanitary facility with directional arrow.
Letter height	AS 1428.2 (1992) clause 17, Table 2
Symbol size	AS 1428.2 (1992) clause 16, Table 1
Sign type	
Conformance	NCC cited AS 1428.1 (2009) clause 8.1 BCA (2022) D4D7

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Non-accessible pedestrian entrance

Location	At each non-accessible pedestrian building entrance
Message	Signage incorporating the international symbol of access to direct a person to the location of the nearest accessible pedestrian entrance
Letter height	AS 1428.2 (1992) clause 17, Table 2
Symbol size	AS 1428.2 (1992) clause 16, Table 1
Sign type	
Conformance	NCC cited AS 1428.1 (2009) clause 8.1 BCA (2022) D4D7

Hearing augmentation

Location	Where hearing augmentation is installed to BCA (2022) D4D8
Message	Braille and tactile signage incorporating the international symbol of deafness in white on a blue background. Identify: - Type of hearing augmentation. - Area covered within the room. - If receivers are being used and where the receivers can be obtained.
Letter height (minimum)	BCA (2022) Spec 15
Symbol size	AS 1428.2 (1992) clause 16, Table 1
Sign type	
Conformance	NCC cited AS 1428.1 (2009) clause 8.2.2 BCA (2022) D4D8 BCA (2022) Spec 15

Main switchboard – Main entry, excluding Class 1 dwellings

Location	Each entry that may be used by emergency services or at Fire detection control and indicating equipment (FDCIE)
Message	Indicate location of main switchboard. Incorporate the term Main Switchboard into notice
Letter height (minimum)	
Sign type	
Conformance	AS/NZS 3000 (2018) clause 2.10.2.4

Main switchboard – Room or enclosure, excluding Class 1 dwellings

Location	The room or enclosure containing the main switchboard
Message	MAIN SWITCHBOARD
Letter height (minimum)	
Sign type	
Conformance	AS/NZS 3000 (2018) clause 2.10.2.4

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Fire orders – Alpine areas

Location	Near main entrance and on each storey.
Message	FIRE ORDERS followed by an explanation of the following: - Method of operation of the alarm system and location of call points - Location and method of operation of all the firefighting equipment - Location of all exits - Evacuation procedure
Letter height (minimum)	
Sign type	
Conformance	BCA (2022) G4D8

0611 RENDERING AND PLASTERING

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide render and plaster finishes, as documented.

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Performance

Requirements:

- Resistant to impacts expected in use.
- Free of irregularities.
- Consistent in texture and finish.
- Firmly bonded to substrates for the expected life of the application.
- Without obvious shrinkage cracks.
- As a suitable substrate for the nominated final finish.

1.2 CROSS REFERENCES

General

Requirement: Conform to the following:

- *0171 General requirements*.
- *Architectural drawings and Schedules*
- *Section 0511b Lining*
- *Section 0671b Painting*

1.3 INTERPRETATION

Abbreviations

General: For the purposes of this worksection, the following abbreviations apply:

- CRF: Cement render – finish.
- CRM: Cement render – medium.
- CRS: Cement render – stronger.
- CRW: Cement render – weaker.
- GPF: Gypsum plaster – finish.

Definitions

General: For the purposes of this worksection, the definitions given in AS 1672.1 (1997) and the following apply:

- Base coat: A plaster coat applied before the application of the finish coat.
- Binder: Material binding aggregate particles together into a heterogeneous mass.
- Bonding treatment: A treatment of a substrate that improves adhesion of a rendering or plastering system.
- Finish coat: The final coat of a coating system.
- Finishing treatment: The treatment applied to a finish coat which may include processes and results.
- Laitance: Scum or whitish deposit that rises to the surface of newly placed, over-wet concrete or over-trowelled mortar.
- Lath: An applied substrate for render or plaster.
- Plaster: A mixture of binders, aggregate and water, which is typically applied to internal substrates, in a plastic state and dries and cures to a hard surface, which may subsequently be decorated or remain self-finished:
  - Cement plaster: Contains general purpose cement as the principal binder.
  - Gypsum plaster: Contains hydrated or anhydrous calcium sulfate as the principal binder.
- Plastering: The process of applying plaster to a substrate with a float or trowel.

- Render: A mixture of binders, aggregate, water and with or without admixtures, which is typically applied to external substrates, in a plastic state and dries and cures to a hard surface, which may subsequently be decorated or remain self-finished.
  - . Cement render: Contains general purpose cement as the principal binder.
- Rendering: The process of applying render to a substrate with a float or trowel.
- Rendering or plastering system: One or more coats of render or plaster and associated treatments comprising some or all of the following in sequence:
  - . Bonding treatment.
  - . Base coat(s).
  - . Finish coat.
  - . Finishing treatment.
- Substrate: The surface to which a material or product is applied.

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1.4 TOLERANCES

Tolerances table

Description	Alignment	Tolerance
Walls and other vertical structures	Vertical	6 mm in 2400 mm
Reveals sides	Vertical	3 mm in 1800 mm
Reveals head up to 1800 mm	Horizontal	3 mm in 1800 mm
Reveals head over 1800 mm	Horizontal	5 mm max
Reveals, piers, beams, wall stop ends up to 300 mm	Square	3 mm max
Reveals, piers, beams, wall stop ends over 300 mm	Square	5 mm max
Radius of corners	Round	Not to vary by more than ±10% over the length of the arris.

1.5 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following:

- Substrates immediately before applying base coats.
- Finishing treatments before decoration.

1.6 SUBMISSIONS

Prototypes

Plaster systems: Prepare prototypes of each plaster system complete with beads and other embedded items:

- Size: 1200 x 2400 mm.

- Prior to commencement of work with the acceptance from the Superintendent. If a panel is rejected, the Head Contractor shall construct other sample panels of each type until acceptance is obtained from the Superintendent.

2 PRODUCTS

2.1 GENERAL

Storage and handling

General: Store materials in a dry, well-ventilated and secure storage area, unaffected by weather.

2.2 MATERIALS AND COMPONENTS

Accessories

Beads: Proprietary PVC or metal sections manufactured for fixing to substrates and/or embedding in the render or plaster to form and protect edges and junctions.

Lath: Provide a proprietary product manufactured from PVC or raised expanded metal for use with render or plaster.

Metallic-coatings to AS 1397 (2021): For metal beads or lath in cement render or plaster, to the **Corrosion resistance and durability table**.

Admixtures

Plasticisers or workability agents: Do not use.

Aggregates

Sand: Fine, sharp, well-graded sand with a clay content between 1% and 5% tested to AS 1141.12 (2015) and free from efflorescing salts.

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Sand grading for base coat plaster table

Sieve size (mm)	Percent passing	
	Minimum	Maximum
4.75	100	100
2.36	90	100
1.18	60	90
0.6	35	70
0.3	10	30
0.15	0	5
0.075	0	3

Render and plaster for autoclaved aerated concrete

General: Provide a proprietary product manufactured for use with the wall system.

Bonding agents

General: Proprietary products manufactured for bonding cement-based render or plaster to solid substrates.

Cement

Standard: To AS 3972 (2010).

Type: GP.

Colouring products

General: Provide proprietary products manufactured for colouring cement plaster.

Integral pigment proportion: 5% maximum weight of cement.

Cornice cement

General: Provide a proprietary product manufactured for use with the cornice.

Cornices

Cast plaster: Proprietary item.

Corrosion resistance and durability

Requirement: To the **Corrosion resistance and durability table** or provide proprietary products with metallic and/or organic coatings of equivalent corrosion resistance and as follows:

- Galvanizing: To AS/NZS 4680 (2006).

Corrosion resistance and durability table

Atmospheric corrosivity category to AS 4312 (2019)	Metal lath, beads and embedded items	Minimum cement content (mix type) above damp-proof course
C1 and C2	Galvanize after fabrication 300 g/m^2 Stainless steel Type 316	CRW
	Powder coated aluminium	CRM
C3	Stainless steel Type 316 Powder coated aluminium	CRM
C4	Stainless steel Type 316 Powder coated aluminium	CRS
Note: For categories C5 and CX seek specialist advice.		

Curing products
General: Provide proprietary products manufactured for use with the render or plaster system.

Gypsum plaster
General: Provide a proprietary product containing calcium sulfate hemihydrate with additives to modify setting.

Lime
Limes for building: To AS 1672.1 (1997).

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Lime putty
General: Prepare lime putty as follows:

- Stand dry hydrated lime to AS 1672.1 (1997) and water for 24 hours or more without drying out.
- Stand quicklime and water for 14 days or more without drying out.

Mixes
General: Select a mix proportion to suit the conditions of application.

Measurement: Measure binders and sand by volume using buckets or boxes. Do not allow sand to bulk by absorption of water.

Mixing: Machine mix for 3 to 6 minutes.

Strength of successive coats: Make sure successive coats are no richer in binder than the coat to which they are applied.

Mix proportion table – Cement render, by volume

Mix type		Substrate	Upper and lower limits of proportions by volume		
			Cement	Lime	Sand
Single or multi-coat systems with integral finishing treatments Base coats in multi-coat systems with cement or gypsum finishes	CRS	Dense and smooth concrete and masonry	1 1	0 0.5	3 4.5
	CRM	Regular clay or concrete masonry	1 1	0.5 1	4.5 6
	CRW	Lightweight concrete masonry and other weak substrates	1 1	1 2	6 9
Second coat - Internal	CRF	Cement render base coats	1 1	1 2	6 9
Second coat - External	CRF	Cement render base coats	1 1	1 2	5 6

Mix proportion table – Gypsum finish coat, by volume

Mix type		Substrate	Upper and lower limits of proportions by volume			
			Gypsum	Cement	Lime putty	Sand
Gypsum finish coats	GPF	Cement render base coats	1 1	- -	1.5 2	- -

Mix proportion table – Gypsum finish coat, by weight

Gypsum plaster (kg)	Lime putty (kg)
17	25
34	50
51	75

Control joint products
General: Provide proprietary products manufactured for use with the plastering system and to accommodate the anticipated movement of the substrates and/or the plaster.

Water
General: Clean and free from any deleterious matter.

3 EXECUTION

3.1 PREPARATION

Substrates
General: Prepare substrates as follows:
- Clean and free from any deposit or finish that may impair adhesion of render or plaster.
- If framed or discontinuous, support members in full lengths without splicing.
- If solid or continuous, remove excessive projections and fill voids and hollows with render or plaster stronger than the first coat and not weaker than the substrate.

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Absorbent substrates: If suction is excessive, control it by dampening without over-wetting. Do not render or plaster substrates showing surface moisture.

Dense concrete: If not sufficiently rough to provide a mechanical key, roughen to remove 2 mm of the laitance and expose the aggregate before applying a bonding treatment.

Painted surfaces: Remove paint and hack the surface at close intervals.

Untrue substrates: If the substrate is not sufficiently true for conformity with the thickness limits for the render or plaster system, or has excessively uneven suction resulting from variations in the composition of the substrate, apply additional coats without exceeding the thickness limits for the substrate or system.

Beads
Location: Fix beads as follows:
- Angle beads: At all external corners.
- Drip beads: At all lower terminations of external render.
- Beads for control of movement: At all control joints.
- Stop beads: At all terminations of render or plaster and junctions with other materials and render or plaster systems.

Joints in beads: Provide dowels to maintain alignment.

Mechanical fixing to substrate: ≤ 300 mm centres.

Bonding treatment
General: If bonding treatment is required to the substrate, throw a wet mix onto the substrate. Mix proportions to the following:
- Cement render (cement:sand): 1:2.
- Gypsum plaster (gypsum:sand): 1:2.

Curing: Cure as follows:
- Keep continuously moist for 5 days or more and allow to dry before applying render or plaster coats.
- Protect cement render from direct sun and drying winds for at least 16 hours after application.

Thickness: ≥ 3 mm and < 6 mm.

Embedded items
General: To the **Corrosion resistance and durability table**. If there are water pipes and other embedded items, sheath them to allow for thermal movement.

Lath
Location: Provide lath as follows:
- Chases: If chases or recesses are 50 mm wide or greater, fix lath extending 75 mm or more beyond each side of the chase or recess.
- Masonry and concrete substrates: If mechanical key cannot be attained by scabbling and bonding, fix lath.
- Metal and other non-porous substrates: Fix lath to provide a key.

Installation: Fix lath as follows:
- General: Run the long way of the mesh across supports with strands sloping downwards and inwards from the intended face of the render or plaster.

- Fixing: Mechanically fix at 150 mm maximum centres.
- Laps: Tie with 1.25 mm galvanized wire at centres of 150 mm or less. Do not stop edges of sheets at corners but bend around.
- On solid substrates: Space the lath 5 mm or more clear of the substrate.
- Support spacing: ≤ 400 mm.

3.2 APPLICATION

Rendering and plastering

Base coats: Scratch-comb each base coat in two directions when it has stiffened.

Lath: Press the render or plaster through the apertures of lath and wings of beads.

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Incidental work

General: Return render or plaster into reveals, beads, sills, recesses and niches. Render or plaster faces, ends and soffits of projections in the substrate, such as string courses, sills, pilasters and corbels. Run neatly finished throating on soffits of external projections. Trim around openings. Plaster exposed internal surfaces of built-in joinery.

Joining up

General: If joining up is required, make sure joints are imperceptible in the finished work after decoration.

Control joints

General: Provide joints in the finish to coincide with control joints in the substrate. Make sure the joint in the substrate is not bridged during rendering or plastering.

Size:

- Depth: Extend the joint right through the render or plaster and reinforcement to the substrate.
- Width: 3 mm, or the same width as the substrate joint, whichever is greater.

Damp-proof courses: Do not continue render or plaster across damp-proof courses.

Rendering or plastering on lath: Provide control joints to divide the rendering or plastering area into rectangular panels of 10 m^2 or less.

V-joints: Provide V-joints, cut right through the render or plaster to the substrate, at the following locations:

- Abutments with metal door frames.
- Abutments with other finishes.
- Junctions between different substrates.

Cornices

General: Accurately cut and mitre corners. Match and align ornament. Do not make butt joints in the length of a cornice.

Installation: Butter edges, mitres and joins for the full length of the cornice with adhesive.

Mechanical fixing: If cornice projects across a ceiling 400 mm or more, provide additional mechanical fixing as follows:

- Fixing centres: ≤ 600 mm.

Decorative joints

General: Apply decorative joints in the second coat of two-coat work as follows:

Render and plaster thickness table

Substrate	Render and plaster, total thickness of single or multi-coat work (mm)	Gypsum/lime plaster (mm)
Dense concrete walls	15 max	3 max
Dense concrete ceilings	9 max	3 max
Brickwork and blockwork	12 min	3 max
Lightweight concrete and blocks	12 min	3 max
Metal lath measured from the face of the lath.	18 min	3 max

Temperature

General: If the ambient temperature is less than 10°C or more than 30°C, make sure the temperature of mixes, substrates and reinforcement at the time of application is between 5°C and 35°C.

Unused mixes

General: Do not use render or plaster unused after 90 minutes from the time of mixing.

3.3 FINISHES

Finishing treatments

Plain even surfaces: Work the hardening plaster as follows:

- Bag: Rub the finish coat when set firm with a hessian bag or similar.
- Carborundum stone: Rub the finish coat when set hard with a carborundum stone to achieve a finish free from sand.
- Foam float: Float the finish coat on application with a wood or plastic float to an even surface and finish with a foam float to achieve a fine sand textured finish.
- Steel trowel: Steel trowel the finish coat to a smooth dense surface which is not glass-like and is free from shrinkage cracks and crazing.
- Wood or plastic float: Float the finish coat on application with a wood or plastic float to an even surface.

Ornamental patterned surfaces: Work the hardening plaster with a trowel or other tool for the documented type.

Sprayed textured surfaces: Spray plaster onto a substrate using a purpose-designed machine.

Stippled textured surfaces: Work the hardening plaster with a stiff brush.

Rough cast surfaces: Throw plaster onto a substrate or pebbles onto a plastic plaster base for the documented type.

Specialist plaster finishes

Polymer modified render:

- Base coat render: Proprietary polymer modified cementitious render supplied as a complete plastering system.
- Finish coats: Proprietary coloured and textured polymer modified finish coats.

Polished plaster: In situ applied plaster system incorporating selected stone dust in a proprietary matrix producing a smooth polished surface with visual patterning.

Glass bead coatings: Glass beads bound in a proprietary matrix.

3.4 COMPLETION

Curing

General: Prevent premature or uneven drying out and protect from the sun and wind.

Keeping moist: If a proprietary curing agent is not used, keep the render or plaster moist as follows:

- Base coats and single coat systems: Keep continuously moist for 2 days and allow to dry for 5 days before applying further render or plaster coats.
- Finish coats: Keep continuously moist for 2 days.

Multiple coats: Cure and dry each successive coat in multiple coat systems.

4 SELECTIONS

4.1 SCHEDULES

Rendering or plastering construction schedule

	A	B	C
Substrate			
Bonding treatment			
Bond coat			
Base coat(s)			
Finish coat			

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	A	B	C
Finishing treatment			

Specialist plastering systems schedule

	A	B	C
Substrate			
Plastering system			
Colour			
Texture			

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Accessories schedule

	A	B	C
Product			
Beads			
Lath			

0612B CEMENTITIOUS TOPPINGS

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide cementitious toppings, as documented.

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Performance

Requirements:

- Consistent in level, finish, colour and texture.
- Free of discontinuities.
- Resistant to impacts and loads expected in use.
- Resistant to environmental degradation within the manufacturer's stated life span.
- Accommodating movement in the substrate between control joints.
- If unbonded, without edge curl.
- If bonded, compatible with the substrate and without drummy areas.
- Without obvious shrinkage cracks.

Self-levelling screeds: Provide if substrates for the various overlaid flooring types cannot meet the performance requirements.

1.2 CROSS REFERENCES

General

Requirement: Conform to the following:

- *0171 General requirements*.
- *Architectural Drawings*
- *Section 0611 Rendering and Plastering*
- *Section 0411b Waterproofing*
- *Section 0310b Concrete*
- *Master Schedule*

1.3 TOLERANCES

Unformed surfaces

Thickness: Deviation from the documented thickness:

- Thickness < 15 mm: ±2 mm.
- 15 mm ≤ Thickness < 30 mm: ±5 mm.
- Thickness ≥ 30 mm: ±10 mm.

Flatness: To the **Flatness tolerance class table**, using a straightedge placed anywhere on the surface in any direction, for the documented class of finish.

Flatness tolerance class table

Class	Measurement	Maximum deviation (mm)
A	2 m straightedge	4
B	3 m straightedge	6
C	600 mm straightedge	6

1.4 SUBMISSIONS

Warranties

Requirement: Submit warranties to **COMPLETION**, **Warranties**.

2 PRODUCTS

2.1 GENERAL

Storage and handling
General: Deliver, unload and store products and accessories in unbroken manufacturer's packaging and containers in a dry, well-ventilated and secure storage area, unaffected by weather.

2.2 MATERIALS

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Aggregates
Standard: To AS 2758.1 (2014).

Coarse aggregate: Nominal single size not more than 1/3 topping thickness.

Fine aggregate: Fine, sharp, well-graded sand with a low clay content and free from efflorescing salts. Nominal single size not more than 1/4 topping thickness for toppings less than 40 mm thick.

Bonding products
General: Proprietary products manufactured for bonding cement-based toppings to concrete substrates.

Type: Bonded Screed Ardex A38 Rapid Set Screed Cement or acceptable equivalent. Concrete shall be primed with a bonding slurry comprising Ardex A51 Primer and Bonding Agent.

Separating layer
General: Provide a bond breaker to separate the topping from the substrate, as documented.

Cement
Standard: To AS 3972 (2010).

- Type: SL.

Colouring products
General: Provide proprietary products manufactured for colouring cement toppings.

Integral pigment proportion: 10% maximum by weight of cement.

Concrete
Standard: To AS 1379 (2007).

Unreinforced topping: Normal-class.

Reinforced topping table

Above ground exposure location	Compressive strength (MPa)	Cover to reinforcement (mm)
Internal residential External more than 50 km from coastline and non-industrial and arid	20	20
Internal non-residential External more than 50 km from coastline and non-industrial and temperate	25	30
External more than 50 km from coastline and non-industrial and tropical External more than 50 km from coastline and industrial in any climatic zone External between 1 to 50 km from coastline in any climate zone	32	40
External coastal less than 1 km from coastline	40	45

Reinforcement
Standard: To AS/NZS 4671 (2019).

Mesh: SL 62.

Maximum joint spacing: 6 m internal, 4 m external.

Curing products

General: Provide proprietary products manufactured for use with cement-based toppings and with the floor finish to be laid on the toppings.

Water

General: Clean and free from any deleterious matter.

Mixes

General: Select mix proportions to the **Mix proportion table**, or alternatively provide pre-mixed concrete for toppings as follows:

- Air entrainment: ≤ 3%.
- Nominal coarse aggregate size: ≤ 0.3 x topping thickness.
- Slump: 80 mm.
- Standard strength grade: N25.

Water quantity: The minimum necessary to achieve full compaction and prevent excessive water being brought to the surface during compaction.

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Mix proportion table

Mix type	Thickness (mm)	Upper and lower limits of proportions by weight		
		Cement	Fine aggregate	Coarse aggregate
Bonded – cement and sand	35	1 1	3 4.5	0 0
Bonded – fine concrete	40	1 1	3 3	1 2
Unbonded – fine concrete	100	1 1	3 3	1 2
Granolithic	Floors: 25 Skirtings: 13	1	2	1
Separated – fine concrete	70	1 1	3 3	1 2

Self-levelling screed

Type: Proprietary self-levelling liquid cement-based screed.

Slip resistance products

General: Provide proprietary products manufactured to improve the wet slip resistance of toppings.

- Silicon carbide granules:
  - Granule size: Between 300 to 600 µm.
- Silicon carbide two-part resin:
  - Granule size: ≥ 300 µm.

Surface treatment products

General: Provide proprietary products manufactured for use with cement-based toppings to change the characteristics of the surface of the finished topping.

Screeds

General: Self-Levelling Polymer Screeds, where the structural slab does not achieve the specified tolerances for flatness and level for nominated floor finish, the surface shall be rectified using a proprietary self-levelling polymer screed Type: Ardex k12 leveling and Smoothing Compound or acceptable equivalent.

2.3 CONTROL JOINTS

Control joint materials

General: As documented.

Control joint strip: A proprietary expansion joint consisting of a neoprene filler sandwiched between plates with lugs or ribs for mechanical keying. Set flush with the finished surface.

Proprietary slide plate divider strip: An arrangement of interlocking metal plates grouted into pockets formed in the concrete joint edges.

Sealant: One-part self-levelling non-hardening mould-resistant, silicone or polyurethane sealant applied over a backing rod. Finish flush with the surface.

- Floors: Trafficable, Shore hardness greater than 35A.

Backing rod: Compressible closed cell polyethylene foam with a bond breaking surface.

3 EXECUTION

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3.1 PREPARATION

Substrates

General: Prepare substrates as follows:

- Clean and remove any deposit that may impair adhesion of monolithic or bonded toppings.
- Remove excessive projections.
- Voids and hollows greater than 10 mm depth, with abrupt edges: Fill with a sand/cement mix as follows:
  - Greater than or equal in strength to the topping.
  - Less than or equal in strength to the substrate.
- Voids and hollows less than 10 mm depth: Scabble edges to eliminate a featheredge and apply a latex modified cementitious product.

Substrates for bonded toppings

Hardened concrete: Roughen by scabbling to remove 2 mm of the surface and expose the aggregate.

3.2 APPLICATION

Installation

General: Spread the mix and compact. Strike off, consolidate and level surfaces to finished levels and to the documented flatness tolerance class.

Bonding product: Before laying topping wash the substrate with water and provide a bonding product, or treat as follows:

- Keep wet for 2 hours or more.
- Remove surplus water and brush on neat cement or a clean slurry of cement and water.
- Place the topping while the slurry is wet.

Monolithic toppings: Lay while concrete subfloor is plastic and the surface water is no longer visible.

Unbonded toppings: Lay separating layer.

Toppings 50 to 75 mm thick:

- Lay in two layers of equal thickness.
- Place a layer of reinforcement between the topping layers. Lap reinforcement 200 mm and tie. Do not create four way laps.

Temperature control

General: Make sure that the temperature of mixes, substrates and reinforcement are not less than 5°C or greater than 35°C at the time of application.

Severe temperature: If the ambient shade temperature is greater than 38°C, do not mix topping.

3.3 SURFACE FINISHES

Finishing methods – primary finish

Machine float finish:

- After levelling, consolidate the surface using a machine float.
- Cut and fill and refloat immediately to a uniform, smooth, granular texture.
- Hand float in locations inaccessible to the machine float.

Steel trowel finish: After machine floating, finish as follows:

- Produce a smooth surface free from defects using power tools.

- When the surface has hardened sufficiently, use steel hand trowels to produce the final consolidated finish free of trowel marks and uniform in texture and appearance.

Burnished finish: Continue steel trowelling until the concrete surface attains a polished or glossy finish, uniform in texture and appearance and free from trowel marks and defects.

Wood float finish: After machine floating, produce the final consolidated finish free of float marks and uniform in texture and appearance using wood or plastic hand floats.

Broom finish: After machine floating, draw a broom or hessian belt across the surface to produce a coarse even-textured slip-resistant transverse-scored surface.

Scored or scratch finish: After screeding, produce a coarse scored surface texture using a stiff brush or rake drawn across the surface before final set.

Sponge finish: After machine floating, produce an even textured sand finish by wiping the surface using a damp sponge.

Exposed aggregate finish: After floating and when concrete has stiffened, wet the surface and scrub with stiff fibre or wire brushes, flushing continuously with clean water, until the aggregate is uniformly exposed. Rinse the surface with water.

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Finishing methods – supplementary finish

Abrasive blast: After steel trowelling, abrasive blast the cured surface to provide texture or to form patterns without exposing the coarse aggregate using fine, hard, sharp, graded abrasive particles.

Coloured applied finish: After machine floating, apply a proprietary liquid or dry shake material to the manufacturer's recommendations and trowel to achieve the required appearance.

Stamped and coloured pattern finish: Provide a proprietary finishing system.

Polished finish: After steel trowelling, grind the cured surface of the concrete.

Slip-resistant treatment

Surface treatment: Apply silicon carbide granules after floating and before the topping surface has set and trowel into the surface so that the granules remain exposed.

Application rate: 1 kg/m^2 evenly distributed.

Slip-resistant treatment to stair treads, nosings, ramps and landings

Surface treatment: To BCA (2022) Table D3D15.

Stair and landing nosing

Type: Approved extruded slip-resisting aluminium nosing or purpose-made moulded slip-resisting vinyl section, or specify by proprietary name for Architect and Access consultant review and approval.

Surface treatment

General: Apply the surface treatment after floating and before the topping surface has set.

3.4 CONTROL OF MOVEMENT

General

Requirement: Provide control joints as documented and as follows:

- Location:
  - . Over structural control joints.
  - . To divide complex room plans into rectangles.
  - . Around the perimeter of the floor.
  - . At junctions between different substrates.
  - . To divide large topping-finished areas into bays.
  - . At abutments with the building structural frame and over supporting walls or beams if flexing of the substrate is anticipated.
- Depth of elastomeric sealant: One half the joint width, or 6 mm, whichever is the greater.

Control joints to divide topping into bays: Provide joints using one of the following methods:

- Form in situ using square edge steel forms and trowelling a 3 mm radius to edges.
- Form a groove, extending at least one quarter the depth of the section, either by using a grooving tool, by sawing, or by inserting a premoulded strip.
- Install a control joint proprietary product, to manufacturer's recommendations.

3.5 SELF-LEVELLING SCREED

Installation

Requirement: Pour on and spread in conformance with the manufacturer's recommendations. Finish without any bubbles and make sure screed is correctly installed into corners and re-entrant angles.

3.6 JOINT ACCESSORIES

Floor finish dividers

General: Provide a corrosion-resistant metal dividing strip suitably fixed to the substrate, at junctions with differing floor finishes, with top edge flush to the finished floor. If changes of floor finish occur at doorways, make the junction directly below the centre of the closed door.

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Weather bars

General: Provide corrosion-resistant weather bars or threshold plates under hinged external doors, located under the centres of closed doors or to manufacturer's recommendations.

3.7 COMPLETION

Curing

General: Prevent premature or uneven drying out and protect from the sun and wind.

Keeping moist: If a proprietary curing agent is not used, as soon as toppings have set sufficiently, keep them moist by water spraying or covering with polyethylene film for 7 days.

Joint sealant

General: If required, seal joints as follows:

- Formed joints: ≤ 25 mm deep with filler and bond breaker.
- Sawn joints: Full depth of cut.

Protection

General: Protect finished work from damage during building operations.

Operation and maintenance manuals

Requirement: Prepare a manual that includes the manufacturer's published use, care and maintenance instructions.

Warranties

Type: Supply and installation warranty

4 SELECTIONS

4.1 SCHEDULES

Cementitious toppings construction schedule

	A	B	C
Proprietary item			
Substrate			
Separation layer: Location			
Separation layer: Type			
Thickness (mm)			
Topping function			
Topping method			
Primary finish			
Flatness tolerance class			
Supplementary finish			
Surface treatment			
Slip resistance classification			
Slip resistance product: Colour			
Crushing resistance/soundness			

	A	B	C
Topping joints			

Control joints schedule

	A	B	C
Control joint strip: Joint side-plate material			
Control joint strip: Neoprene colour			
Control joint strip: Width			
Control joint strip: Fixing			
Proprietary slide plate: Product			
Proprietary slide plate: Material			
Proprietary slide plate: Insert colour			
Sealant: Type			
Sealant: Colour			
Sealant: Width (mm)			

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Joint accessories schedule

	A	B	C
Floor finish divider: Type			
Floor finish divider: Material			
Floor finish divider: Finish			
Floor finish divider: Size			
Weather bar: Type			
Weather bar: Material			
Weather bar: Finish			
Weather bar: Size			

0621 WATERPROOFING - WET AREAS

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide wet area waterproofing systems which:

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- Are graded to floor wastes to dispose of water without ponding.
- Prevent moisture entering the substrate or adjacent areas.

Selections: As documented.

- Be fit for purpose.
- Remains intact and waterproof under the local ambient climatic conditions.
- Accommodates the full range of building movements including shrinkage, structural, thermal and differential movements.
- Accommodate permanent and transient loads without performance compromise.
- Provides adequate means of dealing with vapour pressure, condensation, movement due to long term curing of the low shrinkage waterproof concrete substrates, corrosion and thermal movement.
- Is certified that the hydration and vapour pressure from substrates will not debond the membrane.
- Has all junctions, seams and joints homogeneous.
- Has curing time constraints which do not interfere with the programme for following trades
- Where exposed: is stable to naturally occurring radiation including UV, is incombustible and non flammable.
- Can be repaired to same standard as undamaged installation.
- Where required to be trafficable, it is abrasion, impact, puncture and slip resistant to the degree necessary for the relevant traffic load.
- Where exposed to aggressive chemicals is suitably resistant to the relevant risk.
- Will maintain waterproofing integrity at all large and small penetrations at all separation, joints, expansion and contraction joints, control and isolation joints, internal and external angles, at all terminations.

Performance

Requirements:

- Graded to floor wastes, to dispose of water without ponding.
- Able to prevent moisture entering the substrate or adjacent areas.

1.2 CROSS REFERENCES

General

Requirement: Conform to the following:

- *0171 General requirements*.
- *Architectural Drawings*
- *Section 0631b Ceramic Tiling*
- *BCA Report*

1.3 STANDARDS

Waterproofing wet areas

Standard: To AS 3740 (2021).

1.4 INTERPRETATION

Definitions

General: For the purposes of this worksection, the definitions given in AS 3740 (2021) and the following apply:

- Membranes (waterproof): Impervious barriers to liquid water, which may be:

  - . Installed below floor finishes.
  - . Installed behind the wall sheeting or render.
  - . Installed to the face of the wall sheeting or render.
  - . Applied in liquid or gel form and air cured to form a seamless film.
  - . Applied in sheet form with joints lapped and sealed.
- Waterproofing system: Combinations of membranes, flashings, drainage and accessories that form waterproof barriers and that may be:
  - . Loose-laid.
  - . Bonded to substrates.
- Wet area: An area within a building supplied with a floor waste.

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1.5 SUBMISSIONS

Products and materials

Manufacturer's data: Submit product data sheets.

Type tests: Submit test results for the following:

- Membranes: To **MEMBRANES**, **Tests**.

Records

General: Submit photographic records to EXECUTION, **GENERAL**, **Reporting**.

Flood tests: Submit photographic records to **TESTING**, **Flood tests**.

Samples

Requirement: Submit samples to PRODUCTS, **GENERAL**, **Samples**.

Shop drawings

Requirement: Submit shop drawings showing the following:

- Junctions with vertical surfaces and upstands.
- Junctions at perimeters.
- Drainage details.
- Control joints.
- Flashings.
- Penetrations.
- Corners.
- Terminations and connections.
- Membrane layers.

Subcontractors

General: Submit names and contact details of proposed suppliers and installers as recommended by the manufacturer.

Substrate acceptance

Requirement: Submit evidence of installer's acceptance of the flooring substrate before starting installation.

Tests

Site tests: Submit results, as follows:

- Substrate moisture content test.
- Flood test.
- Electronic leak detection test.
- Seam probe test.

Warranties

Requirement: Submit warranties to **COMPLETION**, **Warranties**.

1.6 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following:

- Substrates prepared and ready for installation of the wet area waterproofing systems.

- Secondary layers prepared and ready for subsequent layers.
- Membranes after installation and before concealment.
- After flood testing, if applicable.

2 PRODUCTS

2.1 GENERAL

Samples
Requirement: Provide 300 x 300 mm samples of each type of membrane.

Storage and handling
General: Store and handle to the manufacturer's recommendations and as follows:

- Protect materials from damage.

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2.2 MEMBRANES

Standards
Standard: To AS/NZS 4858 (2004).

Membrane system
Requirement: Proprietary membrane system suitable for the intended internal wet area waterproofing.

Certification: Current BRANZ Appraisal Certificate

Tests
Standard: To AS/NZS 4858 (2004) Table 8.1.

Total VOC limits
Requirement: Conform to the following maximum TVOC content:

- Waterproof membrane: 250 g/L.

2.3 ACCESSORIES

Shower tray
General: Purpose-made jointless shower tray, with wall upstands at least 50 mm higher than the hob upstands. Set hob on the inside of the tray upstands.

Waterstop angles
Material: Rigid, corrosion-resistant angles compatible with the waterproof membrane system.

Bond breakers
Requirement: Compatible with the extensibility class of the membrane to be used.

Material: Purpose-made bond breaker tapes or fillets of sealant.

Flashings
Requirement: Flexible waterproof flashings compatible with the waterproof membrane system.

Liquid membrane reinforcement
Requirement: Flexible fabric compatible with the waterproof membrane system.

Sealants
Requirement: Waterproof or water resistant, flexible, mould-resistant and compatible with the waterproofing system and to the manufacturer’s recommendations.

Adhesives
Requirement: Waterproof and compatible with the waterproofing system.

3 EXECUTION

3.1 GENERAL

Reporting
General: Make progressive photographic records of the waterproofing installation. Label photographs with the date and location.

Timing: Record at the following stages:

- After substrate preparation.
- After primer application.

- After membrane installation.
- After protection from traffic provided.

Liquid applied membranes:

- Record wet film thickness once every 10 m^2 and compare to the manufacturer's requirements.
- On completion of every 100 m^2 of each coat, compare the amount of membrane used with the manufacturer's application rate and record the result.

3.2 PREPARATION

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Substrates

General: Prepare substrates as follows:

- Clean and remove any deposit or finish that may impair adhesion of membranes.
- If walls are plastered, remove loose sand.
- If walls or floors are framed or discontinuous, make sure support members are in full lengths without splicing.
- If floors are solid or continuous:
  - Remove excessive projections.
  - Fill voids and hollows greater than 10 mm with abrupt edges with a cement:sand mix not stronger than the substrate nor weaker than the bedding.
  - Fill depressions less than 10 mm with a latex modified cementitious product with feathering eliminated by scabbling the edges.
  - Fill cracks in substrates wider than 1.5 mm with a filler compatible with the membrane system.

Concrete substrates: Cure for more than 28 days.

External corners: Round or arris edges.

Moisture content

Requirement: Verify that the moisture content of the substrate is compatible with the water vapour transmission rate of the membrane system by testing to the recommendations of AS 3740 (2021) Appendix F.

Falls

Membrane applied to substrate: Make sure the fall in the substrate conforms to the fall documented for the finish.

Sheet substrate fastening

Requirement: Provide fasteners compatible with the substrate. Mechanically fasten to the supporting structure.

Waterstop angles

Requirement: Provide waterstop angles at door thresholds and shower enclosures to support the waterproof membrane at junctions between waterproofed and non-waterproofed areas.

Sizing: Size the vertical leg of the waterstop angle to conform to the requirements of AS 3740 (2021).

Corners: Cut the horizontal leg and bend the vertical leg at corners instead of forming vertical joints between separate lengths of angle.

Fixing: Fix waterstop angles to the substrate with compatible sealant or adhesive and corrosion-resistant countersunk or wafer head screws.

Priming

Compatibility: If required, prime the substrates with compatible primers for adhesion of the membrane system.

Bond breakers

Requirement: After the priming of surfaces, provide bond breakers at wall/floor junctions, hob/wall junctions and at control joints where the membrane is bonded to the substrate.

Sealant fillet bond breakers:

- Application: Form a triangular fillet or cove of sealant to internal corners within the period recommended by the membrane manufacturer after the application of the primer.
- Width: Conform to AS 3740 (2021) Table 4.10.

3.3 INSTALLATION

Ambient conditions

Requirement: Do not install in conditions outside the manufacturer's recommendations.

Protection

Damage: Protect membrane from damage during installation and for the period after installation until the membrane achieves its service characteristics that resist damage and an overlaying finish is installed.

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Extent of waterproofing

Waterproof or water resistant surfaces: To BCA (2022) F2D2.

Sheet membrane joints

Bituminous sheet membranes:

- Side laps: ≥ 75 mm.
- End laps: ≥ 150 mm.

Synthetic rubber membranes:

- Factory-vulcanized laps: ≥ 40 mm.
- Field side laps: ≥ 50 mm.
- Field end laps: ≥ 100 mm.

PVC membranes:

- Factory-welded laps: ≥ 40 mm.
- Field-welded laps: ≥ 75 mm.

Flashings

Junctions between waterproof surfaces: Provide a bond breaker at internal corners behind flashings.

Junctions between waterproof surfaces and other surfaces: Provide a bead of sealant at the following junctions:

- Waterproof and water resistant surfaces.
- Water resistant and water resistant surfaces.
- Water resistant and non-water resistant surfaces.

Perimeter flashings: Provide continuous flashings to the full perimeter of waterproof areas at wall/floor junctions and to waterstop angles.

Vertical flashings: Provide vertical corner flashings continuous across wall/wall junctions to at least 1800 mm above finished floor level of the shower or base of the bath or tray, or 50 mm above the shower rose, whichever is the higher.

Vertical liquid applied flashings:

- Return legs at least 40 mm on each wall.
- Overlap the vertical termination of the floor waterproofing membrane at least 20 mm.

Vertical sheet flashings:

- Return legs at least 50 mm on each wall.
- Overlap shower tray upstands at least 50 mm.
- Do not penetrate flashing with wall lining fasteners.

Reinforcement: At coves, corners and wall/floor junctions with gaps greater than 3 mm, reinforce liquid applied membranes with reinforcement fabric tape recommended by the membrane manufacturer. Fold the tape in half lengthways and embed it in the first coat of membrane with one half of the tape on each side of the corner or joint. Apply a second coat of membrane to seal the fabric.

Drainage connections

Floor wastes: Provide floor wastes of sufficient height to accommodate the thickness of floor finishes and bedding at the outlet position. Position leak control flange to drain at membrane level. Turn membrane down 50 mm minimum into the floor waste leak control flanges, and adhere to form a waterproof connection.

Floor wastes in shower trays: Provide drainage of the tile bed and a waterproof connection between the tray and the drain.

Preformed drainage channels:

- With continuous leak control flanges: Provide a continuous waterproof connection between the membrane and the channel.
- Without leak control flanges: Provide continuous waterproofing under the channel and terminate the membrane at a floor waste with a recessed leak control flange.

Vertical membrane terminations

Upstands:

- Shower areas with hobs and step-downs: Minimum 150 mm above the highest finished tile level of the shower area or 25 mm above the maximum retained water level, whichever is the greater.
- Shower areas without hobs: Minimum 150 mm above the highest finished tile level of the floor within the shower area.
- Shower areas with ceiling mounted shower rose: To the full height of the wall.
- Bath without an integral upstand edge without showers over: Minimum 150 mm above the shower rose connection.
- Bath with an integral upstand edge, bath with a shower over or bath adjoining an unenclosed shower: Minimum 150 mm above the bath edge.

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Anchoring: Secure sheet membranes along the top edge.

Edge protection: Protect edges of the membrane.

Showers with hobs

General: Provide masonry, concrete or corrosion-resistant metal hobs. Fix securely to the floor, seal against walls and make flush all gaps, joints and intersections before applying the membrane.

Masonry or concrete hob: Extend membrane over the hob and into the room at least 50 mm.

- Autoclaved aerated concrete hobs: Prime before applying the membrane.

Metal hob: Provide metal angle with height at least 15 mm above the finished floor level of the floor outside the shower. Terminate the membrane within 5 mm from the top of the angle. Seal the gap between the shower screen and the angle.

Showers with step-downs

Level of shower area: At least 15 mm below the finished floor level outside the shower.

Framed shower screens:

- Terminate the membrane directly below the floor tiles below the shower screen sill mounted on the upper level of the step-down.
- Support and adhere the membrane to a waterstop angle fixed securely to the substrate.

Frameless shower screens:

- Install a waterstop angle where the base of the shower screen will be installed and across the opening of the shower.
- Install membranes on both sides of the waterstop angle and turn the membranes up against the angle. Extend the membrane at least 50 mm into the adjacent area
- Finish membrane flush with the underside of tiles.
- Provide a sealant joint between the waterstop angle and tiles.
- Install the shower screen with the inside face flush with the step-down.

Showers without hobs or step-downs

Framed shower screens:

- Install a waterstop angle directly below where the base of the shower screen sill will be installed.
- Size the angle so that the vertical leg finishes at least 5 mm above the level of the tiles.
- Support and adhere the membrane over the waterstop angle and extend the membrane at least 50 mm into the adjacent area.

Frameless shower screens:

- Install a waterstop angle directly below where the base of the shower screen will be installed.
- Support and adhere the membrane over the waterstop angle and extend the membrane at least 50 mm in to the adjacent area.
- Install a capping angle over the membrane and vertical leg of the waterstop angle to protect the exposed membrane.
- Install the shower screen over the capping angle.

Framed or frameless shower screens with trench drain located below screen:

- Install a waterstop angle where the outer edge of the trench drain to the perimeter of the shower will be installed.
- Size the angle so that the vertical leg finishes at the underside of the tiles.
- Support and adhere the membrane over the waterstop angle and terminate the membrane at floor wastes as documented in **Drainage connections**.
- Install the trench drain with the shower screen located vertically above it.

Unenclosed showers

Requirement: Extend membrane at least 1500 mm into the room from the shower rose outlet, on the walls and floor.

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Preformed shower bases

Preformed shower bases with integral perimeter upstands:

- Support shower bases to prevent distortion or cracking.
- Recess shower base into walls or batten off wall lining sufficiently to allow water resistant wall finishes to overlap the integral upstands along the top edge of the shower base.
- Maintain the structural integrity of walls that are rebated.

Baths and spas

Baths with integral upstands:

- Recess bath edges into walls or batten off wall lining sufficiently to allow water resistant wall finishes to overlap the integral upstands.
- Maintain the structural integrity of walls that are rebated.

Baths without integral upstands or with showers over:

- Form a rebate in the wall to receive the bath edge.
  - Rendered masonry walls: Form or chase in the render.
  - Framed and lined walls: Form in the wall lining with a corrosion-resistant lipped channel.
- Waterproof the wall above and below the rebate, including the rebate and the floor area under the bath.
- Seal the edge of the bath into the rebate.

Plinth-mounted insert baths and spas:

- Line framed enclosures for insert baths.
- Form an upstand on the inside edge of the enclosure opening to receive the bath with an angle or compressible foam rod.
- Waterproof walls abutting the enclosure, the top of the plinth and the interior and exterior of the enclosure.
- After tiling the walls, top of the plinth and exterior of the enclosure, install the bath with its downturn edge lip outside the upstand formed on the edge of the opening and seal the lip to the tiles.
- Minimum dimension from wall or free edge of the plinth to insert bath: 100 mm.

Taps and spouts

Requirement: Waterproof penetrations for taps and spouts with preformed flange systems or a sealant.

Provision for servicing: Install taps so tap washers or ceramic discs can be serviced without damaging the waterproofing or seal.

Wall recesses

Requirement: Support all faces of the recess and line with the same sheet material as the adjacent wall. Fall base of recess towards the shower area. Flash all junctions and waterproof all surfaces.

Curing of liquid membrane systems

General: To the manufacturer's recommendations.

Curing: Allow membrane to fully cure before tiling.

Overlaying finishes on membranes

Requirement: Protect waterproof membranes with compatible water resistant surface materials that do not cause damage to the membrane.

Suitable materials: Conform to AS 3740 (2021).

Bonded or partially bonded membranes: If the topping or bedding mortar is to be bonded to the membrane, provide sufficient control joints in the topping or bedding mortar to reduce the movement over the membrane.

3.4 TESTING

Substrate tests

Moisture content: Test substrate for suitability for the installation of membranes to AS 3740 (2021) Appendix F.

- Maximum relative humidity of concrete or cementitious screeds: To AS 3740 (2021) Appendix F2.4.
- Moisture content of timber and plywood substrates: To AS 3740 (2021) Appendix F2.3.

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Flood tests

Requirement: To AS 3740 (2021) Appendix C2.

Records:

- Make photographic records of the flooded areas and adjacent areas.
- Label photographs with the date and location.

Electronic leak detection test

Requirement: To AS 3740 (2021) Appendix C3.

Seam probe test

Requirement: To AS 3740 (2021) Appendix C4.

3.5 COMPLETION

Reinstatement

Extent: Repair or replace faulty or damaged work. If the work cannot be repaired satisfactorily, replace the whole area affected.

Warranties

Type: [complete/delete]

Period: [complete/delete]

4 SELECTIONS

4.1 SYSTEMS

Liquid membrane system schedule

	A	B	C
Proprietary system			
Material type			
Tensile stress at break (MPa)			
Tensile strain (elongation at break) (%)			
Method of application			
Number of coats			
Application rate (L/m^2)			
Dry film thickness (total) (mm)			
Reinforcement			
Primer			
Base layer			
Top layer			
Waterstop angles			
Bond breakers			

Single layer sheet membrane system schedule

	A	B	C
Proprietary system			

	A	B	C
System type			
Sheet type			
Sheet thickness (mm)			
Base weight (kg/m^2)			
Tensile strength (MPa)			
Tensile strain (elongation at break) (%)			
Method of application			
Primer			
Bonding agent			
Waterstop angles			
Bond breakers			

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Shower tray schedule

	A	B	C
Material			
Dimensions (mm)			
Surface protection/finish			

0631B CERAMIC TILING

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide tiling systems to walls, floors and other substrates, as documented.

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Performance

Requirements:

- Consistent in colour, texture and finish.
- Firmly bonded to substrates for the expected life of the installation.
- Set out with joints accurately aligned in both directions and wall tiling joints level and plumb.
- Direct all water flowing from supply points to drainage outlets without leakage to the substrate or adjacent areas.

1.2 CROSS REFERENCES

General

Requirement: Conform to the following:

- *0171 General requirements*.
- Architectural Drawings
- Master Schedule
- Section 0621 Waterproofing

1.3 STANDARDS

Tiling

General: Conform to the recommendations of those parts of AS 3958 (2023) referenced in this worksection.

Ceramic tiles

Standard: To AS 13006 (2020).

1.4 TOLERANCES

Completed tiling

Requirement: To the recommendations of AS 3958 (2023) clause 5.4.8.

1.5 SUBMISSIONS

Operation and maintenance manuals

Requirement: Submit manual to **COMPLETION**, **Operation and maintenance manuals**.

Products and materials

Type tests: Submit test results to **TILES AND ACCESSORIES**, **Tests** for the following:

- Slip resistance.
- Accelerated wear.

Evidence of delivery: Submit delivery docket as evidence of delivery of specified tiles.

Samples

Requirement: Submit samples to PRODUCTS, **GENERAL**, **Samples**.

- Three tiles of each type
- Three of each type of tactile indicators
- Grout sample
- Movement joint material, minimum 300mm
- Trial set-out on horizontal surfaces for each area
- Samples of each sealer, trim, movement joint and accessory
-

Tests

Type tests: Submit results, as follows:

- Type test slip resistance of tiles to AS/NZS 4586.

Site tests: Submit results, as follows:

- Site slip resistance test of completed surface to AS/NZS 4663.
- Impact sound insulation: To AS ISO 717.2 as measured for the acoustic underlay as part of the entire tiling system

Warranties

Requirement: Submit warranties to **COMPLETION**, **Warranties**.

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1.6 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following:

- Substrate immediately before tiling.
- Control joints before sealing and grouting.
- Grout and sealant colours before application.
- Completion of tiling

2 PRODUCTS

2.1 GENERAL

Samples

Requirement: Provide labelled samples of tiles, including accessories, grout and sealants, showing the range of variation in colour and finish.

Sample panels: Prepare a sample panel of each type of tiling system as follows:

- Size: > 2 m^2.
- Include samples of junction details and trim.
- Preserve the panel until related work is complete.

2.2 UNDERLAY

Fibre cement underlay

Standard: To AS/NZS 2908.2 (2000), Type B, category 2 minimum.

Thickness: 6 mm minimum.

Acoustic underlay

General: Provide a proprietary product recommended by the manufacturer as compatible with the tiling system.

Damp-Proof Membrane

As Specified in Section 0411b Waterproofing

Bedding

Floor tiling: Mortar, unless detailed otherwise, on power floated concrete slab or graded screed

Fixing

Wall tiling: Adhesive fixed on rendered blockwork or fibre cement lined stud partition

Grout

Cement based. Refer Master Schedule for grout colour. Generally to match tile unless nominated otherwise

2.3 TILES AND ACCESSORIES

Tiles

Standard: To AS 13006 (2020).

Coves, nosings and skirtings: Provide matching stop-end, and internal and external angle tiles moulded for that purpose.

Exposed edges: Provide purpose-made border tiles with the exposed edge (whether round, square or cushion) glazed to match the tile face. If such tiles are not available, mitre tiles on external corners or use proprietary trim.

Accessories

General: Provide tile accessories that match the composition, colour and finish of the surrounding tiles.

Tile trim: Provide proprietary trim for wall tiles and floor tiles, as documented.

Tactile ground surface indicators

Standard: To AS/NZS 1428.4.1 (2009).

Tests

Slip resistance: To AS 4586 (2013).

Accelerated wear: Tested for slip resistance after being subjected to accelerated wear conditioning, as evidence of the permanence of slip resistance.

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2.4 ADHESIVES

General

Standard: To AS ISO 13007.1 (2020).

Type

General: Provide adhesives compatible with the materials and surfaces to be adhered, and as documented.

Prohibited uses: Do not provide the following combinations:

- Cement-based adhesives on wood, metal, painted or glazed surfaces, gypsum-based plaster.
- Organic solvent-based adhesives on painted surfaces.
- Organic PVC-based adhesives and organic natural rubber latex adhesives in damp or wet conditions.
- PVA (polyvinyl acetate) based adhesives in wet areas or externally.

2.5 MORTAR

Materials

Cement type to AS 3972 (2010): GP.

- White cement: Iron salts content ≤ 1%.
- Off-white cement: Iron salts content ≤ 2.5%.

Lime: To AS 1672.1 (1997).

Sand: Fine aggregate with a low clay content selected for grading, sharp and free from efflorescing salts.

Measurement of volume: Measure binders and sand by volume using buckets or boxes. Do not allow sand to bulk by absorption of water.

Bedding mortar

Mix proportion (cement:sand), by volume: Select proportions from the range 1:3 to 1:4 for satisfactory adhesion. Provide minimum water.

Terracotta tiles: Use proprietary polymer modified mortar.

Mixing: To AS 3958 (2023) clause 5.5.

Water

General: Clean and free from any deleterious matter.

2.6 GROUT

Type

Cement-based proprietary grout: Mix with water. Fine sand may be added as a filler in wider joints.

Terracotta tiles: Use proprietary polymer modified grout.

General purpose cement-based grout: Mix with fine sand. Provide minimum water consistent with workability.

Mix proportions (cement:sand), by volume:

- Joints < 3 mm: 1:2.

- Joints ≥ 3 mm: 1:3.

Epoxy grout: As documented.

Pigments

Pigments for coloured grout: Provide colourfast fillers compatible with the grout material. For cement-based grouts, provide lime-proof natural or synthetic metallic oxides compatible with cement.

2.7 CONTROL JOINTS

Control joint materials

Control joint strip: A proprietary control joint consisting of a neoprene core sandwiched between metal plates with lugs or ribs for mechanical keying. Set flush with the finished surface.

Proprietary slide plate divider strip: An arrangement of interlocking metal plates grouted into pockets formed in the concrete joint edges.

Sealant: One-part self-levelling non-hardening mould resistant, silicone or polyurethane sealant applied over a backing rod. Finish flush with the finished surface.

- Floors: Trafficable, Shore hardness greater than 35A.

Backing rod: Compressible closed cell polyethylene foam with a bond breaking surface.

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3 EXECUTION

3.1 SUBSTRATES

Drying and shrinkage

General: Before tiling, allow at least the following times to elapse (for initial drying out and shrinkage) for these substrates:

- Concrete slabs: 42 days.
- Concrete blockwork: 28 days.
- Toppings on slabs and rendering on brick or blockwork: A further 21 days.
- Rendered swimming pool shell: A further 21 days minimum.

3.2 PREPARATION

Standard

Preparation: To the recommendations of AS 3958 (2023) Section 4.

Ambient temperature

General: If the ambient temperature is less than 5°C or greater than 35°C, do not lay tiles.

Substrates without wet area membranes

General: Make sure substrates are as follows:

- Clean and free of any deposit or finish that may impair adhesion or location of tiles.
- If framed or discontinuous, support members are in full lengths without splicing.
- If solid or continuous:
  - Remove excessive projections.
  - Fill voids and hollows greater than 10 mm with abrupt edges with a cement:sand mix not stronger than the substrate or weaker than the bedding.
  - Fill depressions less than 10 mm with a latex modified cementitious product and eliminate feathering by scabbling the edges.

Absorbent substrates: If suction is excessive, control it by dampening but avoid over-wetting and do not apply mortar bedding to substrates showing surface moisture.

Dense concrete: If not sufficiently rough to provide a mechanical key, roughen by scabbling to remove 3 mm of the surface and expose the aggregate; then apply a bonding treatment.

Substrates with wet area membranes

General: Make sure substrates are as follows:

- Clean and free of any deposit or finish that may impair adhesion or location of tiles.
- Compatible with all components of the floor system.

3.3 FIXING UNDERLAY

Installation

Requirement: Lay in staggered (brick) pattern, perpendicular to the direction of the subfloor, with joins in the underlay not coinciding with joints in the subfloor. Fix with fasteners and fastener spacing to the manufacturers recommendations. If panels are not tongue and grooved, make sure edges are fully supported.

Membranes: If sheet flooring is the substrate for a wet area membrane, fix with stainless steel countersunk head screws.

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3.4 TILING GENERALLY

Sequence

General: [complete/delete]

Cutting and laying

Cutting: Cut tiles neatly to fit around fixtures and at margins where necessary. Drill holes without damaging tile faces. Cut recesses for fixtures such as soap holders. Rub edges smooth without chipping.

Laying: Return tiles into sills, reveals and openings. Butt up to returns, frames, fixtures and other finishes. Strike and point up beds if exposed. Remove tile spacers before grouting.

Variations

General: Distribute variations in hue, colour, or pattern uniformly, by mixing tiles or tile batches before laying.

Protection

Floor tiles: Keep traffic off floor tiles until the bedding has set and attained its working strength.

Cleaning: Keep the work clean as it proceeds and protect finished work from damage.

Bath ventilation

General: If required, ventilate the space below fully enclosed baths with at least 2 vermin-proof ventilating tiles.

3.5 SETTING OUT

Tile layout

Requirement: Set out tiles as documented, allowing for control joints, or as follows if desired layout is undocumented:

- General tiling: Provide whole or purpose-made tiles at margins if practicable, otherwise, set out to give equal margins of cut tiles. If margins less than half a tile width are unavoidable, locate the cut tiles where they are least conspicuous. Align floor and wall tile joints, if possible.
- Feature tiling: Provide trial set out for large or complex areas and patterns.

Tile joints

Joint widths: Set out tiles to give uniform joint widths within the following limits:

- Floors:
  - Dry pressed tiles: 3 mm.
  - Extruded tiles: 6 mm.
  - Vitrified: 3 to 5 mm.
  - Quarry tiles: 6 to 12 mm.
  - Chemical resistant epoxy jointed tiling: 5 to 6 mm.
- Large and/or irregular floor tiles: 6 to 12 mm.
- Mounted mosaics: To match mounting pattern.
- Walls:
  - Dry pressed tile: 1.5 mm.
  - Extruded tile: 6 mm.

Joint alignment: Set out tiling with joints accurately aligned in both directions and wall tiling joints level and plumb.

Fixtures

General: If possible, position tiles so that holes for fixtures and other penetrations occur at the intersection of horizontal and vertical joints or on the centrelines of tiles. Continue tiling fully behind fixtures that are not built in to the tiling surface. Before tiling make sure fixtures interrupting the tile surfaces are accurately positioned in their designed or optimum locations relative to the tile layout.

3.6 FALLS AND LEVELS

Grading

Requirement: Grade floor tiling to even and correct falls to floor wastes and elsewhere as required. Make level junctions with walls. If falls are not required, lay level.

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Fall: Conform to falls as documented and the following:

- Falls to floor wastes: 1:80 minimum.
- Continuous fall of floor plane to floor waste for NCC Classes 1, 2, 3 and 4 parts of a building: 1:50 maximum.

Change of finish: Maintain finished floor level across changes of floor finish including carpet.

3.7 BEDDING

Standard

Adhesive: To AS 3958 (2023) clause 5.6.

Cement mortar: To AS 3958 (2023) clause 5.5.

Preparation of tiles

Adhesive bedding: Fix tiles dry; do not soak.

Mortar bedding: Soak porous tiles in water for half an hour and then drain until the surface water has disappeared.

Terracotta tiles: Use pre-sealed tiles or apply a breathable sealer and lay dry. If a final sealed finish is selected, use a compatible laying sealer.

Bedding

General: Use bedding methods and materials that are appropriate to the tile, the substrate, the conditions of service and which leave the tile firmly and solidly bedded in the bedding material and adhered to the substrate. Form falls integral with the substrate.

Thin adhesive beds

General: Provide only if the substrate deviation is less than 3 mm, tested with a 3 m straightedge. Cover the entire tile back with adhesive when the tile is bedded.

Thickness: 1.5 to 3 mm.

Thick adhesive beds

General: Provide on substrates with deviations up to 6 mm, tested with a 3 m straightedge, and with tiles having deep keys or frogs.

Nominal thickness: 6 mm.

Adhesive bedding application

General: Apply adhesive by notched trowel to walls and floors and direct to tiles if required, to provide evenly distributed coverage after laying as follows:

- Domestic internal walls: > 65%.
- Domestic internal floors: > 80%.
- Other walls and floors: > 90%.
- Wet areas and benchtops: 100%.

Pattern of distribution of adhesive: To the recommendations of AS 3958 (2023) clause 5.6.5. Verify by examining one tile in ten as work proceeds.

Wall tile spacers: Do not use spacer types that inhibit the distribution of adhesive.

Curing: Allow the adhesive to cure for the period nominated by the manufacturer before grouting or allowing foot traffic.

Mortar beds

Floor tiles: Either lightly dust the screeded bed surface with dry cement and trowel level until the cement is damp, or spread a thin slurry of neat cement, or cement-based thin bed adhesive, on to the tile back. Do not use mortar after initial set has occurred.

- Nominal thickness: 20 to 40 mm.

Thick reinforced beds: Place mortar bed in two layers, and incorporate the mesh reinforcement in the first layer.

3.8 CONTROL OF MOVEMENT

General

Requirement: Provide control joints carried through the tile and the bedding to the recommendations of AS 3958 (2023) clause 5.4.7 and as follows:

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- Floor location:
  - . Over structural control joints.
  - . To divide complex room plans into rectangles.
  - . Around the perimeter of the floor.
  - . At junctions between different substrates.
  - . To divide large tiled areas into bays.
  - . At abutments with the building structural frame and over supporting walls or beams if flexing of the substrate is anticipated.
- Wall location:
  - . Over structural control joints.
  - . At junctions with different substrate materials when the tiling is continuous.
  - . At vertical internal corners.
- Depth of joint: Right through to the substrate.
- Sealant width: 6 to 25 mm.
- Depth of elastomeric sealant: One half the joint width, or 6 mm, whichever is the greater.

3.9 GROUTED AND SEALANT JOINTS

Grouted joints

General: Commence grouting as soon as practicable after bedding has set. Clean out joints as necessary and remove any tile spacers before grouting.

Face grouting: Fill the joints solid and tool flush. Clean off surplus grout. Wash down when the grout has set. When grout is dry, polish the tiled surface with grout film remover and a clean cloth.

Edges of tiles: Grout exposed edge joints.

Epoxy grouted joints: Make sure tile edge surfaces are free of extraneous matter such as cement films or wax, before grouting.

Colour: Grout and tile beads to match tile colour, unless nominated otherwise.

Mosaic tiles

Grouting mosaics: If paper faced mosaics are to be bedded in cement mortar, pre-grout the sheeted mosaics from the back before fixing. After fixing, rub grout into the surface of the joints to fill any voids left from pre-grouting. Clean off surplus grout. When grout has set, wash down. If necessary, use a proprietary cement remover.

Sealant joints

General: Provide joints filled with sealant and finished flush with the tile surface as follows:

- Where tiling is cut around sanitary fixtures.
- At internal corners of walls.
- Around fixtures interrupting the tile surface, for example pipes, brackets, bolts and nibs.
- At junctions with elements such as window and door frames and built-in cupboards.

Material: Anti-fungal modified silicone.

Width: 5 mm.

Depth: Equal to the tile thickness.

3.10 JOINT ACCESSORIES

Floor finish dividers

General: Finish tiled floors at junctions with differing floor finishes with a corrosion-resistant metal dividing strip fixed to the substrate using mechanical fixings, with top edge flush with the finished floor.

If changes of floor finish occur at doorways, make the junction directly below the closed door. Grout up underneath to provide continuous support.

Type: 1.5mm thick

Material: Stainless steel

Stepping: Less than 3 mm.

Wall trim

General: Provide where documented. Install flush with adjacent tile surfaces and to manufacturer's recommendations.

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Adjustments

Requirement: Check that the height of the floor finish divider is sufficient for the topping and tile thickness. Adjust as required with a matching flat bar adhesive fixed to the divider angle.

Weather bars

General: Provide corrosion-resistant metal weather bars or threshold plates under hinged external doors, located under the centres of closed doors or to manufacturer's recommendations.

Maximum projection between finished surfaces 9mm. Finish: [complete/delete]

3.11 COMPLETION

Cleaning

General: Clean tiled surfaces using an appropriate tile cleaning agent, and polish.

Spare tiles

General: Supply spare matching tiles and accessories of each type for future replacement purposes. Store the spare materials on site.

Quantity: At least 1% of the quantity installed.

Storage location: To Client and Superintendent's Instructions

Operation and maintenance manuals

Requirement: Prepare a manual describing care and maintenance of the tiling, including procedures for maintaining the slip-resistance classification stating the expected life of the slip-resistance classification.

4 SELECTIONS

4.1 SCHEDULES

Wall tiling schedule

Refer Architectural drawings and finishes schedules for floor tiling selection.

	A	B	C
Product			
Tile: Type			
Tile: Size (mm)			
Tile: Colour			
Tile: Surface			
Adhesive bedding: Type			
Adhesive bedding: Thickness			
Tile pattern			
Mechanical fixing			
Grout: Type			
Grout: Colour			
Grout: Pigment proportions			
Grout: Special properties			

Flooring underlay schedule

	A	B	C
Product			
Material			
Thickness			
Glue and nail fixing: Adhesive product			

Floor tiling schedule

	A	B	C
Product			
Tile: Type			
Tile: Size (mm)			
Tile: Colour			
Tile: Surface			
Tile: Edge			
Slip resistance classification			
Water absorption group to AS 13006 (2020)			
Airborne sound insulation			
Impact sound insulation			
Acoustic underlay: Product			
Acoustic underlay: Manufacturer			
Separation layer: Location			
Separation layer: Type			
Adhesive bedding: Type			
Adhesive bedding: Thickness			
Mortar bedding: Thickness (mm)			
Mortar bedding: Reinforcement			
Grout: Type			
Grout: Colour			
Grout: Pigment proportions			
Grout: Special properties			

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Accessories schedule

	A	B	C
Product			
Location			
Type			
Material			
Size (mm)			
Colour			

Tactile ground surface indicators schedule

	A	B	C
Product			
Type			
Edge protector			
Material			

	A	B	C
Colour			

Control joints schedule

	A	B	C
Product			
Control joint strip: Joint side-plate material			
Control joint strip: Neoprene colour			
Control joint strip: Width			
Control joint strip: Fixing			
Proprietary slide plate: Product			
Proprietary slide plate: Material			
Proprietary slide plate: Insert colour			
Sealant: Type			
Sealant: Colour			
Sealant: Width (mm)			

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0652B CARPETS

1 GENERAL

1.1 RESPONSIBILITIES

General
Requirement: Provide textile floor coverings and underlays to subfloors, as documented.

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1.2 CROSS REFERENCES

General
Requirement: Conform to the following:
- *0171 General requirements*.
- Architectural Drawings
- BCA Report
- Access Report
- Acoustic Report

1.3 TOLERANCES

General
Requirement: To AS/NZS 1385 (2007).

1.4 SUBMISSIONS

Fire performance
Fire hazard properties: Submit evidence of conformity to **FIRE PERFORMANCE**, **Fire hazard properties**.

Operation and maintenance manuals
Requirement: Submit manual to **COMPLETION**, **Operation and maintenance manuals**.

Products and materials
Manufacturer's documentation: Submit copies of the following data:
- Product data sheets.

Type tests: Submit test results of the following:
- Slip resistance: To PRODUCTS, **TESTS**, **Slip resistance**.

Samples
Requirement: Submit samples to PRODUCTS, **GENERAL**, **Samples**.

General: Submit labelled production run samples illustrating the range of colour, pattern, texture and pile yarn available in the required carpet types.

Sample size: Submit the following:

- Carpet: Manufacturer's standard swatch.
- Tiles: 4 x tile size.
- Edge strip: Submit a 300 mm length of each type.
- Underlay: Submit one labelled sample at least 600x600 mm.

Penetrations: Submit one production carpet sample with a penetration access cut.

Stitching: Submit one sample at least 1000mm long of a stitch seam.

Edge and Trim: Submit a 500mm x 500mm entrance mat sample including edge frame and trims.
Accessories: A 500mm minimum length sample of all accessories

Subcontractors
General: Submit name and contact details of proposed suppliers and installers.

Evidence of experience: [complete/delete]

Substrate acceptance
Requirement: Submit evidence of installer's acceptance of the substrate before starting installation.

Tests
Site tests: Submit results, as follows:
- Substrate moisture content test.
- Substrate alkalinity test.

Warranties
Requirement: Submit warranties to **COMPLETION**, **Warranties**.

1.5 INSPECTION

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Notice
Inspection: Give notice so that inspection may be made of the following:
- Each batch of material upon delivery.
- Substrate immediately before fixing underlay.
- Fixings, edge strips and underlay installed ready to lay carpet.
- Completed carpet after cleaning and before covering for protection.

2 PRODUCTS

2.1 GENERAL

Samples
Requirement: Provide labelled production run samples demonstrating the range of colour, pattern, texture and pile yarn available in each documented carpet type.

Sample size: Provide the following:
- Carpet: Manufacturer's standard swatch.
- Carpet tiles: 4 x tile size.
- Edge strip, trim, extrusions and stair and landing nosings: 300 mm length of each type.
- Underlay: One labelled sample at least 600 x 600 mm.
- Stitched seam: One sample, minimum 1000 mm length.

Penetrations: Provide one production carpet sample with a penetration access cut as documented in EXECUTION, **INSTALLATION - CARPET**.

Storage and handling
Requirement: Store on a flat, clean, dry, well ventilated and secure storage area, elevated above the subfloor and unaffected by weather.

2.2 FIRE PERFORMANCE

Fire hazard properties
Critical radiant flux: Tested to AS ISO 9239.1 (2003).

2.3 CARPET

Batching
Requirement: Carpet from one manufacturing batch and dye lot.

Insect resistance
Requirement: Carpets and underlays comprising materials either inherently resistant to insect attack or treated against insect attack by moth and carpet beetle, by application of insect resist agents (IRA) to the wool and wool blend yarns during wet processing at the manufacturing stage.

Insect resist treatment of wool: Application Level 4 to the recommendations of Woolmark Specification CP-4 (2016).

Stain and soil resistance
Requirement: Colourless acid-based dye stain blocker applied to dyed fibres.

Total VOC
Total VOC emission tested to ISO 10580 (2010): < 0.5 mg/m^2/h.

2.4 MODULAR CARPET TILES

General

Type: Non-stick, non-curling carpet tiles capable of being taken up without damage and then re-laid in different positions.

Marking: On the back, showing manufacturer's instructions or directional arrow for laying.

Tolerances

Requirement: Conform to the following:

- Dimensional tolerance: 0.2%.
- Squareness: Maximum difference of 2 mm between lengths of diagonals.

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Sustainable carpet tile backing

Re-usable backing: Proprietary vinyl backing to carpet tiles capable of separation and recycling in new carpet tiles.

2.5 BROADLOOM CARPET

Type: Waterproof backed composite level loop pile carpet sheeting.

Range/Colour: Refer Master Schedule

Roll width: 3660mm

Underlay: Regupol 5512 SBR Rubber bound with polyurethane binder 5mm thick on powder floated concrete. Direct stick using water based adhesive or dual bond adhesive fixed where underlay is nominated. Ensure there are no ridges, undulations or the like in the substrate.

Grading: Residential Heavy Duty, Tufted, Level 4 Environmental ACCS LECS

Thickness: 8.7mm +/-10%

2.6 RECESSED MATS

General

Requirement: Provide mats made to fit each designated mat recess, as documented.

Linked metal mats

Type: Proprietary hinged extruded aluminium slatted mat with capability of accepting different types of inserts.

Frames: If the mat is recessed, provide frames to match the mat material and finish.

Coir mats

General: Provide a mat made to fit each designated mat recess to the Master schedule.

Type: Recessed aluminium framed entrance mat to AS 1428.1 Clause 7.4.2 requirements. Inserts as documented.

Location: All Residential lobbies

Installation: The frame shall be installed so that the upper edge is flush with the adjacent floor finish. Where required, provide a drainage point within the slab recess. Refer Hydraulic Services documents.

2.7 UNDERLAYS

Application

Performance: To AS 2455.1 (2019) clause 1.5.2.

Cementitious

General: Polymer modified cementitious smoothing and self-levelling compound.

Thickness: 3 mm minimum.

Fibre cement hard underlay

Standard: To AS/NZS 2908.2 (2000).

Thickness: 5 mm minimum.

Dry process fibreboard (MDF) hard underlay

Standard: To AS/NZS 1859.2 (2017).

Classification: Moisture resistant (MR) Medium density fibreboard (MDF).

Thickness: 5.5 mm.

Wet process fibreboard (hardboard) underlay
Standard: To AS/NZS 1859.4 (2018).

Classification: General purpose (GP) medium board, manufactured specifically as flooring underlay.

Thickness: 5.5 mm.

Soft underlay
Standard: To AS 4288 (2003).

2.8 OTHER MATERIALS

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Adhesives
General: Compatible with the floor covering material, and suitable for bonding it to the subfloor to AS 2455.1 (2019) clause 1.5.3.

Friction compound: Suitable for holding carpet tiles in position without permanent sticking.

Hot-melt adhesive tapes
General: Commercial grade glass fibre and cotton thermoplastic adhesive-coated tape 60 mm wide on a 90 mm wide metal foil base and backed with silicone-coated release paper.

Preformed carpet grippers
General: Architectural plywood carpet grippers with 3 rows of corrosion-resistant angled pins of length appropriate to the carpet type to AS 2455.1 (2019) clause 1.5.4.

Size (minimum): 33 mm wide x 7 mm thick.

Location: At edges, except where edge strips are used. Provide double grippers to edges where recommended by the manufacturer.

Edge strips and threshold strips
General: Heavy duty metal moulding or extruded edge strip appropriate to the floor covering type and if required, capable of accommodating varying levels of adjacent floor finishes.

Type: As documented.

Stair and landing nosing strips
Standard: To BCA (2022) D3D14 and BCA (2022) D3D15.

Type: As documented.

Tactile ground surface indicators
Standard: To AS/NZS 1428.4.1 (2009).

Type: As documented.

2.9 TESTS

Slip resistance
Standard: To AS 4586 (2013).

3 EXECUTION

3.1 PREPARATION

General
Pre-installation requirements: To AS 2455.1 (2019) Section 2.

- Modular carpet tiles: Pre-laying requirements including access panel floors to AS 2455.2 (2019) clause 4.

Working environment: Do not start work before the building is enclosed, wet work is complete and dry, overhead work is complete and good lighting is available.

Protection: Protect adjoining surfaces.

Substrate
General: Conform to the following:

- To AS 2455.1 (2019) or AS 2455.2 (2019), as appropriate.
- Clean and free of any deposit or finish that may impair adhesion or location and functioning of control joints.
- Free of any imperfections, including ridges, indentations and projections that may adversely affect the installed carpet.

Concrete substrate rectification: Remove projections, grind as necessary and fill voids and hollows with a levelling compound compatible with the adhesive to achieve the required tolerance.

Timber substrate rectification: Remove projections. If conformance with the **Substrate tolerance table** cannot be achieved, fix a hard underlay in brick pattern. Make sure joints do not coincide with substrate joints.

Moisture content and alkalinity of concrete substrate: Do not start installation until the moisture content and alkalinity of the concrete substrate has been tested to **TESTING**, **Substrate tests** and conforms to the values in AS 2455.1 (2019) Appendix B.

Moisture content of timber, plywood or particleboard substrate: Do not start installation until the moisture content of the substrate has been tested to **TESTING**, **Substrate tests** and conforms to the values as follow:

- Air conditioned buildings: 8 to 10%.
- Intermittently heated buildings: 10 to 12.5%.
- Unheated buildings: 12 to 15%.

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Fixtures: Remove door stops and other fixtures. Refix in position undamaged on completion of the installation. Make sure fixings penetrate substrate and are stable.

Substrate tolerance table

Property	Length of straightedge laid in any direction (mm)	Maximum deviation under the straightedge (mm)
Planeness	2000	4
Smoothness	150	1

Trial set-out

General: Prepare a trial set-out of each type of carpet with underlay, minimum 10 m^2, including accessories and 3000 mm of typical seam.

Location: [complete/delete]

3.2 TESTING

Substrate tests

Moisture content and alkalinity of concrete substrate: Test substrate to AS 2455.1 (2019) Appendix B.

Moisture content of timber, plywood or particleboard substrate: Test substrate to AS/NZS 1080.1 (2012) for timber and particleboard or AS/NZS 2098.1 (2006) for plywood.

3.3 INSTALLATION - CARPET

General

Requirement: To AS 2455.1 (2019) Section 3 and the manufacturer's recommendations.

Batching

Requirement: In a single area and for each documented type, quality, or colour, use carpet from one manufacturing batch and dye lot.

Setting out

Joints in underlay: Make sure joints in underlay do not coincide with carpet joints. Do not carry underlay over carpet grippers or edge strips.

Partition layout: Confirm that permanent partitions have been installed before starting carpet laying.

Seaming methods

Woven carpet: Machine or hand sew. Do not provide glued taped seams unless selvages are woven to suit and recommended by manufacturer.

Tufted carpet: Seam with hot-melt adhesive tape.

Seam sealing: Apply appropriate seam sealer to each cut edge.

Cutting laid carpet

Method: If penetrations through laid carpet are necessary for electrical, telephone or other outlets, cut the carpet either by cross cutting or by cutting rectangular or circular openings.

Cutting holes in concrete floors: Protect the carpet and remove concrete particles and dust on completion. Replace the cut carpet over the opening without any signs of fraying or other damage, and fix with a peel-up adhesive, or resew.

Edge strips and threshold strips
Installation: To the NCC cited AS 1428.1 (2009) and the manufacturer's recommendations.

Location: At exposed edges of the carpet, and at junctions with differing floor finishes or finishes of a different thickness. If edge strips occur at doorways, locate the junctions directly below the closed door.

3.4 INSTALLATION - CARPET TILES

General
Installation: To AS 2455.2 (2019) and the manufacturer's recommendations.

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3.5 STAIRS AND LANDINGS

Installation
General: To AS 2455.1 (2019) clause 3.10.

Concrete stairs
Fixing: Adhesive method.

Laying method: Apply the floor covering continuously to the treads and risers.

Timber stairs
Closed risers:

- Fixing: Tackless method, with a gripper strip in each angle between treads and risers.
- Laying: Apply the floor covering continuously to the treads and risers.

Open risers:

- Fixing: Adhesive.
- Laying: Wrap the carpet around the tread and neatly butt join beneath the nosing if a separate nosing is required, or if not, in the centre of the underside of the tread.

Stair and landing nosing strips
Installation: To the manufacturer's recommendations.

3.6 COMPLETION

Cleaning
Requirement: Progressively clean the work. Remove waste, excess materials and adhesive.

Final cleaning: When the installation is complete, clean the carpet as necessary to remove extraneous matter, marks and soiling and to lift the pile where appropriate.

Protection
Requirement: Provide fabric drop sheets. Do not use plastic sheeting. If wheeled traffic is to follow carpet installation, protect with hardboard sheets butted and fixed with adhesive tape.

Operation and maintenance manuals
Requirement: Prepare a manual that includes the following:

- A technical specification of the carpet installation.
- The manufacturer’s recommendations for use, care and maintenance of the carpet to AS/NZS 3733 (2018).
- The names and address of the supplier and manufacturer of each component.

Warranties
Type: [complete/delete]

Period: [complete/delete]

4 SELECTIONS

4.1 SCHEDULES

Carpet underlay schedule

	A	B	C
Subfloor			
Hard underlay			
Hard underlay thickness (mm)			

	A	B	C
Soft underlay: Use classification			
Soft underlay: Type			
Airborne sound insulation			
Impact sound insulation			

Carpet and laying schedule by ACCS/ECS

	A	B	C
Carpet type			
Generic type			
Product			
Slip resistance classification			
Colour and pattern			
Recycled material content			
Pile: Composition (backing and pile)			
Pile: Finish			
Pile: Length			
Pile: Thickness/height			
Backing thickness			
ACCS Grade			
ECS			
Suitable for Stairs Icon			
Treatments: Insect resistance			
Treatments: Electrostatic protection			
Critical radiant flux			
Dimensions (mm)			
Fixing method			
Seaming method			

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Tactile ground surface indicators schedule

	A	B	C
Product			
Type			
Edge protector			
Material			
Colour			

Carpet sundry fixtures schedule

	A	B	C
Product			
Type			
Adhesive type			
Finish			
Colour			

Recessed mats schedule

	A	B	C
Product			
Mat type			
Mat size (mm)			
Recess trim			

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0654 MULTILAYERED BOARD FLOORING

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide multilayered board flooring systems to substrates, as documented.

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Performance

Requirements:

- Securely fixed or floated.
- Smooth and flat, suitable for intended use.
- Able to accommodate expected shrinkage or expansion.

1.2 CROSS REFERENCES

General

Requirement: Conform to the following:

- *0171 General requirements*.

1.3 INTERPRETATION

Abbreviations

General: For the purposes of this worksection, the following abbreviations apply:

- MDF: Medium density fibreboard.
- HDF: High density fibreboard.
- PVA: Polyvinyl acetate.

Definitions

General: For the purposes of this worksection, the following definitions apply:

- Acoustic underlay: A resilient material laid between the subfloor and the flooring material to provide sound isolation.
- Flooring - adhesive fixed: Flooring that is adhesive fixed to the supporting subfloor.
- Flooring - floating: Flooring that is not fixed to the supporting subfloor but with boards fixed to each other.
- Flooring - multilayered board: Manufactured board flooring with a decorative wearing surface layer bonded to a core layer such as, solid timber, high-density plywood, HDF or polymer-based material, often with an attached underlay and proprietary glue-less jointing system or tongue and groove edge.
- Moisture content: The percentage by mass of water present in the material.
- Relative humidity: The amount of water vapour present in air, expressed as a percentage of the amount that could be held, at the same specified temperature.
- Subfloor: The structure that supports the flooring.
- Underlay: A non-structural layer of rubber, cork, plywood or in situ levelling compound to provide a smooth and flat surface for flooring installation. Rubber and cork underlays have acoustic sound absorbing properties.

1.4 SUBMISSIONS

Fire performance

Fire hazard properties: Submit evidence of conformity to **FIRE PERFORMANCE**, **Fire hazard properties**.

Operation and maintenance manuals

Requirement: Submit manual to **COMPLETION**, **Operation and maintenance manuals**.

Products and materials

General: Submit the following:

- Flooring product manufacturer's detailed handling and installation recommendations.

- Product data sheets.

Type tests: Submit test results for the following:

- Slip resistance: To PRODUCTS, **GENERAL**, **Tests**.

Samples

Requirement: Submit samples to PRODUCTS, **GENERAL**, **Samples**.

Tests

Site tests: Submit results, as follows:

- Subfloor moisture content test.

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Warranties

Requirement: Submit warranties to **COMPLETION**, **Warranties**.

1.5 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following:

- Subfloor and any subfloor space before installation of flooring material.
- Flooring material on site, before installation.
- Control and expansion joints, after installation.
- Perimeter expansion allowance, before concealing.

2 PRODUCTS

2.1 GENERAL

Samples

Requirement: Provide samples of each multilayered board flooring product illustrating the range of variation in colour, feature and pattern.

Storage and handling

General: Deliver flooring to site in unbroken boxes. Store in dry conditions equivalent to those suitable for the installation of the flooring, preferably in the installation location, a minimum 100 mm above the subfloor, to the manufacturer's recommendations. Do not store in areas with wet plaster or paint.

Formaldehyde emission class

Requirement: Maximum E1 or E_1.

Tests

Slip resistance: To AS 4586 (2013).

2.2 FIRE PERFORMANCE

Fire hazard properties

Critical radiant flux: Tested to AS ISO 9239.1 (2003).

2.3 UNDERLAYS

Moisture protection underlay

Floating flooring: Provide one of the following:

- Underlay with an integrated moisture vapour retarding layer, minimum 150 µm thick or with an SD value of 75 m or greater.
- Minimum 200 µm thick high-impact resistant polyethylene film.

Adhesive fixed flooring: Provide a moisture vapour retarding barrier applied to the subfloor surface, compatible with the subfloor, adhesive, any levelling compound and the documented flooring.

Floating flooring underlay

General: If the flooring is not provided with an integrated underlay, provide proprietary closed cell foam sheeting with acoustic properties if required, compatible with the subfloor, any levelling compound and the documented flooring.

Adhesive fixed flooring acoustic underlay

General: Provide proprietary acoustic underlay, if required, compatible with the subfloor, any levelling compound and the documented flooring, fixed to subfloor with compatible adhesive.

Levelling compound
General: Self-smoothing levelling compound applied to subfloor, compatible with the subfloor, any underlay and the documented flooring, including any adhesive.

2.4 ADHESIVES

General
Requirement: Polyurethane or polymer adhesive, to the flooring manufacturer's recommendations, compatible with the subfloor, underlay and documented flooring.

2.5 ENGINEERED FLOORING

Material
Description: Multilayered board flooring with a decorative layer of timber bonded over supporting layers beneath.

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2.6 LAMINATE FLOORING

Material
Description: Multilayered board flooring with a wearing surface of melamine, bonded typically to a supporting HDF core layer with a timber look finish.

2.7 BAMBOO FLOORING

Material
Description: Multilayered board flooring with boards typically made from layers of cut bamboo strands bonded together with adhesive. Boards may also be made from vertically or horizontally laminated bamboo pieces.

2.8 HYBRID FLOORING

Material
Description: Multilayered board flooring with a resilient decorative surface layer bonded to a supporting polymer-based core.

2.9 OTHER MATERIALS

Trim and accessories
Requirement: Provide trim and accessories compatible with, and matching, the documented flooring.

Tactile ground surface indicators
Standard: To AS/NZS 1428.4.1 (2009).

3 EXECUTION

3.1 PREPARATION

Cleaning
Requirement: Before installation remove loose material, dust and any deposits or existing finishes from the subfloor that may impair any adhesive performance or the location and functioning of expansion or control joints.

Subfloor flatness
Adhesive fix flooring: Conform to the manufacturer's recommendations for the maximum allowable surface deviation. If unknown, conform to a maximum 3 mm deviation of the surface under a 3 m straightedge laid in any direction.

Floating flooring: Conform to the manufacturer's recommendations for the maximum allowable surface deviation. If unknown, conform to a maximum 4 mm deviation of the surface under a 2 m straightedge laid in any direction.

Subfloor surface rectification
Solid or continuous subfloors: Remove excessive projections by abrasion or grinding and fill hollows and depressions with a levelling compound. Feather the levelling compound at all edges making sure that any primer used beneath the levelling compound has been covered or removed, prior to flooring installation.

Plywood and particleboard subfloors: If required to achieve a smooth finish, sand joints between sheets. Make sure that the subfloor is soundly fixed and free of squeaks.

Existing timber flooring subfloors: Sand to a flat and smooth surface. Make sure that the subfloor is soundly fixed and free of squeaks.

Subfloor moisture content

Concrete subfloor: Do not start installation of the flooring until the in-slab relative humidity of the concrete subfloor, tested to **TESTING**, **Subfloor moisture tests**, conforms to the manufacturer's recommended maximum %. If unknown, conform to maximum 80%.

In-slab relative humidity over 80%: If testing shows values in excess of 80%, consult with the manufacturer for what additional protection measures may be required.

Timber, plywood and particleboard subfloors: Do not start installation of the flooring until the moisture content of the subfloor, tested to **TESTING, Subfloor moisture tests**, conforms to the manufacturer's recommended maximum %. If unknown, conform to the following:

- Dry in-service environment (air conditioned buildings): 8 to 10%.
- Normal in-service environment (intermittently heated buildings): To 12.5%.
- Moist in-service environment (unheated buildings): 12.5% to 15%.

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Acclimatisation

Requirement: In addition to the requirements of **Storage and handling**, acclimatise the flooring to the manufacturer's recommendations.

Moisture vapour retarder barrier

Floating flooring: If required, lay over subfloor, lap a minimum of 300 mm and seal laps with 50 mm wide water resistant tape. Return up the vertical surfaces and trim at the finished level of the flooring.

Adhesive fixed flooring: Apply to subfloor surface, to the manufacturer's recommendations.

Floating flooring underlay

Requirement: Roll out to cover the subfloor, with integral moisture vapour retarding layer, if present, facing the subfloor. Butt together joints in underlay and tape if an integral self-adhesive overlap is not present.

3.2 TESTING

Subfloor moisture tests

Moisture content of concrete subfloor: Test subfloor in-slab relative humidity to ASTM F2170 (2019). Perform three tests for the first 100 m^2 of subfloor area and an additional test for each additional 100 m^2.

Moisture content of timber, plywood and particleboard subfloors: Test subfloor to AS/NZS 2098.1 (2006) for plywood subfloors or to AS/NZS 1080.1 (2012) for timber and particleboard subfloors.

3.3 INSTALLATION

Room environment

Site works: Do not commence installation until the following works are complete:

- Heating and cooling systems operational, if needed to achieve the manufacturer's recommended installation conditions.
- Lighting operational.
- Site drainage and stormwater works are complete.
- Space fully enclosed and secure.
- Wet work complete and dry.

General: Before and during installation, if the conditions are outside the anticipated in-service temperature of the room for that time of year, operate the heating system of radiant heated or air conditioned rooms to achieve the required conditions.

In-slab heating: Run heating and allow system to rest before flooring installation, to the time periods recommended by the flooring manufacturer. If unknown, run heating for 72 hours and rest for 24 hours before installation.

Flooring material

Inspection: Open packaging, if not already opened for acclimatisation and inspect boards for any visible defects, confirming product is correct, including colour, pattern and quantity. Do not use any materials showing visible defects or damage to the tongue and groove or glueless jointing system.

Laying multilayered board flooring

Method: To the manufacturer's recommendations.

Expansion and control joints: Provide as follows:

- Against vertical building elements: Provide allowance for expansion of between 8 to 15 mm, to manufacturer's recommendations.
- Flooring compartmentalisation: Divide large or complex shaped flooring areas into smaller square or rectangular shaped areas with the use of control and expansion joints, to the manufacturer's recommendations. Joints can be formed using proprietary trim.
- Over joints in subfloor: Provide a joint in the flooring to correspond with any expansion or control joints in the subfloor.

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Floating flooring:

- Do not fix to subfloor at any point.
- Do not butt against any vertical elements.
- Cut flooring around fixed furniture, such as kitchen units, if the furniture is fixed directly to the subfloor.
- Stagger board end joints in adjacent boards to the manufacturer's recommendations.
- For glued jointing systems use cross-linked PVA and remove any excess glue from the surface of the flooring with a clean cloth as installation progresses.

Adhesive fixed flooring: Provide ventilation, appropriate for curing, spread adhesive and lay boards to achieve the following:

- Provide a full bed adhesive application to achieve a minimum 80% contact between flooring and adhesive.
- Maintain perimeter expansion allowance.
- Make sure adhesive does not bleed through at joints and remove any excess glue from the surface of the flooring using the manufacturer's recommended cleaning product with a clean cloth as installation progresses.
- Remove excess adhesive progressively before initial cure.
- If recommended by manufacturer, weight down flooring in contact with the adhesive overnight to achieve complete adhesive transfer and bond.

3.4 COMPLETION

Skirting and scotia

Requirement: After flooring installation, fix skirting, scotia or trim, as documented, to vertical elements to cover the allowance for expansion. Do not fix to flooring.

Protection

General: Provide protection to the entire surface, as follows:

- Floors: Use a material that will not damage the installed flooring and will be safe to walk upon. Do not cover with sheet plastic. Make sure tape and other fixing materials are not applied directly to floors.
- Stair treads: Full timber or plywood casing.

Heated floor stabilisation

Requirement: If flooring has been installed over a heated floor, turn on the heating system again 48 hours after flooring installation and increase the temperature equally over a 5 day period up to the expected operating floor temperature and maintain this temperature for at least a further 2 weeks. Do not exceed the flooring manufacturer's recommendations for maximum temperature. If unknown do not exceed 27°C.

Spare flooring products

General: Supply an extra 5% of flooring products, to be stored on site as spares.

Storage location: [complete/delete]

Operation and maintenance manuals

General: Prepare a manual that includes details for the ongoing care and maintenance requirements of the installed flooring.

Warranties

Type: [complete/delete]

Period: [complete/delete]

4 SELECTIONS

4.1 PERFORMANCE

Flooring performance schedule

	A	B	C
Airborne sound insulation			
Impact sound insulation			
Environmental factors			
Critical radiant flux			
Product moisture content			
Slip resistance classification			

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4.2 PRODUCT

Engineered flooring schedule

	A	B	C
Product			
Fixing method			
Adhesive			
Timber wearing surface: Species or group			
Timber wearing surface: Recycled			
Profile			
Size (width x thickness) (mm)			
Control and expansion joints			
Underlay type			
Acoustic underlay: Product			
Acoustic underlay: Manufacturer			

Laminate flooring schedule

	A	B	C
Product			
Surface: Finish name			
Size (width x thickness) (mm)			
Control and expansion joints			
Underlay type			
Acoustic underlay: Product			
Acoustic underlay: Manufacturer			

Bamboo flooring schedule

	A	B	C
Product			
Fixing method			
Adhesive			
Finish			
Finish colour			
Profile			

	A	B	C
Size (width x thickness) (mm)			
Control and expansion joints			
Underlay type			
Acoustic underlay: Product			
Acoustic underlay: Manufacturer			

Hybrid flooring schedule

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	A	B	C
Product			
Fixing method			
Surface: Finish name			
Size (width x thickness) (mm)			
Control and expansion joints			
Underlay type			
Acoustic underlay: Product			
Acoustic underlay: Manufacturer			

Samples schedule

Item	Sample size	Number

Tactile ground surface indicators schedule

	A	B	C
Product			
Type			
Edge protector			
Material			
Colour			

0671B PAINTING

1 GENERAL

1.1 RESPONSIBILITIES

General
Requirement: Provide coating systems to substrates, as documented.

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1.2 CROSS REFERENCES

General
Requirement: Conform to the following:
- *0171 General requirements*.
- Architectural Drawings and Schedule
- Section 0511b Lining
- Section 0531b Suspended Ceiling
- Section 0611 Rendering and Plastering

1.3 STANDARDS

Painting
General: To the recommendations of those parts of AS/NZS 2311 (2017) referenced in this worksection.

1.4 SUBMISSIONS

Products and materials
General: Submit the following at least 3 weeks before the paint is required:
- Paint brand name and product range quality statement.
- The published recommendations for maintenance.

Samples
Requirement: Submit samples to PRODUCTS, **GENERAL**, **Samples**.
Submit:
- 300mm x 300mm sample of each paint type and colour on a representative substrate
- 300mm x 300mm sample of sealer on the specified substrate

1.5 INSPECTION

Notice
Inspection: Give notice so that inspection may be made of the following:
- Opaque paint finishes:
  - . After surface preparation.
  - . After application of final coat.
- Clear finishes:
  - . Before surface preparation of timber.
  - . After surface preparation.
  - . After application of final coat.

2 PRODUCTS

2.1 GENERAL

Samples
Requirement: Provide samples, as follows:

- Clear finishes: Labelled samples of each clear finish on representative timber or timber veneer substrates, including putty, stain, seal and coat, showing surface preparation, gloss level and other physical properties.
- Opaque paint finishes: Labelled samples of each paint system on representative substrates, showing surface preparation, colour, gloss level, texture and other physical properties.

Samples schedule

Substrate	Coating system	Colour	Number of samples	Sample size

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Storage and handling

General: Store materials not in use in tightly covered containers in well-ventilated areas with temperatures maintained at the manufacturer's recommendations.

Delivery: Deliver paints to the site in the manufacturer's labelled and unopened containers.

2.2 PAINTING MATERIALS

Standards

Paint types: To AS/NZS 2311 (2017) Table 4.2 and the following:

- Metal primer - general purpose for iron and steel: To AS/NZS 3750.19 (2008).
- Metal primer - latex for metallic zinc surfaces: To AS 3730.15 (2006).
- Metal primer - solvent-borne for ferrous metallic surfaces: To AS 3730.21 (2006).
- Metal primer - zinc-rich organic for iron and steel: To AS/NZS 3750.9 (2009).

Combinations

General: Do not combine products from different manufacturers in a paint system.

Clear timber finish systems: Provide only the combinations of putty, stain and sealer recommended by the manufacturer of the topcoat.

Putty and fillers

Material: To the recommendations of the paint system manufacturer, suitable for the substrate and compatible with the primer.

Tinting

General: Provide only products that are colour tinted by the manufacturer or supplier.

Toxic ingredients

General: To the *Therapeutic Goods (Poisons Standard) Instrument (2024)* Part 2 Division 9.

3 EXECUTION

3.1 PREPARATION

Order of work

Other trades: Complete the work of other trades as far as practicable within the area to be painted, except for the installation of fittings, floor sanding and laying flooring materials.

Clear finishes: Complete clear timber finishes before applying opaque paint finishes in the same area.

Protection

General: Clean the area and protect from dust contamination. Use drop sheets and masking agents to protect surfaces, including finished surfaces and adjacent finishes, during painting.

Fittings and furniture: Remove door furniture, switch plates, light fittings and other fittings. Attach labels or mark fittings using a non-permanent method, identifying location and refixing instructions, if required. Store and protect against damage.

Difficult to remove fittings and fixtures: If removal is impractical or difficult, apply surface protection before substrate preparation and painting.

Substrates

General: Prepare substrates to receive the documented paint systems to the manufacturer's recommendations and as follows:

- Generally: Clean the substrate surface without damaging the substrate or the surroundings.
- Timber surfaces where clear finishes will be applied: Prepare the surface so that its attributes will show through the clear finish without blemishes, including the following:
  - . Remove bruises.
  - . Remove discolourations, including staining by oil, grease and nailheads.
  - . Bleach if necessary to match the timber colour sample.
  - . Fine sanding, with the last abrasive no coarser than 220 grit, so that there are no scratches across the grain.
- Sound external surfaces other than timber: Prepare the surface as follows:
  - . Remove dirt, grease, loose and foreign matter, efflorescence and mould by water blasting or steam cleaning without damaging the surface.
  - . Remove remaining loose material with hand tools.
  - . Use sanding blocks to preserve the arrises of masonry and stone details.

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Filling: Conform to the following:

- Generally: Fill cracks and holes with fillers, sealants, putties or grouting cements as appropriate for the finishing system and substrate, and sand smooth.
- Timber surfaces where clear finishes will be applied: Provide filler or putty tinted to match the surface.

Efflorescence: Before cleaning, eliminate the source of salt and water. Before repainting, allow surface to dry for 15 to 30 days.

New masonry: Before painting, allow masonry to cure and pH level to stabilise for 30 days.

Treated surfaces: If surfaces have been treated with preservatives or fire retardants, make sure the coating system is compatible with the treatment and does not adversely affect its performance.

Substrate moisture content

Requirement: Use a moisture meter to demonstrate that the moisture content of the substrate is at or below the recommended maximum level for the type of paint and the substrate material.

Unpainted surfaces

Standard: To AS/NZS 2311 (2017) Section 3.

Previously painted surfaces

General: Prepare previously painted surfaces, as documented.

Preparation of a substrate in good condition: To AS/NZS 2311 (2017) clause 7.4.

Preparation of a substrate in poor condition: To AS/NZS 2311 (2017) clause 7.5.

Preparation of steel substrates with protective coatings: To AS 2312.1 (2014) Section 8 and AS 1627.1 (2003).

PVC-U: Clean with methylated spirit and a nylon scouring pad.

Wallcovering: Remove wallcovering and residual paste with clean water. Patch and repair substrate to a uniform surface before painting.

Lime wash paints: Remove by brushing with warm water or pressure washing.

Reconditioned damaged surfaces in galvanized steel: To AS/NZS 4680 (2006) Section 8.

3.2 PAINTING SYSTEMS

General

Number of coats: Except where one or two coat systems are documented, provide each coating systems with at least 3 coats or to the manufacturer's recommendations.

New unpainted interior surfaces

Standard: To AS/NZS 2311 (2017) Table 5.1.

New unpainted exterior surfaces

Standard: To AS/NZS 2311 (2017) Table 5.2.

Previously painted interior surfaces
Standard: To AS/NZS 2311 (2017) Table 8.2.

Previously painted exterior surfaces
Standard: To AS/NZS 2311 (2017) Table 8.3.

Specialised paint systems
Standard: To AS/NZS 2311 (2017) clause 5.2.

3.3 APPLICATION

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General
Standard: To AS/NZS 2311 (2017) Section 6.

Timing: Apply the first coat immediately after substrate preparation and before contamination of the substrate can occur. Apply subsequent coats after the manufacturer's recommended drying period has elapsed.

Light levels
General: ≥ 400 lux.

Conditions
General: Unless the coating is recommended by the manufacturer for such conditions, do not apply under the following conditions:

- Rainy conditions.
- Dusty conditions.
- Relative humidity: > 85%.
- Surface temperature: < 10°C or > 35°C.
- Temperature: Within 3°C of the dew point.

Priming timber before fixing
General: Before fixing in position, apply 1 coat of wood primer and 2 coats to end grain to the back of the following:

- External fascia boards.
- Timber door and window frames.
- Tops and bottoms of external doors.
- Associated trim and glazing beads.
- Timber board cladding.

Spraying
General: If the application is by spraying, use conventional or airless equipment that conforms to the following:

- Satisfactorily atomises coating being applied.
- Does not require coating to be thinned beyond the maximum amount recommended by the manufacturer.
- Does not introduce oil, water or other contaminants into the applied coating.

Coatings with known health hazards: Not permitted on site.

Sanding
Clear finishes: Sand the sealer using abrasives no coarser than 320 grit without cutting through the colour. Take special care with round surfaces and edges.

Repair
Requirement: Clean off marks, paint spots and stains progressively and restore damaged surfaces to their original condition.

Repair of galvanizing
Cleaning: For galvanized surfaces that have been subsequently welded, power tool grind to remove all surface contaminants, including rust and weld splatter. Prime affected area immediately after cleaning.

Primer: Type 2 organic zinc-rich coating for the protection of steel to AS/NZS 3750.9 (2009).

Windows
Operation: Make sure opening windows function correctly before and after painting.

Doors
Drying: Maintain door leaf in the open position during drying. Do not allow door hardware or accessories to damage the door finish during the drying process.

Wet paint warning
Notices: Place notices in a conspicuous location and do not remove until the paint is dry.

3.4 COMPLETION

General
Protection and masking: Remove masking and protection coverings before paint has dried.

Cleaning: Remove splatters by washing, scraping or other methods that do not scratch or damage the surface.

Reinstatement: Repair, replace or refinish any damage, including damage made by other trades. Touch up new damaged paintwork or misses only with the paint batch used in the original application.

Fittings: Refix removed and undamaged fittings in the original locations. Make sure they are properly fitted and in proper working order.

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Disposal of paint and waste materials
Requirement: Conform to requirements of the local authority.

4 SELECTIONS

4.1 PAINTING SCHEDULES

Paint colours schedule
Refer 'Studio Johnston' Architectural specifications for painting schedule

Substrate	Number of colours

Interior painting schedule

Paint code	Substrate	Intermediate coat(s)	Final coat	VOC limit (g/L)	Paint reference No. to AS/NZS 2311 (2017)	Colour reference

Exterior painting schedule

Paint code	Substrate	Intermediate coat(s)	Final coat	Paint reference No. to AS/NZS 2311 (2017)	Colour reference

4.2 ADDITIONAL REQUIREMENTS

Paint system characteristics schedule

Paint code	Characteristic	Requirements

Particular preparation requirements schedule

Substrate	Location	Condition	Preparation method	Applicable standard

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211086

IVANHOE – BUILDING C3

MIDTOWN PRECINCT

CONCRETE SPECIFICATION

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DOCUMENT REGISTER

PREPARED BY	APPROVED BY	STATUS	ISSUE	DATE
Hung Nguyen	Hung Nguyen	Tender	A	March 2022

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1 GENERAL CONCRETE

1.1 GENERAL REQUIREMENTS

Standard: Construct the concrete work in a safe manner using materials and methods complying with the relevant requirements of AS 3600 and AS 3610. For concrete structures used for retaining liquids comply also with the relevant requirements of AS 3735.

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Survey Certificates: These are to be certified by a licensed surveyor.

Costs: All items and associated costs referred to in this Specification and the Structural/Civil drawings shall form part of the Contractor's sum, unless noted otherwise. All Materials are to be supplied including wastage and over-supply construction.

Notice: Should any ambiguity, error, omissions, discrepancy or other faults exist or seem to exist in the contract documents then promptly notify in writing to the Superintendent.

Variations: Should the Contractor consider that a variation to the contract exists, then they should refer immediately to the superintendent and obtain written approval prior to variation work proceeding. Refer Contract Conditions.

1.2 SAFETY IN DESIGN

So far as is reasonably practicable, TTW has identified potential risks to the health and safety of persons who may be affected by the structural design.

Identified hazards & risks have been included in the Structural Risks and Solutions Register which has been forwarded to Taylor Thomson Whitting's Client.

The principal contractor must familiarise itself with the hazards and risks identified in the report and the measures proposed to eliminate or mitigate those hazards and risks.

The principal contractor must notify TTW in a timely manner should they require any further information regarding any identified hazards or risks related to the structural design. If no request for further information is received the project principal contractor acknowledges that the information provided is adequate for its purpose.

The provision of such advice by TTW does not release the principal contractor from its own health and safety obligations under any legislation, contract or otherwise.

1.3 QUALITY ASSURANCE

REQUIREMENT: A quality management system complying with the appropriate current Australian standard is required for a specified product or service, or in any case where the supplier already has in place such a system, provide assurance of quality in terms of that system.

Programme**:** Submit a copy of the Contractors quality assurance programme with the tender.

During the construction phase, the Contractor shall provide a written verification to the Superintendent that they have completed a quality assurance and control procedure on the construction works detailed in the specifications and drawings.

Description: Provide a written description of each quality management system, with specific reference to the following:

- the relevant Australian standard;
- where the standard provides for classification levels, the level adopted;
- the scope and field of application;
- the personnel involved and their responsibilities:
- Inspection Test Plans (I.T.P's)
- The various procedures required by the standard including those for management review, contract review, design and document control, process control, inspection and testing, etc.;
- the quality audit system;
- Where external quality audits are required by a recognized independent organizations, the name of that organization;
- other relevant information.

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Quality control: The Contractor shall submit their Construction Method Statement and Inspection Test Plan (I.T.P) for each work procedure to the Superintendent for approval for a minimum of 14 days prior to commencing the relevant work. I.T.P's shall include checklists showing that the Contractor has checked that the work has been completed in accordance with the specifications and drawings and showing testing and inspection requirements.

1.4 ADJOINING ELEMENTS

Requirement: Obtain the requirements for adjoining elements to be fixed to or supported on the concrete and provide for the required fixings. Where applicable provide for temporary support of the adjoining elements during construction of the concrete.

1.5 VARIATIONS TO STRUCTURAL DRAWINGS

Should changes to the design/drawings be requested by the contractor, then the Contractor is to liaise with the Superintendent's representative and allow for all co-ordination and shop drawings to suit this process and shall be at the Contractors expense.

1.6 PROPRIETARY PRODUCTS

Where proprietary products are nominated on the drawings or in the specification, the Contractor shall provide in writing to the superintendent from the proprietary product manufacturer certification and warranty specifically for its intended purpose and performance for this project prior to the product being ordered or used and that the product is suitable for its intended use in the project. The manufacturer shall visit the site during construction and at completion of construction to certify in writing that the work has been carried out in accordance with their requirements. It is also the responsibility of the manufacturer to ensure that individual components of the proprietary product have not been substituted with alternative products.

Alternative to Proprietary Products: An alternative product having the required properties may be offered for review. The Superintendents Representative may in his absolute discretion approve or reject the alternative. No claim shall arise from any rejection.

Unless otherwise agreed, alternatives shall not be ground for any claim for variation to cost or time. When offering an alternative for review, provide all available technical information, and any other relevant information requested by the Superintendent's representative. If so

requested, the contractor shall obtain and submit reports on relevant tests by an independent testing authority. Failure by the contractor to submit sufficient information to allow the superintendent to review the product will result in its rejection.

State whether the use of the alternative will require alteration to any other part of the Works. If the alternative is accepted, carry out any such alteration without extra charge.

1.7 PRODUCT DATA

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Requirement: Before installation commences provide the following information:

Manufacturer's data: The Manufacturer's published product data including:

- technical specifications,
- recommendations for installation and maintenance
- type test or factory test data.
- performance and rating tables

Testing authorities reports: Test reports certified by an independent testing authority showing compliance with the criteria of specified tests.

Product warranties: The Manufacturer's written statement certifying the product complies with the Specification and is suitable for the intended use.

Approval of installer: If the installation is not by the Manufacturer, and the Manufacturer warranty is conditional on his approval of the installer, the manufacturer's written approval of the specialist installation firm is to be provided.

1.8 NON CONFORMING WORK

Where a section of works does not comply with the requirements of the specification and drawings (including requirements for inspection and testing) the Contractor shall submit a non-conformance report detailing the proposed rectification method to the Superintendent for approval. Where the Superintendent deems that the proposed rectification method and work is to be reviewed and/ or inspected by the relevant consultant(s), this review and inspection shall be at the contractor's expense.

1.9 INSPECTION

It is the Contractors responsibility to construct the works in accordance with the specifications and drawings and any inspections by the Superintendent's representative shall not be construed as relieving or relaxing this requirement. The Superintendent and their representatives are not fulltime or part time inspectors for the Contractor, and any inspections made are for the Superintendents purpose only.

Bookings

General Contractor's Foreman is to check all work that is to be inspected for compliance with documents before confirming booking of site inspection.

Where inspection by the Superintendent's representative is required or notification to the Superintendent to allow opportunity to inspect is required, please give minimum 24 hours notice of required inspection.

Book inspections through Taylor Thomson Whitting. Phone to confirm inspection 4 hours before appointed time.

Scheduled inspections should be cancelled a minimum of 4 hrs prior to the scheduled time if work will not be ready for inspection. Phone for cancellations, e.g. due to bad weather, as soon as possible, otherwise a charge for inspection may be incurred.

Inspection Times

Hours 8.00 am to 4.00 pm Monday to Friday only.

Generally no site visits on Saturdays, Sundays or Public Holidays except in emergency situations and by special booking.

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Allow sufficient time, and not less than 4 hours prior to concreting, for the carrying out of the inspection.

Revisits

If the area of work is not completed at the scheduled time of inspection or is defective and requires re-inspection, re-inspection shall be at the Contractors expense. Follow normal booking procedures.

The Superintendent's representative cannot wait on site for work to be completed. However, if the Contractor requests the Superintendent's representative to wait on site while work is being completed then this will be charged to the Contractor at an hourly rate.

Documents

Keep copy of all specifications, current drawings and a drawing register on site.

Drawings approved by the Certifying Authority for CC or BA shall be held on site.

Keep copies of all Inspection Reports on site.

Alterations

Do not accept verbal approval of alterations.

Superintendent's representative should approve alterations in writing.

Responsibilities

The Contractor's Foreman is to accompany the Superintendent's representative on his inspections.

Any inspection carried out by the Superintendent's representative does not relieve the Contractor of his responsibility to construct the structure or works in accordance with the drawings and specifications.

Certificates by the Superintendent's representative do not relieve the Contractor of his obligation to obtain approvals from authorities having jurisdiction over the works.

1.10 WORKSHOP DRAWINGS

General

Where shop drawings are required by this Contract to be supplied by the Contractor, such shop drawings shall include drawings, diagrams, illustration, schedules, performance charts, brochures and other data prepared by the sub-Contractor, manufacturer, supplier or distributor illustrating some portion of the work.

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The Superintendent shall receive shop drawings only for conformity with the design concept of the project and the information given in the contract Documents. The Superintendents permission to use a separate item will not indicate permission to use any assembly in which the item functions.

Number of copies: For each drawing, supply free of charge not less than three copies in the form of prints on paper or provide 1 copy in Adobe PDF format.

Shop drawings shall be thoroughly checked by the Contractor for completeness and for compliance with the Contract Documents before submitting them to the Superintendent and shall bear the Contractor's stamp of approval certifying that they have been checked.

Shop drawings submitted without this stamp of approval and certification, and shop drawings which, in the Superintendent's opinion are incomplete, contain numerous errors or have not been checked or only checked superficially, will be returned unchecked by the Superintendent for resubmission.

The drawings shall show, in standard Engineering drawing manner, clear and complete details of each assembly, component and connection of the work, together with all information, including surface treatment and erection.

In checking shop drawings the Contractor shall verify dimensions and site conditions and shall check and co-ordinate the shop drawings of any section or trade with the requirements of other sections or trades whose work is related thereto, as required for proper and complete installation of the work. Corrections required by the Superintendent shall be made and the shop drawings resubmitted until permission is given for their use.

The Engineering drawings shall be read in conjunction with the Architectural drawings and all other relevant drawings and provision made for all fixings noted therein.

Drawings will not be checked dimensionally for correctness of holes and cleats to suit other building trades. Drawings rejected by the Superintendent's representative shall be corrected and re-submitted before fabrication and shall not constitute a claim for extension of time.

Shop drawings shall be submitted suitably identified and in orderly sequence to cause no delay to the works. Drawings submitted shall correspond to the size of the contract drawings where practical.

Time required for examination: The Contractor shall provide the programme for shop detailing including the number of drawings in each issue making allowance for the examination time required by the Superintendent's representative. Minimum time required: 10 working days.

Construction: Do not commence construction until permission to use the relevant shop drawings has been obtained.

Work-as-executed drawings and Survey certificates required for all work shop drawings and all concrete elements.

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2 CONCRETE FORMWORK

2.1 GENERAL

2.1.1 CROSS REFERENCES

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General

Conform to the General requirements worksection.

Related sections

Conform to associated worksections as follows:

- Concrete finishes.
- In situ concrete.
- Concrete reinforcement.

2.1.2 STANDARD

Any reference documents are as a guide only and the Contractor shall source all appropriate standards and codes and the latest editions are to be adopted.

General

Formwork design and construction: To AS 3610 and Workcover NSW Formwork Code of Practice 1998

2.2 QUALITY

2.2.1 INSPECTION

Witness points

Give a minimum of 2 working days notice and provide the necessary access so that inspections may be made of the following:

- completed formwork before concrete placing.
- evaluation of the finish.
- used formwork, after cleaning and before reuse.

Hold points

- Contractor's Formwork Engineer's certificate confirming adequacy of formwork and falsework prior to casting concrete.

NB: To be included in the contractor's quality assurance submission.

Superintendent to be notified to allow opportunity for inspection if required.

2.2.2 CONTRACTOR'S SUBMISSIONS

Design

Submit formwork drawings and calculations prepared by a professional formwork engineer registered on NPER and experienced in formwork design to show that the allowable concrete stresses will not be exceeded if:

- formwork procedures or loadings differ from the information included in the project documentation;
- project documentation does not include formwork shoring or stripping procedures or allowable loadings from stacked materials; or
- props above a floor do not coincide with the props below.

Certification: Submit certification by a professional formwork engineer registered on NPER and experienced in formwork design for verifying conformance of the design for the formwork, false work and back propping.

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Execution proposals

Certification: Submit certification by a professional formwork engineer registered on NPER and experienced in formwork design and construction for verifying conformance of the completed formwork, false work and back propping prior to concrete placing.

Documentation: Submit formwork documentation in accordance with AS 3610 clause 4.7 together with details of proposed form linings, form coatings, release agents and where applicable, reuse of formwork. Submit details of support propping required for construction loads which exceed design loads for concrete of that age.

Reshoring/Backpropping: If intended, submit proposals.

Slip formwork: Show on formwork drawings the method of lifting the forms during construction and the average rate of movement. Demonstrate that the proposed average rate will permit the production of concrete of the specified quality and surface.

Stripping multi-storey suspended work: If the requirements of AS 3610 cannot be met, or if shores are not concentric floor to floor, submit formwork documentation with reference to loads and concrete properties.

Stripping single storey suspended work: If the requirements of AS 3610 cannot be met, give notice.

The contractor shall submit details of the proposed formwork cycles including;

- Floor cycle time
- Number of levels of undisturbed props
- Number of levels of back propping
- Method statement for stripping and back propping and back propping layout

If the recommendations regarding back propping and stripping of AS3600 and AS3610 are not followed, the contractor shall submit calculations and details from a professional formwork engineer registered on NPER and experienced in formwork design and construction to show the proposed method will not overstress the structure.

Surface repair method: Before commencing repairs, submit the proposed method.

Tests

Void formers: Submit test certificates to confirm that the formers comply with the following requirements, under laboratory conditions, when placed on damp sand and loaded with a mass of wet concrete at least the same mass of the beams or slabs they are required to support:

- Additional deflection between initial set and 7 days does not exceed span/400.

- Collapse and loss of load carrying capacity will occur not more than 48 hours after flooding with water, creating a void at least 60% of the original depth of the void former.
- Deflection during placing and compaction of the concrete is less than the span of the beam or slab divided by 1000.

2.3 EXECUTION

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2.3.1 MATERIALS AND COMPONENTS

Form linings and facings

Compatible with finishes applied to concrete.

Lost formwork

Not to contain timber or chlorides and not to impair the structural performance of the concrete members.

Release agents

Compatible with applied finishes to concrete and the contact surfaces.

Void formers

To be unwaxed cardboard or fibreboard, collapsible on absorption of moisture.

Steel decking

Acts as permanent formwork and positive tensile reinforcement in one way reinforced concrete slab construction. Type of steel decking to be as shown on structural drawings

2.3.2 FORMWORK

General

The Contractor is responsible for the design and construction of the formwork, false work and back propping.

Design and construct the formwork so that the concrete, when cast in the forms, will have the required dimensions, shape, profile, location and surface finish. Allow for dimensional changes, deflections and cambers resulting from the application of post-tensioning forces (if any), applied loads, temperature changes and concrete shrinkage and creep.

Install cast in items for wall cladding and formwork penetrations.

Openings: In vertical forms provide form openings or removable panels for inspection and cleaning at the base of columns, walls and deep beams. For thin walls and columns, provide access hatches for placing concrete.

Responsibility: The Contractor is responsible for the sufficiency of the formwork, except to the extent, if any, that formwork design is shown on the drawings or specified.

Cleaning

Before placing concrete, remove free water, dust, debris and stains from the forms and the formed space.

Corners

Work above ground: Chamfer at re-entrant angles, and fillet at corners.

- Face of bevel 25 mm.

Drip Grooves

Provide drip grooves or alternative form to external slab soffits adjacent vertical concrete surfaces to architects details. If none shown submit proposal for approval.

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Embedments

Fix embedments through formwork to prevent movement, or loss of slurry or concrete, during concrete placement.

Air bleed holes in formwork sills

Formwork sills are to have air bleed holes installed at 300mm maximum spacing so air pockets are not created.

Release agents

Before placing reinforcement, apply a release agent compatible with the contact surfaces, to the interior of the formwork, except where the concrete is to receive an applied finish for which there is no compatible release agent. Clean the reinforcement to remove all traces of release agent. Do not allow release agent to “puddle”.

Steel linings

Clean off any rust and apply rust inhibiting agent prior to re-use.

Defective formwork

If formwork fails to meet the requirements of the contract, any concrete which has been cast in it may be rejected. In that case, remove the rejected concrete, form construction joints, reconstruct the formwork and recast the concrete. Submit proposals for approval prior to recasting concrete.

2.3.3 DIMENSIONAL TOLERANCES

Dimensional tolerances

Position: Construct formwork so that the position of finished concrete is within the tolerances stated in AS3610 and AS3600 but not exceeding tolerances stated in the Position tolerances table and Construction adjacent property boundary section below.

Plumb of elements > 8m high: 15mm.

Construction adjacent property boundary

For construction adjacent property boundaries the dimensional or position tolerance is to be maximum 10mm towards the boundary.

Table 2-1: Position tolerances table

Surface finish class to AS 3610	1	2	3	4	5
Maximum deviation from correct position (mm)	10	15	20	25	40

2.3.4 FORMED SURFACE FINISH

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General

Conform to the Formed Surface Schedule.

Table 2-2: Formed Surface Schedule

Concrete element or surface	Surface Finish Class to AS 3610	Form lining type	Bolt hole filling
Visibly exposed Columns, Beams, Stairs, Walls, Slabs.	2	Plastic faced plywood to AS 3610 table 3.3.1	Cement grout finished flush
Precast Typical.	2	To comply with AS 3610	Cement grout finished flush
Civil Engineering Works, Unexposed columns, beams, walls, stairs and slab soffits	3	To comply with AS 3610 Table 3.3.1	Cement grout finished flush
Circular Columns Exposed to View	2	Round column formers with lining to achieve Class 2 finish	N/A
Circular Columns Concealed from general view or to have thick applied finish	4	Steel spiral form duct	N/A
Surfaces to receive render	4	To comply with AS 3610 Table 3.3.1	Cement grout finished flush
Surfaces to be Permanently Concealed: eg. Footings; rear faces of retaining wall	5	To comply with AS 3610 Table 3.3.1	Cement grout finished flush

Colour control to AS 3610: Use form linings not inferior to those described as "suitable" in AS 3610 Supplement 2 Table C5.4.1.

Table 2-3: Colour control table

Location	Class	% of Reachings	Tone
Concrete Surfaces	2C	90	6

Note: Method of specifying colour shall range within the 10 tonal scales of AS3610, App B.

Visually important surfaces

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For concrete of surface finish classes 1, 2 or 3, set out the formwork to give a regular arrangement of panels, joints, bolt holes, and similar visible elements in the formed surface.

In accordance with section 1.3 The Contractor shall submit their Construction Method Statement and I.T.P which as a minimum shall include formwork cleaning, formwork class achieved, corner bevels incorporated, no exposed post tensioning anchors, no exposed grout tubes and method of vibration of concrete. These are to be submitted to the Superintendant a minimum of 14 days prior to commencing the relevant work.

Form 45^{o} bevels, 25 mm on the face on corners and angles.

Colour: refer to section 5.2.4 and table Table 5-4 Concrete performance schedule.

Placing and compaction: Ensure that the vibrators do not come into contact with the formwork during concrete placing and compaction. Refer to section 5.3.6 PLACING AND COMPACTION.

Evaluation: If the Superintendent considers that the formed surface finish of the completed work does not comply with the specification he may require evaluation of the finish in accordance with AS 3610 clause 5.6. In this case evaluation shall be carried out by the Contractor in the presence of the Superintendent.

Surface repair: To AS 3610 clause 5.6.5.

Exclusion: Repairs to Class 1 surfaces are not permitted.

Method: Before commencing repairs, submit the proposed method.

2.3.5 FORM TIE BOLTS

Bolt hole filling

Durability: Provide material with durability and colour matching the concrete.

Recessed filling: Fill or plug the hole to 6 mm below the surface.

Cover

Position formwork tie bolts left in the concrete so that the tie does not project to within 50 mm of finished surface.

Removable bolts

Remove the bolts without causing damage to the concrete.

2.3.6 SLIP FORMWORK

General

Description: Slip formwork or moving formwork which consists of suitable equipment, constructed and operated by personnel experienced in its use.

Height of the forms

Height of the forms to be 1200mm maximum.

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Provision for inspection

Provide a hanging scaffold below the moving formwork, from which surface treatment and inspection may be carried out.

2.3.7 VOID FORMERS

General

Cast designated suspended ground floor slabs and beams on void formers. Keep void formers dry until use, place them on a firm level surface, cover with a waterproof membrane, and place reinforcement and concrete with minimum delay.

Test certificates: refer section 2.2.2.

2.3.8 STEEL DECKING

Installation

General: Fix sheeting to structural steel supports with puddle welds, or with welded shear studs in composite construction.

Construction to be in accordance with manufacturer's recommendations where the requirements of the relevant Australian Standards are less stringent.

Propping: Provide temporary propping to the manufacturer's requirements at locations indicated on structural drawings during concrete placing and curing.

2.3.9 STRIPPING AND REMOVAL

Formwork removal

Extent: Remove formwork, other than steel reinforcement decking, including formwork in concealed locations.

Timing: Do not disturb forms until concrete is hard enough to withstand it. Do not remove formwork until approval given by Superintendents Representative. Back propping or reshoring shall comply with AS 3600.

Loading before stripping

Do not erect masonry walls or other permanent loading on the structure while it is still supported by formwork.

Stripping of formwork

General: To AS 3600 where it is more stringent than AS 3610.

Multi-storey work: Provide for stripping without disturbing props supporting succeeding floors.

Post-tensioned concrete: Do not remove form supports supporting post-tensioned concrete members until sufficient post-tensioning has been added to support the loads.

Back propping: Submit formwork drawings of stripping and back propping. Do not remove back propping without the superintendent's approval.

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3 CONCRETE REINFORCEMENT

3.1 GENERAL

3.1.1 CROSS REFERENCES

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General

Conform to the General requirements worksection.

Related sections

Conform to associated worksections as follows:

- Concrete formwork.
- In situ concrete.

3.1.2 STANDARDS

Any reference documents to as a guide only and the Contractor shall source all appropriate standards and codes and the latest editions are to be adopted.

General

Steel reinforcing materials: To AS/NZS 4671.

3.2 QUALITY

3.2.1 INSPECTION

Witness points

Give a minimum of 2 working days notice and provide the necessary access so that inspections may be made of the following;

- Reinforcement fixed in place.
- Cores and embedments fixed in place.

Hold points

- Reinforcement fixed in place.

Do not proceed until Superintendent's representative's inspection report is received and all items that require rectification are complete.

NB: To be included in the contractor's quality assurance submission.

Superintendent to be notified to allow opportunity for inspection if required.

3.2.2 CONTRACTOR'S SUBMISSIONS

Certification

The reinforcement material supplier must be certified by the Australian Certification Authority for Reinforcing Steels Ltd for the supply of reinforcement material. Submit current certificate.

Refer http://www.acrs.net.au/Certificates/Cert_Home.html for current certificate holders.

Execution

Changes: Submit proposed changes, if any, in the reinforcement shown on the drawings, including additional splicing.

Damaged galvanising: If repair to AS/NZS 4680 Appendix E is intended, submit proposals.

Mechanical splices: If mechanical bar splices are proposed or required submit details and test certificates for each size and type of bar to be spliced.

Provision for concrete placement: If spacing or cover of reinforcement does not comply give notice.

Splicing: Submit details of any additional splicing not documented.

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3.3 EXECUTION

3.3.1 REINFORCEMENT

General

Extent: Supply and fix reinforcement, including the necessary tie wires, welding, support chairs, spacers and accessories.

Ductility grade: To AS/NZS 4671 class N.

Identification: To AS/NZS 4671 Section 9.

Surface condition: Free of loose mill scale, rust, oil, grease, mud or other material which would reduce the bond between the reinforcement and concrete.

Dowels

Standard: To AS/NZS 4671 grade 250N.

General: Provide each dowel in one piece, straight, with square cut ends free from burrs. Provide dowel expansion covers or apply 2 coats of bitumen emulsion to half the length of the dowel at one end. Refer to drawings.

Bending

General: To AS 3600.

Bending of bars only permitted in locations shown on the structural drawings. Do not heat bars to be bent. Do not bend galvanised bars.

Only N12 or N16 quenched and self tempered reinforcement may be used as pullout bars, using tools that maintain pin diameters given in AS 3600 and using a single smooth bending action. Cast the bar with the bend kept clear of the concrete. Do not use heat to bend bars.

Bending of bars where required must also be to manufacturer's approval and recommendations to ensure properties of reinforcement are not adversely affected.

Fabrication tolerances

General: To AS 3600.

Tie wire

General: Annealed iron 1.25 mm diameter (minimum).

3.3.2 PROTECTIVE COATED REINFORCEMENT

Damage

If damage occurs to the coating undertake the following action:

- Galvanized coatings: Replace the damaged reinforcement.

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Extent

For concrete elements containing protective coated reinforcement, provide the same coating type to all that element's reinforcement and embedded ferrous metal items, including tie wires, stools, spacers, stirrups, plates and ferrules, and protect other embedded metals with a suitable coating.

Galvanising

Standard: To AS/NZS 4680

Sequence: Galvanize after fabrication.

Passivation: By dipping in 0.2% sodium dichromate solution.

Preparation: Pickling to AS 1627.5.

Zinc coating (minimum): 700 g/m^2.

3.3.3 REINFORCEMENT SUPPORTS

General

Provide proprietary concrete, metal or plastic supports, adequate to withstand construction and traffic loads, and in the form of chairs, spacers, stools, hangers and ties. Supports are to ensure clear covers to reinforcement from concrete surfaces are maintained as noted on the drawings. If ferrous metal supports extend to the surface of the concrete, or are used with galvanized reinforcement, provide a protective coating.

Exposure classification A1 (i.e. internal slabs and protected elements):

- Provide a protective coating to ferrous metal supports which extend to the surface of the concrete, or which are used with galvanized or zinc-coated reinforcement.

Exposure classifications more severe than A1: Provide either

- plastic supports of adequate strength and of a shape appropriate to the location or;
- concrete supports of the same concrete quality as the concrete element.

Concrete cover

General structures: To AS 3600.

Structures for retaining liquids: To AS 3735.

Supports over membranes

General: Prevent damage to waterproofing membranes or concrete underlays. Place a metal or plastic plate under each support.

Support spacing

General: Provide supports in adequate numbers and spacing to maintain reinforcement in the correct position within the tolerances under the Fixing requirements subclause.

Standard: To AS 3600.

Minimum spacing:

- Bars: ≤ 60 diameters.
- Fabric: ≤ 800 mm.

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Tolerances

To AS 3600.

3.3.4 FIXING REINFORCEMENT

Dowels

Fixing: If the dowel has an unpainted half, embed this in the concrete first.

Tolerances:

- Alignment: 2 mm in 300 mm.
- Location: ± half the diameter of the dowel.

Fixing requirements

General: Secure the reinforcement against displacement by tying at intersections with either annealed iron 1.25 mm diameter (minimum) wire ties, or clips. Bend the ends of wire ties away from nearby faces of forms so that the ties do not project into the concrete cover.

Beams: Tie ligatures to bars in each corner of each ligature. Fix other longitudinal bars to ligatures at 1 m maximum intervals.

Bundled bars: Tie bundled bars together so that the bars are in closest possible contact. Provide tie wire at least 2.5 mm diameter at centres ≤ 24 times the diameter of the smallest bar in the bundle.

Columns: Secure longitudinal column reinforcement to all ligatures at every intersection.

Starter bars: Prior to the concrete placing, all starter bars shall be positioned and secured by the Contractor, to ensure correct location and alignment of bars. Costs associated to redesign and/or relocate starter bars that have not been positioned and secured adequately shall be at the Contractors expense.

Mats: For bar reinforcement in the form of a mat, secure each bar at alternate intersections, and at other points as required.

Tolerances: To AS 3600 Section 19.

Splicing

General: To AS 3600 Subsection 13.2, for splicing additional to that documented. Obtain approval outlined in section 3.2.2 before implementation.

Welding

General: Do not weld reinforcement

- except where documented, or submitted and approved;
- within 75 mm of a bend with an internal radius < 12 bar diameters; or
- at points which have been re-bent.

Standard: To AS 1554.3.

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Certificate of compliance: Obtain from the manufacturer and furnish a certificate of compliance with the relevant standard AS 4671. Alternatively furnish test certificates from an independent testing authority. All reinforcement welds must be certified and approved by the above procedure before concrete works commence.

3.3.5 REINFORCEMENT PROTECTION

Unencased reinforcement

General: Provide protection for 'starter bars' and other items projecting from cast concrete for future additions, and exposed to the weather.

4 CONCRETE POST-TENSIONING

4.1 GENERAL

4.1.1 CROSS REFERENCES

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General

Conform to the General requirements worksection.

Related sections:

Conform to associated worksections as follows:

- Concrete formwork
- In situ concrete
- Concrete reinforcement

4.1.2 STANDARD

Any reference documents are as a guide only and the Contractor shall source all appropriate standards and codes and the latest editions are to be adopted.

General

Post-tensioning: To AS 3600.

4.1.3 INTERPRETATION

Definitions

General: For the purposes of this worksection the following definitions apply:

- Tendon: assembly of anchorages, duct and strand or bar
- Extension: elongation of strand or bar

4.1.4 INSPECTION

Witness points

Give a minimum of 2 working days notice and provide the necessary access so that inspections may be made of the following:

- Tendons fixed in place.
- Commencing initial or incremental stressing.
- Stressing strands or bars.
- Grouting tendons.
- Grouting of anchorage pockets.

Hold points

- Tendons fixed in place.
- Cut strands at anchorages prior to grouting anchorage recess.

Do not proceed until Superintendent's representative's inspection report is received and all items that require rectification are complete.

NB: To be included in the contractor's quality assurance submission.

Superintendent to be notified to allow opportunity for inspection if required.

4.1.5 TESTS

General

Sample, test and assess the concrete for compliance.

Standard: To AS 1379.

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Testing authority

Carry out testing and assessment of concrete and concrete materials using an authority registered with the National Association of Testing Authorities Australia (NATA) to perform the specified testing. Location of test results shall also be provided and referred to a structural element shown on the structural drawings (eg. Column 72 Level 3, wall 20 Level 6).

Frequency of sampling

Spread the site sampling evenly throughout the pour. The following minimum requirements shall apply in addition to those in AS 1379 but not less than project control testing (Table 5-5), in accordance with Table 4-1 .

Post-tensioned concrete: For each post-tensioned element, take at least 3 test samples for 3 day, 7 day and 28 day testing, from well distributed locations including the anchorage areas. Cure the 3 day and 7 day samples on site by the same method as the post-tensioned element from which it was taken. For hot weather construction the samples are to be kept in insulated compartments on site, to laboratory requirements, and cured by the same method as the post-tensioned element from which it was taken.

The 3 and 7 day samples may be tested on different days to suit the post-tensioning and construction sequence.

Acceptance criteria: The average strength of the samples representing an element shall be not less than the specified strength i.e. the ‘3 day’ samples to be used for 9MPa (1-2 day) early age strength and ‘7 day’ samples used for 22MPa (4-5 day) early age strength.

Refer Table 5-5 for additional control testing requirements for post tensioned water proof slabs. Concrete samples for early age compressive strength shall be taken close to the end of the concrete pour.

Table 4-1: Samples for batches

NUMBERS OF BATCHES PER DAY	NUMBER OF SAMPLES
1	1
2 TO 5	2
6 TO 10	3
11 TO 20	4
For each additional 10 batches, one additional sample shall be taken	

Grout for Tendon Ducts

Refer Table 4-2 below.

Table 4-2: Grout Testing for post-tensioning tendon ducts

GROUT FOR TENDON DUCTS	REQUIREMENT
Compressive strength (75 mm cube) (MPa)	50MPa
Sampling frequency:	3 samples during each days grouting
Number of specimens per sample:	3
Acceptance criteria:	The average shall exceed the required value
Bleeding	To AS 1012 Part 6
Test method:	Use a glass cylinder approximately 100mm in diameter filled with grout to a depth of approximately 100mm and covered to prevent evaporation.
Sampling frequency:	1 sample/floor
Acceptance criteria:	Bleeding shall not exceed 2% of the volume 3 hours after mixing and 4% of the volume at any time The separated water shall be reabsorbed after 24 hours.
Shrinkage (% at 24 hours)	Maximum 1%
Test method:	As per the Australian standards (AS1012).
Sampling frequency:	1 sample per floor.

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Testing for liquid tightness: To AS 3735 clause 7.2. Post-tensioning ducts prior to grouting. Refer section 4.3.4

4.1.6 SAMPLES

Materials

Tendon materials: If manufacturer's certification of compliance with AS 3600 is not available, submit minimum 3 samples for each batch of material for testing to an accredited NATA testing facility. Submit test results to the Superintendant for review and approval.

4.1.7 CONTRACTOR'S SUBMISSIONS

Certification

The reinforcement material supplier must be certified by the Australian Certification Authority for Reinforcing Steels Ltd for the supply of reinforcement) material i.e. strand. Submit current certificate.

Refer http://www.acrs.net.au/Certificates/Cert_Home.html for current certificate holders.

Subcontractor

Submit the proposed system and the name and contact details of the post-tensioner.

Requirement: Supply and install Post-tensioning tendons including the necessary strands or bar, anchorages, ducts, supports, grout and anchorage protection.

Design

Calculations: Submit calculations of strand jacking forces, extensions and losses for each stressing stage. Submit amount of draw-in expected in seating anchorages, friction wobble coefficient and friction curvature coefficient for strands and duct-forming material.

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Shop drawings

Submit shop drawings of post-tensioned work showing details of the proposed system, including the following:

- Profiles, sizes and details of tendons, proprietary anchorages, ducts, duct formers, sheathing, end block reinforcement and other associated components.
- Stressing requirements including sequence of stressing, jacking forces, gauge pressures, and the basis of assumed loss calculations.
- Number, size and position of grout openings, vents and drain holes in the ducts.
- Proposed fabrication, handling and fixing methods for tendons and sheathing.
- Stressing and grouting equipment,
- Grout mix including additives, if any.
- Calculated theoretical strand or bar extensions.

Note: calculated strand or bar extensions shall not be shown on shop drawings. Submit calculated theoretical extensions as a separate document with the shop drawings.

Anchorage Type: For roofs and other external exposed situations the anchorage type shall be edge recesses unless noted otherwise. Slab pockets may only be used where a permanent waterproof membrane is provided over the grouted pockets.

Exposed off form concrete: Anchorage recesses and grout tubes must be located to ensure they are not visible at the completion of the project unless noted otherwise.

Tests

Grout: Before grouting submit certified test results for compressive strength and shrinkage of the proposed grout mix.

Anchorages: Submit performance test certificates for each type and size of anchorage and coupler.

Strand and bar: Submit test certificates prior to delivery of materials to site.

Materials

Grout: Submit proposed grout mix including additives, if any.

Certificate of compliance: Submit the manufacturer's certificate of compliance with the relevant Australian standard for each delivery of post-tensioning steel strand or bar and each delivery of anchorage components.

Epoxy grout: Submit proposed formulation.

Execution

Equipment: Submit details of proposed gauging, stressing and grouting equipment. Submit current calibration certificates for tensioning and tension measuring equipment.

Records

Post-tensioning: Record and submit the following data:

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- Concrete mix and quality.
- Details of placing and curing including dates.
- Details of placing of reinforcement and tendons.
- Date of post-tensioning operation.
- Name of operator.
- Type and identification numbers of equipment used.
- Piston areas.
- Identification of tendons.
- Stressing method (single or double end, monostrand or multistrand).
- Calculated strand extension at each stressing stage.
- Site measured extensions on completion of tensioning after release of jacks.
- Typical certified stress-strain curves for each 10 coils of wire or strand, or each parcel of tendon materials.
- Strand breakage, if any.
- Ramming pressure, if applicable.

All records are to be kept on site in a folder made available to the Engineer for review.

Grouting: For each duct grouted, record and submit a record identifying the duct and strands, giving the stressing and grouting dates, and showing the composition of the grout (water:cement ratio, admixtures), grout tests, and details of grouting (including interruptions, topping up).

4.1.8 SAFETY

A post-tensioned strand when tensioned contains a considerable amount of stored energy. In the rare event of a strand breaking, serious injury to persons and damage to equipment can be caused by the sudden release of energy. Therefore, reasonable precautions shall be taken when working with or near strands which have just been or are in the process of being tensioned or that have been tensioned but not yet grouted. To be included in the Contractor's work method statement.

4.2 PRODUCTS

4.2.1 GROUT

Grout Properties

Maximum shrinkage: 1% by volume after 24 hours.

Maximum water: cement ratio: 0.45 (by weight).

Minimum compressive strength (75 mm cube): 50 MPa at 28 days.

Grout materials

Fine aggregate: Do not include in the grout for ducts.

Admixtures: Do not provide admixtures containing chlorides, nitrates, sulphides or sulphites. Include an anti-bleed additive.

Cement type to AS 3972: GP, free from calcium chloride and < one month old from date of manufacture.

Fly ash: Maximum 10% by weight of cement.

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Epoxy grout

Commercial epoxy formulation of high compressive strength.

4.2.2 DUCTS

Material

Robustness: Ducts shall have sufficient strength to retain their shape, resist damage during construction, and prevent entrance of cement paste and water from the concrete. Material to be left in place must not cause deterioration or electrolytic action.

Size

To allow feeding of strands or bars, and grouting. Refer to structural drawings.

4.3 EXECUTION

4.3.1 TENDONS

Tendons

General: Provide post-tensioning strands, anchorages, ducts, supports, grout and anchorage protection.

Care: Do not weld strand, do not expose them to sparks, ground current or excessive temperatures. Provide shelter for strand coil to minimise direct exposure to weather.

Minimum concrete cover to duct: 20mm

Do not modify tendon profiles where clashes with conduits or reinforcement occur without prior written approval from the Superintendent.

Other requirements: Refer structural drawings

4.3.2 POST-TENSIONING EQUIPMENT

Gauges

Standard: To AS 1349.

Maximum error in pressure indication: 1% of the maximum scale value.

Calibration of gauges and dynamometers

Calibrate at intervals not exceeding 6 months and more frequently if required by the Superintendent.

Jacks

Calibration: Calibrate and measure friction losses at least once a year, or after re-sealing, matched with the gauge calibration.

4.3.3 POST-TENSIONING

Standard

Concrete cover: To AS 3600.

Concrete cover for structures retaining liquids: To AS 3735.

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Sheathing

General: If ducts are formed with sheaths, provide sheathing material strong enough to transfer the strand stresses into the body of the concrete.

Stiffening: If strands are to be installed after concreting, provide temporary stiffening within the sheath such that the duct shape and profile are maintained during concreting. After concreting remove the temporary stiffening and prove the duct using a suitable gauge before installing the strand.

Stressing

Commence stressing immediately after the concrete has attained the required transfer strength. It is very important that the initial 25% stress is carried out immediately after the concrete is up to strength and the longer strands stressed first. Organization, testing and resources must be effective so that the above is achieved without delay or misunderstanding. Notify the Superintendent before commencing second stage stressing of 100% of the required force to each strand.

When more than one wire or strand is stressed simultaneously, stress them equally. Do not leave a group of strands within a tendon unequally stressed.

Submit stressing records within 24 hours to the Superintendent. Do not proceed with any cutting or grouting of tendons until the Superintendent's approval has been given. If strands do not achieve the required extensions the contractor shall be required to restress them, possibly with a lubricant. If the strands continue to not achieve the required extensions, or if extension results are misplaced or strands are cut without instruction, the slab would be liable to rejection and all the costs associated with achieving compliance shall be borne by the Contractor.

Measurement of Site Extensions

The ends of strands must be painted or suitably marked after wedges have been installed and prior to initial stress. The stressing records submitted are to be gross extensions measured on site and include initial and final stress extensions.

Site extensions are to be submitted for review and approval by comparison to the calculated theoretical extensions. The site extensions shall be within ±10% of theoretical extensions. Where discrepancies between site and theoretical extensions are >10%, the contractor shall ascertain the cause to the satisfaction of the Superintendent's representative prior to grouting.

Cutting tendons

Do not cut or grout tendons without written approval from the Superintendent's representative. Strand site extensions must be approved in writing before strands can be cut.

Protection of Strands and Anchorages:

On completion of stressing and grouting, permanently protect all anchorage parts and parts of tendons anchored thereto. Minimum cover to any strands or anchorage parts shall be the greater of the value to surrounding reinforcement or tendons as listed on structural drawings for the element in which they are located and the value in clause 4.3.1.

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Anchorage recesses or pockets are to be protected by method shown below in Table 4-3 unless noted otherwise on structural drawings.

Table 4-3: Anchorage protection schedule.

Anchorage Type	Location	Protection Material	Requirements
Edge Recess	Internal	Sand Cement	
	External	Polymer modified repair mortar	Prepare and apply to manufacturer's specifications
Slab Pockets	Non Trafficable	Concrete (f'c same as main concrete element)	
	Trafficable	Concrete (f'c same as main concrete element)	Scabble and apply 'wet to dry' epoxy binder prior to concreting

Protection of grout fittings and ducts

For bonded construction, protect from collapse and other damage.

Post-tensioning Schedule

Refer to shop drawings.

4.3.4 GROUTING DUCTS

Preparation

Pressure testing of ducts is only required for fully encapsulated tendons, eg electrically isolated or fully corrosion protected. If required, pressure test the ducts prior to concreting at the actual grouting pressure with water. Rectify any leaks. Remove water from ducts with oil-free compressed air. Keep ducts dry until grouting starts.

Grouting

Grout tendons within 28 days of installation of the strand and within 48 hours of completion of stressing. Prevent damage to grout vents and fittings during grouting.

Grout injection shall be at the rate of between 5 and 10 metres of duct per minute. Completely fill the duct during grouting. Inject grout into voids between strands, ducts and anchorages, until grout flows from vents without air bubbles and at the consistency

equivalent to that of the grout injected. Close vents as they fill, progressively in the direction of flow. If there is a blockage or interruption, completely flush grout from the duct using water.

Grout openings

General: Provide grout openings, vents and drain holes as necessary, including at each end, and at high points except where tendon curvature is small and tendon is relatively level. Remove protruding vents and drains after the grout has set and make good to match the adjacent surfaces.

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Maximum spacing: 15 m.

Roofs: Grout openings for watertight post-tensioned roofs and are to be from side forms, not the top of slabs. Where membranes are used for watertightness of post-tensioned roofs, grout openings may be permitted from top of roof.

Grout pressure

Seal the duct on completion of grouting at a pressure ≥ 210 kPa. Fit pressure tap connections to each duct for this purpose.

5 IN SITU CONCRETE

5.1 GENERAL

5.1.1 RESPONSIBILITIES

Provide concrete in situ that:

- Conforms to design details.
- Satisfies quality and inspection requirements.
- Conforms to the SELECTIONS.

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5.1.2 CROSS REFERENCES

General

Requirement: Conform to the following:

- General requirements
- Concrete reinforcement
- Concrete finishes.
- Concrete formwork.

5.1.3 STANDARDS

Any reference documents are as a guide only and the Contractor shall source all appropriate codes and the latest editions are to be adopted.

General

Materials and construction: To AS 3600.

Specification and supply of concrete: To AS 1379.

Concrete structures for retaining liquids: To AS 3735.

5.1.4 INTERPRETATION

Definitions

General: For the purposes of this worksection the definitions given below apply.

Assessment:

- Production: An assessment procedure for concrete specified by strength grade, carried out by the supplier on concrete produced by a specific supplying plant and based on the statistical assessment of standard compressive strength tests on concrete.,
- Project: An assessment procedure for concrete specified by strength grade, specified at the customer's option, which provides additional test data for the statistical assessment of concrete supplied to a specific project.

Concrete class:

- Normal: Concrete which is specified primarily by a standard compressive strength grade and otherwise in accordance with AS 1379 clause 1.5.3.

- Special: Concrete which is specified to have certain properties or characteristics different from, or additional to, those of normal-class concrete and otherwise in accordance with AS 1379 clause 1.5.4.

Batch: A quantity of concrete delivered to the project containing a fixed amount of ingredients and produced in a discrete operation i.e. a truck agitator.

Early age strength: A mean compressive strength at 7 days exceeding the values shown in AS 1379 Table 1.2.

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Joint:

- Construction: A joint provided to suit construction sequence with reinforcement continuous across the joint.
- Control: A weakened plane contraction joint created by forming a groove, extending at least one quarter the depth of the section, either by using a grooving tool, by sawing, or by inserting a premoulded strip.
- Expansion: An unreinforced joint with the joint surfaces separated by a compressible filler.

Ambient temperature: The air temperature at the time of mixing and placing of concrete.

Average ambient temperature: Average value of the daily maximum and minimum ambient temperatures over the relevant period at a site.

Sample: A portion of the material used in the works, or to take such a sample.

Specimen: A portion of a sample which is submitted for testing.

Weather:

- Cold: Surrounding outdoor shade temperature < 10°C.
- Hot: Surrounding outdoor shade temperature > 30°C.

5.2 QUALITY

5.2.1 INSPECTION

Witness points

Give a minimum of 2 working days notice and provide the necessary access so that inspection may be made of the following:

- Base or sub grade before covering.
- Commencement of concrete placing.
- Completed formwork, and reinforcement, cores and embedded items fixed in place.
- Membrane or film underlay installed on the base or subgrade.
- Surfaces or elements to be concealed in the final work before covering.

NB: To be included in the contractor's quality assurance submission.

Superintendent to be notified to allow opportunity for inspection if required.

Rejection

Remove rejected concrete from the site.

5.2.2 CONCRETE TESTS

Production Assessment

Dissemination of production information: If concrete is manufactured off site, register the project in accordance with AS 1379 clause 6.4.3 and submit copies of each of the reports.

Concrete testing methods

Testing methods: Conform to AS 1012.

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Sampling, identification and testing: Sample the concrete on site, at the point of discharge from the agitator to AS 1012.

Testing authority: Carry out testing and assessment of concrete and concrete materials using an authority registered with the National Association of Testing Authorities Australia (NATA) to perform the specified testing. Location of test results shall also be provided and referred to a structural element shown on the structural drawings (eg. Column 72 Level 3, wall 20 Level 6).

Control tests

General: Determine transfer strength and early strength using site cured specimens in conformance with the Table 5-5 Control tests schedule .

Acceptance criteria:

- Average strength of all samples must exceed the required value.
- Strength of any one sample must be at least 0.85 of the required value.

Project Assessment

Standard: To AS 1379 and the Concrete performance schedule

Drying shrinkage: Refer Table 5-4 Concrete performance schedule.

Frequency: Conform to AS 1379. For each property test at least two specimens from each sample.

Sample, test and assess the concrete for conformance with the Project assessment strength grade sampling table each property test at least two specimens from each sample.

Table 5-1: Project assessment strength grade sampling table

Number of batches for each type and grade of concrete per day	Minimum number of samples	
	Columns and loadbearing wall elements per batch	Other elements per day
1	1	1
2 to 5	1	2
6 to 10	1	3
11 to 20	1	4
each additional 10	1	1 additional

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Slump: Test at least one sample from each batch before placing concrete from that batch in the work. Take samples from point of discharge on site.

Strength grade/Characteristic compressive strength: Spread the site sampling evenly throughout the pour.

- Sampling frequency: To the Project assessment strength grade sampling table .
- Specimen size: 200 x 100 mm diameter but, if aggregate size exceeds 20 mm, 300 x 150 mm diameter.

Acceptance criteria: The average strength of the samples representing an element shall be not less than the specified strength, and within the maximum specified standard deviation.

Test records

Records and reports to AS 1012.

The contractor shall review all test records and notify the Superintendent's representative of tests that do not meet early age strength, 7 days and the 28 days requirements as soon as they are known. Only submit a copy of test reports that do not meet the requirements. The contractor shall have on site and in the online centralised data management system an up to date file of test records that can be viewed at any time by the superintendent or their representatives.

All records are to be kept on site in a folder made available to the Engineer for review.

5.2.3 SAMPLES

General

Supply sample panels to AS 3610 for the application specified.

Requirement: Supply sample panels to AS 3610 clause 3.6 for the application specified. Do not proceed with the related work until the test panels have been approved and for surface treatments, the accepted range of treatments determined.

Manufacture

Cast the panels using the formwork, concrete, compaction equipment, form release agents, curing and formwork removal methods which are to be used in the final work.

Storage

Maintain the panels on site undamaged and protected from the weather, as samples for future evaluation of completed work.

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5.2.4 COLOURED CONCRETE

Coloured Concrete

Where coloured concrete is specified in the architectural documentation use a concrete mix with mineral oxides and/or coloured cement to achieve the same performance as the mix and method to be used in the works.

Using the same mix and method to be used in the works, supply sample blocks of coloured concrete.

- Number: 4.
- Size (nominal): 300 x 300 x 50 mm.

Refer requirements in section 2.3.4 and section 6.

5.2.5 CONTRACTOR'S SUBMISSIONS

Design

Loading: Submit calculations to justify the adequacy of the structure to sustain any construction loads and procedures including propping and re-shoring.

Execution

General: Submit proposals for mixing, placing, finishing and curing concrete including the following:

- Changes to the plastic concrete mix.
- Curing and protection methods.
- Curing for low-pressure steam curing, if proposed.
- Cutting or displacing reinforcement, or cutting hardened concrete.
- Handling, placing, compaction and finishing methods and equipment including pumping.
- High early strength cement.
- Placing under water.
- Sequence and times for concrete pours, and construction joint locations and relocations.
- Site storage, mixing and transport methods and equipment, if applicable.
- Target strength, slump and proposed mix for each type and grade of concrete.
- Temperature control methods.
- Sources of materials.

Sawn joints: Submit proposed methods, timing and sequence of sawing joints.

Materials

General: Submit details of proposed sources of materials and certificates of compliance.

Concrete mixes: Submit details, for each grade and type of concrete including proposed use of special-purpose cement types, admixtures, fly ash or granulated slag.

Curing compounds: If it is proposed to use a liquid membrane-forming curing compound submit the following information:

- Certified test results for water retention to AS 3799 Appendix B.
- Efficiency index.
- Evidence of compatibility with concrete, and with applied finishes, if any.
- Evidence that an acceptable final surface colour will be obtained.
- Methods of obtaining the required adhesion for toppings and render.

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Pre-mixed supply

Delivery docket: For each batch, submit a docket listing the information required by AS 1379, and the following additional information:

- For special class performance concrete, specified performance and type of cement binder.
- For special class prescription concrete, details of mix, additives, and type of cement binder.
- Method of placement and climate conditions during pour.
- Name of concrete delivery supervisor.
- Project assessment carried out each day.
- Serial numbers of identification certificates of each batch.
- The amount of water, if any, added at the site.
- The concrete element or part of the works for which the concrete was ordered, and where it was placed.
- The total amount of water added at the plant and the maximum amount permitted to be added at the site.

Shop drawings

Cores, fixings and embedded items: If the locations of embedded items are not shown or are shown diagrammatically, submit shop drawings showing the proposed locations, clearances, cover and indicate proposed repositioning of reinforcement in accordance to section 1.10.

Subcontractors

Submit names and contact details of proposed pre-mixed concrete suppliers, and alternative source of supply in the event of breakdown of pre-mixed or site mixed supply.

Fabrication: Do not commence fabrication until approval to use the relevant shop drawings has been obtained from the Superintendent's representative.

Work-as-executed drawings: Required for all work shop drawings

Survey certificates: Required for all concrete elements

Tests

Dissemination of production information: Submit copies of the reports.

Material tests: Before supplying concrete submit test certificates based on samples from the most recent production or from stockpiles for the project. Submit additional certificates at the scheduled frequency during the course of the works.

Note: Tests also shall be carried out wherever materials are replenished.

Sampling and testing of specimens: Submit records providing the full history of sampling and testing. Submit test certificates, and retain results in tabular form on site.

5.3 EXECUTION

5.3.1 POLYMERIC FILM UNDERLAY

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General

Under internal slabs on ground including integral ground beams and footings, provide a concrete underlay or, in areas prone to rising damp or salt attack, a damp-proofing membrane.

Standard

Concrete underlays and damp-proofing membranes: To AS 2870.

Material: Concrete underlay to be 0.2mm thick high impact resistance film to AS4347

Installation

Lay over the base, lap joints at least 200 mm and seal the laps and penetrations with waterproof adhesive tape. Face the laps away from the direction of concrete pour. Take the underlay up vertical faces as far as the damp proof course where applicable, and fix at the top by tape sealing. Locate vertical laps only on vertical or inclined surfaces. Patch or seal punctures or tears before pouring concrete.

Membrane protection: Protect the membrane after installation with a permanent protective boarding in accordance with the manufacturer's recommendations. Use a low melt bitumen or suitable solvent-free adhesive to adhere the protection boards to the membrane with maximum 6 mm gap at joints in the boards.

Base preparation

According to base type, as follows:

- Concrete working base: Remove projections above the plane surface, and loose material.
- Graded stone base: Blind with sufficient sand to create a smooth surface free from hard projections. Wet the sand just before laying the underlay.
- Around tunnels and retaining walls a protection layer to the polymeric film shall be required. Verification of the sufficiency of the protection layer shall be supplied to the superintendent for approval prior to installation.

5.3.2 CONCRETE MATERIALS

General

Aggregate: To be unsegregated and uncontaminated.

Cementitious materials: To be dry and uncontaminated.

Admixtures: No deterioration.

Bagged cement

Standard: To AS 3972.

- Type: GP.
- Age: Less than 6 months old.

Chemical admixtures

Contents: Free of chlorides, fluorides and nitrates.

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5.3.3 CONCRETE

The concrete supplier is to provide the concrete mix design for the Superintendent for review prior to manufacture.

General

Provide concrete in conformance with the Concrete performance schedule.

Concrete performance

Drying shrinkage: refer Table 5-4 Concrete performance schedule.

Placement: Mix must work readily into corners and angles, and around reinforcement, without segregation or excess free water on the surface, producing sound concrete, with minimal plastic settlement and shrinkage cracking.

Material requirements: Use materials complying with Australian Standards. Do not use breccia or dolerite in concrete mix.

Elapsed delivery time

Elapsed time between the wetting of the mix and the discharge of the mix at the site must be as short as possible, and must conform to the Elapsed delivery time table below. Do not discharge at ambient temperature below 10°C or above 30°C unless approved measures are taken by heating or cooling so that the delivered concrete is in the range of 5°C to 35°C

Table 5-2: Elapsed delivery time table

Concrete temperature at time of discharge (°C)	Maximum elapsed time (minutes)
10 to 24	120
24 - 27	90
27 - 30	60
30 to 32	45

Pre-mixed supply

All concrete shall be pre- mixed supply.

Addition of water: Do not add water at the site after starting discharge.

Method: To AS 1379, by the batch production process. Deliver in agitating trucks.

Transport: Mode must prevent segregation, loss of material and contamination, and must not adversely affect placing or compaction.

Note: Do not add water or any other material to the concrete after leaving the batch plant without prior approval from the Superintendent's representative.

Plastic cracking: Design the concrete mix to minimise plastic settlement and shrinkage cracking.

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Site mixed supply

Emergencies: Do not mix by hand.

Plant: Mix concrete in a plant located on the construction site.

5.3.4 CORES, FIXINGS AND EMBEDDED ITEMS

Standard

To AS 3600 Section 14 and complying to B.C.A clause 11.1.

Lifting, bracing and fixing inserts for precast units: To AS 3850.

Shop drawings: If the locations of embedded items (including downpipes, electrical conduits, etc) are not shown on the drawings, or are shown diagrammatically, or if it is proposed to vary the locations shown, submit for review shop drawings showing the proposed locations, clearances, cover, bleed holes and the like.

Adjoining elements

For adjoining elements to be fixed to or supported on the concrete, provide for the required fixings. Where applicable provide for temporary support of the adjoining elements during construction of the concrete.

Inserted fixings

Methods: Do not insert fixings using drilling (including masonry anchors), or using explosive tools, unless approved.

Protection

General: Grease threads. Cover and protect embedded items against damage.

Threaded fastenings: To AS 1214.

Structural sections: To AS/NZS 4680.

Compatibility: Ensure inserts, fixings and embedded items are compatible with each other, with the reinforcement and with the concrete mix to be used.

Corrosion: For all embedded and inserted ferrous fixings (other than stainless steel) provide galvanized surface coating passivated by dipping in 0.2% sodium dichromate solution.

Structural integrity

Fix cores and embedded items to prevent movement during concrete placing. In locating cores, fixings and embedded items, do not cut or displace reinforcement, or cut or core

hardened concrete. Ensure that embedded pipes and conduits do not adversely affect structural integrity.

Tolerances

Maximum deviation from correct positions:

- Anchor bolt groups for structural steel: To AS 4100.
- Cores and embedded items generally: ± 10 mm.
- Fixings, including anchor bolts: ± 3 mm.

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Isolation: Isolate fixings so that water can not track from fixings to reinforcement.

5.3.5 CONCRETE WORKING BASE

Finish

Membrane support: Wood float finish or equivalent.

Material

N20 concrete. Lay over the base or sub grade and screed to the required level.

Surface tolerance

± 5 mm from the correct plane, ± 5 mm from a 2 m straight edge.

Thickness

Minimum 50 mm.

5.3.6 PLACING AND COMPACTION

Compaction

General: Remove air bubbles and fully compact the mix. Provide not less than one reserve vibrator in working order.

Methods: Use immersion and screed vibrators accompanied by hand methods as appropriate.

Vibrators: Do not allow vibrators to come into contact with partially hardened concrete, or reinforcement and items including pipes and conduits embedded in it. Do not use vibrators to move concrete along the forms. Avoid over-vibration that may cause segregation. Do not allow vibrators to come into contact with the formwork of visually important surfaces.

Horizontal movement

Use suitable conveyors, clean chutes, troughs or pipes. Do not use water to facilitate the movement.

Placing

General: Use placing methods which minimise plastic settlement and shrinkage cracking. Avoid segregation. Avoid loss of materials. Continuous between construction joints and in such a manner that a plastic concrete edge is maintained.

Layers: Place concrete in layers not more than 300 mm thick, such that each succeeding layer is compacted before previous layer has taken initial set.

Placing slabs and pavements: Place concrete uniformly over the width of the slab so that the face is generally vertical and normal to the direction of placing.

Placing records

Keep on site and make available for inspection a log book recording each placement of concrete, including the following:

- Date.
- Specified grade and source of concrete.
- Slump measurements.
- The portion of work.
- Volume placed.

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Rain

Do not expose concrete to rain before it has set, including during mixing, transport or placing.

Concrete exposed to rain before it has set, including during mixing, transport or placing shall be liable to rejection.

Sequence of pours

Minimise shrinkage effect by pouring the sections of the work between approved construction joints in a sequence such that there will be suitable time delays between adjacent pours.

Time delay between pours

Conform to Table 5-7 Minimum time delay schedule.

Vertical elements

In vertical elements, limit the free fall of concrete to 1500 mm per 100 mm element thickness, up to a maximum free fall of 3000 mm, using enclosed chutes or access hatches in forms. As far as practicable keep chutes vertical and full of concrete during placement, with ends immersed in the placed concrete.

5.3.7 PLACING IN COLD WEATHER

Cement: Do not use high alumina cement.

Placing concrete: Maintain the temperature of the freshly mixed concrete at ≥ 5°C.

Formwork and reinforcement: Before and during placing maintain temperature at ≥ 5°C.

Severe weather: If severe weather conditions are predicted, use high early strength cement to develop sufficient strength to permit formwork removal within the specified time. Do not use as a substitute for the heating of materials or for adequate protection of placed concrete against low temperatures.

Temperature control: Heat the concrete materials, other than cement, to the minimum temperature necessary to ensure that the temperature of the placed concrete is within the limits specified.

Admixtures: Do not use calcium chloride, salts, chemicals or other material in the mix to lower the freezing point of the concrete.

Frozen materials: Do not allow frozen materials or materials containing ice to enter the mixer, and keep free of frost and ice any forms, materials, and equipment coming in contact with the concrete.

Maximum temperature of water: 60°C when it is placed in the mixer.

Plastic concrete: Prevent plastic concrete from freezing, without using salts or chemicals.

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5.3.8 PLACING IN HOT WEATHER

Handling: Prevent premature stiffening of the fresh mix and reduce water absorption and evaporation losses. Mix, transport, place and compact the concrete in conformance with the Table 5-2: Elapsed delivery time table.

Placing: Maintain the temperature of the freshly mixed concrete in conformance with the Table 5-3: Hot weather placing table.

Post tensioned waterproof slab concrete: When the air temperature exceeds 32°C, the concrete shall be placed at a temperature not exceeding 32°C.

Formwork and reinforcement: Before and during placing maintain temperature at ≤ 35°C.

Severe weather: If ambient shade temperature > 38°C, do not mix concrete.

Temperature control: Select one or more of the following methods of maintaining the specified temperature of the placed concrete:

- Cool the concrete using liquid nitrogen injection before placing.
- Cover the container in which the concrete is transported to the forms.
- Spray the coarse aggregate using cold water prior to mixing.
- Use chilled mixing water.

Table 5-3: Hot weather placing table

Concrete element	Temperature limit
Normal concrete in footings, beams, columns, walls and slabs	35°C
Concrete in sections ≥ 1 m in all dimensions except for concrete of strength 40 MPa or greater, in sections exceeding 600 mm in thickness	27°C

5.3.9 PLACING UNDER WATER

General: Do not place under water if placing in the dry is practicable by pumping or other means of dewatering.

Minimum cement content for the mix: Increase by 25%.

Method: If required, submit proposals

5.3.10 CURING

General

Requirements: Taking into account the average ambient temperature at site over the relevant period affecting the curing and adopt procedures to ensure the following:

Curing period (from time of placing): Commence curing immediately after finishing, and cure continuously until the cumulative number of days or fractions thereof, not necessarily consecutive, during which the air temperature in contact with the concrete is above 10°C, totals not less than the following:

- Fully enclosed internal surfaces/Early age concrete: 3 days.
- Other concrete surfaces: 7 days.

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Protection: Protect fresh concrete, during the curing period, from premature drying and from excessively hot or cold temperatures. Protect fresh concrete from physical and thermal shock, from traffic likely to damage the surface, and from rain. If temperature of surrounding air is > 35°C, protect from wind and sun until the concrete can be covered. Maintain at a reasonably constant temperature with minimum moisture loss, during the curing period. Prevent rapid drying out at the end of the curing period.

Additional protection for post tensioned waterproof slabs: Freshly cast concrete shall be protected from premature drying and excessively hot temperatures. The Contractor is to take due regard of climatic conditions which will increase the possibility of plastic cracking such as hot, dry or windy conditions. Inform the supplier of the conditions under which the concrete will be placed. If the temperature of the surrounding air is higher than 32°C, the Contractor shall apply aliphatic alcohol, using spraypacks, to the exposed surface of the concrete in accordance with the manufacturers specification. This is to occur immediately after initial screeding. In addition, suitable barriers shall be erected to protect the freshly placed plastic concrete from wind and sun until the concrete has hardened sufficiently to allow covering. Freshly finished concrete shall be protected from physical or thermal shock and traffic likely to damage the surface, including damage from rain.

Cold weather curing

Prevent plastic concrete from freezing, but do not use salt or chemicals. Maintain concrete temperature between 10 - 20°C for curing period.

Curing compounds

Standard: To AS 3799.

Application: Provide a uniform continuous flexible coating without visible breaks or pinholes, which remains unbroken at least seven days after application.

Substrates: Do not use wax-based or chlorinated rubber-based curing compounds on surfaces forming substrates to concrete toppings and cement-based render and the like.

Self levelling toppings: If used also as curing compounds confirm compliance with AS 3799.

Curing compounds: If it is proposed to use a liquid membrane-forming curing compound submit the information above in 5.2.5 CONTRACTOR'S SUBMISSIONS.

Approvals: The Superintendent's written permission is required prior to use of any curing compound.

Quality: Quality control measures must be in place while curing is being carried out and verification of the actual quantity of curing compound used must be immediately supplied to the superintendent at the completion of every application to ensure that the required approved rate of application is achieved.

Samples: The sub contractor shall allow for the cost of a minimum of three random samples to be tested for water retention in accordance with AS 3799. Samples shall be taken from the material delivered to site during the period of the works as directed by the superintendent and shall be tested by an approved NATA registered laboratory.

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Hot weather curing

Curing compounds: If it is proposed to use a curing compound provide details.

Protection: Select a protection method as applicable;

- If the temperature exceeds 25°C or if not protected against drying winds, protect the concrete using a fog spray application of aliphatic alcohol evaporation retardant.
- If ambient shade temperature is > 35°C, protect from wind and sun using an evaporative retarder until curing is commenced.
- Immediately after finishing, either cover exposed surfaces using an impervious membrane or hessian kept wet until curing begins, or apply a curing compound.
- Pond or continuously sprinkle with water.

Water curing

General: If water is used, pond or continuously sprinkle in such a way as to not cause damage to the concrete surface for the required curing period.

Visually important surfaces

Produce uniform colour on adjacent surfaces.

Curing methods

Acceptable methods of curing include the following:

- Ponding or continuous sprinkling with water (moist curing).
- An impermeable membrane. (i.e. plastic sheet)
- An absorptive cover kept continuously wet.
- 90% efficiency index equal to class C AS3799 (synthetic rubber-based compound) and type 1-D (containing a coloured fugitive dye only if curing is exposed to sun light)

Curing with an impenetrable membrane

The covering sheet joins must be taped and the sheet must cover at least 300mm beyond the edges and sides of the concrete. The sheet must not be able to be blown open or away.

5.3.11 PROTECTION

Loading

Notice: Give notice before loading the concrete structure.

Protection: Protect the concrete from damage due to load over-stresses, heavy shocks and excessive vibrations, particularly during the curing period. Do not place construction loads on self-supporting structures which will overstress them. Provide calculations to justify the adequacy of the structure to sustain construction loads.

Surface Protection

Protect finished and exposed aggregate concrete surfaces from damage from any cause, including mortar splashes and stains, timber stains, rust stains, chemical attack, additives, curing compounds, protective coatings, rain and running water.

Visually important surfaces

Rectification: Concrete is liable to be rejected if visually important surfaces are damaged. Rectification may be attempted only if prior approval is given. The Superintendent may refuse approval, or, if approval is given, may reject the concrete if the attempt fails.

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5.3.12 CONSTRUCTION JOINTS

Location

Do not relocate or eliminate construction joints, or make construction joints not shown on the drawings without notifying the Superintendents Representative for instruction. Where no construction joints are shown on the contract drawings and such are required their location and design shall be to the approval of the Superintendents Representative.

If emergency construction joints are made necessary by unforeseen interruptions to the concrete pour refer to Emergency Construction Joint below.

Finish at construction joints

Butt join the surfaces of adjoining pours. In visually important surfaces make the joint straight and true, and free from impermissible blemishes relevant to its surface finish class.

Joint preparation

Before fresh concrete is placed at a construction joint, roughen and clean the hardened concrete surface of the joint, so that all loose or soft material, free water, foreign matter and laitance is removed. Just prior to placement, dampen the hardened concrete surface, without leaving free water. For post tensioned waterproof slabs the joint surface shall be prepared using a wet to dry epoxy in accordance with the manufacturer's specification.

Pool Construction Joint

Where a construction joint is to be placed in a swimming pool, a hydrophilic water stop is to be placed continuous across the entire joint. Installation and sealant are to manufacturer's specifications.

Emergency Construction Joint

Where an emergency construction joint is required

Case 1) Concrete Plant Failure - supplier is to make arrangements for a substitute concrete plant as a backup.

Case 2) Equipment failure – contractor is to make arrangements for a substitute equipment as a backup.

Case 3) Concrete placement has stopped. If an emergency construction joint is required please contact TTW engineer immediately for advice on what action should be taken.

General Requirements when a Concrete Placement has stopped;

Please note that depending on the location on the joint the potential solution detail will vary and this should be a last resort only and may involve rectification works.

As general advice the following would be considered in introducing an additional construction joint;

- The joints should be orthogonal to the reinforcement (i.e. at right angles to the reinforcement so reinforcement is protruding from the joint to lap) this would typically be located at the 1/3 to 1/4 of the slab span between columns or walls.
- Partially casting of the PT bands should be avoided therefore a joint would be introduced adjacent and parallel to the beam where possible.
- The joints should be at a location where there is top and bottom reinforcement and either side of the joint would require typically a minimum 40 x diameter length of reinforcement to accommodate a full reinforcement lap.
- Provide three sections of formwork between the protruding reinforcement to form the joint. The joint should be maintained as a straight line and have well compacted concrete. The formwork at the top and bottom of the slab (i.e. effectively the cover zone of the reinforcement) should be a clean, straight and a 90 degree edge to avoid spalling of these exposed faces to maintain a clean interface for the next pour.
- For the next pour, scabble the central area between the top and bottom steel layer removing any loose material and providing a clean and roughened surface for the next pour. Depending on the location there may require treatment prior to the next pour.

After any emergency construction joint occurrence, prepare and submit a report to the Superintendents Representative.

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5.3.13 EXPANSION JOINTS

Joint Filling:

Joint filling: Fill with jointing materials. Finish visible jointing material neatly flush with adjoining surfaces.

Preparation: Before filling, dry and clean the joint surfaces, and prime.

Watertightness: Apply the jointing material so that joints subject to ingress of water are made watertight.

Sealants: Two part gun grade polysulphide based sealant coloured to match the colour of the adjoining pavement colour and approved by the Superintendent. Pourable sealant shall not be used unless the installation method and sealant performance have been demonstrated and approved by the Superintendent.

Jointing Materials

Types: Use jointing materials, including sealants, mastics, primers, gaskets, compressible fillers, and joint covers, as recommended by the material manufacturers for the location and type of joint, compatible when used together, and non-staining to concrete in visible locations.

The Contractor is to submit the proposed product for review.

Preparation: Where joints are to be filled with jointing materials, including sealants, bond breakers, backing rods, taped edges and preformed strips, dry and clean the joint surfaces before application and prime as recommend by the joint material manufacturer.

Bond breaking**:** Use back-up materials for sealants, including backing rods, which do not adhere to the sealant. They may be faced with a non-adhering material.

Foamed materials (in compressible fillers): Closed-cell or impregnated types which do not absorb water.

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Compressible Filler: Compressible filler, thickness as designated on drawings.

Expanding Cork Filler: Expanding cork filler, thickness as designated on drawings.

5.3.14 DOWELS

Joint dowels

Provide galvanised steel reinforcing rod dowels in expansion and contraction joints, where required. Embed dowels normal to the plane of the joint, so that half the dowel lies on each side of the joint. Heavily grease or bitumen coat one half and fit an expansion cap to that end. Dowels to have neatly sawn ends not sheared.

Location: Across joints at the required spacings and vertical locations correctly aligned parallel to the finished pavement surface and parallel to the longitudinal joints in plan. If the construction methods require alterations to the designed spacing, use a closer spacing with additional dowels or tie bars.

Placing in fixed-form paving: By the bonded-in-place method. Embed the unpainted half of the dowels in the slab placed first.

Placing in longitudinal joints in slip-form paving: By machine placing, or by vibration into the plastic concrete using a suitable template.

Dowel placement tolerances

General: To achieve the required tolerances the dowels should be securely attached to a reinforcing cage. Provide proposed details to the Superintendent for approvals prior to installation.

Horizontal and vertical location: Plus or minus half the diameter of the dowel.

Alignment: All bars in the joint shall be within 3 mm in 300 mm and adjacent bars shall not differ in alignment by more than 3 mm in 300 mm.

Pre-embedment testing: The Superintendent may require dowels to be fixed and tested before embedment by subjecting either end to a load of 100 kg in any direction normal to the bar.

Rejection: Dowels and tie bars are liable to rejection if they become distorted or displaced beyond the alignment tolerances under testing or during construction. Do not remove and replace dowels in pre-formed holes for any reason including to assist in form stripping.

5.3.15 WATER STOPS

Locations

Install water stops as shown on drawings, surrounded by fully compacted concrete, and located so that

- their correct positions in the finished work are ensured;
- the proper placing and compaction of the concrete is not inhibited; and
- reinforcement is not displaced from its correct position.

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5.3.16 CONCRETE PLINTHS

Construction

General: Provide galvanised steel surround at least 75 mm high and 1.6 mm thick, fixed to floor with masonry anchors. Fill with concrete.

Reinforcement: Single layer of SL62 fabric.

Concrete: Grade N20.

- Finish: Steel float flush with the surround.

5.3.17 BLOCKWORK CORE FILLING

For all reinforced and load bearing walls, fill all cores with grout and thoroughly compact by mechanical vibrator and/or rodding with a plain round bar.

Grout shall be in accordance with the following specification, conforming to AS 3600.

Characteristic strength f'_c = refer structural drawings (20MPa if not specified)

Specified slump = 230mm

Maximum aggregate size = 10mm

Cleanout opening shall be provided at the bottom of each core containing vertical reinforcement. Reinforcing cores shall be cleaned of mortar protrusion before grouting.

5.4 SELECTIONS

5.4.1 SCHEDULES

Table 5-4 Concrete performance schedule

Item	Requirement
Normal and Special Class Concrete	
Air entrainment - air volume (%)	Freezing and thawing requirements to AS 3600 clause 4.8. For external concrete in Canberra and Alpine region 4.5%. Test to AS 1379 clause 5.4 and AS 1012.4
Maximum aggregate size (mm):	Refer Drawings (but not greater than 40mm)
Slump (mm)	Refer Structural Drawings, Test to AS 1012.3.1
Strength grade	Refer Drawings
Characteristic 28 day compressive strength f'_c (MPa)	Refer Drawings, Test to AS 1012.9
Special Class	
Cement Type	GP
Early age strength for post-tensioned concrete	Refer section Table 5-5 Test to AS 1012.9
Water/Cement ratio	0.55 maximum (0.45 for acidic and sulphate soils)
Fly ash content	Note: For post tensioned water proof slabs fly ash content to be limited to the lesser of 10% of total cementitious content or 40kg/m3
Ground granulated slag	For post tensioned water proof slabs ground granulated slag is not to be used in the concrete mix
Intended method of placement	To AS 3600
Cement content	400 kg/m^3 SR cement minimum for acidic and sulphate soils

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Item	Requirement
Drying shrinkage - to relevant Australian Standards	Maximum permissible drying shrinkage measured as a percentage change after 56 days (Test to AS 1012.13).
Duration of air drying:	56 days
Limits	Refer Table 5-6 Drying shrinkage schedule
Acceptance criterion	Average strain of three specimens from each sample shall not exceed the required value
Early age shrinkage prediction:	Must be carried out on each sample at 7 days and must be issued to the superintendent within 10 calendar days of the concrete pour date

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Table 5-5 Control tests schedule

Concrete element	28 day strength (MPa)	Transfer strength (MPa)	Days after pouring	Early age strength (MPa)	Days or hours after pouring
Post-tensioned slabs	40	25	5	7	1 day

Table 5-6 Drying shrinkage schedule

Concrete element	Strength grade	Drying shrinkage limit (microstrain)
Pad and piled footings	N50-80	1000
Columns (NE3)	S40-80	600
Columns (Other)	S40-80	650
Walls	S40-80	700
Slab on ground	S40	650
Suspended slabs and beams (internal)	S40	650
Suspended slabs and beams (external), Roof, Podium and Landscape.	S40	600
Pool	S40	600

Table 5-7 Minimum time delay schedule

Between (pour locations)	Minimum period between adjacent pours (days)
Adjacent pours abutting vertical construction joints in walls	1
Columns or walls ≤ 4.5m high and Floor slabs/beams	2 hours
Columns or walls > 4.5m high and Floor slabs/beams	1 day
Horizontal construction joints in columns or wall	1
Floor Slab Construction Joints	1
Retaining wall construction joints	1
"Pour strips" and adjacent concrete	56

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6 CONCRETE FINISHES

6.1 GENERAL

6.1.1 AIMS

Responsibilities

General: Provide finishes to formed and unformed concrete surfaces which are as follows:

- Appropriate to the importance (visual or physical) of the concrete elements.
- Compatible with following trades and finishes.

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6.1.2 CROSS REFERENCES

General

General: Conform to the General requirements worksection.

Associated worksections

Associated worksections: Conform to the following:

- Concrete formwork.
- In situ concrete.
- Precast concrete.

6.1.3 STANDARDS

General

Formed surfaces: To AS 3610.

6.1.4 INTERPRETATIONS

Definitions

General: For the purposes of this worksection, the following definition applies:

- Green concrete: Concrete which has set but not appreciably hardened.

6.1.5 TOLERANCES

Surface quality

Formed surfaces: Confirm conformance with the surface finish requirements of AS 3610 for the surface class nominated in Table 2-2: Formed Surface Schedule.

Flatness

Unformed surfaces: Confirm conformance with the Flatness tolerance class table for the class of finish nominated using a straight edge placed anywhere on the surface in any direction.

Determine tolerance classes using a straight edge placed anywhere on the surface in any direction in accordance with Cement and Concrete Association of Australia - Industrial Pavements (Guidelines for Construction).

Table 6-1: Flatness tolerance class table

Class	Measurement	Maximum deviation (mm)
A	3 m straight edge	3
B	3 m straight edge	6
C	600 mm straight edge	6

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For classes A and B the specified maximum deviation shall not occur within a 500mm distance any where on the surface.

6.1.6 SAMPLE PANELS

General

Conformance: Supply sample panels to AS 3610 for the application specified.

Manufacture

General: Cast the panels using the formwork, concrete, compaction equipment, form release agents, curing and formwork removal methods which are to be used in the final work.

Storage

General: Once accepted, maintain the panels on site undamaged and protected from the weather, as reference prototypes for future evaluation of completed work.

6.1.7 SURFACE TREATMENT

General

Range: Do not proceed with the related work until the acceptable range of surface treatments has been determined.

6.2 PRODUCTS

6.2.1 MATERIALS

Surface hardeners, sealants and protectors

Supply: If required by the project documentation, provide proprietary products.

Clear Resin Sealer

Radfloor and Radcon Formula #7 additive or equal equivalent

6.3 EXECUTION

6.3.1 SURFACE MODIFIERS

General

Application: Apply to clean surfaces in accordance with the manufacturer's requirements.

6.3.2 UNFORMED SURFACES

General

General: Strike off, screed and level slab surfaces to finished levels, to the tolerance class noted in the Unformed surface finishes schedule.

Surface finishes

General: Provide surface finishes in conformance with the Unformed surface finishes schedule.

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Surface repairs

Surface repair method: If surface repairs are required, submit proposals.

Finishing methods – primary finish

Float finish:

- After levelling, consolidate the surface using a bullfloat or machine float or hand float as appropriate.
- Cut and fill and refloat immediately to a uniform, smooth, granular texture.
- Hand float in locations inaccessible when using a machine float.

Steel trowel finish: After floating finish as follows:

- Use power or hand steel trowels to produce a smooth surface relatively free from defects.
- When the surface has hardened sufficiently, retrowel to produce the final consolidated finish free of trowel marks and uniform in texture and appearance.

Burnished finish: Continue steel trowelling until the concrete surface attains a polished or glossy appearance, uniform in texture, appearance and free of trowel marks and defects.

Wood float finish: After machine floating use wood or plastic hand floats to produce the final consolidated finish free of float marks and uniform in texture and appearance.

Broom finish: After machine floating and steel trowelling draw a broom or hessian belt across the surface to produce a coarse even-textured transverse-scored surface.

Scored or scratch finish: After screeding, give the surface a coarse scored texture using a stiff brush or rake drawn across the surface before final set.

Sponge finish: After machine floating and steel trowelling, produce an even textured sand finish by wiping the surface using a damp sponge.

Finishing methods – supplementary finish

Honed finish: After steel trowelling, grind the cured surface of the concrete to produce a smooth yet matt surface.

Polished finish: After a honed finish is achieved, continue grinding surface with progressively finer abrasives to achieve the required smoother polished finish.

Granolithic topping

Topping mix: 1:1:1.5 cement: fine aggregate: coarse aggregate maximum size 5 mm.

Water: cement ratio: 0.50 maximum.

Slump: 50 mm maximum.

Topping thickness: 20± 5 mm.

Monolithic placing: As soon as surface water has disappeared from the newly placed base, spread the topping mix, compact, and float to the required tolerance class and surface finish.

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Prior to completion arrange to:

- Remove all topping contractor's rubbish, plant and surplus materials from the site.
- Remove temporary protection coverings.
- Replace damaged parts and fittings.
- Remove splash marks and stains.
- Remove and replace work that cannot be successfully cleaned or repaired to eliminate any evidence of damage.
- Handover all certificates and guarantees required by this section of the works.

6.3.3 FORMED SURFACES

General

General: Provide formed concrete finishes in conformance with Table 2-2: Formed Surface Schedule.

Damage: Do not damage concrete works through premature removal of formwork.

Curing

General: If forms are stripped when concrete is at an age less than the minimum curing period, commence curing exposed faces as soon as the stripping is completed.

Evaluation of formed surfaces

General: If evaluation of formed surface tolerance or colour is required, complete the evaluation before surface treatment.

Finishing methods

General: If soffits of concrete elements or faces of concrete columns are to have a finish other than off the form, provide details of proposed procedures.

Bush hammered finish: Remove the minimum matrix using bush hammering to expose the coarse aggregate, recessing the matrix no deeper than half the aggregate size, to give a uniform texture.

Exposed aggregate finish: Remove the vertical face forms while the concrete is green. Wet the surface and scrub using stiff fibre or wire brushes, using clean water freely, until the surface film of mortar is mechanically removed, and the aggregate uniformly exposed. Do not use acid etching. Rinse the surface with clean water.

Floated finishes:

- Sand floated finish: Remove the vertical face forms while the concrete is green. Wet the surface and rub using a wood float. Rub fine sand into the surface until a uniform colour and texture are produced.

- Grout floated finish: Remove the forms while the concrete is green. Dampen the surface and spread a slurry, using hessian pads or sponge rubber floats. Remove surplus slurry and work until a uniform colour and texture are produced.

Smooth rubbed finish: Remove the vertical face forms while the concrete is green. Wet the surface and rub using a carborundum or similar abrasive brick until a uniform colour and texture are produced.

Surface repairs

Surface repair method: If surface repairs are required, submit proposals. Where exposed off form concrete requires repair, an acceptable architectural finish will also be required.

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6.3.4 EPOXY FLOOR FINISH

Acid And Oil Resistant Finish (AO)

Requirement: To areas indicated in the existing Concrete Floor (refer drawings) install Durafloor TF, screened epoxy resin floor topping with Durafloor HP with ANTI-SLIP grains by Fosroc or equivalent.

Preparation and installation shall be to the manufactures detail and a minimum thickness of 6mm shall be achieved. At the direction of the Superintendent the Contractor shall carry out spot checks of the thickness achieved.

Areas to be coated shall be saw cut at the edge then scabbled back to allow a feathered transition to the untreated floor. Ensure all oil or grease contamination of existing floors is removed.

Colour and anti-slip grade to Superintendents selection.

The epoxy topping is to be cured for a period of 24 hours before foot traffic is permitted and a period of 7 days before heavier than foot traffic is permitted.

The Topping Contractor shall be responsible for ensuring proper adhesion and thickness of finishes to structure and allowance shall be made to keep surfaces dry and new slabs aged prior to application of epoxy. Any loose, deficient thickness, or damaged work shall be replaced at Topping Contractor's expense.

GUARANTEES: The works to be carried out as specified herein shall be guaranteed by the Contractor against defects arising as a result of faulty materials and/or workmanship for a minimum period of ten years after completion.

PRIOR TO COMPLETION: Keep the work under the contract clean and tidy as it proceeds and regularly remove from the site rubbish and surplus materials arising from the execution of the work under this section of the contract including any work performed during the Defects Liability Period.

Crack repair methods: Crack repair methods for existing and new cracks formed by the contract work shall be submitted to the Superintendent's representative for review during tender submission. Any damaged caused to the epoxy floor topping by inadequate crack repair shall be the responsibility of the Contractor. All damaged work shall be replaced at the Contractors expense.

Note: Refer PROPRIETARY PRODUCTS, Section 1.6.

6.4 SELECTIONS

6.4.1 SCHEDULES

Note: Tolerance class A is particularly high tolerance and contractor is to allow for special attention to achieve this if and where required.

Table 6-2: Unformed surface finishes schedule

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Location	Property			
	Flatness tolerance class	Primary finish	Supplementary finish	Comments
Internal Slab on ground	B	Steel trowel finish		Not burnished
Internal Suspended slab.	B	Steel trowel finish		Not burnished
External pavements and driveways Internal and external ramps	B	Coved trowel and grooves for ramp		
Slab on ground driveway pavements	B	Coved trout		
Base to all tiled and granolithic finishes	B	Float finish.(alternately steel trowel then broom finish).		
Car park slabs. Any external areas with membrane applied.	B	Steel trowel		One pass with machine
Areas to be vinyl finished. Stairs.	A	Steel trowel finish		Not burnished
Precast elements	A	Steel trowel finish equivalent to Class 2 Formed surface finish. Refer section 2 CONCRETE FORMWORK		
Level one carpark slab grid N15-South	B	Coved trowel	Densiproof	Used as curing compound and densifier
Concrete re-entrant	B	Coved trowel	Densiproof	Used as curing compound and densifier

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7 PRECAST CONCRETE

7.1 GENERAL

7.1.1 AIMS

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Responsibilities

Provide precast concrete elements that are:

- Independently designed and documented.
- Designed for handling, transport and erection by a NPER professional engineer.
- Independently certified by a NPER professional engineer for the design and the erected components.
- Undamaged by handling and installation.

Contractor Design

The Contractor shall be responsible for the manufacture and erection of all precast concrete units shown on the Structural and Architectural drawings. The contractor shall also be responsible for the design of the units to resist the forces imposed during the manufacturing and erection of the units.

The design shall take into account all loadings to be imposed on the units during casting, lifting, transporting, erecting and temporary propping stages. The units shall be designed to ensure visible cracking is not induced during erection. Units deemed to have unacceptable cracking shall be liable to rejection.

The contractor is to engage a practising NPER engineer to certify the erection of all precast concrete units. This is to include and any required temporary bracing and members and any associated works.

7.1.2 CROSS REFERENCES

General

General: Conform to the General requirements worksection.

Associated worksections

Associated worksections: Conform to the following:

- Concrete formwork.
- Concrete reinforcement.
- In situ concrete.
- Concrete post-tensioned.
- Concrete finishes.

7.1.3 STANDARDS

Any reference documents referred to are for a guide only and the Contractor shall source all appropriate standards and codes and the latest editions are to be adopted.

General

Precast members: Conform to the recommendations of NP:PCH (Precast Concrete Handbook).

Transport, erection and installation: To AS 3850.

Precast flooring: To AS 3600.

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7.1.4 INTERPRETATION

Definitions

General: For the purposes of this worksection the definitions given in AS 3850 clause 1.3 and the following apply:

- Precast units: Concrete elements manufactured in other than their final position including elements manufactured on site such as tilt-up panels.
- Project design engineer: The engineer responsible for the design of the precast concrete elements as part of the complete structure. This design is for in-service conditions and covers the performance of the precast concrete elements as part of the complete structure.
- Design and construct engineer: The engineer responsible for a contractor design and construct component, such as a suspended floor, walls or column, which forms part of the complete structure. This design includes construction loading and in-service conditions and the performance of the precast concrete elements individually and/or with any associated in situ concrete toppings together forming the contractor design and construct component. This design and construct role includes certification that the construction is carried out in accordance with the relevant design drawings.
- Erection design engineer: The engineer responsible for the design aspects related to manufacture and construction including the handling, transportation, erection, bracing, and propping and lateral stability of the individual precast concrete elements.

7.1.5 INSPECTION

Notice

Inspection: Give minimum 24 hours (one working day) notice so that inspection may be made of the following:

- Formwork dimensions and stability.
- Panel edge details and penetrations.
- Connection materials and inserts in place.
- Reinforcement and/or prestressing tendons in place.
- Concreting.
- Stripping and storage.
- Site erection including fixings, in situ topping.

7.1.6 SUBMISSIONS

Subcontractors

Details: Submit name and contact details of proposed manufacturer of precast concrete units for approval.

Experience: The Contractor shall show evidence of a least 5 years experience in the production of precast units, and provide a list of recent projects undertaken in the previous twelve (12) months with contact names for inspection and review. Workmen shall be proficient in production operations and shall be under the direct supervision of a competent Foreman at all times.

Quality: The contractor shall demonstrate that quality assurance procedures are used in the design and construction of all precast units to ensure all products meet the requirements of this specification and relevant drawings.

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Certification

Precast units: Where precast units are designed by the contractor provide independent design and inspection certification by a professional engineer experienced in design of precast and registered on NPER for compliance with relevant design standards, structural drawings and approved shop drawings.

Manufacture and erection: Provide independent design certification by a professional engineer experienced in design of precast and registered on NPER for compliance of the design with relevant standards for forces imposed during manufacture and erection stages of the units.

Shop drawings

General: Submit shop drawings of precast units showing the proposed details for their design, manufacture, assembly, transport and installation, including the following:

- Project title and manufacturer's name.
- The information specified in AS 3850 clause 3.10.3.
- Marking plans and elevations referenced to the building grids and floors to locate each precast unit.
- Shape or profile drawings (submit these before fabrication of moulds and tooling).
- Concrete mix and type of cement if special-class concrete.
- Concrete cover to reinforcement.
- Locations, sizes, details, materials and stress grades of strands and reinforcement.
- Locations, sizes, details, materials, corrosion protection and grades of cast-in ferrules, locating plates and angles, cut outs and openings, bolts, anchors and lifting devices.
- Locations, sizes, details, materials of conduits and services.
- Details of all joints caulking, baffles and waterproofing.
- Jack clearances, procedures, stressing sequence, initial tensioning forces gauge pressure, and strand elongation.
- Surface finish class and surface treatment, if applicable.
- Formwork type
- Curing and protection methods.
- Veneer details, if applicable.
- Weights of units.
- Calculated maximum loadings on lifting and bracing inserts and attachments.
- Equipment and methods for handling, transport and installation, including lifting inserts and pick-up points.
- The rigging system including minimum sling length
- Calculations showing method of complying with nominated performance requirements.

- Evidence of load capacity of lifting and bracing inserts and attachments in the form of test reports or calculations.
- Specification of plugs for sealing recesses for cast-in fixings.

Documentation: The Contractor shall submit a copy of all design calculations and fabrication drawings for review and acceptance at least 14 days prior to work commencing.

Construction proposals

The Contractor shall submit construction proposals for the manufacture and erection of the units and include a construction programme and casting and erection sequence. The casting sequence shall clearly indicate the proposed casting position of each unit by number.

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Lifting

Early lifting: If it is proposed to lift the units by their designated lifting points before design strength has been achieved, submit evidence to demonstrate that the unit has adequate strength to carry its own weight without damage or residual cracking or deflection on removal of the lifting device.

Attachments for handling purposes: If it is proposed to locate lifting attachments, holes and other temporary fixings for handling purposes on visible faces of units, submit proposals.

Lifting units: If it is proposed to lift or support units at other than specified points, submit proposals.

7.1.7 PROTOTYPES

General

Requirement: Do not manufacture units prior to approval of the prototypes.

Storage: Maintain prototypes on site, undamaged and protected from discolouration for comparison with manufactured precast units.

Performance testing

Test each prototype for the nominated properties.

Structural testing

Static load tests: If structural performance requirements are nominated for the precast unit, perform static load tests on the prototype.

Waiver: The Superintendent may waive the requirement for structural testing if the Superintendent is satisfied with the calculations for performance requirements provided with the precasting shop drawings.

Standard: To AS 3600.

Test panels

Refer to architectural specification

7.2 PRODUCTS

7.2.1 PRECAST UNITS

Approved sub-contractor: Manufacture precast concrete units using an approved sub-contractor.

Colour

General: Provide details of how selected colour will be achieved including details of the type and colour of the cement, sand and aggregates as well as colouring oxide pigments to be used.

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Stockpile: Stockpile sand, cement and aggregates proposed to be used if required for uniform, consistent colour.

Marking

Identification: Identify units by marks which are as follows:

- Remain legible until after the unit has been fixed in place.
- Are not visible in the completed structure.
- Show the date of casting.
- Show the correct orientation of the unit.
- On other than units manufactured as a standard product, indicate the locations within the structure in accordance with the marking plan.
- Show the weight of the unit.

Structural performance requirements

Additional: Comply with the following requirements:

Surfaces bonded to in situ concrete

Surfaces bonded to concrete: Fully scabble and roughen all surfaces required to bond with in situ concrete to achieve a shear plane surface coefficient in accordance with Table 8.4.4 of AS 3600.

Tolerances

General: During manufacture restrict the variation from documented dimensions of a precast member to limits defined in Chapter 4 Tolerances of CIA Z48.

Fixings and embedded items in precast units: To AS 3610 and AS 3850, as applicable.

Casting bed

Following construction of the proposed casting bed, the Contractor shall survey the area to show that the surface tolerances are within those specified in AS 3850. If a specialist sub-contractor is being used, written acceptance of the casting bed as constructed, shall be obtained from the sub-contractor prior to any casting commencing.

Lifting devices and bracing inserts

General: Provide proprietary lifting devices with published load data designed specifically for lifting concrete elements. Use face and edge lifters as required.

Requirements: Comply with the following:

- Mark the working load capacities on the exposed face so that it can be identified even after the unit has been cast into concrete.
- Do not use reinforcing bars as lifting hoops.
- Provide hot-dipped galvanizing finish with a coating thickness of 600 gm/m2 to all cast-in lifting and bracing devices.
- Provide bracing inserts designed by the erection design engineer.

Capacity: To AS 3850 clauses 2.4.2 and 2.4.3.

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Attachments for handling

Sealing: Recess lifting attachments such as bracing ferrules, or other types of cast-in fixings, and provides plugs for sealing. Do not place lifting attachments, holes and other temporary fixings for handling purposes on visible faces of units.

Attachments for structural or architectural fixings

If it is proposed to use any alternative fixings to those shown on structural drawings submit proposals for consideration prior to shop drawing to allow sufficient time for review.

Ferrules: Provides ferrules anchored behind the reinforcing as shown on the drawings.

Dowel bars: Provide dowel bars loose, cast in or screwed into a ferrule or coupler and projecting from the precast unit. Alternatively, where dowels are cast into and project from in situ concrete, provide a mating sleeve without tube.

Grout tube: Provide grout tubes as documented, made from thin wall galvanised duct or similar cast into either in situ concrete or the precast unit into which a dowel bar will be grouted.

Cast in plates and bolts: Provide purpose made steel brackets with bars, bolts or studs welded to them.

Support and fixings: Provide supporting brackets (loose or cast in), ferrules, double inserts, bolts, nuts, packers and washers.

Restraint brackets: Provide all support or restraint brackets for the precast units as documented or as required.

Connections and fixing: The precast manufacturer to provide connections and fixings of precast units in accordance with BCA specification C1.11.

Unformed faces

General: Provide a wood float or ‘helicopter’ travelling machine finish to all uniformed faces such as the rear face of precast units that are not visible in their final state to give a smooth lightly textured surface.

Lifting points

Marking: Clearly mark all lifting points and the positions for temporary bearing for storage and transport. Lift or support members only at specified points. Do not use the fixing devices for lifting or hoisting.

Rejection

Assessment: Set aside for inspection any unit having damage such as cracking or deformation spalling, or exhibiting lack of adequate concrete cover. Repair or recast as instructed.

Units deemed to have unacceptable cracking, missing or misaligned cast in fixings shall be liable to rejection.

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Welding of connections

Standard: To AS/NZS 1554.3.

7.2.2 VENEERED CONSTRUCTION

General

Requirement: Do not provide veneered construction without prior approval.

7.3 EXECUTION

7.3.1 HANDLING

General

Manufacture the precast units so that they can be lifted into position and secured immediately before final adjustment.

Precautions

Lifting: Lift or support units only at designated points. Use handling methods which do not overstress, warp or damage the units.

Manufacturing certification: Prior to the lifting of any precast unit, the precast manufacturer shall provide written confirmation that the manufacture of the unit complies with AS 3850, this specification and the contract documentation.

Attachments

Remove temporary attachments after erection. Seal or otherwise make good residual recesses.

Lifting devices

Capacity: Provide reusable lifting devices with a capacity limit state factor of 5 in relation to the working load limit.

7.3.2 INSTALLATION

General

Work method statement: Prepare a work method statement specific to the project for the precast erection and submit on request.

Erection: The method of erection must be in accordance with the assumptions made during the design of the precast units with regards to rigging configuration, lifting inserts and strong backs. The Contractor shall obtain written certification from the Structural Engineer responsible for the erection of the units confirming that the method of erection is acceptable

and the units have been designed in accordance with AS 3850 and the contract documentation.

Fixing: Fix the units securely and accurately in their final positions.

Ancillaries: Provide components and materials, including fasteners, braces, shims, jointing strips, sealant, flashings, grout and mortar, necessary for the installation of the units.

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Certificates

Manufacturer's Certificate: a manufacturer's certificate shall be provided for all precast units stating that they have been;

- constructed in accordance with approved precast shop drawings
- installed in accordance with approved precast shop drawings and structural drawings

Survey Certificates: For all precast elements, provide a survey to ensure that all precast heights and plan locations are within tolerances. These are to be certified by a licensed surveyor.

7.3.3 PROTECTION

General

General: Protect the units against staining, discolouration and other damage until they are installed in their final location.

Safety requirements: To AS 3850.

8 BORED PILES

8.1 GENERAL

8.1.1 CROSS REFERENCES

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General

Conform to the General requirements worksection.

Related worksections

Conform to associated worksections as follows:

- Concrete finishes.
- Concrete reinforcement.
- Concrete formwork.
- In situ concrete.

Related Documents

Refer to the current geotechnical investigation reports.

8.1.2 STANDARD

General

Construction and materials to requirements of AS 2159 and AS 3600.

8.2 BORED PILE EXCAVATION

Extent: The work specified under this section shall comprise:

- Excavation for pile holes in other than rock (OTR) and rock.
- Removal off site of excavated material.
- Provide an independent approved geotechnical engineer engaged at the Contractors expense to monitor and certify the foundations capacity of the installed bored piles. Geotechnical inspection records and certificates are to be kept on site in a folder made available to the Engineer for review

Schedule Of Rates: The following items are to be covered in the Schedule of Rates, as these quantities are likely to vary from the Contract during construction (either addition or deduction).

- Excavation of pile holes in O.T.R. (for various diameters shown on the drawings).
- Excavation of pile holes in Rock (for various diameters shown on the drawings).
- Socketing base of piles.
- Proving Holes.

Site Investigation: Borehole information carried out by the client's Geotechnical Engineer shall be supplied as tender documents. Positions of the boreholes are shown on the Structural Engineer's drawings.

The supply of this information is for the convenience of the Contractor and does not exempt him from the responsibility of satisfying himself as to the true nature of the material to be excavated.

The Contractor is to carry out a thorough investigation and review of the location of existing services in the ground, prior to installing any bored piles.

The Piling Contractor shall report immediately to the Superintendent any unexpected ground conditions encountered that significantly differ from his interpretation of the Geotechnical Investigation or in relation to the proximity of services which will materially affect the location or design or founding depth for the piles. Should this constitute a variation then further work shall not proceed until approved by the Superintendent.

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Equipment: The Contractor shall provide all necessary equipment for boring, socket scouring, cleaning pile base out and proving pile holes together with power for operating it. Provide all necessary lighting and ventilation where hand work is required within the pile excavation, in accordance with the requirements of Work Cover.

Levels: Bore depths and socketing shown on the Structural Engineers drawings are for contract purposes only. The final excavated base level of all pile holes will be as directed on site by the contractor's Geotechnical Engineer during construction.

Tolerances:

All piles are to be vertical to within 5mm in 1000mm.

Single pile excavations shall not vary from design plan position by more than 75mm.

Contiguous piles excavations shall not vary from design plan position by more than;

- Inwards - toward excavation 0 mm
- Outwards - away from excavation 50 mm
- Spacing between piles 25 mm max

Should any pile be constructed outside the tolerances specified, the contractor shall have to rectify the foundations at no extra to the principal, including but not limited to the associated design, documentation, construction and delay costs.

Retaining of Excavation: The Contractor shall provide and install a casing in the bored hole where necessary to support the sides of the excavation to prevent loose material falling into the excavation up to time of concreting. The casing shall be provided in all pile holes where proving holes are required. The Contractor shall design the casing to be a snug fit inside the bored hole and capable of withstanding all earth and water pressures. The casing shall be permanent and shall not be removed during concreting. The casing shall extend 150mm below rock level.

Trimming: Trimming between and on the exposed face of piles shall be carried out to expose the concrete piles as detailed and conform to the tolerances specified for the general excavation.

Socketing Base of Piles: The Contractor shall socket base of piles to achieve, with the end bearing the required load capacity as specified on the Structural Engineer's drawings by mechanical means to the satisfaction of the contractor's Geotechnical Engineer.

Cleaning Out: The base of all piles shall be cleaned out to remove all loose material to the satisfaction of the geotechnical engineer. Pile holes shall be free of water prior to placing concrete. Excavated material at top of pile hole shall be kept sufficiently clear so as not to fall into the excavation during placing of reinforcement and concrete.

Proving Holes: The Contractor shall provide proving holes to the base footings as required by the contractor's Geotechnical Engineer.

The Contractor shall provide all necessary equipment access, ventilation and lighting for inspection of the proving holes by the contractor's Geotechnical Engineer.

Open Excavations: Contractor to provide safety covers to openings of all unattended pile holes.

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Prior To Concreting: After pile excavations have been taken to the required bearing base level and cleaned out, an instruction from the contractor's Geotechnical Engineer stating that end bearing and the sides are sufficient for the load capacity noted on the structural drawings must be given prior to placing reinforcement and concrete. The Contractor will be responsible for maintaining the excavation in its correct condition up to and including the time of placing concrete.

Removal Of Excavated Material: The Contractor shall remove all excavated material from the site.

8.3 BORED PILE CONCRETE

All these requirements are additional to those noted in related worksections.

Extent: The Contractor shall construct all reinforced concrete piles indicated on the Structural Engineers drawings including:

- Reinforcement and concrete to piles.
- Reinforcement and concrete to pile caps including casting in column starter bars.

Schedule Of Rates: The following items are to be covered in the Schedule of Rates for these quantities are likely to vary from Contract during construction (either addition or deduction) and be included in the tender contract.

- Reinforcement to piles.
- Concrete to piles.

Formwork: No form lining is required to the excavated face unless excavation is required to be retained as noted in 8.2 BORED PILE EXCAVATION.

Pile Caps: Provide permanent form lining to pile caps as shown on the Structural Engineers drawings. Remove form lining above top of pile cap after concrete has cured. (Minimum two days).

Reinforcement: Reinforcement to piles shall be fabricated into cages and carefully lowered into position so as to avoid dislodging material into the excavation. Reinforcement to piles shall be securely held in correct position during concreting operations.

Starter bars cast into pile caps shall be accurately set-out and securely held in correct position during concrete placement and curing.

Reinforcement to both piles and pile caps shall be inspected by the Superintendent prior to placing concrete.

Down-Pipes: Confirm requirement for down pipes cast into pile caps with superintendent.

Preparation Before Placing: Placing methods shall be submitted to the Superintendent before placing any concrete. Pile excavation to be completely cleaned and free of debris and water at time of placing concrete. Approval from the Superintendent shall be obtained prior to concreting any pile or pile cap.

The construction joint surface at the top of the pile shall be clean and scabbled to remove laitance.

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Concrete Placing: Concrete to piles shall be placed using a tremie tube placed centrally within the reinforcement cage. The maximum drop permitted from underside of tremie tube to placement level will be 3 metres. The tremie tube and entry hopper will be supported independently from the reinforcing cage and shall be withdrawn as concreting proceeds.

Concrete to piles where there is no liner shall be placed using a tremie or funnel placed centrally within the reinforcement cage. The maximum drop permitted from underside of tremie tube to placement level can be up to 20m providing the freefall is vertical and does not hit the sides of the hole.

Where liners are used or if the diameter of the pile is 1.2 metres or greater, concrete may be placed with a freefall of up to 20 metresand is allowed to come in contact with the side of the liner.

Compaction: Compaction of freshly placed concrete shall be carried out immediately and continuously using mechanical immersion-type vibrators. In the case of piles the vibrator shall be lowered inside the reinforcement cage and vibration shall be co-ordinated with tremie or alternative placement. The maximum depth of concrete placed in piles prior to vibration shall be two lineal metres.

Finishing: Construction joint at top of pile shall be hand finished to provide a dense level surface free from laitance. The top of pile caps shall be smooth wood float finished around the perimeter of the starter bars to the levels shown on the drawings.

9 ESD REQUIREMENTS

Concrete

The revised concrete credit has new criteria. Three points are available:

- 1 point where the Portland cement content is reduced by 30%, measures by mass across all concrete uses in the project compared to the reference case.
- 1 point where the mix water for all concrete used in the project contains at least 50% captured or reclaimed water and one of the following is met:
    - At least 40% of coarse aggregate is crushed slab aggregate or other alternative materials, provided that the use of such materials does not increase the use of Portland cement by over five kilograms per cubic meter of concrete.
    - At least 25% of fine aggregate (sand) inputs are manufactured sand or other alternative materials, provided that the use of such materials does not increase the use of Portland cement by over five kilograms per cubic meter of concrete.

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All concrete, including structural and non-structural concrete but with the exception of masonry, used on the project must achieve the following:

- Reduction in Portland cement content by 30% measured be mass compared to a reference case
- The mix water for all concrete must contain at least 50% captured or reclaimed water (defined as rainwater captured onsite or recycled / recovered from a previous use at any location.)

AND, one of the following criteria must be achieved for all concrete used:

- A minimum of 40% of coarse aggregate must be crushed slag aggregate or other alternative material, provided that the use of such materials does not increase the use of Portland cement by over five kilograms per cubic meter of concrete.

OR

- A minimum of 25% of fine aggregate (sand) in the concrete must be manufactured sand or other alternative materials, provided that the use of such materials does not increase the use of Portland cement by over five kilograms per cubic meter of concrete.

Acceptable types of alternative coarse and fine aggregate are listed in Cement Concrete and Aggregate Australia publications Use of Recycled Aggregates in Construction and Guide to the Specification and Use of Manufactured Sand in Concrete.

The reference case is used as the basis for calculating the percentage of Portland cement used in the building. The reference case should be established as follows:

- Establish the concrete mixes used, their volume and strength grade
- Calculate the amount of Portland cement in each mix (in kilograms), assuming no supplementary cementitious materials are used – using the table below:

It is noted that not all concrete mixes will have exactly the strength grades shown in the table, therefore the concrete designer or concrete technologist will need to do a linear interpolation of the two closest mixes to establish the reference case.

Concrete Strength Grade (MPa following AS1379)	Portland cement content to be used in establishing the reference case (kg Portland cement / m3 conrete)
20	<=280
25	<=310
32	<=360
40	<=440
50	<=550
65	<=550
80	<=610
100	<=660

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The amount of Portland cement is reduced as a percentage, measured as a mass weighted average in kilograms per cubic meter of Portland cement across all mixes.

The proposed use of supplementary cementitious materials must result in the same structural and functional requirements and apply to the same location and season as if the project was using Portland cement based concrete as required by the project specification and applicable standards.

The Subcontractor shall provide confirmation that the concrete mixes used on all works are as per Lend Lease Project Management & Construction specification and drawings. This shall be demonstrated by identifying all concrete uses in the works and describing the mix and product used.

Subcontractors will be required to participate in the review of the sustainability performance of all the concrete supplied.

The subcontractor shall also provide the following:

The Subcontractor (or supplier) shall provide a summary of absolute quantities of Portland cement used across all concrete mixes delivered to the project, and confirmation on the percentage of reduction in all concrete mixes in the project.

All batching or production records are to be retained and submitted to the head contractor. This must include specify the type, quantity and strength of all concrete, and detail the quantity and type of Portland cement, water, recycled, captured and reclaimed water, virgin aggregate and alternative aggregate (fine or coarse). Batching records should be maintained for 5 years from practical completion.

For more information on the reports and records required, refer to the Revised Concrete credit (dated 16 May 2012) on the GBCA website (www.gbca.org.au).

Sustainable Timber

All timber used on the project (building and construction works) is to be sourced from any combination of the following:

Re-used timber.

Certified Timber. This is timber which has been sourced from forests which has been which have been certified under the FSC International and/or PEFC-accredited certification schemes.

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Where re-used timber is used a minimum of 80% (by area, length, volume or mass) of the item must be from the original/reused source. A description must be provided demonstrating how this requirement is met and providing calculations (e.g. a breakdown of all components by area, length and mass). Where the actual cost of the item is known then this cost must be reported. Where the actual cost of reused items is not known then the cost may be estimated on the basis of replacement cost (i.e. the cost of an equivalent new item).

Where certified timber is used, it must be supplied in accordance with the Chain of Custody (CoC) rules of the respective forest certification scheme. Relevant CoC certificates or invoices including a relevant CoC code or serial number must be provided.

If timber products are produced from 100% post-consumer recycled timber without any virgin timber content, then this can be deemed “re-used timber”. Third party verification, in the form of a signed statement, is required to confirm the percentage of post-consumer recycled content in such product(s) in order for them to be recognised as ‘reused timber’. The third-party verification statement must be provided by an auditor registered by the Registrar Accreditation Board Quality Society of Australasia (RABQSA), or other equivalent national or international auditor accreditation system.

The contractor is to provide monthly reports of all timber and timber products used or installed on site, with the following details:

Description of timber use and/or timber product

Whether it is re-used, certified, or uncertified timber

For certified timber, provide:

Name of Forest Certification scheme

CoC Code or Serial number

Quantity of timber by area (m^2), lineal metres (lm), or number of items (no.)

Cost of each timber item

The contractor is to obtain approval of the design team or client before substituting any timber specifically listed in this specification.

A schedule of timber uses must form a part of the specification that specifically states what type of material, be it timber (either FSC, PEFC or recycled) or otherwise, is to be used for all common uses of timber on a project. As a minimum this should include:

Wall, floor and roof structures

External and internal cladding

Flooring/wall/ceiling finishes

Internal & external joinery (windows, doors, built-in furnishings, balustrades etc)

Structural formwork

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10 APPENDIX - DELIVERABLES SCHEDULE

Deliverables Schedule

The deliverables schedule shown below is informative only and is to assist Superintendent's representative and Contractor in identifying and supplying key deliverables under this specification required to be submitted to Taylor Thomson Whitting.

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Deliverable schedule

Section	Test Result/Submission Required	Frequency
1 GENERAL CONCRETE	Alternative proprietary products – Product data	Each instance
2 CONCRETE FORMWORK	Formwork stripping and back propping procedures	Each instance
	Proposals for concrete crack repair where required	Each instance
3 CONCRETE REINFORCEMENT	Certification from 'Australian Certification Authority for Reinforcing Steels Ltd' for the supply of reinforcement material.	Submit current certificate.
	Certificate of compliance for reinforcement	Each batch
	Additional splicing proposals	Each instance
4 CONCRETE POST-TENSIONING	Certification from 'Australian Certification Authority for Reinforcing Steels Ltd' for the supply of reinforcement(strand) material.	Submit current certificate.
	Strand certificates	Each coil
	Design calculations for strand/bar elongations i.e. theoretical extensions	Each concrete pour
	Shop drawings	Each concrete pour
	Post-tensioning equipment details and calibration certificates	Prior to commencing
	Post-tensioning records including site measured strand/bar elongations i.e. site extensions	Each concrete pour
5 IN SITU CONCRETE	Concrete Materials tests	Refer schedule
	Details for sources of materials	Refer schedule
	Concrete mix details	Each discrete mix
	Curing compound test data	Refer schedule
	Proposals for curing concrete	Prior to commencing
	Shop drawings for fixing of embedded items	Each instance
6 CONCRETE FINISHES	Crack repair methods	Each instance
7 PRECAST CONCRETE	Proposed precast subcontractor	Each instance

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Section	Test Result/Submission Required	Frequency
	Shop drawings	All elements
	Design certification	All elements
	Inspection Certification (design and construct)	All elements
	Manufacturers Certificate for precast construction and installation	All elements
	Lifting certification and procedure	All elements
8 BORED PILES	Geotechnical engineers certification foundation materials	Each pile prior to pouring concrete

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Donnelley Simpson Cleary
Consulting Engineers

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MIDTOWN MACPARK

SITE C3

PERFORMANCE SPECIFICATION

For

HYDRAULIC SERVICES

Project No : 8163

Revision : A – Tender Issue

REVISION SCHEDULE

NO	DATE	DESCRIPTION
1	26 November, 2021	Preliminary Issue
2	17 December, 2021	Final Coordination Issue
A	4 March, 2022	Tender Issue
☒	APPROVED	This document is issued for the purpose of the latest revision.
☐	UNCONTROLLED	Content in this document may differ from that contained in the latest revision.

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Note: Revisions to the text of this specification section subsequent to Tender Issue are indicated with a coloured highlight, as follows.

Modified text - eg: Provide and install pressure switches and flow switches where required to ensure correct operation of the pumps.

Deleted text, no longer applicable - eg: ~~Provide and install pressure switches and flow switches where required to ensure correct operation of the pumps.~~

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1 GENERAL REQUIREMENTS

1.1 INTERPRETATION

Terms Used

In addition to the definitions in the General Conditions of Contract the following applies to the terms used throughout this Specification. Terms used in this specification and associated drawings have the following meanings:

"Approved" or "Approval"	:	approved by or for the approval of the Superintendent.
“Approved Equal”	:	an alternative to the brand specified may be considered, however in no way implies that the alternative will be accepted. Acceptance or rejection of alternatives is entirely at the discretion of the Superintendent.
“Authority”	:	relevant statutory body or bodies responsible for the particular work specified
“Client”	:	the owner or operator of the building on completion of the works.
“Consultant”	:	Donnelley Simpson Cleary Consulting Engineers or another member of the design team for the project.
“Contractor”	:	the Contractor performing the works of this section.
“Demolish”	:	decommission, disconnect, make safe and remove from site referred and redundant existing equipment, without damage or impairment of any remaining systems or equipment.
“Documents”	:	the Specification and Drawings.
“Drawings”	:	diagrammatic representations which visually define the scope of the work associated with this section.
"May"	:	an option that will be available only at the discretion of the Superintendent unless stated otherwise.
"Other Trades"	:	the referred work is not intended to be undertaken in this section of the Contract however must be undertaken within the Contract.
"Provide"	:	to design, manufacture, supply, deliver, install, test, commission, warrant, guarantee, maintain, service, enter data for, and do all other things necessary to make the device, system, concept, method or requirement an integral part of the working installation.
"Shall"	:	is imperative and means that the device, system, concept, method or requirement must be provided as specified.
"Should"	:	is advisory and means that the referenced item is a preferred option.
"Replace"	:	de-commission, disconnect, make safe and remove from site existing equipment without damage or impairment of any remaining systems or equipment. Then provide new equipment equivalent to the existing and fully compatible with remaining systems or services.
"Reclaim"	:	decommission, disconnect, make safe and remove to safe storage on site existing equipment without damage or impairment of any remaining systems or equipment.
“Specification”	:	this document in its entirety.
“Superintendent”	:	the Client's representative managing the project.

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1.2 INTENT

Clarification

It is the intent of this Specification to define the scope of work required and the standards of workmanship and materials expected. It is the intent of this Specification to call for finished work, which is commissioned, tested, fully functional and ready for operation. The work includes the design, manufacture, fabrication, co-ordination, supply, installation, commissioning and maintenance of the installation in accordance with the requirements of the Specification, the requirements of all Authorities and relevant Australian Standards and to a high-quality commercial standard.

1.3 REFERENCES

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Attention is directed to other sections of the specification which contain relevant information, particularly with respect to the General and Special Conditions of Contract, Preliminaries and Associated Works. This section is to be read in conjunction with all other sections of the specification and their associated drawings to ensure a full and complete understanding of the project.

1.4 PROPRIETARY BRAND NAME REFERENCES

Clarification

Reference in the Specification to proprietary brand names or to a particular manufactured product is given as an indication of the minimum quality, class, performance, configuration, type and finish of the items to be used and as information to Tenderers on the type and size on which the design is based.

The reference indicates that the product is preferred and is to be used as the basis of the tender price.

Alternatives to the brand specified may be considered, if submitted as a Proposed Alternative in addition to the tender that includes the preferred item, or during construction. Provide full supporting technical and cost adjustment details for all alternatives offered. Submission of an alternative in no way implies that the alternative will be accepted.

Where an alternative is proposed, allow for all costs associated with the inclusion of the alternative, including changes and additions to other services, building and civil trades.

List all proposed alternatives in the Returnable Schedules “PROPOSED ALTERNATIVES”.

1.5 WARRANTIES

Requirement

Warrant the entire works of this section up until the completion of the Defects Liability Period. Obtain warranties for all items of equipment provided from any supplier or subcontractor for the works. Where the manufacturers of items of equipment give standard warranty periods in excess of the Defects Liability Period assign such warranties to the Principal prior to Final completion.

The full Defects Liability Period shall apply to all material and items of equipment and if a situation arises where the full extent or period of warranty cannot be obtained from the supplier of goods or equipment then allow for and provide the warranty for the full extent or period specified.

Replaced items of equipment shall carry a warranty covering a period equal in duration to the Defects Liability Period and dating from the time of installation of the replacement.

1.6 REJECTION OF PLANT/WORK

Requirement

Make good or alter to comply, the complete plant or any portion thereof which is defective or fails to fulfil the requirement of this contract to the approval of the Superintendent. Failure to do this within fourteen (14) days may result in plant being rejected and requiring complete replacement. Such rejection shall not be a cause for extension of time or additional costs.

1.7 SETTING OUT

Requirement

Thoroughly examine the specification, drawings and site to determine actual spaces available for the accommodation of the systems. Obtain all such information and measurements required to carry out the work. Locate all equipment that must be serviced, operated, or maintained, in fully accessible positions with access in accordance with manufacturers’ recommendations.

Ensure the correct positioning and installation of all work and equipment coordinated and installed in consultation and cooperation with all other trades on the project.

1.8 QUALITY OF WORK AND MATERIALS

Requirement

Install all components in compliance with the requirements of all relevant Australian Standard specifications or codes.

Provide all materials and equipment of proven and established design by manufacturers experienced in producing such equipment. Spare parts and technical data and service facilities where equipment may require maintenance shall be readily available in the locality. Where the Superintendent considers that equipment and materials do not meet these requirements, he may order substitutions to be made in order that the requirements of this clause are satisfied.

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Include in the installation all parts necessary or usually supplied for safe and convenient operation irrespective of whether such parts have been specified.

Provide materials and equipment to be incorporated in the Works that are new and clean and free from corrosion. Remove all temporary coatings and finishes and other measures for protection during handling, make good any damage incurred before completion and bring the whole installation to a clean and operational condition.

Where two or more units of the same kind of component are furnished, use products of the same make and similar or identical type as far as is practicable. Similarly, standardise the method of fitting and installing all similar items.

If any particular component part of the installation exhibits a potential weakness by failing at a rate which is unusually high for the class of equipment, replace all similar components to the satisfaction of the Superintendent.

Design systems to remain in economic service for a period of twenty-five (25) years.

1.9 PROTECTION

Requirement

Protect all works and equipment during delivery and installation on site. Deliver all equipment to site wrapped in plastic sheeting and housed in timber casings. Maintain the coverings during installation or provide additional coverings to ensure that the equipment and all finishes are in perfect condition upon completion. For damaged items where repairs do not result in an as new finish, completely replace the whole item or components thereof to ensure that the item is in as new condition.

1.10 WORKING DETAILS

Scope

Prepare details of the work to be carried out including Working Drawings and Technical Data and existing system performance results where applicable.

Submit working details together with additional manufacturers information describing application, selection, performance, installation, maintenance and where applicable, trouble shooting to fully describe and detail the work to be done. Submit working details in Portable Document Format (PDF) and where requested in hard copy. Allow a minimum period of two (2) weeks for review and return of each submission.

Bear all costs associated with abortive and corrective work which result from work proceeding without obtaining review of working details. Such abortive / corrective work shall not be cause for extension of time.

Coordinate all working details with the structure and all other services within this and other sections of the contract prior to their submission. Ensure that all information from all sub-contractors, is fully and clearly cross referenced.

Issue completed working details to the Superintendent for distribution to all interested parties after all requested modifications have been made.

Availability of Tender Drawings
The tender drawings in electronic format will not be made available to the Builder or trades for use. Architectural backgrounds should be obtained through the superintendent for use as the basis for the production of Workshop and As Installed drawings. Allow for the full development and production of Workshop and As Installed drawings in accordance with the requirements of this section.

Working Drawings
Prepare all drawings to Australian Standard AS 1100 using competent and experienced drafters.

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Include detailed information on new and existing systems and equipment. Where existing systems are to remain, site survey and measure the actual location, size and arrangement of all existing systems and detail on the Working Drawings. Prepare and submit Working Drawings for the entire installation including but not be limited to, those required by other parts of this specification. All Working Drawings shall be accompanied by all calculations relevant to the content of the drawings.

Include at least the following on the working drawings:

- Pipe systems for the works including all invert levels of pipework.
- Dimensioned drawings showing positions and sizes of all core holes proposed throughout the buildings. These drawings shall be submitted to the Superintendent prior to the commencement of any works.
- Floor plans, including the position of control equipment and valves. Valve tag identification labels and numbers are to be referenced on the plans.
- Ceiling access panels and access openings in walls and at other positions as required for adjustment, maintenance and access of isolation valves, expansion joints, inspection openings to sewer, sanitary, grease, downpipes and stormwater pipework and the like and access to traps.
- Detail drawings of:
  - Wet area and apartment layouts
  - Pumps and Pump Sets
  - Electrical Control Panels for all pump-sets and electrical equipment
  - Hot water plant
  - Cold water plant
- Diagrammatic drawings of electrical power and control wiring for all Hydraulic Services equipment

Technical Data
Submit manufacturers technical data for all equipment, including detailed selections indicating equipment make, model, number and net capacities satisfying the specified requirements.

Site Copy
Provide a complete hard copy set of original Contract Drawings and Specifications as well as the latest Working Drawings and Specifications on site for reference purposes. Ensure that these documents are up to date at all times.

Review
Review of Working Details in no way relieves the contractor of the responsibility to satisfy all requirements of the Specification unless non-compliances have been specifically identified and written acceptance obtained from the Superintendent.

1.11 SAMPLES

Requirement
Provide samples for review as listed below and in other sections of this Specification. Allow a minimum period of three (3) weeks for their review, prior to ordering. Tag or otherwise properly identify their purpose and provide all associated data, fittings and apparatus proposed for use. Submit drawings and sketches of

all special equipment or parts, together with such other details as may be deemed necessary to enable the suitability of the proposed equipment to be fully assessed.

Samples may be retained until the completion of the work, and used as a standard for acceptance or rejection of the items provided. In particular provide samples of :

- Pumps
- Filters
- Pipe and fittings
- Hot water plant

In addition, provide samples as requested by the Superintendent.

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1.12 STANDARDS, REGULATIONS AND FEES

Requirement

Comply with the relevant rules and requirements of the following :

- National Construction Code (NCC) / Building Code of Australia (BCA) as amended and the NSW BCA Appendix
- Relevant Australian Standards
- Electrical Supply Authority
- Water Supply Authority
- Sewerage Waste Authority
- Relevant Government Authority Regulations
- Workcover Authority (Workplace Health and Safety)
- Fire Brigade
- Local Council
- Environment Protection Act and Authority
- Any other Authority having jurisdiction over this installation.
- Relevant Australian standard specifications or codes, except where such specifications or codes shall be varied by any governing authority. Such compliance shall in all cases be with the current edition or issue of the specification or code concerned.

Where requirements of any governing authority or any applicable Australian or British standard specification or code differ from the requirements specified herein, the more stringent requirements shall prevail unless expressly stated otherwise or agreed with the Superintendent.

The terms AS and BSS refer to the Australian Standards and British Standard Specifications respectively and, unless otherwise specified, shall be deemed to include the whole of the standards and all amendments thereto up to date of issue of documents.

Give all necessary notices, obtain all permits, perform all tests and pay all fees and other costs in connection with the work. File all necessary plans and obtain all necessary approvals from the statutory Authorities having jurisdiction over the work. Notify the Superintendent should the procurement of such permits etc. threaten to delay the project in any way.

All materials supplied and all work installed shall comply with codes, rules and regulations of all Statutory Authorities, with the rules and recommendations of the Insurance Council of Australia and with all requirements of the Local Council, Australian Standards and utility undertakings.

Procure certificates indicating a satisfactory installation from all relevant Authorities and provide the Superintendent with copies.

Pipes fittings, accessories and the like used in the works shall bear approval marks where and as required by the relevant Authority

1.13 QUALITY ASSURANCE

Requirement

Implement a Quality Assurance ("QA") System for the work, generally in accordance with Australian Standard AS 9000 and the General Conditions of Contract.

Provide requirements for inspection, testing, witness points, commissioning, quality audits, hold points, acceptance documentation and the like. Appoint a Quality Manager who will be responsible for the contractor's QA System for the works and for participation in the overall project QA System.

The QA System must prove that the Services Installation conforms to the design requirements, is installed, checked, commissioned and tested and that the QA System is able to be audited by the Superintendent during the course of and after the completion of the installation.

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Provide a copy of the following QA System documentation :

- Project Quality Plan within 30 days of the commencement of the Services Contract.
- Prepare and issue a regular Monthly Report outlining the status of implementation of the QA System.

1.14 CERTIFICATES OF COMPLIANCE

Requirement

Provide certificates of compliance in a form acceptable to the Authorities, certifying that those sections of the work which are essential services or are services requiring certificates of compliance with any other Ordinance, Regulation or Act, are installed and have been tested and proved to be in conformity with the relevant requirements.

Carry out tests to prove compliance prior to Practical Completion. The test programme and task of proving that the system conforms with Authority requirements shall be the responsibility of the Contractor. Give prior advice to the Superintendent of the tests and the opportunity to witness them.

Practical Completion will not be granted until the certificates have been provided.

Prior to the end of the Defects Liability Period deliver three copies of the following documents for approval :

- Certificates of Certification as required by BCA or the Principal Certifying Authority (PCA).

Sign the certificates using a signatory who is approved or registered by the relevant authority as competent and authorised to provide such certification. Provide evidence of such authority.

1.15 ELECTROMAGNETIC COMPATIBILITY

Equipment

All electrical and electronic equipment installed as part of the work is to meet Electromagnetic Compatibility requirements and to bear the “C-Tick” label.

Systems

Installed systems shall be capable of functioning in their electromagnetic environment without introducing disturbances to any other equipment or systems in that environment.

1.16 SITE ASSESSMENT & ADJUSTMENT

Requirement

Prior to submitting a tender, visit the site and become familiar with all site conditions that may affect the work, including but not limited to, existing buildings and their services, site access, actual location of existing in ground services. Make allowances for modification and augmentation of all such systems and conditions to accommodate the works.

Determine and make allowance for all local requirements, with particular reference to relevant regulations and requirements of Authorities and union groups having jurisdiction over the works.

Prior to commencing work, undertake a detailed review of the site, architectural, structural and all services drawings. Adjust the arrangement, construction and sizing of ductwork, pipework and fittings indicated

diagrammatically on the tender drawings to ensure fit within the available shaft, plant, ceiling and other spaces and to co-ordinate with structure and other services. Determine the extent of all such adjustments and indicate in detail on the workshop drawings.

1.17 DRAWINGS AND SPECIFICATION

Drawings

The Drawings are provided as a guide only and are diagrammatic showing the approximate arrangement of the systems to be provided. Where figured dimensions are provided on the drawings, these are to be considered minimum required dimensions and are to be adhered to.

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Drawings and Specification

The Drawings and Specification are intended to be mutually explanatory. Fully execute all work called for by one, even if not by the other. Should either document contain conflicts, or both documents be in conflict, the Contractor will be deemed to have included in his tender price for the larger quantity and/or the more expensive components.

1.18 PIPEWORK GENERALLY

Spare Capacity

Size and design the systems to cater for future loads that are not currently nominated. Allow for an additional 10% spare capacity in all services.

Headroom and Void Space

Pipework shall be installed as high as possible to underside of structure. All pipework located within the basement carpark areas shall be at 2200mm (minimum) above finished floor level and higher where required by the local Authority, other standards and other briefing documents.

Services shall be installed within ceiling voids and bulkheads made available for this purpose.

Future Works

Avoid locating services in areas shown for future works so as to avoid future diversions and re-routing of pipework within future works/stages.

1.19 COORDINATION OF PIPEWORK AND EQUIPMENT

Requirement

Consult the Architectural details and construction drawings for actual spaces available and for building details before installing outlets, fittings, conduits, pipework and equipment.

Locate all equipment that must be serviced, operated, or maintained, in fully accessible positions. If any equipment cannot be so located call it to the attention of the Superintendent prior to fabrication or installation.

Be fully responsible for the correct positioning and installation of all work and equipment installed in consultation and cooperation with all other trades. No extras of any kind will be allowed if work and equipment have to be removed and replaced due to lack of coordination.

1.20 QUALITY OF MATERIAL

Requirement

All materials and apparatus required for the work shall be new, of first-class quality, and shall be supplied, delivered, erected, connected and finished in every detail. Where no specific kind or quality of material is specified or shown, first class articles as approved by the Superintendent shall be supplied.

1.21 EQUIPMENT DEVIATIONS

Requirement

Where provided, dimensions and ratings of equipment specified herein or indicated on the Drawings, they are intended to establish the quality and characteristics of equipment furnished by the particular manufacturer specified.

Where it is intended to use an item of equipment other than that specified, the Superintendent's approval thereof must be obtained in writing.

Where offers are made for alternatives to major items of equipment specified, or if proposed controls and other minor equipment differ in operation or standard to that specified, clearly describe these deviations in the tender. Deviations to the specified equipment will not be accepted after the acceptance of the tender.

Where any approved deviation requires any redesign of the structure, partitions, foundations, piping, wiring or redesign of any other part of the mechanical, electrical, structural, or architectural layout, all such redesign and all new drawings and detailing required will be the responsibility of the Contractor. The Contractor shall provide to the Superintendent all information to enable the re-design work to be carried out by the consultant team and accept the cost and responsibility of all changes incurred in the execution of such redesign work whether or not the deviation is described in the tender offer.

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Where such approved deviation requires a different quantity and arrangement of architectural or structural materials, or a different quantity and arrangement of piping, sheet metal, insulation, wiring, wiring conduit, equipment and the like from that shown on the Drawings, furnish and install any such additional materials and equipment required by the system without additional charge.

1.22 VARIATIONS

Requirement

The nature of a Design and Construct Contract based on this Specification and associated Drawings (where provided) is that the scope of work required to compete the design and construction of the works in a complete manner is considered to be included in the scope of work.

However, should the Contractor believe that the scope of work has changed, for example due to post Tender changes to the scale of the project, the Contractor shall immediately notify the Superintendent of any such issue and provide details of proposed Variation Claim for review.

1.23 SUB-CONTRACTORS, EQUIPMENT AND MATERIALS ACCEPTANCE

Requirement

Comply with the following sub-clauses in order to obtain approval for the use of Sub-Contractors, equipment and materials.

Submit for approval a list that includes:

- The names of all Sub-Contractors proposed to be employed in executing any work on a Sub-Contract basis.
- A list of the manufacturers of equipment and of materials proposed to be included in the Sub-Contract works.

Following acceptance of the proposed Sub-Contractors and manufacturers of equipment and materials by the Superintendent, the Contractor will be bound to use the Sub-Contractors and manufacturers stated.

Each item of equipment shall be a standard catalogue product of an established, reputable, approved manufacturer, type, class and finish, unless otherwise specified.

1.24 DA CONDITIONS, BCA REPORT, BASIX REPORT AND FIRE ENGINEERS REPORT

Requirement

Obtain copies of the DA Conditions, BCA Report, BASIX report and Fire Engineers Report (where available). Ensure the design and construction of the services is carried out in accordance with the requirements of these documents.

1.25 DELIVERY AND STORAGE OF MATERIALS

Requirement

Coordinate the delivery of all materials to minimise on-site storage requirements. Adequately protect all plant and materials to avoid damage or corrosion during transit, storage and installation. Any plant or materials damaged prior to erection shall be replaced or rectified at the Contractor's expense, unless the offender can be determined and the damage directly attributed to the blatant carelessness of the offender. In this case the offender will be deemed responsible and be responsible for replacement costs.

1.26 OUTSTANDING ITEMS

Requirement

At the commencement of the Defects Liability Period, the Superintendent will provide a list of incomplete items. Complete the outstanding items within two months of the commencement of the Defects Liability Period. If the items are not completed within the stated period, the Defects Liability Period and Maintenance Period shall be extended by the amount of excess time taken to complete them.

1.27 SUPERVISION

Requirement

Personnel holding appropriate Licenses shall undertake the supervision of work.

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Provide continuous supervision during the Construction stage including the following:

- Continuous supervision of the works.
- Continuous coordination of the installation with the Superintendent.
- Preparation of commissioning check lists for testing procedures of all installed plant and equipment.
- Provision of assistance to the Superintendent for the initial running of the plant.
- Supervision of the preparation of Design Drawings, work shop drawings "As-Built" Drawings, Maintenance Manuals and procedures.

1.28 LOCATION OF EXISTING SERVICES

Existing Drawings

Undertake a Dial Before You Dig application and obtain all existing services drawings from Authorities and other relevant sources prior to submission of the tender in order to determine the scope of temporary and permanent diversions required to enable the construction of the new works.

Pre-Tender Site Visit

Visit site prior to the submission of the tender and survey the existing services that are required to be connected to, to enable the works to proceed. This includes (but is not limited to) confirmation of the location of existing Authorities services and the location of existing site services which are to remain as part of the completed development or during the construction works.

Pre-Construction Requirement

Determine and confirm the depth of the existing Authorities' services to ensure the installations of the new services are physically achievable. Invert levels of existing services noted on the Drawings are to be considered estimates only and are to be confirmed on site. Confirmation of invert levels for grade reliant services is to be carried out prior to commencement of any works on those services.

Any clashes with existing services due to site survey or difficulties in achieving connections on grade reliant services are to be brought to the attention of the Superintendent immediately.

1.29 EXISTING SERVICES CONNECTIONS AND DIVERSIONS

Requirement

Provide all necessary connections and diversions of existing services during demolition and construction works required, ensuring that all existing services supplying other areas of the site remain operational during construction, whether or not they are within the contract works. Temporary diversions will either be made redundant or permanent as required at the completion of the works.

1.30 INTERRUPTION AND SHUTDOWN OF EXISTING SERVICES

Requirement

Interruption and down time of existing services is to be kept to a minimum. Notify the Superintendent 48 hours before interruption to, or shutdown of any existing services for the purposes of connection, diversion and the like. If requested by the Superintendent, reschedule the interruption or shutdown to a time and day that better suits the operation of the existing site.

Out of Hours Work

Where the existing services are critical to the operation of the existing site and the Superintendent advises that shutdown of existing services cannot be tolerated within normal working hours, undertake such work at an agreed time and day which is most suitable for the sustainment of the existing site.

1.31 STAGED DEVELOPMENT

Staged Work

Undertake works in accordance with staging requirements of the Builder and the Superintendent to enable areas of the development to be complete (and handed over to the Client if necessary) without further need to enter the completed area.

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Plant Equipment and Service Connections

Provide major plant and equipment and connections to Authorities infrastructure at an early stage of the works, as required to enable particular areas of the development to be handed over to the Client in accordance with the staging of the works.

Temporary Services

Provide temporary services as necessary to enable hand over of particular completed areas of the development in accordance with the staging of the works.

1.32 REMOVAL OF REDUNDANT EXISTING SERVICES

Requirement

Visit the site prior to the submission of the tender and survey the existing services to enable the extent of existing services down-takings to be determined. Include for all down-takings and removal from site, all redundant materials and services that fall within the Contract and are no longer required.

1.33 SEALING OF REDUNDANT SERVICES

Requirement

Seal all redundant existing site and Authorities' services including electrical wiring to hydraulic equipment to the requirements of the relevant Authority and the Superintendent.

1.34 AMENITIES DURING CONSTRUCTION

Requirement

Provide temporary water and sewer connections to amenities areas provided by the Main Contractor. This may require temporary water and sewer connections to be undertaken where existing services are not available. Liaise with the Main Contractor to determine the extent of services required to be provided during construction.

1.35 GREEN STAR

Requirement

The project is committed to the achievement of 5 Star Green Star Design and As-Built rating for the building and 6-star Green Star Communities rating for the precinct. The requirements of this rating are outlined within the Green Star specification prepared by Integral Group.

Provide all necessary equipment, materials, services, documentation and the like necessary to achieve the necessary credits as outlined in the Green Star specification.

Where a conflict exists between the Green Star specification and this specification, allow for whichever is the more onerous.

2 SCOPE OF WORKS

2.1 PROJECT DESCRIPTION

This project constitutes Site C3 of the Midtown MacPark development.

The project includes the construction of the following components:

- Two residential buildings (Buildings A and B) consisting of 162 apartments;
- Three levels of common basement car parking incorporating a loading dock with turntable;
- Ground level incorporating Commercial Retail Tenancies and associated spaces;
- One level incorporating outdoor courtyard space and communal/conference room on level 15;
- Associated roof plant and utility spaces.

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2.2 CONSTRUCTION STAGING

The project may be constructed in more than one separable portion, with selected areas achieving occupation in advance of others. This will require temporary services to be provided and maintained at various stages during construction.

During the tender period, determine and allow for the full extent of works required to effect the construction staging. Determine any diversions, demolition and temporary services required to facilitate the staging. Provide temporary connections and services to existing and new areas that are required to become or remain operational during the construction period and ensure that the operation of those areas/services is maintained.

Temporary connections and services will either be made redundant and removed, or become permanent as required to suit the programme of works. Wherever possible, demolish all systems that become redundant once the construction staging is complete.

2.3 GENERAL

Extent of Work

The Contractor shall supply all labour, materials, equipment and services for the complete design, installation, setting to work and maintenance during the defect liability period of the complete hydraulic services systems. The works shall include the following systems that are further described in each section of the specification:

- Sewer drainage.
- Stormwater drainage.
- Sanitary plumbing.
- Trade Waste drainage.
- Rainwater downpipes and planter drainage.
- Domestic Cold water.
- Domestic Hot and warm water.
- Recycled System for Irrigation.
- Irrigation pipework including cast in pipework to planters, garden beds and green walls.
- Fire hose reels.
- Sanitary fixtures and tapware.
- Commissioning and testing.
- Operation and maintenance.

2.4 INSPECTION OF DOCUMENTS AND THE SITE

Requirement

Visit the site and inspect all documents and programmes during the tender period and obtain a full understanding of the true nature and extent of the work to be carried out under the Contract.

Check access to the site and all relevant parts of the existing development. Determine all local information required in preparation of the tender, with particular reference to the relevant regulations and requirements of the Authorities and union groups having jurisdiction over the works.

2.5 DESIGN OF SERVICES

General

Design the hydraulic services works in accordance with relevant Australian Standards, National Construction Code, Authorities requirements and in accordance with the Specification and Drawings. Coordinate with architecture, structure and all other services.

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Design Reference Documents

Attention is directed to other sections of the specification which contain relevant information, particularly with respect to the General and Special Conditions of Contract, Preliminaries and Associated Works. This section is to be read in conjunction with all other sections of the specification and their associated drawings to ensure a full and complete understanding of the project. Principal Project Requirements documents.

Comply with the requirements of all documents associated with the project, including but not limited to:

- Architectural documents;
- Structural documents;
- All other services documents;
- BCA report;
- Acoustic report;
- BASIX report;
- Green Star documentation;
- Real Utilities Brief;
- DDA report;
- Fire engineering report/brief;
- Council Conditions of Consent;
- Any other contract documentation;

Briefing Documentation

The solutions documented in the Specification and on the Drawings represent the type and minimum standard to be provided, and these are to form the basis of the tender. The D&C nature of the contract does not entitle the contractor to alter the concepts, or reduce the quality or functionality of systems and equipment specified without approval.

Design of Services

Carry out Schematic Design, Design Development as scheduled below.

Schematic Design

Schematic design shall include the following:

- Consult with the architect to establish suitable risers, passages and equipment locations as necessary.
- Develop outline drawings and schematics for all items of equipment and pipework.
- Prepare schematic designs outlining access requirements in ceilings.
- Attend design meetings to incorporate services requirements into the design.

Design Development

Design development shall include the following:

- Coordination of the design with the Architect.
- Attend design meetings to incorporate services requirements into the design.

- Develop detailed Design Drawings of systems layouts and equipment.
- Prepare a full technical specification for equipment, systems, workmanship and material.
- Provide advice to all other trades for Associated works.

Associated works

Liaise with other contractors during the design process to ensure that all associated work required for the proper installation of the hydraulic services is included in other services trades work and that any services required by other trades are included in the hydraulic scope of works.

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Authorities

During the design phase, liaise with all relevant Authorities to fully determine their requirements and incorporate those requirements within the Design Drawings.

Calculations

Undertake all design calculations associated with determining capacity and sizing of pipework, equipment, storage and systems. Provide calculations along with referenced drawings and documentation to the Superintendent for review and comment by the Consultant.

Spare Capacity

Size and design the systems to cater for future loads that are not currently nominated. Allow for an additional 10% spare capacity in all services.

Headroom and Void Space

Pipework shall be installed as high as possible to underside of structure. All pipework located within the basement carpark areas shall be at 2200mm (minimum) above finished floor level and higher where required by the local Authority, other standards and other briefing documents.

Services shall be installed within ceiling voids and bulkheads made available for this purpose.

Services Risers

Provide risers to accommodate the hydraulic services. Liaise with the architect and other services contractors to coordinate spatial requirements for risers throughout the development.

Future Works

Avoid locating services in areas shown for future works so as to avoid future diversions and re-routing of pipework within future works/stages.

2.6 DESIGN DRAWINGS

Requirement

Submit for examination in accordance with this section, detailed, Design Drawings and layouts of equipment showing general construction, size and arrangement and operating clearances. Supply together with the Design Drawings, performance characteristics and capacity of all equipment, with sufficient engineering data to show compliance with the relevant clauses of this Specification and Drawings where provided.

Positions of all equipment shall be shown on Design drawings.

Format and Presentation of Design Drawings

Design Drawings shall be produced in AutoCAD and provided in AutoCAD format (".dwg") and in Portable Document Format (".pdf") for examination and comment. Each drawing will be examined and commented on by the Superintendent and will be returned.

Drawings requiring correction shall be corrected and re-submitted. Drawings shall be of 1:100 scale for main runs of pipework and 1:50 scale for plant areas and for water services in wet areas and the like. In congested areas where 1:50 scale drawings do not clearly define the installation, 1:20 scale shall be used.

Review of Design Drawings is not to be considered as a guarantee of measurements or building conditions. Where drawings are inspected, said inspection does not in any way relieve responsibility nor the necessity of furnishing material or performing work required by the Contract Specifications which shall, in the event of a dispute, take precedence over shop drawings.

All drawings submitted by the Contractor (including those by Suppliers) shall be labelled with a suitable title-block and description as necessary to identify the drawing.

Submit to the Superintendent for examination, six copies of a schedule of shop drawings, within seven days of the Contract being awarded. The schedule shall include the following:

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- Drawing Number
- Title
- Planned Date of Submission
- Planned Date of Examination

Dates for submission and examination shall be Coordinated with the overall Construction Programme. Design Drawings shall be submitted for checking by the Superintendent a minimum of 14 days prior to the required return date.

The Consultant shall not be regarded as the checking agent. Approvals of Design Drawings shall be given in principle only, without removing the responsibility for the proper coordination, installation and operation of the services from the Contractor.

Failure to include all Design Drawings on the schedule shall not reduce the responsibility of submitting all required shop drawings in time to permit correct processing as specified herein.

Design Drawings shall be submitted for the entire installation and shall include, but not be limited to, those required by other parts of this Specification.

It is the responsibility of the contractor to ensure all Design Drawings co-ordinate with other building services, structure and architectural documentation prior to their submission.

Design Drawings shall include but not be limited to the following data:

- Pipe systems for the works including all sizes and invert levels of pipework.
- Floor plans, including the position of control equipment and valves.
- Detail drawings of:
  - Wet area and apartment layouts
  - Pumps and Pump Sets
  - Hot water plant
  - Cold water plant

2.7 COORDINATION

Requirement

Determine the routes of all services in coordination with all other services and the position of all conduits, pipes, cables, ductwork and the like in connection with the works. The breaking or cutting of completed work must be avoided wherever possible.

2.8 CO-OPERATION

Requirement

Closely schedule the Works so that they are installed at the proper time and without delaying the completion of the project or affecting the progress of other trades. Fully coordinate Design Drawings and workshop drawings with other Contractors and the Superintendent prior to the manufacture and installation of pipework, plant and equipment. Costs associated with the failure to coordinate with other trades will be borne by the Contractor.

2.9 OBVIOUS WORK

Requirement

The nature and spirit of the Specification and Drawings is to provide for the complete work described herein and shown on the tender documents. The Contractor is to furnish everything reasonably necessary for such construction notwithstanding any omission in the Specification and/or Drawings.

2.10 SAFETY

Requirement

Ensure that all tools, plant machinery and equipment are maintained in a sound condition and are safe for use, operated in a safe manner and do not obstruct the road-ways or impede the passage of vehicles or pedestrian traffic. The work shall not, at any time, be left in an unsafe condition or in a condition that might cause damage to other existing work, plant, machinery or equipment. Work shall be continued (after hours if required) so that it is left in a safe condition at the end of the day. All costs, including the cost of labour and overtime, of any such continuation of work shall be borne by the Contractor.

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2.11 DIAL BEFORE YOU DIG

Application

Before commencing any work on site, undertake a Dial Before You Dig application in order to determine locations of existing Authority Services in the vicinity of the development.

Contact Authorities

Contact relevant Authorities as required by the responses to the Dial Before You Dig application prior to commencing any excavation works. Carry out any further applications or works required by the Authority in relation to work in the vicinity of the Authority services.

Services Investigation

Where Authorities services are shown to be near the proposed works, obtain the Authorities approval to physically locate and expose the services by potholing in appropriate locations in order to confirm the exact location, size and depth of the Authority Services. Such work is to be carried out in accordance with the Authorities' requirements and extra care is to be taken when working near any existing Authorities services. Note that services may not be located exactly as per Dial Before You Dig information.

Coordination

Should the Authorities' services be found to be clashing with any proposed structure or services, advise the Superintendent and modify the Design and Shop Drawings to coordinate with the existing services.

Authorities Diversion

Where the Design cannot be modified to suit the existing services make application to the relevant Authority to undertake a services diversion. Carry out all design, documentation and construction works required in order to modify the Authority's service in accordance with the relevant Authority.

2.12 PROTECTION

Requirement

Protect all work that may be liable to suffer damage from exposure to the weather or other causes.

Protect all existing services at and / or close to the vicinity of the work during the construction period. Rectify any existing services damaged during construction, whether damaged by the Contractor or other trades. Should the damage be due to lack of protection by the Contractor, the Contractor will bear the cost of repair. If the damage can be proven to be due to negligence by another party, the costs of repair will be reimbursed to the Contractor.

2.13 SETTING OUT

Core Holes & Penetrations

Set out all core holes and openings as required for the passage of pipes, sleeves and/or conduits throughout the structure. This set-out is to be in accordance with the core hole drawing plan submitted to the Superintendent prior to work commencing on site. Should additional holes or openings be required due

to the failure to fulfil the conditions of this clause, then arrange with the Superintendent for approval to drill at no extra charge, such holes or openings and pay all costs involved.

Do not cut any holes, openings or chases without the specific approval of the Superintendent. Any damage to other trades shall be made good without extra charge.

Accessibility

The set-out of piping, valves and equipment shall be arranged in conjunction with other trades so as to be readily accessible for operating, servicing, maintaining and repairing same.

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As far as practicable, install plumbing work inside buildings so that it is removable without damage to the building structure or finishes. Where practicable, conceal pipework so that it is accessible within ducts or non-habitable enclosed spaces and does not appear on external walls. Obtain prior approval for the location of exposed pipework.

In no circumstances, shall any pipes, valves, etc. be concealed before inspection and approval by the Authorities and/or the Superintendent.

Piping, valves, etc. that are installed in unsuitable locations, shall be removed and relocated as directed by the Superintendent at the Contractor's expense.

Fire Rated Structure

Pipework penetrations through certain parts of the building fabric are to be considered as Fire Rated Penetrations.

Verify with the Superintendent prior to installation, which of the pipework penetrations are to be made through building elements that require a Fire Resistance Level (FRL) rating or a resistance to the incipient spread of fire. That installation must comply with one of the following:

(a) The method and materials used are identical with a prototype assembly of the service and building element which has been tested in accordance with AS4072.1 and AS1530.4 and has achieved the required FRL or resistance to the incipient spread of fire.

(b) It complies with (a) except for the insulation criteria relation to the service if -

  (i) The service is protected so that combustible material cannot be located within 100 mm of it; and

  (ii) It is not located in a required exit.

The installation of the required method of fire sealant or treatment of penetrations is to be carried out by a Registered Installer.

At the completion of the installation and no less than one week prior to the hand-over of the building or relevant part, a Certificate is to be provided by one of the above-mentioned installers.

2.14 RESIDENTIAL APARTMENTS

Requirement

Provide all hot and cold water and sanitary drainage to apartments, as required to complete the apartment. Particular attention is to be given to sanitary drainage pipework to ensure containment within the given ceiling height configuration.

Provide all sanitaryware, tapware and connections as required, and as nominated in the architectural documentation, schedule of finishes and fit-out guide.

All podium level apartments and all three bedroom apartments elsewhere and balconies larger than 15m^2, are to have a hosetap.

2.15 DISABLED ACCESSIBLE APARTMENTS

Requirement

Provide all hot and cold water and sanitary drainage, fixtures and fittings to disable accessible apartments, as described within the Architectural package. Particular attention is to be given to sanitary drainage pipework to ensure future provisions for DDA fixtures and fittings while maintaining containment within the given ceiling height configuration.

Provide all sanitaryware, tapware and connections as required, and as nominated in the architectural documentation, schedule of finishes and fit-out guide.

All podium level apartments and all three bedroom apartments elsewhere and balconies larger than 15m^2, are to have a hosetap located on all terraces.

2.16 RETAIL TENANCIES

Provide for each retail tenancy, as per the retail matrix, the following services;

- 25mm water service with isolating valve, remote readout sub-water meter and capped supply for extension to fit-out.
- 100mm sanitary drainage connection finished flush with finished slab level at rear of shop.
- 100mm grease waste drainage connection finished flush with finished slab level at rear of shop for possible food tenancies.
- 2 x 100mm capped junctions below slab level for both sanitary and grease waste (food tenancies) drainage for future connection / extension.
- 50mm trade waste and sanitary plumbing capped vents at high level ground floor at rear of tenancy.

Note: Retail tenancy fit-out and hot water provision is not part of the scope of works. Drainage is to be installed at a level that allows the servicing of fixtures anywhere within the tenancy.

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3 ASSOCIATED WORKS

3.1 GENERAL

Scope

The following works associated with the hydraulic services systems are to be provided under the main project contract. The works are to be coordinated with, and may be provided by other trades within the main contract.

- Forming of all openings in walls, floors, ceilings and roofs for the passage of pipes, conduits and the like.
- All patching and making good of the building structure and ceilings for the installation of fittings, piping and conduits including acoustic and fire rated packing where necessary, provided the installation takes place in accordance with the programme.
- Ceiling access panels and access openings in walls and at other positions as required for adjustment, maintenance and access of isolation valves, expansion joints, inspection openings to sewer, sanitary, grease, downpipes and stormwater pipework and access to traps.
- Provision of floor topping properly graded to floor wastes.
- Building-in of sleeves, conduits, pipes and brackets where necessary.
- Concrete kerbs around penetrations through slabs exposed to the weather.
- Provisions of bulkheads where required.
- Normal making good of building components after the installation of work.
- Providing silicon/mastic seals where sanitary fittings abut vinyl, tiles and stainless steel.
- Datum level set out points in each room where sanitary fixtures are to be installed.
- Cutting holes in finished surfaces, timber cupboards, false ceilings, vanity units and shelves as required.
- Sealing wet areas with epoxy membranes or other method to the room floor waste, shower waste or penetration.
- Access covers for concealed cisterns.
- Fire hydrant and fire hose reel cupboards and regulatory signage affixed to the face of these doors. Note: Fire hydrant and hosereels located outside buildings or where noted on the Drawings are to be located in metal cabinets provided by the hydraulic Contractor.
- Recesses (in brickwork or dry wall) for thermostatic mixing valve installation.
- Forming up of block-outs or penetrations within pipe service ducts.
- Provision of support framing systems for equipment unless specified as a standard item with the equipment.
- Provision and fixing of all roof under-flashing where vents of flue pipes pass through roof sheeting.

  Note: Over-flashing is to be supplied and installed by hydraulic Contractor.
- Roof box gutters, sumps expansion joints and overflows associated with box gutters.
- External downpipes (sheet metal, exposed to view on completion of the work).
- Provision of stainless steel sinks forming part of stainless steel benches including plugs and washers associated with these sinks.
- Concrete sumps that form part of the concrete floor slabs and are detailed on structural documentation.
- Construction of concrete storage tanks including water storage
- Geotextile fabric, drainage cell and any other associated material located behind retaining walls (subsoil pipework, blue metal and geotextile fabric surounds at the base of the retaining wall are included in the hydraulic services work).
- Power to control panels and equipment associated with:
  - Pumps
  - Urinal infra-red flushing devices
  - Boiling water units

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  - Electric hot water heaters
- Wiring from monitored fire hydrant and fire sprinkler supply isolation valves.
- Extensions of condensate drainage from A/C equipment and plant (by mech contractor) to tundishes or floor wastes provided by the Hydraulic Contractor.
- Extension of cold water service and cold water make-up to the sprinkler storage tank.
- Extension of overflows, pipework etc from sprinkler tank to sumps and drains etc.
- Provision of fire extinguishers.
- Extension of irrigation system from connection points provided to planters, garden beds and green walls.
- Interconnection of irrigation provision and cast in pipework to planters, garden beds and green walls.
- Provision of back-flow prevention devices where required for irrigation systems or items of equipment not detailed in this Specification or on the Drawings.
- Geotextile fabric, drainage cell and any other associated drainage layers in the base of planters (rainwater outlets at the base of the planter are included in hydraulic services work).
- Supply and installation of road drainage and stormwater system and associated works.

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4 PIPEWORK AND EQUIPMENT INSTALLATION

4.1 SCOPE

Scope of Section

This section applies generally to all services work included in the Specification and in particular relates to the following sections of the Specification:

- Sewer Drainage.
- Stormwater Drainage including fitout of tanks.
- Sanitary Plumbing and Downpipes.
- Trade waste including grease arrestors.
- Domestic Cold Water.
- Domestic Hot Water.
- Recycled water system for Irrigation supply and cast in pipework to planters, garden beds and green walls.
- Fire Hose Reels.

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4.2 INTERPRETATION AND DEFINITIONS

Interpretation

This section applies to all services generally included in the scope of works for the hydraulic services scope of works. Some references may be made to particular materials or services not included in the scope of work for this Contract. The Contractor may ignore references which are clearly irrelevant to the project.

Where section or clause headings are followed by a reference to a particular service or services, the section or clause only applies to the service or services stated in the section/clause heading. If no reference is made to a particular service in the section or clause heading, the section or clause applies to all services.

Definitions

As this section applies to several services, for brevity, the following additional definitions will apply to this section:

“Drainage”	includes Sewer Drainage, Stormwater Drainage and Downpipes
“Water Services”	include Domestic Cold Water, Non-potable cold water and Hot water services
“Fire Services”	include Fire Hydrant, Fire Hose reel, Drenchers and Sprinkler supply services

4.3 INSPECTION

Requirement

Give sufficient notice to the Superintendent so that inspections may be made at the following stages:

- Trenches excavated and ready for pipe bedding.
- Work ready for specified testing.
- Underground or enclosed work ready to be covered up or concealed.

Unless otherwise specified, not less than:

- four hours for on-site inspecting personnel;
- forty eight hours for off-site inspecting personnel;
- forty eight hours prior to testing.

4.4 EQUIPMENT SELECTION

Exposed Locations

Where hydraulic services equipment is to be installed in external location exposed to atmosphere and sea spray/salt water; equipment selections shall be made to ensure that, where available, equipment shall be constructed from marine grade 316 stainless steel.

4.5 EQUIPMENT SUPPORT

Concrete Plinths

Provide concrete plinths for all floor-mounted plant and equipment unless indicated otherwise. Concrete shall be Grade N20 with a single layer of F62 reinforcing fabric. Ensure plinths are sized to neatly match the equipment supported and not exceeding the equipment footprint by more than 100mm.

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Provide 1.6mm galvabond form on all exposed sides of each plinth and curb. Do not use metal edges along sides that adjoin walls. Provide continuous form with a minimum 100mm width in contact with the floor; turn up vertically for 50mm; turn 45degrees inwards for a further vertical height of 25mm; turn inwards to the horizontal plane for a width of 25mm then turn vertically downwards for 15mm to finish in a tooled joint provided all around the exposed edges of the plinth. Provide 3mm dia. vent holes at 610mm centres in the 25mm wide horizontal section of the frame. Bolt the form to the floor and provide concrete infill.

Steel Supports

Provide steel support structures to all equipment that is not supported directly on concrete plinths. Provide steel support frames fabricated from fully welded RHS and SHS section neatly finished and hot dipped galvanised after construction. Bolt frames securely to building surfaces. For platform areas adjacent to supported equipment and access walkways, provide fully galvanised Webforge grid flooring arranged in removable sections.

For equipment requiring hanger support from above, provide all necessary elements necessary to span structure and distribute load as required.

4.6 SEISMIC REQUIREMENTS

Seismic Restraints

Provide seismic restraints for the installation in accordance with AS1170.4 Earthquake loads as determined by the structural engineer in accordance with the following requirements.

Design Criteria

The services, equipment and associated supports are to be designed to meet the requirements for a building with the following criteria:

- Importance Level - 4.
- Probability factor (kp) – 1.5
- Hazard factor (Z) – 0.05
- Earthquake Design Category (EDC) - 3

Applicable Services and Equipment

The following services and equipment are to be restrained against seismic action in accordance with AS1170.4:

- Water heaters
- Pumpsets
- Water Storage Tanks
- Main piping distribution systems
- The supports of pipework in the following situations do not need to be assessed against Section 8 of AS 1170.4:
    - Supports and fxings for all other pipework and conduits with an internal diameter less than 64mm

- Piping supported by individual hangers 300mm or less from the top of the pipe to the bottom of the support for the hanger.

Support and Restraint Criteria

All plant, equipment and suspended pipework as noted above must be securely fixed to the building structure. Fixings must be capable of withstanding seismic loads determined in accordance with clause 8.2 / 8.3 of AS 1170.4 and be capable of resisting both horizontal and vertical seismic forces.

Anti-vibration mounts must be of the "housed" type capable of withstanding these loads. To prevent damage to the building and services in the event of an earthquake.

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Pay particular attention to the attachment of heavy components such as pumps, water storage tanks, hot water heaters and appliances to prevent movement and damage under earthquake conditions.

Where necessary, allow to engage a specialist seismic restraint designer, to determine structural forces and carry out design of the seismic restraint systems. Obtain certification from the seismic restraint designer and/or support and fixing suppliers to confirm that the support systems can withstand the forces determined above.

Installation

Supports are to be installed in accordance with the certification requirements and shall be coordinated with other services (and their associated supports) structure and ceilings.

4.7 UNDERGROUND INSTALLATION

Excavation

Keep adequate de-watering equipment on the site at all times and keep excavation free of water.

The ground shall be excavated in material as may be found in the form of trenches to enable the various pipelines to be constructed in the locations shown on the Drawings with trench width increased where necessary to permit the construction of pits. Trenches shall be excavated at uniform grades and in straight lines.

Remove all excess excavation material from site, pay all cartage and disposal fees wherever applicable to provide a clean neat site devoid of all debris and spoil.

Excavation In Existing Pavement And Roadways

When excavating through existing pavement, sawcut the pavement and /or road to a depth of at least 100mm and then remove the material with pneumatic tools. If required by the Superintendent, trenches across existing roads shall be excavated and the pipeline constructed therein to allow half the roadway to remain open to traffic at any time. Provide 25mm thickness steel plates over the excavated trench when the trench is not being worked in and at the end of the working day to maintain vehicular and pedestrian access during those periods. At the completion of the work in the roadway, the pavement or roadway shall be reinstated to its original condition to the satisfaction of the Superintendent and the relevant Authority if required.

Boring

If under-road boring is required in lieu of trenching, engage a suitably qualified subcontractor to undertake the work. Ensure a tight fit to the pipes. If voids are encountered, fill by pressure grouting.

Timbering Of Excavation

Where necessary for safe and efficient completion of the work erect shoring and timbering of sufficient strength and quality to prevent earth and other material slipping or falling in or being shaken from the side of the excavation. As the work proceeds, all shoring and timbering shall be withdrawn except in the cases where the Superintendent has indicated in writing that such shoring and/or timbering shall be left in position. The supply, erection and withdrawal of timberwork shall be included in the cost of excavation.

Pipe Bedding – Drainage

HDPE & UPVC pipe lines shall be laid on a tampered bed of blue metal having a minimum depth of 75mm for the full width of the trench.

All other drainage pipelines shall be bedded on a minimum of 100mm thickness of blue metal.

Form chases where necessary to prevent sockets, flanges or the like from bearing on the trench bottom or the bedding. Fill and compact the chases with granular bedding material after the laying and testing of the pipes.

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Bedding of Fittings – Drainage

Bed fittings, including junctions, traps, gullies, and the like, on concrete bedding not less than 5 MPa, 100mm thick, 450mm long, and the width of the trench.

Provide short lengths (not more than 600 mm) of flexibly jointed pipe on each side of concreted fittings, pits, manholes and the like, in principle as illustrated in AS CA56, Figures 10-17.

Pipe Bedding – Water and Fire Services

Pipework shall be bedded on 75mm thickness of underlay material of sand or selected excavated material free from hard or sharp objects or lumps, to AS 2032 Clause 4.2.1.2. The trench bottom is to be trimmed to provide continuous, uniform, and adequate support to the pipe, including chases where necessary to prevent sockets, flanges or the like from bearing on the trench bottom.

Backfilling

After a length of pipeline has been constructed, tested and inspected, the trench shall be backfilled with granular material 150mm above the pipe collars. Granular material shall be in the form of sand, fine sized "river" gravel or similar, free of clay and rock. Unless otherwise directed by the Superintendent, the remainder of the trench filling shall be carried out using the original topsoil (where suitable) or approved sand - sandy/loam fill.

Pipework Identification and Tracing – Water and Fire Services

Provide a plastic marker tape in the trench after pipe laying, testing and initial backfilling, for the purposes of identification.

For non-metallic water service pipework, provide a detectable metal strip over the pipe to allow for detection and tracing without the need to excavate to determine the location of the pipework.

Compaction

Thoroughly compact the material around and above pipes by hand tamping or mechanically ramming. Selected excavated material capable of compaction shall be placed for the remainder of the trench depth up to 150mm from the finished surface level. Compact in layers of not more than 150mm loose thickness without damage to the pipework, in accordance with AS1280. Cohesive material is to be compacted to not less than 90% modified maximum dry density. Non-cohesive material is to be compacted to not less than 95% modified maximum dry density.

Precautions & Safeguards

Carry out the work in a careful, secure, safe and tidy manner and take all precautions against damage whether arising from bad workmanship, breakage or machinery or plant, in-efficient timbering, flooding or any other cause whatsoever.

Provide, erect and maintain warning signs, temporary fences, barriers and night lights adjacent to any works such as trenches and excavations or stacks of material, which could be considered a danger to persons, or traffic of any kind.

Depth of Cover over Pipework

Unless overridden by Regulatory Authority requirements, manufacturer's recommendations or otherwise specified, the following table shall apply to minimum cover over pipes:

MINIMUM COVER OVER PIPEWORK

Location	Drainage	Water Services	Fire Services
Public roads, rights of way, and other public areas subject to vehicular traffic	500 mm	500 mm	500 mm
Private roads and driveways	450 mm	450 mm	500 mm
Private areas subject to vehicular loadings under unsealed roadways	450 mm	450 mm	750 mm
Private areas not subject to vehicular loadings	300 mm	300 mm	500 mm
In embankments	750 mm	750 mm	750 mm
Subject to construction equipment loading	750 mm	750 mm	750 mm
Below buildings (with reinforced concrete slabs not bearing on the pipework)	100 mm	100 mm	100 mm

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Non-Complying Cover – Drainage

Where the above minimum cover requirements cannot be met, the pipework shall be covered with 50mm depth of appropriate overlay material backfilled and paved over with minimum 100mm thickness of reinforced concrete (engineered to suit the subject loading) spanning across the full width of trench and bearing on undisturbed ground on both sides of the trench.

Thrust Blocks – Water and Fire Services

Concrete thrust blocks shall be installed for all underground pipework with rubber ring joints. Thrust blocks shall be located at all bends, tees, valves, pipe reducers and capped ends and in accordance with AS3500.1.

4.8 RESTORATION ABOVE TRENCHING

General

The top of the trench shall be reinstated with the same material found prior to excavation and will be subject to approval by the Superintendent.

Grass

Grass and topsoil shall be removed and retained prior to excavation. Should the trench be exposed for an extended period of time, such that grass from the top of the trench would not survive, provide new turf of the same species.

Paving

Paving and other replaceable surfaces shall be lifted and retained prior to excavation and reinstated on completion of backfilling. Provide sand or concrete base as for the existing surrounding pavement prior to reinstatement of paving.

Bitumen

Provide crushed rock base and sub-base to match the existing pavement. Prime coat the edges of the existing surfacing with bitumen. Lay and compact hot-mix asphalt so that the edges are flush and the centre is cambered 10mm above the existing pavement.

Concrete

Provide concrete of suitable strength for the implied loadings and surrounding conditions. If necessary, provide steel reinforcement keyed into the adjacent concrete and laid to prevent the reinstalled concrete from subsiding and cracking.

4.9 UNSTABLE OR WATER-CHARGED GROUND – DRAINAGE

Requirement

Contact the relevant Authority to determine if the area is subject to mine subsidence or any other instability and obtain any specific installation requirements that the Authority may have, prior to tendering.

Should any part of the site be in unstable or water-charged ground, engage a structural engineer to provide recommendations for the support of pipework in unstable or water-charged ground.

Install pipework to the Authority's requirements and to the structural engineer's recommendation.

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4.10 PIPELAYING AND INSTALLATION – SANITARY PLUMBING AND DRAINAGE

Requirement

Lay pipelines to uniform gradients falling from the waste outlets to the branch lines, main drainage run and connection to the Authority main. Pipework is to be straight between required changes of direction, properly supported, with watertight joints aligned flush at internal surfaces, and with spigot ends pointed in the direction of flow. Provide the necessary fittings and accessories, including junctions, branches, inspection and cleaning openings, expansion joints, and the like.

Pipe Gradients

Lay pipework to gradients complying with the relevant Authority's requirements and in not less than the following unless noted otherwise by means of a percentage or pipe grade (not by invert levels) on the Drawings:

MINIMUM PIPE GRADES

Pipe Diameter	Sewer Drainage	Stormwater Drainage and Downpipes	Sanitary Plumbing	Vent Pipes
40 mm	----	----	1 in 40	1 in 80
50mm	----	----	1 in 40	1 in 80
65mm	1 in 60	----	1 in 40	1 in 80
100 mm	1 in 60	1 in 100	1 in 60	1 in 80
150 mm	1 in 80	1 in 100	1 in 80	----
225 mm and larger	1 in 80	1 in 100	----	----

Pipe gradients may be steeper in order to provide adequate cover or to meet invert levels indicated on the Drawings.

Steep Pipe Gradients In Ground

Where pipework is installed in ground at grades steeper than 20% (1 in 5), anchor blocks shall be installed in accordance with AS3500. Anchor blocks are to be minimum 150 thick reinforced concrete and are to extend across the full width of the trench and be firmly keyed into the sides and base of the trench. Anchor blocks shall extend 150mm above the top of the pipe.

Jointing of Pipework

Pipework shall be jointing utilising methods in accordance with the relevant Australian Standard, Code of Practice and manufacturers' recommendations.

Inspection Openings – Sewer Drainage and Sanitary Plumbing

Provide inspection openings as required by the Regulatory Authority and in any case so that each straight length of pipework can be inspected in at least one direction. Seal the openings with purpose-made covers fixed by a jointing method appropriate to the pipework.

Support of Suspended Pipework

Suspended pipework shall be supported from the structure. Pipework will not be supported from other pipework. Pipework will be supported at distances as nominated by the relevant standards in accordance with the pipework material and manufacturer's recommendations.

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Pipework shall be fixed in a manner so as to allow venting and draining, and free movement without causing undue stresses in the pipework or in the pipe joints and without transmitting lateral stresses via fixings to walls, slab or ceilings.

Prior to fixing of supports and pipework obtain approval from the Superintendent to ensure the building fabric/structure be fixed to is suitable for the load being placed on it by the piped service in a fully charged state.

All pipework to comply with provisions of AS1170.4 2007 Amdt 1 Structural Design Actions – Earthquake actions in Australia

Supports shall be galvanised mild steel "Millstrut" P1000 channel complete with all-purpose made galvanised spring nuts, framing, fittings and pipe clamps for each pipe. Galvanised bolts or zinc plated metal expansion fastenings shall be used to secure the channel supports to the building structure. A minimum of two (2) fastenings shall be used for each support channel. Hanger rods are to be fixed into the channel. Pipe hangers shall be installed at every change of direction. No pipe hangar shall be fixed to a pipe clamp already supported from other pipework.

Hanger rods shall be of hot rolled steel and threaded and then anti-corrosion plated and shall conform to the following table:

HANGER ROD SIZES

Nominal Pipe Size	Rod Diameter
40 mm	10 mm
50 mm	10 mm
65 mm	10 mm
80 mm	12 mm
100 mm	12 mm
150 mm and larger	12 mm

Note: Steel pipe clamps with plastic coating are not permitted. PVC pipes shall be supported with "unistrut" type two (2) piece zinc plated pipe clamps. Provide between the pipe clamps and PVC pipes a 3mm thick strip of soft PVC.

Vertical frames used to support suspended horizontal runs of pipework, shall allow for complete adjustment of clamp support to suit pipe grades.

Explosive power tools shall not be used in the fixing of pipe supports.

Pipework shall be regarded as being fixed at all supports where no provision has been made for axial and/or lateral movement. Provision for movement shall be achieved by the provision at the support of an annular space around the pipe of not less than 8mm clear.

Vertical pipework must be clear to move vertically at least 8mm in both directions through ceilings and roofs, through which they pass. Vertical pipes must be restricted against downward vertical movement at their junctions with in-ground pipework, at offsets and changes of direction and at branches at all floors.

Horizontal supports for rising mains connected to pumps shall be 'Powersorb' Type H.N. type hangers.

4.11 PIPEWORK DESIGN – WATER SERVICES

Requirement

Cold water and hot water pipework shall be sized adequately to service the fixtures and equipment being supplied in accordance with AS 3500.1. Water velocities are not to exceed 1.2m/s within buildings and velocities are not to exceed 1.5m/s outside buildings.

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4.12 PIPEWORK INSTALLATION – WATER AND FIRE SERVICES

Workmanship

Pipework shall be fixed in continuous straight lengths wherever practicable and without sags. Arrange pipework so that it runs together with other services where practicable, in convenient and readily accessible positions. Pipework shall be run parallel with walls, slabs, beams and with other pipework and have branches taken off at right angles. Copper pipework is to be bent at changes of direction in preference to using fittings. Arrange and support pipework as necessary so that it remains free from vibration whilst permitting necessary movements such as thermal expansion and contraction. Fit joints tightly and ensure that they are leakproof, with no internal projections, burrs or obstructions.

Pipework Below Slabs (To be Avoided)

Pipework under slabs on ground is to be avoided. Where it is unavoidable, pipework under slabs on ground is to be minimised and is to be in straight runs with the minimum number of joints.

Pipework Connections to Fixtures

Pipes shall not be bent when penetrating through walls to connect to fixtures but are to be fitted to threaded brass elbows to allow for correct fitting of cover plates. Short pipe extension pieces from walls connecting fixtures shall be fitted with union connections to allow for removal of fixtures.

Exposed Pipework (To be Avoided)

Exposed pipework in areas other than plantrooms is to be avoided wherever possible. Where exposed pipework cannot be avoided, it is to be located hard up to underside of joinery so that it is not visible from general view. Otherwise, the location of exposed pipework is to be approved by the Superintendent prior to installation and shall be chrome plated copper.

Pipework Through Framing

Where piping passes through metal framing, provide purpose made clips or grommets to ensure the pipework does not come into direct contact with the framing. Pipework passing through timber studwork shall be fixed appropriately to avoid rattling of the pipework through the frame.

Provide additional noggins where required to adequately support pipework.

Pipe Sizes

Where pipe sizes are provided on the Drawings, these are indicative sizes, provided for preliminary coordination purposes and are to be confirmed by the Contractor. Pipework shall be designed and installed to the sizes determined and documented on the shop drawings, with the exception that 15mm diameter piping may be used for the last 2m run to sanitary fixtures. Other piping shall be not less than 20mm diameter.

Dissimilar Metals

Do not install copper in contact with steel, zinc, or other materials likely to generate electrolytic, galvanic or corrosive action. Make junctions between dissimilar metals with purpose-made fittings manufactured in suitable compatible material.

Support of Suspended Pipework

Provide supports including hangers, saddles, bolted clips and the like, sufficient to secure the pipework to adjacent surfaces, to restrain the internal forces of pressure piping. Provide support at joints, changes of direction, at intervals suitable to the size and type of pipe, and as necessary to prevent sagging of pipework. Supports shall be fastened directly to the adjacent surface and not to another pipe or service. Pipework is to be supported directly and not via surrounding insulation where provided.

Where structural members are not available to provide adequate support, provide additional cross members to support the pipework. Liaise with and obtain approval form the Builder to provide the required supports.

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All pipework to comply with provisions of AS1170.4 2007 Amdt 1 Structural Design Actions – Earthquake actions in Australia

Support and Fastening Materials

Supports shall be the same material as the pipe, or galvanised or non-ferrous metals, with bonded PVC or fibreglass woven tape sleeves to separate dissimilar metals. Supports shall be fixed using galvanised steel or non-ferrous metal bolts or screws into expanding metal masonry anchors. Do not use explosive powered fixings.

Support Intervals

Install pipework at the following maximum support intervals:

MAXIMUM PIPEWORK SUPPORT INTERVALS

Pipe Size	Copper Pipework	Galvanised Steel Pipework	PVC, MDPE, XLPE Pipework	
			Vertical	Horizontal
15mm	1.5 m	N/A	1.2m	0.6m
20mm	1.5 m	N/A	1.4m	0.7m
25mm	2.0 m	N/A	N/A	N/A
32mm	2.5 m	N/A	N/A	N/A
40mm	2.5 m	N/A	N/A	N/A
50mm	3.0 m	N/A	N/A	N/A
65mm	3.0 m	3.0 m	N/A	N/A
80mm	4.0 m	4.0 m	N/A	N/A
100mm	4.0 m	4.0 m	N/A	N/A
150mm and larger	4.0 m	4.0 m	N/A	N/A

Note: Support vertical pipework between floors at the floor, ceiling, and at least one intermediate location.

4.13 CHASES AND ENCASING – WATER SERVICES

Requirement

Cut all chases with a power saw. Provide a depth of chase to enable the pipe to be flush with brickwork or blockwork. Chasing of pipework in through structural members is prohibited unless prior approval is obtained in writing from the structural engineer.

Pipes chased into masonry or encased in concrete shall not cross any expansion joint and shall be insulated with ‘Kemlag’ or equivalent lagging so that expansion and contraction can take place without damage to the pipe or to the surrounding structure.

Once pipework has been installed, re-fill chase with sand cement mix.

Chasing and encasement of fire hydrant and hosereel pipework in walls or slabs is prohibited.

4.14 PIPEWORK PASSING THROUGH STRUCTURE

Sleeves

Where pipes pass through walls, floors, beams, or columns, provide uPVC sleeves with 12 mm clearance all round pipes, packed with gunned silicone rubber joint sealer (self-extinguishing grade).

Fire Stop Collars

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Provide fire stop collars to all uPVC, polyethylene and other inferior material pipe work passing through fire rated structure (floors and walls). Fire stop collars shall, comply with NCC BCA Specification C3.15, have a minimum fire rating equal to the structure the service is passing through. Prior to the procurement of the fire stop collars, submit to the Principal Authorised Person a copy of the fire stop collar manufacturers Australian Standards Certification regarding the adequacy of the collars for use in fire stopping, in relation to the pipework material being used and the particular application (eg. floor wastes, stackwork etc.).

4.15 ACOUSTIC INSULATION

Requirement

Pipework located within ceiling voids and non-brick services risers above and adjacent to habitable areas, lobbies, function rooms, meeting rooms, offices, other noise sensitive areas and also where nominated on the Drawings and as instructed by the Superintendent, shall be lagged with acoustic insulation.

Acoustic insulation shall consist of one layer of 5kg / m² loaded vinyl having an outer aluminium foil backing separated from the pipe with a layer of 25mm thick acoustic foam equivalent to Pyrotek ‘Soundlag 4525C’.

Prior to ordering submit a sample, method of installation and a drawing indicating the extent of lagging to the Superintendent for approval by the acoustic consultant.

4.16 THERMAL INSULATION FOR COLD WATER PIPEWORK AND CONDENSATE DRAINAGE

Requirement

Thermal insulation is required for pipework conveying cold water pipework and condensate drainage where there is a possibility of condensation forming on the outside of the pipework. This typically occurs where services pass through plantrooms, carparks and other relatively warm, humid areas.

Thermal insulation shall be 25mm thick Thermotec 4-Zero’ insulation, in one metre lengths. Provide 75mm wide, self-adhesive, reinforced aluminium tape to longitudinal joints and circumferential butt joints.

Prior to ordering submit a sample, method of installation and a drawing indicating the extent of lagging to the Superintendent for approval.
Note: This requirement is in addition to the insulation required under the Hot Water section of the Specification.

4.17 COVER PLATES – WATER SERVICES

Requirement

Where pipework emerges from walls, floors or ceiling surfaces, provide stainless steel, or chrome plated metal cover plates with sizes nominated in the table below:

COVER PLATE SIZES

Pipe Diameter (Nominal)	Cover Plate Diameter
Up to 20mm	65mm
25mm to 50mm	100mm
Larger than 50mm	50mm larger than pipe diameter

4.18 CAPPING OFF

Requirement

During construction, temporarily seal open ends of pipes and valves to prevent the entry of foreign matter into pipe systems. Provide purpose-made covers of pressed steel or rigid plastic. Do not use rags, paper or wood plugs.

4.19 CLEANING OUT – WATER AND FIRE SERVICES

Requirement

Clean piping of loose scale and dirt prior to installation and again after installation and sealing of joints. Flush piping systems through with clean water at a velocity sufficient to remove foreign matter and until only clean water is discharged at outlets. The system shall be free of foreign matter on completion.

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4.20 CLEAR OUTS (CO) - DRAINAGE

Requirement

Provide clear outs to all drainage nominated on the drawings and to the requirements of AS 3500.2 Clause 10.5.2

Access panels are to be provided to inspection openings at all levels as per AS 3500.2 Clause 10.5.4

Clearouts are to be provided on common branch line to wet areas at the upstream section.
Clearouts in bathrooms are to be as per architectural specification.

Clear outs in hard surface areas are to be Galvin Engineering cast iron body with polished nickel bronze bolted access. Provide a 150mm thick concrete pad at the base of the turn up or junction in areas subject to vehicular traffic.

For clearouts in floors with vinyl finishes, provide Galvin Engineering Vinyl Clear Outs with cast iron body and polished nickel bronze bolted access tops with bodies that allow the membrane to be turned down into the clear out.

In landscaped areas, provide uPVC capped risers to 25mm above finished soil levels, painted to suit surrounding landscape colours.

5 SEWER DRAINAGE

5.1 SCOPE

Extent of Work

The extent of work in this Section requires the payment of all fees and permits, supply of materials, labour, equipment and services necessary to complete works in accordance with the Drawings. This includes, but not limited to, the following:

- Design and document the sewer drainage system.
- Provide all pipework and associated fittings relating to sewer drainage for the development.
- Provide grated sewer overflow gullies.
- Provide tundishes and floor wastes for the Mechanical Services Trade.
- Pipework shall be installed hard up against slabs where possible due to restricted headroom.
- Pay all necessary fees and obtain approvals prior to commencement of works.
- Provide fire stop collars (vertical and horizontal) where necessary to maintain fire rating of the building structure.
- Provide capped off pipework as per nominations in Retail Matrix.

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5.2 DESIGN CRITERIA

Requirement

Design the sewer drainage system in accordance with the following:

- AS 3500.2.
- National Construction Code (NCC) including Building Code of Australia and Plumbing Code of Australia.
- Water Authority requirements.

5.3 PIPEWORK MATERIALS

Aerial Sewer Drainage and Sewer Drainage up to three metres deep

Sewer drainage and vent pipes shall be uPVC (DWV) 'SH' grade pipes and fittings and shall comply with AS1260. Pipes and fittings shall be joined with solvent welded joints in accordance with manufacturer's recommendations. Apply priming fluid to all joints prior to application of the solvent cement.

Sewer Drainage Over three metres deep

Sewer drainage and vent pipes be uPVC (DWV) 'SEH' grade with solvent cement joints and shall comply with AS1260. Pipes and fittings shall be joined with solvent welded joints in accordance with manufacturer's recommendations. Apply priming fluid to all joints prior to application of the solvent cement.

5.4 FLOOR WASTES (FW, SHR, VFW, PFW, GFW, KFW)

Requirement

Grates are to be solid brass, chrome plated and to incorporate a uPVC collar equal to a 100mm leak control puddle flange. The puddle flange is to finish level with concrete slab to enable membrane to turn down into the collar. The grating is to incorporate a short section of brass or copper tube to be inserted in collar. All floor waste grate selections shall comply with the Architectural selection schedule and specification.

Samples

Provide samples of all floor wastes to the Superintendent for approval. Obtain approval from the Superintendent prior to installation of any floor wastes.

Location of Floor Wastes

Coordinate floor waste locations with Architectural documentation. Locate floor wastes as nominated on the Architectural documentation provided that this can be achieved without compromising pipe length limitations under AS3500.2 and avoiding clashing with structure. Preference is to locate floor wastes outside of beams where possible.

Floor Waste Type

Where the symbol 'FW' appears on the drawings, the Contractor shall provide a floor waste which is of a type suitable to the floor finish in the room (to be confirmed on the architectural drawings) and for the type of room. Eg. A 'FW' noted on the Drawing in a kitchen with a vinyl floor shall be a Kitchen Floor Waste with a vinyl clamp ring. In addition to the above, where a specific extended abbreviation is used on a Drawing, that particular floor waste is to be provided. Eg. Where a 'GFW' is noted on the Drawing in a carparking area, a Garbage Floor Waste shall be provided in that location despite it not be a designated garbage area.

Floor Wastes (FW)

Floor wastes shall incorporate 100mm solid brass chrome plated screw-in type grate with 100mm riser. Provide uPVC self cleansing pattern trap gullies with 100mm waste pipes for drainage and 50mm or 65mm waste pipes (determined by discharge to FW) for sanitary plumbing installations.

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Shower Outlets (SHR)

Shower outlets shall be located in designated shower areas. Shower outlets connecting to floor wastes shall incorporate 80mm solid brass chrome plated screw-in type grate with 80mm riser and 50mm waste pipe (provide an 80mm x 50mm leak control flange). Where shower outlets do not connect to a floor waste, a Floor Waste (FW) shall be installed in lieu of a Shower Outlet (SHR).

NOTE: Shower Outlets in areas where the floor finish is vinyl shall incorporate vinyl (dress) clamp ring.

Vinyl Floor Wastes (VFW)

Floor wastes in areas with vinyl flooring shall be "Galvin Engineering" Vertical Vinyl Combo Floor Drain model DE4S06VX, cast iron body with 100mm outlet, 150mm diameter Stainless Steel 316 grate and vinyl (dress) clamp ring to allow the vinyl to be turned down into the floor waste.

Plantroom Floor Wastes (PFW)

Floor wastes in plantrooms shall be "Galvin Engineering" Vertical Round Combo model DE4S08SX, cast iron body with 100mm outlet and 200mm diameter Stainless Steel 316 grade grate.

Garbage Floor Wastes (GFW)

Floor wastes in garbage areas and loading docks shall be "Galvin Engineering" Bucket Trap Combo model DEB4S06RX, cast iron body with 100mm outlet and 150mm diameter Stainless Steel 316 grade grate and basket strainer.

5.5 REFLUX VALVES (RV)

Requirement

Provide reflux valves where indicated on the Drawings and as required to protect sensitive areas from surcharge of sewer.

Reflux valves 100mm and larger shall be Cast Iron swing check type valves approved for sewer applications. When located below ground, they shall be located in Pits to allow ease in maintenance and access. Reflux valves smaller than 100mm shall be brass.

Where reflux valves are installed above ground, sufficient space shall be provided for access and maintenance of the valves.

5.6 SEWER DRAINAGE CAST IN SLAB (CIS)

Requirement

Casting sewer drainage in slabs / beams is to be avoided wherever possible. However, where drainage is located over sensitive areas, limited sections of pipework may be cast in the slab (or beam). Wrap the pipework with Bradford 10mm thick Bradflex Generation II flexible rubber pipe insulator. Seal all joints with Bradflex LA6 adhesive. Prior to pour, fill the pipework with water to maintain structural stability of the pipework during the curing process. Where pipework passes through slabs or beams and is not noted to be cast in the beam, pipework shall be installed with sleeves and fire collars as described in the PIPEWORK AND EQUIPMENT INSTALLATION section of the Specification.

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6 STORMWATER DRAINAGE

6.1 SCOPE

Extent of Work

The extent of work in this Section requires the payment of all fees and permits, supply of materials, labour, equipment and services necessary to complete works in accordance with the Drawings. This includes, but not limited to, the following:

- Design and document the stormwater drainage system.
- Provide all pipework and associated fittings relating to stormwater drainage for the development.
- Fitout of OSD, First Flush, Rainwater and water quality chamber including pit lids and surcharge grates to civil and hydraulic documents.
- Connect to the Authorities stormwater main from the OSD, as per civil documents.
- Provide all rainwater outlets, pits, drainage turnups for the collection of surface stormwater runoff.
- Provide all grated trench drains where indicated on architectural, landscape and hydraulic drawings
  - Cast iron grated trench drainage to be used where exposed to vehilcular movement.
- Provide overflows to all areas where exposed to stormwater catchment
  - Most are built into the façade but some locations are landlocked and will need to be piped.
  - Liase with the architect for sizing of oveflows built into the architecture/facade
- Provide test pits and drainage for fire sprinkler test points and system drains.
- Provide expansion joint drip trays where required and drainage to tundishes.
- Provide pre-packaged stormwater pumping stations, electrical control panels and rising mains and associated piping relating to the pumping of stormwater to the gravity pipework.
- Provide subsoil drainage.
- Pipework shall be installed hard up against slabs where possible due to restricted headroom.
- Pay all necessary fees and obtain all necessary approvals prior to commencement of works.
- Provide fire stop collars (vertical and horizontal) where necessary to maintain fire rating of building structure.

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6.2 DESIGN CRITERIA

Requirement

Design the stormwater drainage system in accordance with the following:

- AS 3500.3.
- National Construction Code (NCC) including Building Code of Australia and Plumbing Code of Australia.
- Local Council requirements.

6.3 PIPEWORK MATERIALS

Aerial Stormwater Drainage and Stormwater Drainage up to three metres deep

Stormwater drainage up to and including 225mm diameter shall be uPVC (DWV) 'SH' grade pipes and fittings and shall comply with AS1260. Pipes and fittings shall be joined with solvent welded joints in accordance with manufacturer's recommendations. Apply priming fluid to all joints prior to application of the solvent cement.

Stormwater drainage 300mm and larger shall be James Hardie FRC 'Supertite' stormwater Drainage. The 'Speed Drain' system shall be used for suspended pipework. Where full lengths of FRC pipe are not required, or a cut has to be made to the length of pipe, use the purpose-made FRC-pipe cutter. Pipes and fittings shall be jointed with 'Supertite' rubber V-rings manufactured and tested in accordance with AS1646. Utilise FRC adaptor couplings to enable the connection of uPVC pipes and other materials to the FRC pipe system. The installation (and support) of FRC pipe and fittings shall be in accordance with the manufacturers recommendations. Where pipework penetrates fire rated structure (vertical and horizontal), fire rate the penetration in accordance with the manufacturer's recommendations.

Stormwater Drainage Over three metres deep

Stormwater drainage up to and including 225mm shall be uPVC (DWV) 'SEH' grade with solvent cement joints and shall comply with AS1260. Pipes and fittings shall be joined with solvent welded joints in accordance with manufacturer's recommendations. Apply priming fluid to all joints prior to application of the solvent cement.

Stormwater drainage 300mm and larger shall be James Hardie FRC 'Supertite' stormwater pipework. Where full lengths of FRC pipe are not required, or a cut has to be made to the length of pipe, use the purpose-made FRC-pipe cutter. Pipes and fittings shall be jointed with 'Supertite' rubber V-rings manufactured and tested in accordance with AS1646. Utilise FRC adaptor couplings to enable the connection of uPVC pipes and other materials to the FRC pipe system.

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Stormwater Drainage in Public Property

Stormwater drainage in public roads and pathways shall be steel reinforced concrete pipe with rubber ring joints. The class of pipe shall be suitable for the installation depth, anticipated loading and in accordance with Council requirements. Installation shall be in accordance with AS3725 and Council and manufacturer's recommendations.

Stormwater Rising Mains

Shall be uPVC class 12 pressure pipework with solvent welded joints. Apply priming fluid to all joints prior to application of the solvent cement. Solvent cement for pressure applications shall be used. Only long radius bends shall be used for changes in direction. Pipework shall be supported as recommended by the manufacturer and in accordance with the relevant Australian Standard.

Subsoil Drainage

Shall be 90mm slotted uPVC pipework wrapped in cloth sock. Pipework is to be surrounded by 150mm thickness of 10mm and 20mm blue metal or reconstituted concrete. The blue metal surround is to be surrounded further by geotextile fabric.

6.4 LONGITUDINAL TRENCH GRATES (LTG)

Requirement

Provide longitudinal trench grates where indicated on the Drawings and as required. The duty of the grates and frames shall be selected to suit the application.

Samples

Provide samples of all trench grates to the Superintendent for approval. Obtain approval from the Superintendent prior to installation of any trench grates.

LTG

Where nominated on the Drawings, provide a lockable cast iron trench grate and frame of width nominated on the Drawings. The concrete trench drain shall be provided by others. Provide Drainage Turn Ups in the base of the LTG's as indicated on the Drawings.

GTD - ACO

Where nominated on the Drawings, provide ACO Polycrete KS100S (or KS2002 if noted as 200 wide on the Drawings) channel drain system with Heelguard 'S" Stainless Steel Grates and stainless steel edge rails. Request deeper load bars from the manufacturer to suit heavy duty load application.

Provide KS01 Constant Channel for channels up to 4m in length and Pre-sloped Channels for lengths of channel longer than 4m.

LTG - Stormtech

Where nominated on the Drawings, provide Stormtech - 65DG100 Special Assembly with 65A stainless steel architectural grating. Provide spigot and socket connections from the base of the channel at intervals as recommended by the manufacturer, to a 100mm stormwater drain below the channel.

6.5 DRAINAGE TURN-UPS (DTU)

Requirement

Provide drainage turn-ups where indicated on the Drawings and as required. Drainage turn-ups inside voids, trench grates and elsewhere shall have open pipe ends (collars) with loose fitting uPVC grates.

6.6 REFLUX VALVES (RV)

Requirement

Provide reflux valves where indicated on the Drawings and as required to protect sensitive areas from surcharge of stormwater.

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Reflux valves shall be uPVC swing check type valves approved for stormwater applications. They shall be provided with riser pipe and clear out to surface to allow maintenance and removal of the swing check.

6.7 TEMPORARY CONSTRUCTION DEWATERING

Requirement

Refer to Council requirements / conditions in relation to temporary dewatering of the site during construction. Carry out water quality testing of the ground water and obtain approval from the Local Council for appropriate disposal of ground water off site.

Maintenance

Carry out regular inspections and maintenance / cleaning of the pumpout system during construction.

Pumps

Where pumps are used for dewatering during construction, they shall not be used as the permanent subsoil pumps for the development. Replace any temporary pumps prior to Practical Completion.

6.8 TEMPORARY STORMWATER DRAINAGE

Requirement

Allow to provide temporary stormwater drainage systems / connections during the construction process to allow ensure the site is adequately protected against rainfall events during construction. The temporary drainage may be required to be modified during various stages of the construction work.

Liaise with the Builder to confirm which areas of the site need to be protected by installation of temporary stormwater drainage.

6.9 WORK AS-EXECUTED DRAWINGS

Requirement

In addition to the standard requirements for As-Built Drawings, provide work-as-executed drawings of the stormwater drainage system including floor levels, ground levels, pit and pipe reduced levels and invert levels, OSD tank dimensions and levels (where installed), pipe sizes undertaken by a qualified surveyor.

These drawings will be provided to Council / Private Certifier as record of actual installation of the stormwater drainage system for the site.

7 SANITARY PLUMBING AND DOWNPIPES

7.1 SCOPE

Extent of Work

The extent of work in this Section requires the payment of all fees and permits, supply of labour, equipment and services necessary to complete works in accordance with the Drawings. This includes, but not limited to, the following:

- Design and document the sanitary plumbing and downpipe systems.
- Provide pipework, fittings and fixtures as necessary for the construction of sanitary plumbing system including vent pipes. Connect fixture discharge pipes and branches to stacks. Connect vent pipes to drainage and branch pipes and extend to above the roofline.
- Provide tundishes and floor wastes for the Mechanical Services Trade.
- Provide tundishes from hot water discharge with a product capable of transferring high temperature liquid for a minimum of 10m. eg, TPR drains, mech discharge.
- Pipework shall be installed hard up against slabs where possible due to restricted headroom.
- Provide all downpipes for connection from gutter sumps and rainwater outlets to the stormwater drainage system.
- Provide fire stop collars (vertical and horizontal) where necessary to maintain fire rating of building structure.
- Provide all aerial stormwater drainage including connection to inground stormwater system.
- Provide a piped overflow system from all internal box butters if atmospheric overflows cannot be incorporated.
- Provide drainage to awning gutters – spigot by roofing contractor
- Provide drainage from planters, garden beds, greenwalls and awnings.
- Provide capped off pipework as per nominations in Retail Matrix.
    - Provide capped off vents at high level

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7.2 DESIGN CRITERIA

Sanitary Plumbing

Design the sanitary plumbing system in accordance with the following:

- AS 3500.2
- National Construction Code (NCC) including Building Code of Australia and Plumbing Code of Australia.
- Water Authority requirements.

Rainwater Downpipes

Design the rainwater downpipe system in accordance with the following:

- AS 3500.3.
- National Construction Code (NCC) including Building Code of Australia and Plumbing Code of Australia.
- Local Council requirements.

7.3 PIPEWORK MATERIALS

Sanitary Plumbing and Vent pipes

Sanitary plumbing and vent pipes shall be uPVC (DWV) 'SH' grade pipes and fittings and shall comply with AS1260. Pipes and fittings shall be joined with solvent welded joints in accordance with manufacturer's recommendations. Apply priming fluid to all joints prior to application of the solvent cement.

Where waste pipes from fixture traps are approved by the Superintendent to be exposed, they shall be chrome plated, type D copper tube with 5% silver brazed joints. Chrome plating shall occur after the fabrication and jointing of all exposed sections of pipework.

Suspended Stormwater Drainage and Downpipes

Stormwater drainage up to and including 225mm diameter shall be uPVC (DWV) 'SH' grade pipes and fittings and shall comply with AS1260. Pipes and fittings shall be joined with solvent welded joints in accordance with manufacturer's recommendations. Apply priming fluid to all joints prior to application of the solvent cement.

Stormwater drainage 300mm and larger shall be James Hardie FRC 'Supertite Speed Drain' stormwater Drainage. Where full lengths of FRC pipe are not required, or a cut has to be made to the length of pipe, use the purpose-made FRC-pipe cutter. Pipes and fittings shall be jointed with 'Supertite' rubber V-rings manufactured and tested in accordance with AS1646. Utilise FRC adaptor couplings to enable the connection of uPVC pipes and other materials to the FRC pipe system. The installation (and support) of FRC pipe and fittings shall be in accordance with the manufacturers recommendations. Where pipework penetrates fire rated structure (vertical and horizontal), fire rate the penetration in accordance with the manufacturer's recommendations.

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7.4 FLOOR WASTES

Specification Reference

Refer to the Sewer Drainage section of the Specification.

7.5 RAINWATER OUTLETS (RO, PRO, PLRO, TRO, SRO, DRO)

Requirement

Provide rainwater outlets applicable to the surface and structure that they are being installed within. Check the latest revision of architectural documentation to confirm surface finishes and structure.

Connection To Pipework

Select rainwater outlets with suitable jointing systems for the pipework being connected.

Samples

Provide samples of all rainwater outlets to the Superintendent for approval. Obtain approval from the Superintendent prior to installation of any rainwater outlets.

Rainwater Outlet (RO)

For carpark areas and similar areas without concrete topping/paving and membrane, provide "Galvin Engineering" model 285101 DI MULTI-PURPOSE HD FLAT VERT RAINWATER OUTLET (W/-MEM C/RING) 100/PVC/HDPE. Vertical Puddle Flange type, cast iron rainwater outlet body and 310mm diameter flat aluminium grate.

For areas with concrete topping/paving and membrane, provide "Galvin Engineering" model DE4S06RX VERTICAL MULTI-PURPOSE DRAIN COMBO – DI 100PVC W/- ST/ST 316 RND GRATE 150. Cast iron rainwater outlet body with 100mm outlet and 150mm diameter, Stainless Steel 316 grade Floor Drain Grate assembly.

Parapet Rainwater Outlet (PRO)

Provide "Galvin Engineering" model 283024 ST/ST 304 FLAT PARAPET DRAIN W/- FLASHING CLAMP & GALV BODY 100BSP. Two-Way Type Parapet Outlet with aluminium grate and 100mm diameter outlet (vertical or horizontal application to suit downpipe location).

Planter Rainwater Outlet (PLRO)

Provide "Galvin Engineering" model DV4S04P Planter Box Combo Drain with single or dual inlet subsoil drain and 100mm diameter outlet.

Terrace Rainwater Outlet (TRO)

Provide "Galvin Engineering" model DH2S04RX Horizontal Floor Drain Combo, with Stainless Steel 316 grade round grate and 50mm diameter outlet pipe for Cast In Slab (CIS) applications.

Where slab thickness will not allow the above specified drain, provide a "Galvin Engineering" model DH2B04RX Horizontal Floor Drain Combo, with Stainless Steel 316 Grade round grate and 50mm diameter outlet pipe for Cast In Slab (CIS) applications.

Square Rainwater Outlet (SRO)
Provide "Galvin Engineering" model DV4S12SX cast iron rainwater outlet body with 100mm outlet with 300mm x 300mm, Stainless Steel 316 grade Floor Drain Grate assembly.

Domed Rainwater Outlet (DRO)
For roof areas and similar areas without concrete topping/paving and membrane, provide "Galvin Engineering" model 282202 Vertical Puddle Flange type, cast iron rainwater outlet body and 310mm diameter domed aluminium grate.

For areas with concrete topping/paving and membrane, provide "Galvin Engineering" model 285205 DI MULTI-PURPOSE HD DOMED VERT RAIN WATER OUTLET (W/- MEM C/RING) 100PVC/HDPE. Vertical Clamp Ring style, cast iron roof outlet with membrane clamp ring and 100mm vertical outlet.

For areas where gravel or other fill material is placed on the finished roof area, provide "Galvin Engineering", 304 grade stainless steel pebble guard to suit the domed rainwater outlet.

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7.6 TUNDISHES (TD)

Requirement

Provide where indicated on the Drawings and as required, 50mm x 32mm chrome plated copper concentric reducers with waste pipes connected to the nearby floorwaste or waste fixture trap. Tundishes shall be chrome plated unless located in a plant room. Where two or more pipes are to discharge over a tundish, provide a larger concentric reducer with larger waste pipe to cater for the number of pipes discharging to it.

7.7 CONDENSATE DRAINAGE FROM A/C CONDENSERS

Requirement

Provide where indicated on the Drawings and as required, open condensate drain to discharge in the basement above disconnector gully. Coordinate with mechanical trade for locations required. Disconnector gully to be provided with accessible reflux valve and concentric reducer showing visible air gap from condensate drain. Where two or more pipes are to discharge over a tundish, provide a larger concentric reducer with larger waste pipe to cater for the number of pipes discharging to it.

7.8 RECESSED TUNDISHES (RTD)

Requirement

Where indicated on the Drawings and as required, provide MOD-TEC or similar in wall recessed tundishes with powder coated stainless steel cover plate to match wall colour.

7.9 RECESSED TRAPPED TUNDISHES (RTTD)

Requirement

Where required, provide, MOD-TEC inwall recessed tundishes complete with waterless trap. Traps that are located within the wall below the tundish are to be located in a recessed stainless steel enclosure. Enclosure and Tundish are to be finished with a powder coated stainless steel cover plate to match wall colour.

7.10 EXPANSION JOINTS IN PIPEWORK

Requirement

Expansion joints shall be of a type, material and manufacture approved by the Water Authority.

Expansion joints shall be installed in such a manner that axial movement with adjacent sections of the pipe in either direction is possible.
On vertical vent pipes, one expansion joint shall be fitted at the base and in the vertical pipe above an offset bend and at each alternate floor level except the top level. They shall be installed immediately below the lowest branch connection for that floor.

Expansion joints shall be fitted on horizontal branch soil, waste and vent pipes. Expansion joints shall be installed to the vertical stack or other graded line. Where branch pipes are fixed at closer intervals, an expansion joint shall be installed between every two (2) fixed supports.

7.11 INSPECTION OPENINGS AND TEST GATES

Requirement

Install inspection openings in pipes so that each section of pipework is accessible in at least one direction. Inspection openings shall be placed in accessible positions and to the approval of the Water Authority.

Screwed inspection opening plugs shall be brass when located in cast iron, brass or copper sanitary plumbing fittings. Screwed plastic inspection openings are to be used for uPVC pipework and fittings.

Provide 100mm diameter test gates at the foot of each stack.

Provide at each junction to a stack, a 100mm inspection opening. Provide at least one inspection opening in each branch drain. The inspection openings shall be provided in locations that provide adequate rodding access to pipes within false ceiling spaces from access hatches.

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7.12 BASIN AND SINK TRAPS

Requirement

Exposed traps to basins and sinks shall be chrome plated copper 'P' Trap Universal pattern unless noted on the Drawings to be 'S' Trap type. Concealed traps to sinks shall be uPVC Universal pattern. Basin waste pipes shall be 40mm diameter and shall be set inside the walls. Where basins are set back to back, offset the waste pipes in the wall to ensure maximum wall structure between pipe chases.

7.13 PIPE OFFSETS

Requirement

Where offsets occur in soil and waste stacks, sweep bends shall be used and the maximum allowable fall shall be provided to the pipework within the space available.

7.14 TERMINATION OF VENTS

Location of Terminals

Vent pipes are to terminate above roof lines with vent cowls in locations in accordance with figure 6.6 of AS3500.2. Where possible, combine vents into header vents in ceiling voids and below slabs to provide a minimum number of vent termination points. Where several vents penetrate through a roof or section of roof, they shall be offset within the ceiling void in order to penetrate the roof in a common line parallel to the building line. Termination points shall be in a location aesthetically acceptable to the Superintendent and offsets in ceiling voids shall be provided to accommodate this requirement.

Weathering Aprons

Under-flashing is to be provided by the builder. Provide weathering aprons over under-flashing to enable a watertight seal.

Finishing

Sections of exposed vent pipe, vent cowls, weathering aprons and under-flashing shall be painted to match the surrounding roof colour. Obtain approval for the proposed colour from the Superintendent prior to painting.

7.15 AIR ADMITTANCE VALVES

Requirement

Provide Studor air admittance valves (AAV's) where indicated on the design drawings and as required to provide adequate venting to remote fixtures in the building in accordance with manufacturer's requirements.

Location

Air admittance valves shall be located in accessible positions hidden from general view and in locations where dust and other air borne pollutants are minimised. These should be easily found for maintenance and replacement purposes.

Type

Provide Studor Mini-vents for branch vents and trap vents. Ensure sizing is in accordance with manufacturer's requirements or alternatively provide additional vents.

Main Vents

Where air admittance valves are provided commonly throughout the development, a 100mm induct vent and a 100mm educt vent are required for the building and are to terminate in accordance with AS 3500.2. Air admittance valves are not permitted to be used for these vents.

7.16 DESIGN OF GUTTERS AND DOWNPIPES

Requirement

Gutters and downpipes shall be designed in accordance with AS3500.3. Downpipe locations and sizes shall be approved by the Superintendent and the gutter dimensions shall be in conformity with the architectural detailing of the roof.

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Any gutters that do not have a capability to overflow to ground or a lower roof area for the full length of one side of the gutter shall be considered a box gutter and designed as such.

7.17 CONNECTION TO BOX GUTTER SUMPS AND PIPED OVERFLOWS

Requirement

Provide Charmac Aussie Connectors to the outlet spigot of box gutter sumps and overflow spigots (where required) provided by the roofer, to provide a watertight connection between the spigot and the downpipe. Aussie Connectors shall incorporate 316 stainless steel screw tight banding. These are only to be used external to the building on awnings.

7.18 STORMWATER DRAINAGE CAST IN SLAB (CIS)

Requirement

Where indicated on the Drawings and as required, pipework is to be cast in the slab (or beam). Wrap the pipework with Bradford 10mm thick Bradflex Generation II flexible rubber pipe insulator. Seal all joints with Bradflex LA6 adhesive. Prior to pour, fill the pipework with water to maintain structural stability of the pipework during the curing process. Where pipework passes through slabs or beams and is not noted to be cast in the beam, pipework shall be installed with sleeves and fire collars as described in the PIPEWORK AND EQUIPMENT INSTALLATION section of the Specification.

7.19 DOWNPIPES CAST IN COLUMNS (CIC)

Requirement

Downpipes cast in columns are to be uPVC, (DWV) 'SH' grade and shall comply with AS1260. Pipes and fittings shall be joined with solvent welded joints in accordance with manufacturer's recommendations. Apply priming fluid to all joints prior to application of the solvent cement.

Wrap the pipework with Bradford 10mm thick Bradflex Generation II flexible rubber pipe insulator. Seal all joints with Bradflex LA6 adhesive. Prior to pour, fill the downpipe with water to 500mm above the level of the proposed pour to maintain structural stability of the pipework during the curing process.

Warning signage to be placed, after formwork has been removed, to indicate cast in downpipe. This is to be contrasting to the column and located where the downpipe might be damaged by other trades. Keep in mind face concrete if using stencil and spray paint.

7.20 DOWNPIPE & SANITARY PLUMBING LOCATED IN CARPARKING AREAS

Requirement

Where downpipes and sanitary plumbing is located within carparking areas, they shall be located so that they are protected against mechanical damage. ie. downpipes and stackwork must be located on rear faces of columns. Where this cannot be achieved, a galvanised mild steel shroud is to be fixed over the downpipe / stackwork. The shroud shall be fabricated from 3mm (min) sheet and protect the downpipe / stackwork from slab level to a height of 1500mm above floor level. Under no circumstances is a downpipe to encroach into parking space width. All shrouds are to be painted safety yellow.

7.21 OVERFLOWS

Requirement

Provide overflows to all areas where exposed to stormwater catchment and where built into façade components, provide advice to the architect on sizing. Some balconies and planters are landlocked and will need to be piped to atmosphere.

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8 TRADE WASTE PLUMBING AND DRAINAGE

8.1 SCOPE

Extent of Work

The extent of work in this Section requires the payment of all fees and permits, supply of labour, equipment and services necessary to complete works in accordance with the Drawings. This includes, but not limited to, the following:

- Design and document the trade waste system.
- Provide pipework, fittings and fixtures as necessary for the construction of trade waste plumbing and drainage system including vent pipes. Connect discharge pipes and branches to drainage. Connect vent pipes to drainage and branch pipes and extend to above the roofline.
- Provide grease arrestors and chamber vents to atmosphere
  - Allow for gantries to grease arrestors if applicable
- Provide pumpouts to loading dock.
- Pipework shall be installed hard up against slabs where possible due to restricted headroom.
- Provide fire stop collars (vertical and horizontal) where necessary to maintain fire rating of building structure.
- Provide capped off pipework as per nominations in Retail Matrix.
  - Provide capped off vents at high level

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8.2 DESIGN CRITERIA

Design the trade waste plumbing and drainage system in accordance with the following:

- AS 3500.2.
- National Construction Code (NCC) including Building Code of Australia and Plumbing Code of Australia.
- Water Authority requirements.

8.3 PIPEWORK MATERIALS

Trade Waste Plumbing, Drainage and Vent pipes

Trade waste plumbing, drainage and vent pipes shall be Geberit Industries HDPE pipework and fittings, for drainage installations with butt welded or electrofusion joints. Only long radius bends are to be used for changes of direction. Pipework shall be installed and supported as recommended by the manufacturer and in accordance with the relevant Australian Standard.

Where waste pipes from fixture traps are approved by the Superintendent to be exposed, they shall be chrome plated, type D DR brass tube with 5% silver brazed joints. Chrome plating shall occur after the fabrication and jointing of all exposed sections of pipework.

8.4 PIPE OFFSETS

Requirement

Where offsets occur in soil and waste stacks, sweep bends shall be used and the maximum allowable fall shall be provided to the pipework within the space available.

8.5 TERMINATION OF VENTS

Location of Terminals

Vent pipes are to terminate above roof lines with vent cowls in locations in accordance with figure 6.6 of AS3500.2. Where possible, combine vents into header vents in ceiling voids and below slabs to provide a minimum number of vent termination points. Where several vents penetrate through a roof or section of roof, they shall be offset within the ceiling void in order to penetrate the roof in a common line parallel to the building line. Termination points shall be in a location aesthetically acceptable to the Superintendent and offsets in ceiling voids shall be provided to accommodate this requirement.

Weathering Aprons

Under-flashing is to be provided by the builder. Provide weathering aprons over under-flashing to enable a watertight seal.

Finishing

Sections of exposed vent pipe, vent cowls, weathering aprons and under-flashing shall be painted to match the surrounding roof colour. Obtain approval for the proposed colour from the Superintendent prior to painting.

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8.6 AIR ADMITTANCE VALVES

Requirement

Provide Studor air admittance valves (AAV's) where indicated on the design drawings and as required to provide adequate venting to remote fixtures in the building in accordance with manufacturer's requirements.

Location

Air admittance valves shall be located in accessible positions hidden from general view and in locations where dust and other air borne pollutants are minimised. These should be easily found for maintenance and replacement purposes.

Type

Provide Studor Mini-vents for branch vents and trap vents. Ensure sizing is in accordance with manufacturer's requirements or alternatively provide additional vents.

Main Vents

Where air admittance valves are provided commonly throughout the development, a 100mm induct vent and a 100mm educt vent are required for the building and are to terminate in accordance with AS 3500.2. Air admittance valves are not permitted to be used for these vents.

8.7 TRADE WASTE PLUMBING AND DRAINAGE LOCATED IN CARPARKING AREAS

Requirement

Where Trade waste plumbing, drainage and vent pipes are located within carparking areas, they shall be located so that they are protected against mechanical damage. ie. stackwork must be located on rear faces of columns. Where this cannot be achieved, a galvanised mild steel shroud is to be fixed over the stackwork. The shroud shall be fabricated from 3mm (min) sheet and protect the stackwork from slab level to a height of 1500mm above floor level. Under no circumstances is a downpipe to encroach into parking space width. All shrouds are to be painted safety yellow.

8.8 GREASE ARRESTORS

Grease arrestors shall be Halgan in manufacture and be provided on 100mm plinths

8.9 HEAT TRACE

Requirement

Where trade waste pipework exceeds acceptable limits (typically longer than 10m), provide a heat trace system to the maintain grease cooling down and fixing itself to pipework and fittings. The heat trace system shall be equivalent to Thermon self regulating heater cable with all necessary cable component accessories to maintain a minimum temperature of 50°C.

Power Supply

Connect the heat trace to 240 V AC power supply to an Earth Leakage Circuit Breaker (ELCB) via a power output control unit. The unit is to be located as shown on the Drawings and mounted on the wall in a location approved by the Superintendent.

Installation of Cable

Secure the cable to the pipework with GT-66 glass tape. Where heat trace wiring passes through wooden blocks associated with support of the pipework, provide a rebate in the wooden block to allow the heat trace wire to be in direct contact with the pipework through the support.

Prior to wrapping with insulation and when installation of the cabling is complete, obtain a written report from the supplier that the installation has been installed and tested in accordance with their guidelines.

Note: Maximum length of each circuit is 100 metres with a 20A circuit breaker.

Insulation

Insulation is to be provided to all pipework with heat trace in accordance with the THERMAL INSULATION subsection of the Specification. Fix self-adhesive 'Electric Tracer' warning labels to the outside of the insulation.

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8.10 REFLUX VALVE

Provide a line size reflux valve on the outlet of the grease arrestor to protect the arrestor from surcharging sewage.

8.11 GREASE WASTE REMOTE PUMPOUT

Provide a remote grease waste pumpout point for remote cleaning of the grease arrestor. The remote cleaning point will be terminated with a Kamlok fitting in a location with access to a grease pump truck and approved by the Superintendent. Pipework shall be extended from a Kamlok connection with flexible hose adjacent to the grease arrestor to the remote pumpout point in pressure PVC pipework.

9 DOMESTIC COLD WATER

9.1 SCOPE

Extent of Work

The extent of work in this Section requires the payment of all fees and permits, supply of labour, equipment and services necessary to complete works of domestic cold water reticulation in accordance with the Drawings. This includes, but is not limited to, the following:

- Design and document the domestic cold water system.
- The domestic cold water service shall feed all fixtures and other equipment requring a water supply.
- Install backflow prevention devices to the requirments of AS 3500.1.
- Provide water meters with remote read outs to apartments.
- Provide a domestic cold water pumpset and filtration as per existing precinct stages.
- Provide capped off pipework as per nominations in Retail Matrix.

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9.2 DESIGN CRITERIA

Requirement

Design the domestic cold water system in accordance with the following:

- AS 3500.1.
- National Construction Code (NCC) including Building Code of Australia and Plumbing Code of Australia.
- Water Authority requirements.

9.3 EXISTING MAINS FLOW AND PRESSURE INFORMATION

Flow and Pressure Testing

Engage a suitable flow and pressure test contractor to undertake a physical flow and pressure test. The test should be undertaken during a weekday at the expected peak time during the day, typically being in the morning when surrounding residents are showering.

9.4 PIPEWORK MATERIALS

Inground Domestic Cold Water Pipework

Inground domestic cold water pipework 100mm diameter and larger shall be Copper tube type 'B' with 5% silver brazed joints (or Viega Propress joints) or Hardie Iplex Blue Rhino PVC-M Class 20 with rubber ring joints and Cast Iron fittings. Pipework 80mm diameter and smaller shall be copper tube Type B with 5% silver brazed slip joints (or Viega Propress joints) or Vinidex High Density Polyethylene (HDPE) PE100, PN16,SDR11, pipework with electrofusion jointing. The pipe sizes indicated on the Drawings are internal bore sizes for PVC, HDPE and XLPE pipework. The installation is to be in accordance with the manufacturer's recommendations.

Above Ground Domestic Cold Water Pipework

Above ground pipework shall be Copper Tube Type B with 5% silver brazed joints. Pipework 15mm and 20mm in size and downstream of the isolation valves for a fixture group may be Rehau XLPE HIS311 Cross linked, high density polyethylene, translucent with co-extruded black polyethylene sheath with mechanical joints for use with cross linked high density polyethylene pipes. The pipe sizes indicated on the Drawings are internal bore for XLPE pipework. The installation is to be in accordance with the manufacturer's recommendations.

Irrigation Service

The irrigation service riser shall be Copper Tube Type B with silver brazed joints if dosing is not provided by the landscape trade. If irrigation system is dosed with chemicals, check water quality parameters with landscape trade and nominate suitable product as sample for approval.
Irrigation provision is to be capped with ball valves at each floor in hydraulic risers. Coordinate cast in pipework with architect and landscape trade and leave capped off at each end.

Riser, cast in pipework and pipework to irrigation plantroom, is to be under test by hydraulic trade during construction to have early warning of leaks.
Cast in irrigation pipework to planters, garden beds and green walls to be Rehau XLPE HIS311 Cross linked, high density polyethylene translucent with co-extruded lilac polyethylene sheath with mechanical joints for use with cross linked high density polyethylene pipes. The pipe sizes indicated on the Drawings are internal bore for XLPE pipework. The installation is to be in accordance with the manufacturer's recommendations.

Slip Joints

Where copper slip joints are to be used, a proper tool shall be used to soften and expand the pipe to form a slip joint of not less than the following lengths:

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LENGTHS OF SLIP JOINTS

Nominal Pipe Size	Length of Slip Joint
15mm to 20mm	10mm
25mm to 32mm	12mm
40mm to 65mm	16mm
80mm to 100mm	20mm

9.5 VALVES

Location and Access

Valves are to be located in easily accessible positions for operation and repair. Conceal valves wherever possible in ducts or non-habitable enclosed spaces. Where valves are located in service ducts or other enclosed spaces, provide access openings with minimum dimensions of 300mm x 300mm square in the building elements and cover with removable, hinged access covers. Position valves in ducts generally at 600mm from the finished floor level.

Valve Specification

Provide valves of suitable materials, and designed for the service for which they are to be used. Valves shall be tested to a pressure of 2,100 kPa by an approved testing Authority. Unless otherwise specified, valves are to be not less than the nominal size of the pipeline in which the valve is installed.

Valves shall not be brazed direct to pipes. Valves shall connect to pipes by either using a three brass bull nose union or flanges. Use a brass thread to capillary straight connector to join valves into the pipe system.

Valves up to and including 50mm shall be bronze with screwed connections. Valves 65mm and 80mm shall be bronze with flanged connections. Valves 100mm and larger shall be cast iron with flanged connections.

Commissioning

At the completion of the project, inspect and clean the internal seats and washers of the valves of all foreign material. Replace any valve faces or seats found damaged.

9.6 ISOLATION VALVES (SV)

Location

Provide isolating valves: on each branch line from the main service lines of water supply systems, on both the inlet and outlet of all items of equipment and also where shown on the Drawings.

Specification

All valves (other than underground sluice valves) shall be provided complete with handwheel or levers for ball valves and butterfly valves. Provide valves capable of normal operation under pressure from one side only. Provide valves permanent markings indicating the direction of closing on handwheels. Provide a spring pin and lockable lever to all ball and butterfly valves, to prevent accidental or unauthorised operation

of the handle. Spindles shall be non-rising type (with the exception of loose jumper type valves). Install valves with spindles in a vertical position where practicable.

Provide loose jumper type stop valves for valves 15mm and 20mm. Provide gate valves or ball valves for valves 25mm to 65mm in size. Provide butterfly valves or gate valves for valves 80mm and larger.

9.7 CHECK VALVES

Requirement

Provide bronze screwed swing check valves for valves up to 40mm in diameter. Provide bronze flanged Mission Duo Check II, Style G, Figure G15 BMF for valves 50mm and larger.

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9.8 ADJUSTABLE PRESSURE REDUCTION STATION

Requirement

Provide a "Wilkens" manufacture, adjustable Pressure Reducing/Regulating Valves, with all bronze bodies where water pressure exceeds maximum limits.

Pressure reducing valves shall be installed in a manifold installation with valves rated in handle low, medium and high flows. Provide valves with suitable springs to provide the pressures indicated on the Drawings. Allow for all testing required for this procedure.

Pressure reducing valves shall be flanged for sizes 50mm and larger. Sizes smaller than 50mm shall be screwed with brass nipple and bronze screwed flanges on either side.

Supply and install individual isolation valves and strainers for each valve in accordance with the manufacturer's recommendation. Supply and install 100mm dia dial face pressure gauges to the inlet and outlet manifold pipework.

Connect to drain point on each valve with a brass union and pipe the waste to the nearest tundish.

9.9 FIXED PRESSURE LIMITING VALVES (PLV)

Requirement

Pressure limiting valves shall be equal to RMC model No. PSL75C. Install a three-way bullnose brass union to enable easy removal of the valve.

9.10 ADJUSTABLE PRESSURE REDUCTION VALVES (PRV)

Requirement

Pressure reduction valves shall be equal to RMC model No. SYR 31220. Install a three-way bullnose brass union to enable easy removal of the valve.

9.11 BACKFLOW PREVENTION DEVICES

Requirement

Provide backflow prevention devices to the various hazard zones and fixtures in accordance with AS3500.1. A master backflow prevention device is to be provided immediately downstream of the master meter assembly unless otherwise required by the Water Authority.

Where required provide tundishes to drain backflow prevention devices. Extend tundish drains to the drainage system via a trapped connection or through connection to an adjacent floor waste.

Signage

Outlets supplied from a service with a backflow prevention device are to have a sign affixed in close proximity to the outlet indicating:

"WARNING
NOT FOR DRINKING"

Obtain approval from the Superintendent for the type and location of the sign prior to fixing.

9.12 VALVES BELOW GROUND

Requirement

All valves other than sluice valves installed below ground are to be located in precast concrete access pits with cast iron, concrete infill covers and frames. The duty of the cover is to be in accordance with the proposed loadings. Provide infill covers with brass edge strips where pits are located in paved areas or areas with finishes other than concrete, to allow the surface finish to be continued through the cover.

Provide 200mm clear space below and on all sides of the valves in the access pit.

Grade the floor of the pit to a point on one side and provide a weephole to allow water to drain from the pit base.

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9.13 SLUICE VALVES BELOW GROUND

Path Boxes

Where sluice valves are located below ground, provide proprietary cast iron path boxes with hinged covers for access. Set the top of the cover flush with pavement, or 30mm above unpaved surfaces, and encase in formed concrete 150mm deep and 150mm wide to sides of box with top surface trowelled smooth.

Access Riser

Set beneath each box a shaft formed of uPVC pipe from the cover to the body of the valve to give clear access to the valve spindle.

Support of Valves

Valves 80mm diameter and larger shall be supported on a 50mm thick 5 MPa concrete pad extending 50mm beyond the flanges on both sides of the valve.

9.14 STRAINERS

Requirement

Provide 'Spirax Sarco' bronze bodied strainers on all lines up to and including 50mm and Cast Iron above 50mm with easily removable perforated stainless steel mesh having perforations 0.4mm maximum.

Mesh shall have a net free area of not less than four times that of the pipe diameter. Fit strainers with valve and drain line to waste to facilitate cleaning

9.15 PRESSURE GAUGES

Requirement

Provide pressure gauges to inlet and outlet sides of pumps and adjustable pressure stations and elsewhere as shown on the Drawings. Isolate from pump vibration and install complete with isolation valve on the inlet.

Provide gauges with full-scale reading in kPa, a minimum diameter of 100mm and capable of reading pressures at least 25% higher than the maximum static pressure of the system.

Pressure gauges available from Pegler Beacon. Pressure Gauge model Wika 213.53.

9.16 PUMP SETS

Specification

Provide packaged pumpsets to pressurise the cold water supply to ensure adequate pressure is available to all fixtures and equipment based upon the results of Pressure and Flow data as noted in clause 8.3. Pumpsets shall include pumps, pressure vessels, valves, pressure and flow switches pipe manifolds, control panels and all other associated equipment necessary for the pressurisation of the cold water system.

Pumps exposed to the weather shall be enclosed in purpose built weatherproof enclosure with lockable cover / access with adequate ventilation.

Pumps shall be Grundfos multi-stage vertical spindle pumps, unless noted otherwise. The make and model shall be selected to conform with this specification, Australian Standards and Supply Authority requirements

and shall based on available pressure and flow data as noted in clause 8.3. The duty of the pumps shall be confirmed with the manufacturer prior to ordering.

Provide pressure gauges and gauge control valves on the inlet and outlet of each pumpset.

Electrical Control Panels

Provide electrical control panels for each pumpset. Provide control panel cabinets, mounting brackets, contactors, isolating and control switches, auxiliary switches, alarms and wiring between the pumps / switches and the control panel to enable the lights, switches and functions to operate as noted below and for the safe and effective operation of the pumps. Coordinate control panel locations to the Architect and head contractor satisfaction.

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Control panels shall be wall mounted adjacent to the pumps or in a location shown, with top at approximately 1800mm high above floor. Panels may be mounted on the pumpset frame where this comes standard with the installation. The face of the panel is to be oriented so as to be easily accessible and visible.

Control panels located internal to buildings shall be constructed with an IP50 rating. Control panels exposed to the weather shall be enclosed in purpose built weatherproof cabinet constructed with an IP54 rating.

Provide lockable doors with dustproof neoprene seals. Panels not located in plant rooms are to be fitted with an additional lockable cover to house the switches and indicator lights in order to prevent unauthorised tampering of the switches.

Control panels shall be designed for ease of access to all equipment and wiring and shall be provided with at least 10% spare space for the addition of future equipment. The panel functions, switches and lights on the face of the control panel shall be in accordance with the following:

COLD WATER PUMP ELECTRICAL CONTROL PANEL FUNCTIONS

Switches	Indicator Lights	Functions / Features
----	Power On – Blue Light	Indicates power to panel
Pump 1 On/Off/Auto	Pump 1 Run – Green Light	Indicates Pump 1 in operation
----	Pump 1 Off – Amber Light	Indicates Pump 1 on stand-by
----	Pump 1 Fail – Red Flashing Light	Indicates failure of pump 1. Audible alarm is to be triggered with this function.
----	----	Pump 1 run meter (requires time clock). To indicate the number of hours the pump has run over it's life.
Pump 2 On/Off/Auto	Pump 2 Run – Green Light	Indicates Pump 2 in operation
----	Pump 2 Off – Amber Light	Indicates Pump 2 on stand-by
----	Pump 2 Fail – Red Flashing Light	Indicates failure of pump 2. Audible alarm is to be triggered with this function.
----	----	Pump 2 run meter (requires time clock). To indicate the number of hours the pump has run over it's life.
* Pump 3 On/Off/Auto	* (Indicator Lights as per Pump 2 above)	* (Functions / features as per Pump 2 above)
Panel Light Test Button	----	Tests all lights on panel
Reset Button	----	To clear a pump fail indicator and alarm.
----	----	Automatic 24hr alternation of pumps (requires time clock).

----	----	Pumps to operate simultaneously to meet set pressures on higher flows.
----	----	Transformers 415V / 240V to 24V for control wiring
----	** Water Storage Tank – High Level - Red Flashing Light	** Indicates high water storage in Tank (Transfer pump / float valve failure). Audible alarm is to be triggered with this function and transfer pumps are to be halted.
----	** Water Storage Tank – Low Level - Red Flashing Light	** Indicates low water storage in Tank (Transfer pump/ float valve failure). Audible alarm is to be triggered with this function and supply pumps halted.

Notes: * Required if a triplex pumpset is specified.

** Required if a cold water storage tank is specified.

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9.17 AUTHORITY WATER METERING CONFIGURATION

Requirement

Water metering shall be undertaken in accordance with the requirements of:

- Strata plan subdivisions;
- Water Authority;
- The Principal's requirements.

Generally, the following areas will require individual meters (but not limited to):

- Each apartment
- Common service (providing water across various titles). eg. Irrigation service.

9.18 SUBSIDIARY WATER METER ASSEMBLIES

Requriement

Provide subsidiary cold water meter assemblies where required by:

- The Superintendent
- Relevant Authority
- BCA requirements
- Elsewhere as indicated on the Drawings.

9.19 SUBSIDIARY APARTMENT WATER METER ASSEMBLIES

Requriement

Provide water meter assemblies and associated equipment to each apartment in accordance with the Water Authority requirements. Meters are to be located in common areas in fully recessed enclosures. Water meters shall be hard wired to a remote monitoring system suitable to be read by the Water Authority.

10 HOT AND WARM WATER

10.1 SCOPE

Extent of Work

The extent of work in this Section requires the payment of all fees and permits, supply of labour, equipment and services necessary to complete works in accordance with the Drawings. This includes, but not limited to, the following:

- Design and document the hot water system.
- Provide commercial grade heat pump units and hot water storage vessels.
- Provide circulating pumps and all necessary fittings, valves, risers and distributions mains necessary to facilitate the reticulation of pressurised hot water.
- Connect to equipment, fixtures and tapware as shown on the Drawings.

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10.2 DESIGN CRITERIA

Requirement

Design the hot water system in accordance with the following:

- AS 3500.4.
- National Construction Code (NCC) including Building Code of Australia and Plumbing Code of Australia.
- Water Authority requirements.
- BASIX Requirements.

10.3 HOT WATER TEMPERATURE

Requirement

Provide hot water to the following areas and fixtures at the respective temperatures:

HOT WATER TEMPERATURE

Area / Fixture Type	Temperature Range
Ablution Areas (basins, baths, showers, spas)	45°C to 50°C
Kitchen sinks, washing equipment and laundry areas	50°C to 65°C

Hot and Warm Water

References to hot water in the Specification also relate to components of the warm water installation unless compliance would result in a warm water installation which is non-compliant with relevant warm water codes of practice or in direct conflict with relevant Authority requirements.

10.4 PIPEWORK MATERIALS

Hot Water and Warm Water Pipework

Hot and warm water pipework shall Copper Tube Type B with 5% silver brazed slip joints (or Viega Propress joints). Pipework 15mm and 20mm in size and downstream of the isolation valves for a fixture group may be Rehau XLPE HIS311 Cross linked, high density polyethylene, translucent with co-extruded black polyethylene sheath with mechanical joints for use with cross linked high density polyethylene pipes. The pipe sizes indicated on the Drawings are internal bore for XLPE pipework. The installation is to be in accordance with the manufacturer's recommendations

Pipework Below Ground

Below ground hot and warm water pipework should be avoided where possible. However, where no alternative exists, pipework may be located below ground utilizing Insapipe pre-insulated and sheathed pipework and fittings installed to manufacturer's requirements. Pipework is to be copper tube and jointing as specified above and insulation and sheathing materials are to be as appropriate to the ground and cover conditions.

Slip Joints

Where copper slip joints are to be used, a proper tool shall be used to soften and expand the pipe to form a slip joint of not less than the following lengths:

LENGTHS OF SLIP JOINTS

Nominal Pipe Size	Length of Slip Joint
15mm to 20mm	10mm
25mm to 32mm	12mm
40mm to 65mm	16mm
80mm to 100mm	20mm

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10.5 PIPEWORK EXPANSION

Requirement

Take care in planning hot water pipe routes to ensure that sufficient offsetting is achieved to compensate for length increases from pipe expansion. Pipe brackets on the hot and warm water pipework systems are to be guide type and are not to restrain the pipe from longitudinal movement.

10.6 THERMAL INSULATION

Pipework Insulation

Hot and warm water pipework shall be insulated with 25mm thick 'Thermotec 4-Zero' insulation, in one metre lengths. Provide 75mm wide, self-adhesive, reinforced aluminium tape to longitudinal joints and circumferential butt joints. Only hot and warm water pipework chased in walls may be insulated with Kemlag insulation.

Pipe Brackets

Provide at each pipe support, specially manufactured, two part, hardwood blocks and clamps for the support of pipework. The width of the hardwood blocks shall be a minimum of 50mm. The diameter of hardwood blocks shall be at least equal to the external diameter of the insulation material after it has been applied to pipework.

Sheathing

Hot and warm water piping including both flow and return pipework in plant rooms, loading dock and exposed to view shall be sheathed with 0.5mm thickness zinc anneal sprung over the insulation in one piece with 32mm laps and fastened with approved zinc plated steel self tapping screws. Metal sheathing is to be coned down to valves and tees. Bends are to be lobster backed.

Valves

Provide 25mm thick 'Thermotec 4-Zero' insulation or purpose-made valve insulators to all valve bodies. Fix insulation using self-adhesive, reinforced aluminium tape.

10.7 VALVES

Location and Access

Valves are to be located in easily accessible positions for operation and repair. Conceal valves wherever possible in ducts or non-habitable enclosed spaces. Where valves are located in service ducts or other enclosed spaces, provide access openings with minimum dimensions of 300mm x 300mm square in the building elements and cover with removable, hinged access covers. Position valves in ducts generally at 600mm from the finished floor level.

Valve Specification

Provide valves of suitable materials, and designed for the service for which they are to be used. Valves shall be tested to a pressure of 2,100 kPa by an approved testing Authority. Unless otherwise specified, valves are to be not less than the nominal size of the pipeline in which the valve is installed.

Valves shall not be brazed direct to pipes. Valves shall connect to pipes by either using a three brass bull nose union or flanges. Use a brass thread to capillary straight connector to join valves into the pipe system.

Valves up to and including 50mm shall be bronze with screwed connections. Valves 65mm and 80mm shall be bronze with flanged connections. Valves 100mm and larger shall be cast iron with flanged connections.

Commissioning

At the completion of the project, inspect and clean the internal seats and washers of the valves of all foreign material. Replace any valve faces or seats found damaged.

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10.8 ISOLATION VALVES (SV)

Location

Provide isolating valves: on each branch line from the main service lines of water supply systems, on both the inlet and outlet of all items of equipment and also where shown on the Drawings

Specification

All valves (other than underground sluice valves) shall be provided complete with handwheel or levers for ball valves and butterfly valves. Provide valves capable of normal operation under pressure from one side only. Provide valves permanent markings indicating the direction of closing on handwheels. Provide a spring pin and lockable lever to all ball and butterfly valves, to prevent accidental or unauthorised operation of the handle. Spindles shall be non-rising type (with the exception of loose jumper type valves). Install valves with spindles in a vertical position where practicable.

Provide loose jumper type stop valves for valves 15mm and 20mm. Provide gate valves or ball valves for valves 25mm to 65mm in size. Provide butterfly valves or gate valves for valves 80mm and larger.

10.9 CHECK VALVES

Requirement

Provide bronze screwed swing check valves for valves up to 40mm in diameter. Provide bronze flanged Mission Duo Check II, Style G, Figure G15 BMF for valves 50mm and larger.

10.10 FIXED PRESSURE LIMITING VALVES (PLV)

Requirement

Provide pressure limiting valves on the inlet to all hot water units and in other locations indicated on the Drawings. Pressure limiting valves shall be equal to RMC model No. PSL75C. Install a three-way bullnose brass union to enable easy removal of the valve.

10.11 ADJUSTABLE PRESSURE REDUCTION VALVES (PRV)

Requirement

Pressure reduction valves shall be equal to RMC model No. SYR 31220. Install a three-way bullnose brass union to enable easy removal of the valve.

10.12 BACKFLOW PREVENTION DEVICES

Requirement

Provide backflow prevention devices to the various hazard zones and fixtures in accordance with AS3500.1.

Where required, provide tundishes to drain backflow prevention devices. Extend tundish drains to the drainage system via a trapped connection or through connection to an adjacent floor waste.

10.13 THERMOSTATIC MIXING VALVES

Requirement

Provide thermostatic mixing valves where required to service Accessible, ambulant areas and areas with specific accessibility for children to achieve the required temperature control under AS 3500.4. Provide

stainless steel box recesses and cover plates to conceal the valves where not located in an accessible riser shaft.

Installation

The installation of thermostatic mixing valves is to be carried out by a plumber licensed for this type of work and in accordance with the manufacturer's recommendations. Connect cold water, hot water, and mixed water outlet pipework to the thermostatic mixing valve with ground face, bronze, screwed unions to enable removal and testing of the valve.

The final location and mounting height of valves is to be approved by the Superintendent prior to installation.

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Records and Maintenance

Provide As Installed drawings showing locations of Thermostatic Mixing Valves and include in the maintenance manuals. Provide tags on each valve as a reference for maintenance records. Advise the owner/occupier that regular testing and maintenance of the valves is to be carried out in accordance with the manufacturer's recommendations to ensure their satisfactory operation.

Signage

Provide and fix in close proximity to each thermostatic mixing valve a sign with the words:

"THIS VALVE REQUIRES REGULAR SERVICING BY A QUALIFIED PERSON"

Obtain approval of the location of the sign from the Superintendent prior to installation.

10.14 AIR RELIEF VALVES

Requirement

Provide Spirax Sarco Model AE 30 air relief valves with gate valves to pipelines at the top of circulation loops that do not have an outlet at the highest point in the loop. Extend a 15mm drain pipeline from the valve to a drainage point or tundish.

10.15 PRESSURE RELIEF VALVES

Requirement

Provide bronze screwed relief valves up to 50mm diameter. Provide bronze screwed hexagon screwed unions on both the inlet and outlet of each relief valve. Relief valves 65mm and over shall be flanged.

10.16 BALANCING VALVES

Requirement

Balancing valves shall be provided at the end of each hot or warm water distribution circuit before the circuit joins the common return line to automatically control the return water temperature and flow.

Balancing valves shall be Watermarked balanced "STAD" type screwed up to 50mm in diameter and "STAF" type flanged for larger sizes. Ensure sufficient pipe length without bends, upstream and downstream of the balancing valve to enable an accurate flow reading is achievable.

10.17 PRESSURE GAUGES

Requirement

Provide pressure gauges to inlet and outlet sides of pumps and adjustable pressure stations and elsewhere as shown on the Drawings. Isolate from pump vibration and install complete with isolation valve on the inlet.

Provide gauges with full-scale reading in kPa, a minimum diameter of 100mm and capable of reading pressures at least 25% higher than the maximum static pressure of the system.

Pressure gauges available from Pegler Beacon. Pressure Gauge model Wika 213.53.

10.18 SECONDARY BUILDING CIRCULATING PUMP SETS

Specification

Provide hot and warm water circulating pumpsets to circulate hot and warm water throughout the development. Pumpsets shall include all required valves and control panel. Fix the return pumps associated pipework and electrical control panel to purpose made galvanised steel support frames, either fixed to the ground or to the wall.

Pumps shall be dual Grundfos circulators mounted in the vertical position with interconnecting pipework and valves. Provide and install pressure gauges and gauge control valves on the inlet and outlet of each pump.

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Fit an isolation valve on the inlet of each pump and a balancing valve and isolation valve on the outlet of each pump.

Pumps exposed to the weather shall be enclosed in purpose built weatherproof enclosure with lockable cover / access with adequate ventilation.

Electrical Control Panels

Provide electrical control panels for each pumpset. Provide control panel cabinets, mounting brackets, contactors, isolating and control switches, auxiliary switches, alarms and wiring between the pumps / switches and the control panel to enable the lights, switches and functions to operate as noted below and for the safe and effective operation of the pumps.

Control panels shall be wall mounted adjacent to the pumps or in a location with the top at approximately 1800mm high above floor. Panels may be mounted on the pumpset frame where this comes standard with the installation. The face of the panel is to be oriented so as to be easily accessible and visible.

Control panels located internal to buildings shall be constructed with an IP50 rating. Control panels exposed to the weather shall be enclosed in purpose built weatherproof cabinet constructed with an IP54 rating.

Provide lockable doors with dustproof neoprene seals. Panels not located in plant rooms are to be fitted with an additional lockable cover to house the switches and indicator lights in order to prevent unauthorised tampering of the switches.

Control panels shall be designed for ease of access to all equipment and wiring and shall be provided with at least 10% spare space for the addition of future equipment. The panel functions, switches and lights on the face of the control panel shall be in accordance with the following:

HOT AND WARM WATER CIRCULATING PUMPSET ELECTRICAL CONTROL PANEL FUNCTIONS

Switches	Indicator Lights	Functions / Features
----	Power On – Blue Light	Indicates power to panel
Pump 1 On/Off/Auto	Pump 1 Run – Green Light	Indicates Pump 1 in operation
----	Pump 1 Off – Amber Light	Indicates Pump 1 on stand-by
----	Pump 1 Fail – Red Flashing Light	Indicates failure of pump 1.
----	----	Pump 1 run meter (requires time clock). To indicate the number of hours the pump has run over it's life.
Pump 2 On/Off/Auto	Pump 2 Run – Green Light	Indicates Pump 2 in operation
----	Pump 2 Off – Amber Light	Indicates Pump 2 on stand-by
----	Pump 2 Fail – Red Flashing Light	Indicates failure of pump 2.
----	----	Pump 2 run meter (requires time clock). To indicate the number of hours the pump has run over it's life.

Panel Light Test Button	----	Tests all lights on panel
Reset Button	----	To clear a pump fail indicator
----	----	Automatic 24hr alternation of pumps (requires time clock).
----	----	Transformers 415V / 240V to 24V for control wiring

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10.19 BALANCING OF THE HOT AND WARM WATER SYSTEMS

Requirement

Balance the entire hot water flow and return system to ensure that hot water is adequately circulated through each hot and warm water return branch of the system. Ensure that required flows/temperatures are being achieved at the balancing valves. Provide evidence in writing to the Superintendent that such balancing has taken place.

10.20 HOT AND WARM WATER METER ASSEMBLIES

Requriement

Provide hot and warm water meter assemblies where required by the Superintendent and relevant Authority and elsewhere as indicated on the Drawings. Install Elster S110 water meters supplied by IntelliHub applicable to the size of service. Real Utilities are to approve all hot water meters.

Remote Readout

The meters shall have provision for remote readout wiring.

10.21 HOT AND WARM WATER APARTMENT METER ASSEMBLIES

Requriement

Provide hot water meter assemblies Elster S110 (1 pulse per 10 litres) private hot water meters to each apartment. Meters are to be located in common areas in fully recessed enclosure. Water meters shall be hard wired to a remote monitoring system suitable to be read by Real Utilities. Interconnection of Elster S110 meters to the EDMI electrical meters via RS485/Cat 6 by electrical trade;

10.22 TEMPERATURE THERMOMETERS

Requirement

Thermometers shall be fitted in the following locations:

- On each hot water unit.
- On each hot and warm water storage vessel.
- On the discharge side of circulating pumpsets.
- Elsewhere as indicated on the Drawings.

Thermometers indicating temperature shall be stainless steel case dial type with 80mm diameter dial face with temperature range indicated between 20 and 120 degrees celsius. The dial thermometer shall be a direct reading stem mounted (either) bottom or back entry type (depending on its location).

The thermometer probe shall be installed in a 316 stainless steel Thermowell to suit bi-metallic thermometer probe. When installed in pipework, the thermowell is to be fabricated from a copper pipe with a minimum length 250mm and to the diameter indicated in the schedule on the Drawings.

Thermometer and Thermowell are available from Pegler Beacon. Thermometer model: Teltru BC-350.

10.23 MAINS PRESSURE HOT WATER HEATERS AND STORAGE TANKS

Requirement

Provide mains pressure hot water heat pumps and storage complete with isolation valves, check valves, temperature and pressure relief valves, primary circulating pump sets and storage tanks in accordance with the manufacturer's recommendations. The heaters shall be of sufficient capacity and redundancy such that failure of any component still provided 60% of the maximum hot water demand for the development.

Specification

The water heater(s) shall be Rheem commercial heat pumps to achieve a hourly recovery rate through 50°C rise. The water heater shall operate on the top down heating principle. The water heater shall have electronic staging and rotation for models with more than two continuous flow units to reduce energy consumption. The water heaters shall be factory assembled and tested and include thermostatic control, housed in an IP54 enclosure. The frame shall be hot dip galvanised and third party certified for wind loadings up to 74.87m/sec. Models shall be suitable for wall, floor or back to back mounting, model dependent. Indoor models shall be supplied with factory integrated condensate drains and traps. Storage tanks shall be Rheem model no. 61043050 with a storage capacity of 410 litres with heavy duty enamelling and 25mm sacrificial anode and shall be fitted with 50mm BSP connections. Internal models shall have condensate drains and traps factory installed. The controller shall communicate with each continuous flow water heater and diagnose up to seven (7) system faults including all continuous flow water heater errors.

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Primary circulating pumpsets shall be provided to circulate hot water throughout the hot water plant. The pumpsets shall include all required valves and control panel. Fix the return pumps associated pipework and electrical control panel to purpose made galvanised steel support frames, either fixed to the ground or to the wall. Primary circulating pumps shall be equal to or better than dual Grundfos CM10 – 1 with circulators mounted in the horizontal position with interconnecting pipework and valves. Provide and install pressure gauges and gauge control valves on the inlet and outlet of each pump. Fit an isolation valve on the inlet of each pump and an isolation valve on the outlet of each pump. Pumps exposed to the weather shall be enclosed in purpose built weatherproof enclosure with lockable cover / access with adequate ventilation.

Electrical Control Panels

Provide electrical control panels for each pumpset. Provide control panel cabinets, mounting brackets, contactors, isolating and control switches, auxiliary switches, alarms and wiring between the pumps / switches and the control panel to enable the lights, switches and functions to operate as noted below and for the safe and effective operation of the pumps. Control panels shall be wall mounted adjacent to the pumps or in a location with the top at approximately 1800mm high above floor. Panels may be mounted on the pumpset frame where this comes standard with the installation. The face of the panel is to be oriented so as to be easily accessible and visible. Control panels located internal to buildings shall be constructed with an IP50 rating. Control panels exposed to the weather shall be enclosed in purpose built weatherproof cabinet constructed with an IP54 rating. Provide lockable doors with dustproof neoprene seals. Panels not located in plant rooms are to be fitted with an additional lockable cover to house the switches and indicator lights in order to prevent unauthorised tampering of the switches. Control panels shall be designed for ease of access to all equipment and wiring and shall be provided with at least 10% spare space for the addition of future equipment. The panel functions, switches and lights on the face of the control panel shall be in accordance with the following:

PRIMARY HOT WATER CIRCULATING PUMPSET ELECTRICAL CONTROL PANEL FUNCTIONS

Switches	Indicator Lights	Functions / Features
----	Power On – Blue Light	Indicates power to panel
Pump 1 On/Off/Auto	Pump 1 Run – Green Light	Indicates Pump 1 in operation
----	Pump 1 Off – Amber Light	Indicates Pump 1 on stand-by
----	Pump 1 Fail – Red Flashing Light	Indicates failure of pump 1.
----	----	Pump 1 run meter (requires time clock). To indicate the number of hours the pump has run over it's life.
Pump 2 On/Off/Auto	Pump 2 Run – Green Light	Indicates Pump 2 in operation
----	Pump 2 Off – Amber Light	Indicates Pump 2 on stand-by
----	Pump 2 Fail – Red Flashing Light	Indicates failure of pump 2.

----	----	Pump 2 run meter (requires time clock). To indicate the number of hours the pump has run over it's life.
Panel Light Test Button	----	Tests all lights on panel
Reset Button	----	To clear a pump fail indicator
----	----	Automatic 24hr alternation of pumps (requires time clock).
----	----	Transformers 415V / 240V to 24V for control wiring

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Provide appropriately sized Temperature and Pressure Relief (T&PR) valves incorporating vacuum break component in each mains pressure heater and pipe to terminate 150mm above floor or surface level so that discharged water from the heaters will not cause damage or flow back under the base of the water heaters. T&PR valves are to discharge into an adjacent floor waste via individual tundish.
Provide beneath each heater, (when located outside a plantroom area) a 0.6mm thick sheet copper safetray with all joints soft soldered. Provide a safety edge on all sides of the trays. Safetrays are to be mounted on hardwood battens. The heater is to be mounted on additional hardwood battens located in the safetray.

Cold Water Supply to Hot Water Heaters

Connect cold water supply to hot water systems in accordance to AS3500.1, AS3500.4 and AS 1529. Provide all valves and fittings recommended by the manufacturer for reliable and safe operation of the hot water units and for ease in maintenance and replacement.

Heat Traps

Install cold water pipework connections to hot water storage vessels with heat traps to prevent energy loss. Provide hot water heat traps on the hot / warm outlet of all hot water units not including circulating systems. All heat traps shall be insulated and sheathed.

10.24 HEAT TRACE

Requirement

Hot water deadlegs should be kept to a minimum, however where hot water dead legs exceed acceptable limits (typically longer than 15m), provide a heat trace system to the main reticulated hot water pipework and fittings. The heat trace system shall be equivalent to Thermon self regulating heater cable with all necessary cable component accessories to maintain a minimum temperature of 50°C.

Power Supply

Connect the heat trace to 240 V AC power supply to an Earth Leakage Circuit Breaker (ELCB) via a power output control unit. The unit is to be located as shown on the Drawings and mounted on the wall in a location approved by the Superintendent.

Installation of Cable

Secure the cable to the pipework with GT-66 glass tape. Where heat trace wiring passes through wooden blocks associated with support of the pipework, provide a rebate in the wooden block to allow the heat trace wire to be in direct contact with the pipework through the support.

Prior to wrapping with insulation and when installation of the cabling is complete, obtain a written report from the supplier that the installation has been installed and tested in accordance with their guidelines.

Note: Maximum length of each circuit is 100 metres with a 20A circuit breaker.

Insulation

Insulation is to be provided to all pipework with heat trace in accordance with the THERMAL INSULATION subsection of the Specification. Fix self-adhesive 'Electric Tracer' warning labels to the outside of the insulation.

11 IRRIGATION PROVISION

11.1 SCOPE

Extent of Work

The extent of work in this Section requires the supply of labour, equipment and services necessary to complete works of irrigation reticulation in accordance with the Drawings. This includes, but is not limited to, the following:

- Design and document the pipework for the irrigation system.
  - Valve to be provided within 1m of the inside of the irrigation plant room.
  - Valve to be provided at each floor with temporary supply to cast in pipework for testing during construction;
    - Timers, solenoids and wiring to be supplied and installed by landscape trade.
    - Cap each valve if not used for landscape trade
  - Provide rainwater reuse top up to tank via solenoid valve and float with air gap above tank surcharge level
    - Tank to be kept at 20% capacity
- Install backflow prevention devices to the requirments of AS 3500.1.
- Provide water meter on top up water supply.
- Irrigation contractor will fit out plant room.
  - Liaise with irrigation contractor for sizing of pipework out of the tank and into the room

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11.2 DESIGN CRITERIA

Requirement

Design the irrigation riser and pipework system in accordance with the following:

- AS 3500.1.
- National Construction Code (NCC) including Building Code of Australia and Plumbing Code of Australia.
- Water Authority requirements.

11.3 PIPEWORK MATERIALS

Refer to cold water section for full extent of requirements other than below

Above Ground Irrigation Pipework

The irrigation service riser shall be Copper Tube Type B with silver brazed joints if dosing is not provided by the landscape trade. If irrigation system is dosed with chemicals, check water quality parameters with landscape trade and nominate suitable product as sample for approval.
Irrigation provision is to be capped with ball valves at each floor in hydraulic risers. Coordinate cast in pipework with architect and landscape trade and leave capped off at each end.
Riser, cast in pipework and pipework to irrigation plantroom, is to be under test by hydraulic trade during construction to have early warning of leaks.
Cast in irrigation pipework to planters, garden beds and green walls to be Rehau XLPE HIS311 Cross linked, high density polyethylene translucent with co-extruded lilac polyethylene sheath with mechanical joints for use with cross linked high density polyethylene pipes. The pipe sizes indicated on the Drawings are internal bore for XLPE pipework. The installation is to be in accordance with the manufacturer's recommendations.

12 FIRE HOSE REELS

12.1 SCOPE

Extent of Work

The extent of work in this Section requires the payment of all fees and permits, supply of labour, equipment and services necessary to complete works in accordance with the Drawings. This includes, but not limited to, the following: -

- Design and document the fire hose reel systems.
- Provide fire hose reels and a hose reel service connecting to the domestic cold water supply.
- Provide fire hose reels in retail tenancies to achieve coverage.

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12.2 DESIGN CRITERIA

Fire Hose reel System

Design the fire hosereel system in accordance with the following:

- AS 1221.
- AS 2441.
- AS 3500.1.
- National Construction Code (NCC) including Building Code of Australia and Plumbing Code of Australia.
- Local Council requirements.

12.3 WATERMAINS FLOW AND PRESSURE INFORMATION

Flow and Pressure Testing

Engage a suitable flow and pressure test contractor to undertake a physical flow and pressure test. The test should be undertaken during a weekday at the expected peak time during the day, typically being in the morning when surrounding residents are showering.

12.4 PIPEWORK MATERIALS

Above Ground Fire Hose Reel Pipework

Above ground pipework shall be Copper Tube Type B with 5% silver brazed joints. The installation is to be in accordance with the manufacturer's recommendations.

Slip Joints

Where copper slip joints are to be used, a proper tool shall be used to soften and expand the pipe to form a slip joint of not less than the following lengths:

LENGTHS OF SLIP JOINTS

Nominal Pipe Size	Length of Slip Joint
25mm to 32mm	12mm
40mm to 65mm	16mm

12.5 VALVES

Location and Access

Valves are to be located in easily accessible positions for operation and repair. Valves shall be located no higher than two metres above the finished floor level adjacent for access. Valves are to be preferably located within fire isolated passages and stairs for safe access by the Fire Authority.

Labeling

Provide a permanent numbered label for each isolation valve and be noted on the schematic.

Valve Specification

Provide valves of suitable materials, and designed for the service for which they are to be used. Valves shall be tested to a pressure of 2,100 kPa by an approved testing Authority. Unless otherwise specified, valves are to be not less than the nominal size of the pipeline in which the valve is installed.

Valves shall not be brazed direct to pipes. Valves shall connect to pipes by either using a three brass bull nose union or flanges. Use a brass thread to capillary straight connector to join valves into the pipe system.

Valves up to and including 50mm shall be bronze with screwed connections.

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Commissioning

At the completion of the project, inspect and clean the internal seats and washers of the valves of all foreign material. Replace any valve faces or seats found damaged.

12.6 ISOLATION VALVES ON FIRE HOSE REEL SUPPLY

Limited Locations

Ensure that fire hose reels are connected to an uninterrupted supply i.e., there are to be no isolation valves between the meter valve and the isolation valve on fire hose reel, unless they are pad-locked in the open position.

Valve Types

All valves shall be provided complete with handwheel. Provide valves capable of normal operation under pressure from one side only. Provide valves permanent markings indicating the direction of closing on handwheels. Provide gate valves for valves 25mm to 65mm in size. Provide straps and locks to hold the valve in the open position.

12.7 CHECK VALVES

Requirement

Provide bronze screwed swing check valves for valves up to 40mm in diameter. Provide bronze flanged Mission Duo Check II, Style G, Figure G15 BMF for valves 50mm and larger.

12.8 FIRE HOSE REELS

Requirement

Provide fire hose reels where nominated on the Drawings. Fire hose reels shall be wall mounted, 36m drum type reels with Off/Jet/Spray type nozzles. Fire hose reels shall bear the 'Standards Mark' symbol.

Cabinets

Where fire hosereels are not located in a cupboard nominated on the Architectural Drawings, provide purpose made cabinets to contain the hosereels.

Supports

Where hosereels are not located against a wall, provide a purpose-made free standing frame to support the hose reel and cabinet.

Protection Against Weather

Where hose reels are exposed to weather effects and UV light, provide a proprietary industry standard enclosure / cover. These are to be clearly identifiable and protected against wind, yet easily removed for use.

12.9 HOSE REEL BACKFLOW PREVENTION DEVICES

Requirement

Provide a backflow prevention assembly on the main supply line to the fire hosereel system. The backflow prevention assembly shall consist of two parallel, double check valve assemblies with associated isolation

valves to enable uninterrupted supply to the fire hosereel system during maintenance of one of the double check valves.

Alternatively, individual double check valve assemblies may be provided on the inlet to each of the fire hosereels.

12.10 FIRE SAFETY CERTIFICATE

Requirement

Engage an approved Registered Company with the Australian Securities Commission which provides as its main business, the work of Fire Services Consultancy to attend the site to carry out tests on the Fire Hose Reel Systems, and to provide a Fire Safety Certificate for the fire hose reel services installations as required by Building Code of Australia. Such firm and personnel shall be recorded as being qualified and acceptable to undertake the work of certification for the project. Submit in writing names of three (3) firms for approval to the Superintendent.

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The selected certifying company shall provide to Superintendent typewritten results of flow tests, static pressure tests at each fire hose reel in the development.

12.11 TAGGING OF FIRE HOSE REELS

Requirement

On completion of the fire hose reel installation, provide ‘tags’ for all hose reels and engage a Fire Protection contractor to inspect the hose reels for compliance.

12.12 PRESSURE GAUGES

Requirement

Provide pressure gauges to inlet and outlet sides of pumps and adjustable pressure stations and elsewhere as shown on the Drawings. Isolate from pump vibration and install complete with isolation valve on the inlet.

Provide gauges with full-scale reading in kPa, a minimum diameter of 100mm and capable of reading pressures at least 25% higher than the maximum static pressure of the system.

Pressure gauges available from Pegler Beacon. Pressure Gauge model Wika 213.53.

13 SANITARY FIXTURES AND TAPWARE

13.1 SCOPE

Extent of Work

The extent of work in this Section comprises the complete design, supply and installation of sanitary fixtures, tapware and equipment specified and shown on the Drawings. Allow for the supply and fixing of all sanitary fixtures, tapware and equipment in accordance with the manufactures' instructions.

13.2 PROVISION, RESPONSIBILITY AND GUARANTEE OF SANITARY FIXTURES AND TAPWARE

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Requirement

Provide sanitary fixtures and tapware as shown on the Drawings and included in the following schedule. Confirm that the fixtures and tapware match the architectural details and elevations and provide any accessories, shrouds, pedestals etc. that may be required to match those details. Where sanitaryware or tapware is not specified for a particular room or area, assume that an item of the same standard to others in the room or similar rooms is to be installed. Advise the Superintendent of any discrepancies or specifications that are not clear.

Responsibility

The Contractor is responsible for the condition and quantity of sanitary fixtures and tapware from the time that they are delivered to the site until Practical Completion of the project. Ensure that the fixtures are stored in a secure location.

Guarantee

Provide to the Superintendent, a written guarantee from the manufactures, guaranteeing the condition of fixtures against faults for a period of one year following the issue of the certificate of Practical Completion. The guarantees shall cover costs associated with replacement of faulty fixtures and tapware.

13.3 SAMPLES

Requirement

Provide samples of all sanitaryware and tapware to the Superintendent for approval. Fit tapware to fixtures prior to presenting to the Superintendent, ensuring all combinations of fixtures and tapware can be reviewed by the Superintendent. Obtain approval from the Superintendent prior to ordering the tapware and sanitary fixtures.

13.4 SANITARY FIXTURES

Specification

Fixtures shall be high quality and constructed of Vitreous China and be white in colour unless specifically noted otherwise. Provide 'P' or 'S' trap outlets to suit architectural details. When ordering basins and sinks, ensure that the number of tapholes matches the number of outlets required for the tapware specified and as nominated on the architectural details.

Installation

Installation of the sanitary fixtures shall be in accordance with the requirements of the Water Authority, Council and the manufacturers recommendations. Brackets used to support the sanitary ware and stainless steel fixtures shall be secured to walls with metal expansion fastenings, hexagon head zinc plated bolts, or brass screws as applicable. Plastic fixing plugs and uncoated steel bolts or screws are not permitted. The fixing brackets shall be of the type appropriate to the fixture and to the structure that the fixture is being fixed to. Seal fixtures to walls and benches with appropriate silicone sealant.

Plug and Washers

Plug and washers for basins shall be 40mm diameter chrome plated brass, complete with approved type plastic plug, grey in colour. Plug and washers for stainless steel sinks shall be stainless steel on plastic type. Set each plug and washer in position with clear Roof and Gutter Silicone Sealant.

Water Closets

Water Closet pans are to be full sewer pans with 100mm soil pipe connection and shall be set to the floor with 2:1 cement mortar mix. Pans are to have a back flush inlet with a concealed "Key Seal" where the

flush pipe joins the pan. Where flush pipes are exposed and do not form part of a standard toilet suite, the flush pipes are to be copper with chrome plating.

13.5 TAPWARE, SPOUTS AND ACCESSORIES

Specification

Refer to Architectural materials and finishes schedules and specification. Tap handles and spouts shall be metal bodied and unless noted otherwise, shall be bright chromium plated. Fit a vandal-proof or anti-tampering device where this is available as an option on the types selected. Water spouts and outlets shall be of the aerated swivel type unless otherwise specified. Tapware handle button/indicators shall be of the colour nominated in the table below:

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TAPWARE BUTTON/INDICATOR COLOURS

Service	Button Indicator Colour
Cold Water Tap	Blue
Hot Water Tap	Red
Warm Water Tap	Yellow

Installation

Installation of the tapware shall be in accordance with the requirements of the Water Authority, Council and the manufacturers recommendations.

Accessories

Provide each fixture with all accessories, including taps, valves, outlets, and the like, necessary for the proper functioning of the fixture, compatible with the fixtures they serve and of types as selected and/or described in the Specification and the manufacturers recommendations.

Spindles

Provide to all taps, extension spindles of sufficient length to enable top cover plates to be screwed onto spindles. In determining the length of spindle, check thickness of wall finishes and benches detailed in the architectural drawings and architectural specification. All wall mounted spindles are to be installed with Waterbar (or equivalent) tap penetration flange and shower outlet washer.

13.6 WELS RATING

Requirement

Sanitaryware and tapware shall be WELS rated to suit the requirements of BASIX and / or Local Authority for water efficiency as applicable.

13.7 WATER CONNECTIONS TO FIXTURES

Mini-cistern Taps

Provide chrome plated mini-cistern taps on hot and cold water points to each fixture.

Connections Hidden from View

Where water connections are hidden from view, (eg. below a vanity basin), extend from the mini-cistern taps to the tapware/fixture connections with ‘Aquaknect’ stainless steel braided flexible connections.

Connections Exposed to View

Where water connections are exposed to view, (eg. connecting to a toilet suite), extend from the mini-cistern taps to the tapware/fixture connections with chrome plated copper pipework.

13.8 CONNECTIONS TO EQUIPMENT

Requirement

Provide water and waste connections to all items of equipment whether or not they specified in this Specification. Some items of equipment may be supplied by the Client or other contractors. Obtain

manufacturers information of all equipment and connect all necessary hydraulic connections to equipment to enable the complete and proper operation of the equipment.

13.9 ADAPTABLE APARTMENTS

Requirement

Provide water and waste connections to suit final locations of fixtures and tapware in Adaptable Apartments such that pipework does not need to be retrofitted in walls or below slabs to enable transformation of an apartment to an Adaptable Apartment.

Note that this includes provision of a Recessed box for a future Thermostatic Mixing Valve.

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Specification Reference

Refer to architectural documentation for location and number of Adaptable Apartments.

13.10 SCHEDULE OF SANITARY FIXTURES AND TAPWARE

FIXTURE	SANITARYWARE SPECIFICATION	TAPWARE SPECIFICATION
Refer to Architectural Documentation		
Internal Hose Taps	N/A	Enware hose tap with vandalproof non-removable institutional handle (code 305).
External Hose Taps	N/A	20mm thread brass hose taps.

14 CORROSION PROTECTION, PAINTING AND LABELLING

14.1 GENERAL

Scope

This section sets out the requirements for protective and decorative treatments and measures for equipment and fittings as well as requirements for labelling.

14.2 CORROSION PROTECTION AND PAINTING

General

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Provide high quality decorative and protective final coatings using the methods specified in this section to all surfaces. Provide coatings to protect all surfaces against corrosion immediately after fabrication and/or erection. Apply decorative final coatings to all surfaces of all system components except those concealed from view above solid panel ceilings, in service shafts or sub floor voids. Provide factory applied finishes for all equipment.

Treatments

Provide the following treatments:

Wipe insulation with a damp cloth. Apply semi gloss water based latex enamel WB Armaflex or approved equal to clean dry insulation.

Materials

Mix all paints and apply in strict conformity with the printed instructions of the manufacturer. Supply all paints for the project as new product and deliver to site in unopened, sealed containers. Supply all paints used for one painting system from one manufacturer.

Formulate wash primers and etching solutions to be compatible with subsequent primer, undercoats and finishing coats and procure them from the same manufacturer as the subsequent coatings. Ensure sealers, adhesives and the like are compatible with the painting systems used.

Workmanship

Perform all painting in a neat, thorough and workmanlike manner utilising experienced, specialist tradesmen. Provide high quality finishes for all decorative coatings achieving uniform gloss finish, free from runs, overspray, sags, dust and other imperfections.

Thoroughly protect surfaces not required to be painted and upon completion of painting work remove any paint spots, oil or stains from floors, walls, steelwork, concrete, machinery, glass, hardware and surfaces that are not to be painted, leaving assemblies and their finish in a clean and acceptable condition.

Do not paint baked enamel finishes, rubber hoses, flexible mountings, lubricated surfaces, name plates and the like.

Colour

Colours are to be as prescribed by Australian Standards where applicable, consistent with common practice or surrounding elements of the work. Pipework and valve bodies shall be painted in accordance with the colour codes set out in AS 1345 unless requested otherwise by the Superintendent. Obtain approval from the Superintendent for the proposed colour of any surfaces exposed to view prior to applying colour coats to these surfaces.

14.3 GENERAL PROTECTIVE MEASURES

Contact Between Dissimilar Metals

Where dissimilar metals are likely to result in cathodic corrosion, separate them by an air gap of 3mm or join them using either rubber, PVC, polythene or other appropriate insertion packing not less than 1.5mm thick. Fit bolts or fasteners with isolation ferrules and washer having an electrical resistance not less than the joining material used.

Welding and Machining of Corrosion Protected Surfaces

Where corrosion protection is provided by hot dip galvanising or metal flame spraying, all welding and machining must be carried out prior to the application of the protective coating. Welding or machining will not be permitted after the coating has been applied.

Where other types of protective coatings are specified, welding or machining will not be permitted after the corrosion protection coating has been applied, unless the coating is restored to its original condition after welding or machining. Undertake coating restoration in accordance with the manufacturers requirements for the original coating.

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Surfaces Inaccessible After Installation

Surfaces to be painted that will be inaccessible after installation must be completely painted prior to installation.

Repairs to Defective or Damaged Surface Treatments

Restore at the end of the Defects Liability Period all painted finishes that have been damaged during maintenance or while carrying out repairs. Carry out the repair of defective or damaged surface coatings prior to the expiry of the Defects Liability Period.

14.4 LABELLING AND IDENTIFICATION

General

Label all equipment items, pipework, fittings, valves, electrical systems including gauges, meters, sensors, controls, panels, switchboards, plant casings and the like, to facilitate operation and maintenance. Provide direct engraved labels on switches and similar items, otherwise engraved labels must be fixed as required.

Utilise three (3) layer engraved laminated plastic generally, White/Black/White, with special or emergency equipment labelled in other colours eg. Red/White/Red.

Fix firmly in position with pins, screws or in slide holders which allow for replacement. Approved adhesive fixings may be used on plastic accessories.

Size labels to suit importance and application and uniform for similar items. Minimum letter size will be 3 mm and 0.3 mm line thickness.

Relabel all existing equipment services modified as part of the work.

Equipment

Apply adhesive lettering to all major items of equipment with letters 50 mm high, 8 mm thick for major items of plant. Apply engraved laminated plastic labels with 20mm mm high lettering for other items of plant.

Pipework

Exposed pipework and pipework located in areas accessible for maintenance purposes or in accessible roof areas are to be labelled.

Identify pipes in accordance with AS 1345 for the identification of Piping, Conduits and Ducts, AS 1318, SAA Industrial Safety Colour Codes, AS 1319 Safety Signs for the Occupational Environment and AS 2648 Underground Marking Tape. "Safetyman" adhesive labels are an acceptable method of identification of pipework. Provide flow direction arrows to all pipework.

Provide labels between each change of direction in the pipework and at minimum 6 metre intervals. Labels are to be located on the pipework so as to be visible from the most readily accessible position.

Valves

All isolation valves, thermostatic mixing valves and tempering valves are to be provided with solid plastic or brass tags stamped with identification letters and numbers.

The tags are to be attached to the valves with nickel or brass bead chain with sufficient slack to enable easy access and visibility while ensuring the tags unable to be removed from the valves. The identification

on the tag shall indicate the service type (with abbreviations used on the legend of the Drawings as a minimum) and a number referenced on the As-Installed drawings.

Electrical and Control

Label and identify cubicles and equipment with appropriate engraved traffolyte labels, generally white with black letters and red with white letters for essential equipment or warning notices or otherwise as required by Supply Authority, to indicate function and/or designation. Label separately each:

- cabinet
- isolator or main switch
- compartment or zone
- switchfuse unit with rating of fuse cartridges
- circuit breaker and set of fuses except where typed schedules are provided
- switches and indicating lamps associated with each item of equipment
- relay, motor starter or other control device
- meter, switch and pilot lights
- outgoing circuit load stalks in cable compartment
- set of fault current limiting fuses
- terminal strip to indicate function

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Source: Under assembly name label, or adjacent to main isolator, provide a label stating origin of circuit supplying switchboard including location and name of board of origin and size and type of cables.

Wiring: Identify at terminations with engraved, interlocking non ferrous ferrule type sleeves. Associate identification with associated wiring diagrams. Use an approved numbering system.

Information

Include on the label the equipment identification code, make and model, together with relevant performance details as follows:

Electric Heaters
- Capacity (KW)
- Stages

Pumps
- Design water flow (l/s)
- Motor size
- Impellor size

15 NOISE AND VIBRATION CONTROL

15.1 GENERAL

Scope

This section sets out the requirements for the control of noise and vibration associated with the operation of the hydraulic services and equipment.

Requirement

Ensure that the transmission of noise and vibration from hydraulic services and equipment is minimised and complies with the criteria levels set by this specification.

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The installation is required not to exceed to the Maximum Noise Level Criteria scheduled and where not listed to satisfy the recommended criteria set out in Australian Standard AS 2107 1987. Take all necessary measures in supporting, mounting, selecting and treating of equipment to prevent the emission of noise and the transmission of vibration to the building and to ensure the noise levels are not exceeded as a result of the mechanical equipment operation.

Standards Criteria

Noise- Building and Occupied Spaces: as scheduled and defined in Australian Standard (AS) 2107 Acoustics- Recommended Design Sound Levels and Reverberation Times for Building Interiors, and

Noise - Environmental: As defined by the Environmental Protection Authority (EPA) and/or Noise Control Legislation relevant to the particular locality and AS 1055, Description and Measurement of Environmental Noise.

Vibration: Isolate to achieve criteria defined in Australian Standard AS 2670. Evaluation of human exposure to whole body vibration:

- AS 2670.1 : General requirements
- AS 2670.2 : Continuous and shock-induced vibration in buildings (1 to 80 Hz)
- AS 2670.3 : Evaluation of exposure to whole-body Z-axis vertical vibration in the frequency range 0.1 to 0.63 Hz.

Balancing: For static and dynamic balancing of all rotary machinery comply with the requirements of:

- AS 1359 Parts 50 and 51, General Requirements for Rotating Electrical Machines, and
- AS 2625 Rotating and Reciprocating Machinery - Mechanical Vibration.

15.2 TESTING ON COMPLETION

Standards

Criteria detailing testing of noise and vibration is provided in "COMMISSIONING AND TESTING". Levels of noise and/or vibration that impair the efficiency of working do not comply with the specified maximum levels in any environment will not be accepted.

Unacceptable Results

In the event of unacceptable noise or vibration levels resulting from faulty plant or negligence during the installation, carry out all alterations and additions to the installed plant as directed by the Superintendent, in order to reduce levels to acceptable values. Undertake the work without variation to the contract price.

15.3 AIR BORNE NOISE

Requirement

Install, balance and adjust all hydraulic services and equipment to minimise noise generation and result in levels which do not exceed the criteria specified. Where pipes and any other services provided in this contract pass through walls, roofs and floors, seal the clearance holes

15.4 STRUCTURE BORNE NOISE AND VIBRATION

Requirement

Isolate all hydraulic equipment from the building structure such that the transmission of energy into the structure results in minimum noise and vibration levels not in excess of the criteria specified. Incorporate the following method(s) below to minimise the transmission of energy to building structure.

Flanking Transmission Paths: Support pipework from the building fabric using vibration isolation mounts and hangers where shown on the drawing(s) and listed in the schedule. Additionally connect rotating and reciprocating equipment to piping etc, with flexible connections. Provide a flexible connection of approved type to all service connections such as electrical, drainage, flues etc, to resiliently mounted equipment.

Mounts: Mount all equipment on support channels, frames or rigid bases supported by vibration isolators.

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15.5 CLEARANCE HOLES

Requirement

Minimise the noise transmission across penetrations, and vibration energy transmission at penetrations, of a building structure or element where services pass from one area to another.

Sleeves: Provide sleeves for pipes and cables penetrating the building slabs or walls. They shall be firmly grouted in place. The sleeves shall be sized to allow a uniform 12 mm minimum clearance around the item and this space shall be packed through its depth with an approved resilient material, fire rated where necessary. The joints on both sides shall be sealed using a non-hardening resilient compound.

15.6 VIBRATION ISOLATION MOUNTS

Requirement

Provide all equipment incorporating rotating or reciprocating machinery anti-vibration mounts with transmissibilities low enough so as not to cause excessive vibration of the building structure.

Select vibration isolation equipment on the basis of fully charged operating weights of equipment including the shared weight of any connected piping or components and shall, where necessary, include travel limits to provide for control at different operating weights.

Operation Reactions: Take account of the static weight of the equipment and any dynamic reaction forces, in particular the thrust forces in the case of high pressure fans, and the reaction forces at start up. Adjust all mountings when the equipment is operating at design conditions to ensure that each mounting is carrying its correct portion of the load.

Exposed Locations: Mountings for use in exposed or moist locations shall have galvanised steel housings and epoxy coated springs set in self draining locating cups.

Pad-Isolation: Vibration isolation for deflections up to 10 mm may be provided by either double deflection neoprene mounts or multiple layers of ribbed neoprene pad with steel plates between layers. For optimum performance the neoprene pads should be of approximately 40 durometer hardness and loaded to but not in excess of 350 kPa (3.6 kg/cm^2).

15.7 PIPE HANGERS AND MOUNTINGS

Pipework

Provide vibration isolating hangers and mountings to support piping located in the following areas:

- Between any spring mounted equipment and the flexible connection
- Within 40 pipe diameters of any spring mounted equipment which is not isolated from the piping by a flexible connection
- the two hangers closest to equipment
- In plant rooms if not included above
- In ceiling spaces, or under floors of occupied spaces

15.8 FLEXIBLE CONNECTIONS

Requirement

Unless otherwise indicated provide flexible connections to prevent vibration from rotating equipment, through piping to the building structure.

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16 COMMISSIONING AND TESTING

16.1 GENERAL

Scope

This section sets out the requirements for testing, commissioning and verification of the hydraulic services.

Requirement

Engage specialist contractors with the appropriate expertise and resources to fully commission, test and verify the entire hydraulic services systems to prove the systems comply with every requirement of this specification and the design intent of the system.

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Progressively and finally test all equipment components and systems, including the piping, electrical and control installations both individually and collectively to the satisfaction of all authorities having jurisdiction over the project and the Superintendent. Demonstrate that the systems are functioning correctly and that the commissioning process has fully integrated all elements and systems to achieve the specified operating conditions and functionality.

Provide all necessary meters, instruments, temporary wiring, labour and specialist expertise to perform the commissioning and testing and to undertake verification of the systems performance and operation.

Record all tests in an approved manner and provide copies of test results.

Manufacturers' Representatives: Have authorised representatives of manufacturers of hot water heaters, pumpsets, controls and the like attend the site commissioning and testing procedures and to certify that the plant is operating and performing correctly before handover.

Testing Stages

The following testing stages apply:

- Manufacturers' Tests: Carried out on production items before dispatch from the factory
- Type Tests: Carried out on an item identical with a specified production item.
- Site Tests: Carried out on site to demonstrate the satisfactory operation and performance of the system.
- Preliminary Tests: Carried out to demonstrate that the system appears to meet the performance and operating requirements prior to acceptance testing.
- Acceptance Tests: Carried out on the completed installation to demonstrate that the system, including all components and equipment, operates correctly, safely and efficiently, meets the performance requirements, and is acceptable for handover.
- Final Tests: Acceptance tests carried out before expiry of the Defects Liability Period to demonstrate that the system has been properly maintained during the Defects Liability Period and complies with the Specification.

Test Records

For each test, provide a report or certificate in a form suitable for inclusion in an operation and maintenance manual, signed and dated, legibly typed recording:

- the type of test
- the test procedures
- the apparatus and instruments used
- the date, time and place of the test
- the ambient and other relevant conditions
- the name, status, function and signature of each person present
- the test results
- where applicable, calculations, instrument readings, control settings, name plate ratings, and the like
- variations to the Specification, if any.

Manufacturers' Certificates

For each factory or type test provide a certificate from the manufacturer stating that the relevant item has been tested and meets the specified requirements. Certify that each type tested item is identical with the specified production item.

Pressure Vessels: Provide the manufacturer's certificate required by AS 1210 clause 7.7 and statutory requirements. Mount the certificate in a glazed frame on a wall adjacent to the vessel.

Instrument Calibration

Certification: For each measuring instrument included in the site test apparatus, provide a current calibration certificate from an approved authority, showing the information listed in AS3912.1.

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Recalibration: Recalibrate each instrument on or before the certified date for recalibration. Recalibrate or replace faulty instruments or instruments rejected by the Superintendent.

Remedial Work

If a tested item or system fails to meet the performance requirements, rectify the item before Practical Completion and retest.

16.2 NOISE AND VIBRATION TESTING

Requirement

Carry out noise level acceptance tests in conjunction with the acceptance tests of the completed installation. Demonstrate that noise levels within each area do not exceed the maximum noise level criteria specified.

Measurements

Utilise sound level meters to AS 1259 Types 1 and 2, as appropriate, calibrated to the dB(A) scale. Take readings, with the plant operating normally, over the full spectrum of octave band centre frequencies from 31.5Hz to 8kHz and associated dB(A) readings.

Carry out testing when background noise is relatively steady and continuous at the usual level. Measure background sound spectrum and dB(A) levels with the plant stopped.

Schedule the noise spectra and dB(A) readings with the plant on and off. Note the specified required noise level in dB(A). In the preliminary test reports detail the reasons for any nonconformance with the specified required noise levels, and the proposed method of resolution.

16.3 PERFORMANCE VERIFICATION

Requirement

Prior to offering the hydraulic services systems as complete and fully commissioned, thoroughly review the commissioning and testing undertaken and verify that the systems are in fact fully functional and fulfill the operational and performance requirements of the specification.

Where the project managers representative (generally the Consultant) subsequently identifies deficiencies which result from inadequate or inappropriate commissioning, testing and rectification of defects or where rectification of the deficiencies is not promptly and thoroughly resolved resulting in the problem causing discomfort to occupants, engage an independent consultant and expert commissioning and testing or controls specialist, approved by the project manager, to overview and assist with the resolution of the problems. Resubmit Commissioning and Testing results demonstrating the resolution and rectification of the problems.

16.4 HYDROSTATIC PRESSURE TESTING

General

Supply apparatus and materials necessary for, and carry out the tests required by the Specification or Regulatory Authorities, in the presence of the Superintendent and the authorised representative of the relevant Authority for the service under test.

Do not cover or conceal underground or enclosed work until it has been inspected and tested, in sections where necessary, to the approval of the Superintendent, standards and the relevant Authority. Leave pipe joints exposed to enable observation during the tests.

Seal off items of equipment not designed to withstand the test pressure. Securely anchor pipes and fittings in position to prevent movement during the tests.
Test completed pipework systems including equipment designed to withstand the test pressure. Isolate items of equipment not so designed. Securely anchor pipes and fittings in position to prevent movement during the tests.

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During and on the completion of the test, check pipe joints, valve seats, tap washers, strainers and the like. Replace if damaged, and re-test.

Hydrostatic Tests
Pressure test the pipework installation progressively in accordance with the procedures and requirements outlined in the relevant standards.

Sanitary Plumbing and Drainage
The pipework is to be tested in the following manner unless overridden by Regulatory Authority requirements:

Fill the pipework with water to the static pressure head stated in the table below and test as follows:

HYDROSTATIC TEST TABLE

Type of Joint	Pressure Head (metres)	Test Period	Maximum Water Loss (per 30 metre Length of Drain)
Cement Mortar	1.5 min to 3 max	15 minutes	600 millilitres/ 25mm pipe diameter
Solvent Welded	1.5 min to 3 max	15 minutes	No loss permitted
Rubber Ring	1.5 min to 3 max	15 minutes	No loss permitted

Pipework exceeding the permitted water loss limits above is to be inspected to determine the leakage, the leakage rectified and the pipework retested.

Upon satisfactory completion of hydrostatic testing, mirror test the pipework for visual evidence of straight alignment and flush internal jointing. Give prior notice to the Superintendent for verification of the mirror test.

At the completion of the project allow to thoroughly water flush all pipework to ensure no debris remains in the system.

Water Services
Cold, hot and warm water services systems shall be tested to a pressure of 1500 KPa or higher if recommended by the pipework manufacturer.

Maintain tests pressures for 24 hours. A test will be deemed successful if no loss of pressure occurs.

Fire Services
Fire hydrant systems shall be tested to a pressure at the highest outlet to not less than 1.5 times the highest operating pressure at that location or 1700kPa (whichever is the greater).

Maintain test pressures for 24 hours. A test will be deemed successful if no loss of pressure occurs.

Fire sprinkler supply systems shall be tested to a pressure of 1700kPa or 400kPa above the maximum static working pressure (whichever is greater).

Retesting
If a section of pipework fails a required test, repair the fault and retest.

16.5 ELECTRICAL SYSTEM TESTING

Requirement

Undertake the following minimum site tests for each completed section of the electrical installation:

- Electrode and earthing system tests.
- Insulation resistance tests.
- Continuity tests.
- Tests to prove correct operation of interlocks, tripping and closing circuits, indications, etc.
- Vector group, phasing and synchronising tests.
- Operation of all protective gear circuits by primary injection and system fault tests to check sensitivity and stability.
- Protective gear timing tests as may be necessary.
- Test operation of alarm devices.
- Rotational tests on all motors.
- Polarity tests to verify that single pole switches are installed in the phase or live conductor of each circuit, and not in the neutral conductor.
- A test to verify the continuity of all conductors in every ring circuit, correct connections to terminals or all socket.
- Insulation resistance tests to earth and between conductors before and after fitting of lamps. The standard of acceptance for electrical insulation tests shall be as recommended in the IEE Wiring Regulation.
- Insulation resistance tests on any electrical apparatus supplied and/or erected under this or other contracts before and after connecting such apparatus to the supply.

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17 OPERATION AND MAINTENANCE

17.1 GENERAL

Scope

This section sets out the operational maintenance requirements for all systems and details the content provision of Operating and Maintenance Manuals, As Installed Drawings and Electronic Information.

17.2 MAINTENANCE

Requirement

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During the defects liability period, provide experienced maintenance personnel to perform comprehensive operational and preventive maintenance required for safe, efficient and reliable operation of the systems. Supply the necessary maintenance materials including lubricants, cleaning materials, all replacement parts and filters. Incorporate the servicing and maintenance requirements of the manufacturer of all items of plant (or systems).

Callouts

Provide to the Principal, telephone numbers for maintenance staff who can be contacted in the event of a breakdown to attend site within 16 hours for a problem that is not an emergency. Attend site to repair any fault that affects essential or major plant within 4 hours including problems with fire hydrant pumpsets, fire hose reel pumpsets, sewage pumpout plant, subsoil pumpout plant, hot water plants and cold water pressure pumpsets.

Program

Before the start of the maintenance period, submit a maintenance program showing the proposed dates of required service visits. Undertake regular visits at not less than 1 month intervals. Record the result of each service visit in the log book, including comments on the functioning of the system, work carried out, items requiring corrective action, testing results, any necessary remedial action, adjustments made, name of service operator, and the like, and obtain the signature of the Principal's designated representative.

Certification

At the end of the maintenance period, make a final service visit and, upon satisfactory completion of the above procedures, certify in writing that the system is operating in as-installed condition.

Activities

Undertake as a minimum servicing requirements of the system set out below and in addition all servicing to ensure that the system remains in a fully operational and clean state:

- Replace all faulty and damaged parts of the installation. Replace all consumable components such as filters, oil, fuel, etc. as necessary. Make all necessary adjustments.
- Service all equipment in accordance with the recommendations of all equipment and component manufacturers.
- Check all bearings for correct operation and lubrication.
- Lubricate all equipment as necessary. Clean out systems as necessary.
- Check and adjust as necessary belt tensions and alignment of all belt drives and couplings. Check couplings and pulleys for wear and tightness. Replace worn belts.
- Check all motors for excessive operating temperatures and record current draw.
- Check all anti-vibration supports for deterioration of rubber or springs, and for freedom of movement of assembly.
- Examine all flexible pipe connections for correct adjustment and tightness.
- Check operation of all automatic controls.
- Check all piping systems for leaks and repair these where they have occurred. Correctly adjust and repack pump and valve glands as necessary and clean gland drains. Check, blow down and clean strainers.
- Repair paintwork damaged through the actions of maintenance staff to provide a surface finish in keeping with undamaged section on the component concerned.

- Ensure that plantrooms are left in a clean and tidy condition equal to the state at practical completion. Replace all equipment in correct positions. Leave plant in correct operating order.

Release of the final payment and retention sum shall be made at the end of the Defects Liability Period upon submission of inspection and maintenance reports and inclusion of them into all copies of the Operation and Maintenance Manuals.

Service Contract

Submit during the Defects Liability Period, in draft form, a proposal for a service agreement covering regular inspections and servicing of the installation, to take effect on the expiration of the Defects Liability Period.

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17.3 TRAINING

Requirement

Provide training of the Principal's Representatives on site at times and dates to be agreed during the contract. Provide initial training for a full period of 3 days within 1 month of practical completion. Allow a further full period of 1 day each within 3 months, 6 months and 11 months of practical completion. Provide at each session, sufficient training for the Principal's Representative to operate and maintain all systems. Provide a full outline of the training course to the Principal, two weeks prior to the courses and obtain approval of the adequacy of the course outline.

Maintain full responsibility for the operation of all plant and equipment until the Principal acknowledges having received all necessary instructions in the operation of equipment and systems.

17.4 MANUALS

Requirement

Provide Operating and Maintenance Manuals for all systems and equipment utilised throughout the project. Submit draft copies of the proposed Operating and Maintenance Manuals at 50% of project, complete in all respects with the exception of As Installed Drawings and Commissioning and Test results. Provide one final draft prior to practical completion. Practical Completion Certificates will not be issued until the final draft copy of the manuals are received.

Provide 3 sets of the corrected and completed manuals within 4 weeks of Practical Completion.

Form

A4 size, typed on durable printing paper, each page consecutively numbered, neatly bound in durable hard-backed vinyl covers permanently labelled. Place diagrams on the same page as the relevant text, or on the facing page, or on gatefold pages at the end of the volume. The type, style and manual form shall be continuous through the manual.

Manual

Provide the information necessary for the satisfactory long-term operation and regular maintenance of the installation as well as technical reference information on all plant and equipment, including:

- Binder Information: Provide the following information:
  - Project name and service on the spine.
  - Project name and service on the front cover along with the Principal's name, Contractor's name, Subcontractor's name and the Superintendent's Representative's name.
- Title Page: Provide the name of the Contractor and his address and contact numbers and the expiry date of the Defects Liability Period.
- Index: Provide a comprehensive Table of Contents.
- General Description: Providing an easy to read description of the installation covering all systems and their functions. Reference shall be made to latter and more detailed descriptions of plant or systems.
- System Information: Providing information relating to each system installed by the Contractor. Each system is to be a separate section of the manual and shall consist of the following information and enclosures (a breakdown of information forming each of the sections are noted in the sections below):
  - General Description of Systems and Equipment
  - Operation Instructions

- Maintenance Instructions
- Equipment Schedules.
- Manufacturer's Literature.
- Test Records and Commissioning Data
- Miscellaneous Information.

- As-Installed drawings: Include drawings of the systems "AS-INSTALLED", complete with index. Provide reduced scale reproduction A3 sheet for all drawings included in the manuals. Care shall be taken in the drafting of the drawings to ensure that the reproductions are legible. Include a graphic scale as well as a designated scale.

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General Description of Systems and Equipment

Include brief overall description of systems, design references and description of each individual system and equipment involved.

Operation Instructions

For the correct starting, operating, shut down, fault finding, etc. for each system and item of plant, and instructions for adjusting all controls and cut out settings. Include instructions for actions to be taken in the event of abnormal or emergency conditions. A complete schedule of the normal operating conditions of all items of plant including motor currents, temperatures, pressures, etc. and the settings of all safety and other controls. Where operation, test or maintenance involves a hazard to personnel or equipment, the description of that action shall be immediately preceded by a warning, caution or note

Maintenance Instructions

Detail all requirements for preventive and corrective maintenance of the complete plant. Arrange in tabulated sections of recommended daily, weekly, monthly and annual maintenance in the form of a log book.

Note periodicity, performance standards to be maintained, physical inspections to be performed, cleaning, lubrication, adjustments, special tools required, special materials required, testing procedures, trouble shooting and fault diagnosis procedures, dismantling and assembly procedures.

Equipment Schedules

Include schedules of equipment showing quantity, location, make, type, supplier, etc, and a schedule of all suppliers with addresses and telephone numbers.

Manufacturer's Literature and Waranties

Provide originals of manufacturer's manuals and equipment specific brochures. Label each brochure or manual/manual page with the equipment item number. Where brochures include data for multiple models, neatly strikeout irrelevant data to avoid confusion. Provide performance and physical details such as size, shape, weight, mounting and securing, interconnection, etc. Include warranties associated with all plant and equipment. Do not include irrelevant data or data that does not pertain to the model of equipment actually installed.

Test Records And Commissioning Data

Typed with the same text format as all other text and contained in ruled, titled tables with an index. Hand written tables will not be accepted.

Miscellaneous Information

Include any miscellaneous charts, graphs, descriptions, data, etc., needed for complete maintenance and operating instructions of all systems and equipment installed.

As-Installed Drawings

Include drawings of the systems “As-Installed”, complete with index in accordance with “WORK AS-INSTALLED DRAWINGS”.

17.5 WORK AS-INSTALLED DRAWINGS

Requirement

Provide drawings of the work "As-Installed" using a computer aided drafting (CAD) program, prepared by experienced specialist draughtspersons. Produce drawings on the same sheet size as the tender drawings. Include a graphic scale as well as a designated scale.

Provide three (3) sets of full size prints of the drawings, each set bound separately. Provide three (3) sets of reduced scale A3 prints incorporated into the Operating and Maintenance Manuals.

Before the date of Practical Completion, provide the Superintendent's Representative with one full size print of "As-installed" drawings for review. Provide finalised As-Installed drawings with the Operating and Maintenance Manuals. Include all changes and variations made during the execution of the work and the information in accordance with "WORKING DRAWINGS" but with all details and notes specific to construction only and not specifically required to show work as-installed removed.

City Plan Services Pty Ltd
Reference: 2107917/2
Date: 09/04/2025
Construction Certificate
Chris Michaelis
Director
BDC1974

CAD Files

Provide CAD drawing files in accordance with the following:

- Drawing files in the latest version of AutoCAD or one version earlier (DWG) format.
- Bind cross-referenced files used in the production of the drawings.
- Prepare all CAD drawings at full scale, ie. 1:1.
- Provide a CAD file summary including :
  - index of CAD file names related to drawing names
  - list of all layers, line types and blocks
  - scales at which CAD files are plotted

Revit Files

Where the design drawings are produced in Revit format, provide As-Built drawing files in accordance with the following:

- A Revit model in the latest version of Revit or one version earlier (RVT) format.
- CAD and PDF exports of all the drawing sheets

17.6 SURVEY OF EXTERNAL SITE SERVICES

Requirement

Provide survey of all services installed in-ground including location, size, invert levels and depths of cover. The survey shall be undertaken by a registered surveyor during the works.

Include surveyed services records and associated documentation in the "Operating and Maintenance Manual" in CAD (dwg) and/or Revit formats and prints as nominated in the "Work As-installed Drawings" clause.

17.7 ELECTRONIC INFORMATION

Requirement

Provide two sets of electronic data associated with the Manuals and As-Installed drawings containing :

- All text within the Operating and Maintenance Manuals in Microsoft Word 2003 format.
- All text within the Operating and Maintenance Manuals in PDF format.
- As-installed CAD drawing files.
- As-installed PDF files.
- As-installed Revit model (where designed in Revit).

Provide each electronic copy on separate CD-R media clearly labelled and indexed in labelled proprietary diskette storage containers. Provide within the manuals, all information and instructions necessary for retrieval of information from the disks.

18 RETURNABLE SCHEDULES

18.1 SCOPE

Requirement

Complete a full set of returnable schedules for each hydraulic trade contractor proposed and return as part of the tender submission.

18.2 CONTRACTOR DETAILS

Requirement

Complete the following Contractor details.

City Plan Services Pty Ltd
Reference: 210791/2
Date: 03/04/2025
Construction Certificate
Chris Michaels
Director
BDC1974

PROPOSED HYDRAULIC TRADE CONTRACTOR

DETAILS	
Company	:
Contact Name	:
Telephone	:
Facsimile	:

Tenderer .....

Date ..... Signed .....

18.3 NON CONFORMANCES / ALTERNATIVES

Requirement

Provide details of deviations from the specified equipment and materials and relevant cost implications for the alternatives provided. Provide manufacturer's details of the proposed alternative along with the returnable schedules.

PROPOSED ALTERNATIVES

SPECIFIED ITEM	PROPOSED ALTERNATIVE	REDUCTION	ADDITION
		$	$
		$	$
		$	$
		$	$

City Plan Services Pty Ltd
Reference: 210791/2
Date: 03/04/2025
Construction Certificate
Chris Michaels
Director
BDC1974

Tenderer .....

Date ..... Signed .....

18.4 BASE COMPONENT PRICES

Requirement

Complete the following table of itemised Base Tender Prices for the works.

BASE TENDER PRICE	
ITEM	**COST**
Sewer Drainage	$
Stormwater Drainage	$
Sanitary Plumbing and Downpipes	$
Trade Waste Plumbing and Drainage	$
Domestic Cold Water	$
Hot and Warm Water	$
Irrigation Provision	$
Fire Hose Reels	$
Sanitary Fixtures and Tapware	$
Corrosion Protect, Painting and Labelling	$
Noise and Vibration Control	$
Commissioning and Testing	$
Operation and Maintenance	$
Miscellaneous	$
TOTAL	**$**

City Plan Services Pty Ltd
Reference: 210791/2
Date: 03/04/2025
Construction Certificate
Chris Michaels
Director
BDC1974

18.5 COMPONENT PRICES

Requirement

Complete the following table of major component / equipment prices for the works. These costs are to be included in the Base Tender Price schedule above, however are extracted here to confirm their inclusion and component price. Where specific components are not applicable or have not been included in the prices above, please note these as “N/A”.

MAJOR COMPONENT PRICES	
ITEM	**COST**
Sewer Drainage	
	$
Stormwater Drainage	
	$
	$

Tenderer .....

Date ..... Signed .....

Domestic Cold Water Service	
Domestic Cold Water Pumpset/s	$
Hot Water Service	
Hot Water Plant/s	$
Circulating pumpset/s	$
Thermostatic mixing / Tempering valves	$
Irrigation Provisons	
	$
Fire Hose Reels	
TOTAL	**$**

City Plan Services Pty Ltd
Reference: 210791/2
Date: 03/04/2025
Construction Certificate
Chris Michaels
Director
BDC1974

Tenderer .....

Date ..... Signed .....

Pre-Application Submission Form

Certificate Case NumberCFT-696072

Apply for certificate

Select the certificate action you would like to apply for	Construction certificate
Select the type of certificate you wish to apply for	Certificate for part of the development
Is the application for modification of a current construction certificate?	No
Which approval type is this certificate in relation to?	State determined (SSI / SSD)
Enter State determined number of the approval which is related to this certificate application (please include the SSD/SSI prefix)	SSD15822622
Has the SSI / SSD case been determined?	Yes
Date of determination of the state determined case	28/11/22
Is the development exempt from the *State Environmental Planning Policy (Sustainable Buildings) 2022 Chapter 3* relating to non-residential buildings, for any of the following reasons? • The DA was submitted on the NSW Planning Portal before 1st October 2023 • The DA was submitted on the NSW Planning Portal on or after 1st October 2023 but was deemed exempt due to the reasons outlined in Chapter 3.1.	Yes

Site address #	1
Street address	IVANHOE ESTATE, MACQUARIE PARK
Local government area	RYDE
Lot / Section Number / Plan	
Primary address?	Yes
Planning controls affecting property	Land Application LEP Land Zoning Height of Building Floor Space Ratio (n:1) Minimum Lot Size Heritage Land Reservation Acquisition Foreshore Building Line

Applicant details

Title	Mr
First given name	Salar
Other given name/s	NSW
Family name	Salarvand
Contact number	0401909953
Email	salar.salarvand@frasersproperty.com.au
Address	Level 2, 1C Homebush Bay Drive
Is the applicant a company?	Yes
Name	FRASERS PROPERTY IVANHOE JV2 PTY LIMITED
ABN	22669307395
ACN	669307395

Trading Name	

Developer details

Name	FRASERS PROPERTY IVANHOE PTY LIMITED
ABN	23 619 909 992
ACN	619 909 992
Trading Name	Frasers Property Australia
Email	midtownprojectteam@fraserspropery.com.au
Address	Level 2, 1C Homebush Bay Drive, Rhodes NSW 2138

Land owner details

Owner/s of the Development Site	A company, business, government entity or other similar body owns the development site
Owner Builder?	
Title	
First given name	
Other given name/s	
Family name	
Contact number	
Email	
Address	
Company name (if applicable)	
ABN/ACN	
I declare that I have shown this document, including all attached drawings, to the owner(s) of the land, and that I have obtained their consent to submit this application.	
Who will be doing the building work?	Licensed Builder

Builder or Principal contractor details

Builder Type	A Company , business , government entity or other similar body
Company Name	RICHARD CROOKES CONSTRUCTIONS PTY. LIMITED
ABN	33001375266
ACN	001375266
Trading Name	
Billing Address	
Email Address	

Long Service Levy

Have you paid the Long Service Levy?	Yes
Are there any security or site conditions which may impact on the person undertaking the inspection? eg: locked gates, dogs, animals etc	No
Provide details	

Payer details

Payer Type	A company, business, government entity or other similar body
Company Name	FRASERS PROPERTY IVANHOE JV2 PTY LIMITED
ABN	22669307395
ACN	669307395
Trading Name	
Billing Address	Level 2 1C HOMEBUSH BAY DRIVE RHODES 2138
Email ID	salar.salarvand@fraserspropery.com.au
Title	
First given name	

Other given name/s	
Family name	
Contact number	
Email	
Billing address	

Proposed development details

Selected common application types	Erection of a new structure
Selected development types	Residential Accommodation Retail Premise
Class of development	Class 2 Class 6 Class 7a
Please provide a detailed description of the development	162 apartments mixed use development located in Midtown MacPark. This Construction Certificate is for slab on ground and associated drainage works ONLY.
Estimated Development Cost	$96,380,228.00
Please provide the estimated development cost including GST	$96,380,228.00

Information to be collected for the Australian Bureau of Statistics

Total site area (m2)	2375
Existing gross floor area (m2)	0
Total Net Lettable Area (m2))	12943
Proposed gross floor area (m2)	15000
What are the current uses of all parts of the building (s)/land? (if vacant please state)	Vacant Land
What is the proposed use of all parts of the building (s)/land?	Residential Apartments and Retail Tenancies
Is the proposed building is attached, detached (i.e. free standing) or semi-detached?	

Ultimate height of the development (m)	55
Number of pre-existing dwellings on site	0
Number of storeys proposed in the new building(s)	20
Number of proposed lots	

Materials to be used

Walls	Concrete (20) Fibrous cement (30) Steel (60) Other (80)
Roof	Aluminium (70) Concrete (20) Other (80)
Floor	Concrete (20) Other (80)
Frame	Aluminium (70) Steel (60) Other (80)

Fire safety measures

Are you proposing to carry out alterations/modifications to existing ‘relevant fire safety systems’?	No
Are proposed fire safety measures to be installed in the building?	Yes

Fire Safety Measure	Access Panels, doors and hoppers to fire resisting shaft
Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Automatic fail-safe devices
Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Automatic fire detection and alarm system*
Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Automatic fire supression system (sprinkler)*
Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Emergency lighting
Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Emergency lifts
Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Emergency warning and intercommunication system
Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Exit signs
Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Fire control centres and rooms
Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Fire dampers
Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Fire doors
Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Fire hydrant systems*
Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Fire seals (protecting openings in fire resisting components of building)
Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Fire shutters
Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Fire windows
Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Hose reel systems
Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Lightweight construction
Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Mechanical air handling systems (smoke control)*
Is this measure installed in the building?	No

Please enter proposed standard of performance	
Fire Safety Measure	Perimeter vehicle access for emergency vehicles
Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Portable fire extinguishers
Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Safety curtains in proscenium openings
Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Smoke and Heat Vents
Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Smoke dampers
Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Smoke detectors and heat detectors
Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Smoke doors
Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Solid-Core doors
Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Standby Power Systems
Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Wall wetting sprinkler and drencher systems*
Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Warning and operational signs
Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Other (please specify)
Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Access Panels, doors and hoppers to fire resisting shaft
Is this measure installed in the building?	Yes
Please enter proposed standard of performance	Relevant Codes and Standards
Fire Safety Measure	Automatic fail-safe devices
Is this measure installed in the building?	Yes
Please enter proposed standard of performance	Relevant Codes and Standards
Fire Safety Measure	Automatic fire detection and alarm system*
Is this measure installed in the building?	Yes
Please enter proposed standard of performance	Relevant Codes and Standards
Fire Safety Measure	Automatic fire supression system (sprinkler)*
Is this measure installed in the building?	Yes
Please enter proposed standard of performance	Relevant Codes and Standards
Fire Safety Measure	Emergency lighting
Is this measure installed in the building?	Yes
Please enter proposed standard of performance	Relevant Codes and Standards
Fire Safety Measure	Emergency lifts

Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Emergency warning and intercommunication system
Is this measure installed in the building?	Yes
Please enter proposed standard of performance	Relevant Codes and Standards
Fire Safety Measure	Exit signs
Is this measure installed in the building?	Yes
Please enter proposed standard of performance	Relevant Codes and Standards
Fire Safety Measure	Fire control centres and rooms
Is this measure installed in the building?	Yes
Please enter proposed standard of performance	Relevant Codes and Standards
Fire Safety Measure	Fire dampers
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Please enter proposed standard of performance	Relevant Codes and Standards
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Is this measure installed in the building?	Yes
Please enter proposed standard of performance	Relevant Codes and Standards
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Fire Safety Measure	Hose reel systems
Is this measure installed in the building?	Yes
Please enter proposed standard of performance	Relevant Codes and Standards
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Fire Safety Measure	Mechanical air handling systems (smoke control)*
Is this measure installed in the building?	Yes
Please enter proposed standard of performance	Relevant Codes and Standards
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Please enter proposed standard of performance	Relevant Codes and Standards
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Is this measure installed in the building?	Yes
Please enter proposed standard of performance	Relevant Codes and Standards
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Is this measure installed in the building?	No
Please enter proposed standard of performance	
Fire Safety Measure	Smoke and Heat Vents
Is this measure installed in the building?	Yes
Please enter proposed standard of performance	Relevant Codes and Standards
Fire Safety Measure	Smoke dampers
Is this measure installed in the building?	Yes
Please enter proposed standard of performance	Relevant Codes and Standards

Fire Safety Measure	Smoke detectors and heat detectors
Is this measure installed in the building?	Yes
Please enter proposed standard of performance	Relevant Codes and Standards
Fire Safety Measure	Smoke doors
Is this measure installed in the building?	Yes
Please enter proposed standard of performance	Relevant Codes and Standards
Fire Safety Measure	Solid-Core doors
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Fire Safety Measure	Warning and operational signs
Is this measure installed in the building?	Yes
Please enter proposed standard of performance	Relevant Codes and Standards
Fire Safety Measure	Other (please specify)
Is this measure installed in the building?	Yes
Please enter proposed standard of performance	Relevant Codes and Standards

Registered certifier

The applicant has selected the following certifying organisation to assess this application

Company name	CITY PLAN SERVICES PTY LIMITED
Trading name	
ABN	30075223353
ACN	075 223 353
Address	L7 S2, 80 Clarence Street Sydney NSW 2000
Email	reception@cityplan.com.au

Principal certifier

The applicant has selected the following certifying organisation to assess this application

Company name	CITY PLAN SERVICES PTY LIMITED
Trading name	
ABN	30 075 223 353
ACN	075 223 353
Address	L7 S2, 80 Clarence Street Sydney NSW 2000
Email	reception@cityplan.com.au

Declarations

I declare that all the information in the application and checklist is, to the best of my knowledge, true and correct	Yes
I agree to the appropriately delegated assessment officers attending the site for the purpose of inspection	Yes
I/we own the subject land, consent to this application and consent to Council officers entering the premises during normal office hours for the purpose of conducting inspections relative to this application. I accept that all communication regarding this application will be through the nominated applicant. In the case of an owners corporation, a seal is required, or if crown land, written authorisation of the relevant statutory authority.	Yes

I have read and agree to the collection and use of my personal information as outlined in the Privacy Notice.	Yes
I declare that all works that are the subject of the relevant consent have been completed and that all conditions that are required to be satisfied prior to the issue of this certificate have been satisfied	Yes
I agree to pay any required NSW Planning Portal Service Fee/s specified under Part 9, Schedule 4 of the Environmental Planning and Assessment Regulation 2021 to the Department of Planning, Housing and Infrastructure.	Yes

Review of application

What is the outcome of your review?	Accept application
Additional certifier comments	.
Certifier reference number	210791/2
Has the applicant paid the application fees?	Yes
Enter the date the application was lodged into the certifier's system	21/02/25

BUILDING CODE OF AUSTRALIA COMPLIANCE ASSESSMENT REPORT

MIXED-USE DEVELOPMENT

MIDTOWN ESTATE – LOT C3, EPPING ROAD, MACQUARIE PARK

DATE ►13/03/2024

REPORT NO. ►11067.3 Rev 5.0

PREPARED FOR ►Parkview

PREPARED BY ► AE&D

AEDGROUP

Innovation & expertise in building regulations

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DRAFT

REVISION STATUS				
REPORT NO/REV	DATE	STATUS	WRITTEN	CHECKED
11067.3 Rev 5.0	14/03/2024	UPDATED FOR BCA 2022	BM	

COMMERCIAL IN CONFIDENCE

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AE&D Pty Ltd A: Suite 3.04, 55 Miller Street, Pyrmont NSW 2009
Southern Highlands A: Unit 6, 13 Lyell Street, Mittagong NSW 2575
Sutherland Shire A: Level 4 – Suite 33, 29 Kiora Road, Miranda NSW 2228
P: (02) 9571 8433 E: admin@aedconsulting.com.au W: www.aedconsulting.com.au ABN: 15 149 587 495

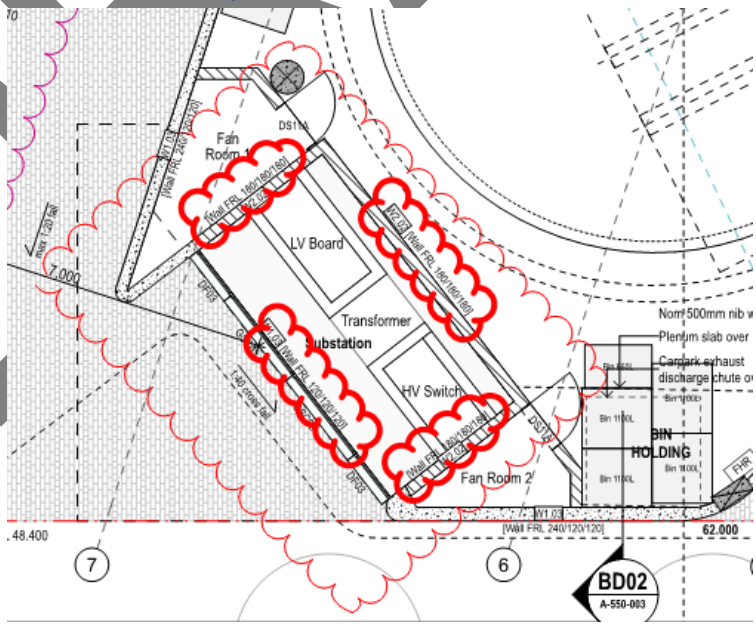
EXECUTIVE SUMMARY AND RECOMMENDATIONS

This report provides a Building Code of Australia (BCA) 2022 assessment of mixed use building, to be located at Midtown Estate – Lot C3, Epping Road, Macquarie Park.

The primary purpose of this report is to identify the non-compliance matters contained in the proposed design against the current Deemed-to-Satisfy (DTS) Provisions of the BCA and to provide compliance recommendations to overcome the DTS non-compliances.

Recommendations

The following is a list of Deemed-to-Satisfy Provisions that should be addressed either by design amendments, additional information **OR** by way of a Performance Solution:

BCA Clause	Deemed-to-Satisfy Provision to be addressed
C2D10 Non-combustible building elements [2019: C1.9]	• **Manufacturers specifications and Test Reports (detailing the AS 1530.1 test) are required for the following components:** - **External wall sarking;** - **Insulation within external wall;** - **Insulation within the internal walls required to be fire resisting;** - **External wall cladding**
NSW C2D11 Fire hazard properties [2019: C1.10 and NSW C1.10]	**Details of materials to be provided at CC stage.**
C2D14 Ancillary elements [2019: C1.14]	• **Manufacturers specifications and Test Reports (detailing the AS 1530.1 test) are required for the following components:** - **Awnings** - **Batten & signage** - **Vertical screen**
C3D14 Electricity supply system [2019: C2.13]	**Substation – compliance achievable.**  **Main switchboard – FRLs to be detailed on the architectural plans.** **FRLs to be 120/120/120.**

DRAFT

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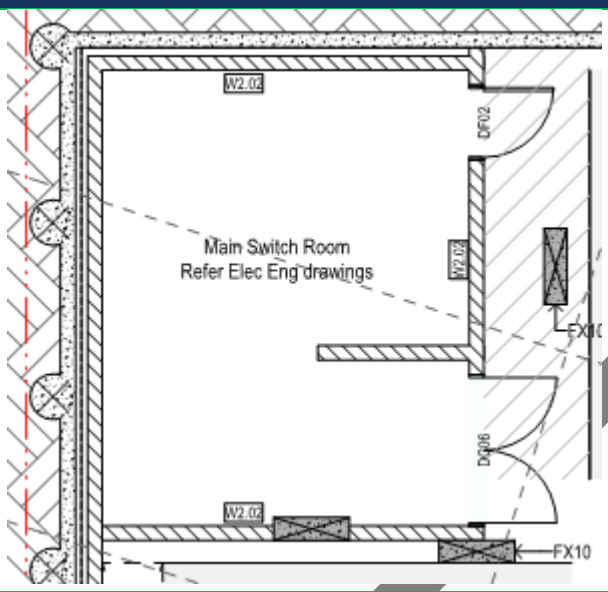
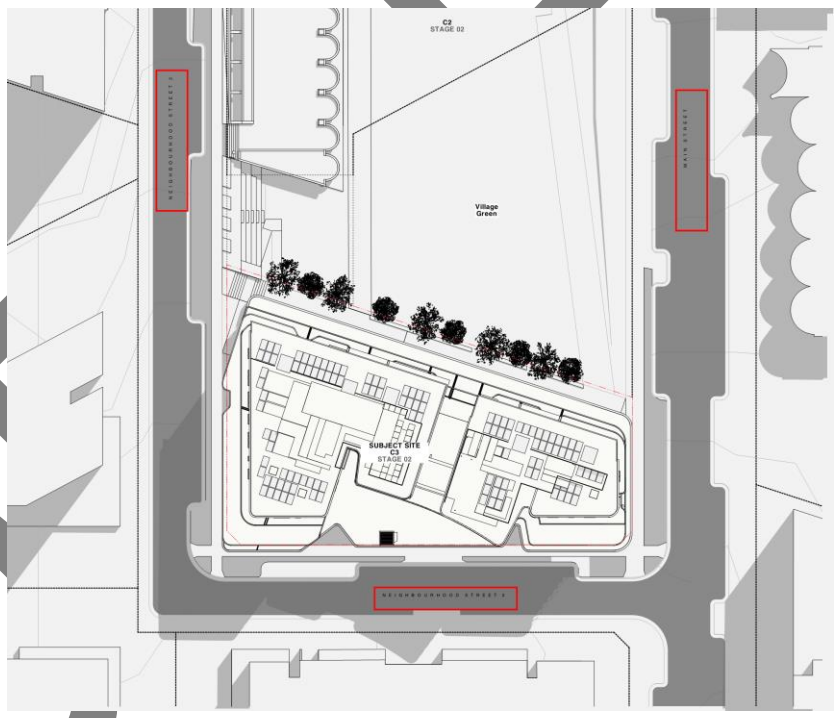
P: (02) 9571 8433 E: admin@aedconsulting.com.au W: www.aedconsulting.com.au ABN: 15 149 587 495

BCA Clause	Deemed-to-Satisfy Provision to be addressed
	
C4D3 Protection of openings in external walls [2019: C3.2]	**Confirmation is required the "neighbourhood road" are public roads or private roads.** 
C4D6 Doorways in fire walls [2019: C3.5]	**Doorway separating Class 7b loading dock and the Class 7a carpark driveway must comply with this clause.**

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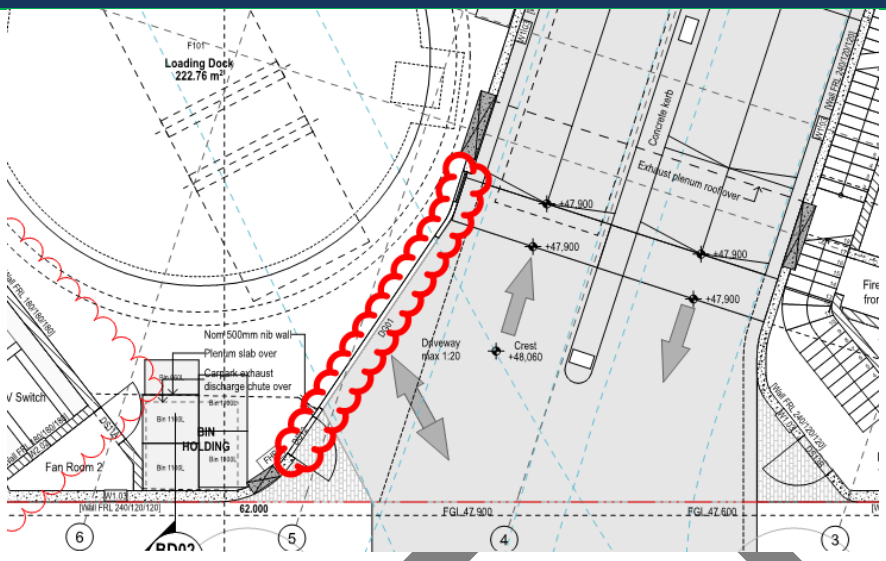
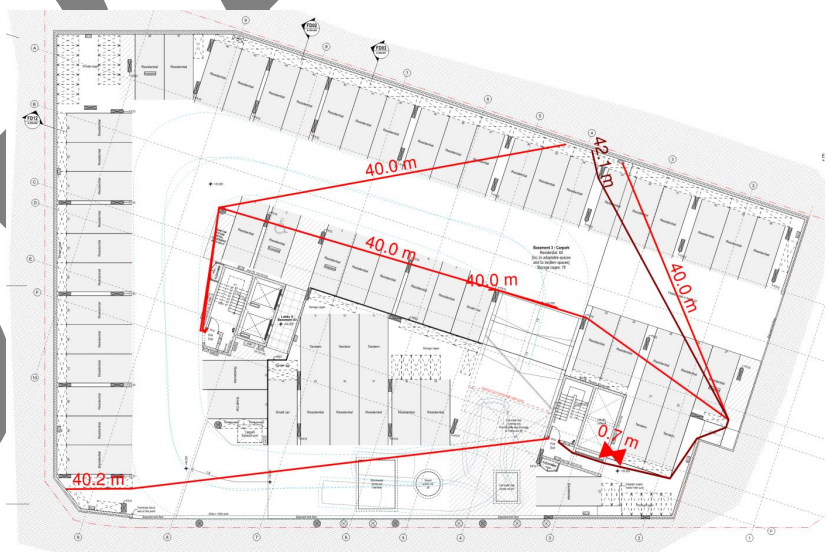
BCA Clause	Deemed-to-Satisfy Provision to be addressed
	
D2D5 Exit travel distances [2019: D1.4]	**Basement 3 – Point on the floor that exceeds 40m, being 42.1m** **Basement 2 – Point on the floor that exceeds 40m, being 41.6m** **Ground Floor - point on the floor of a room which is not in a sole-occupancy unit must be more than 20 m from a point at which travel in different directions to 2 exits is available, being 24m.** **Level 1 – Level 14 - The entrance doorway of any sole-occupancy unit is more than 6 m from an exit or from a point from which travel in different directions to 2 exits is available, maximum being 7.4m.** **Level 16- The entrance doorway of any sole-occupancy unit is more than 6 m from an exit or from a point from which travel in different directions to 2 exits is available, maximum being 6.9m.**  Basement 3

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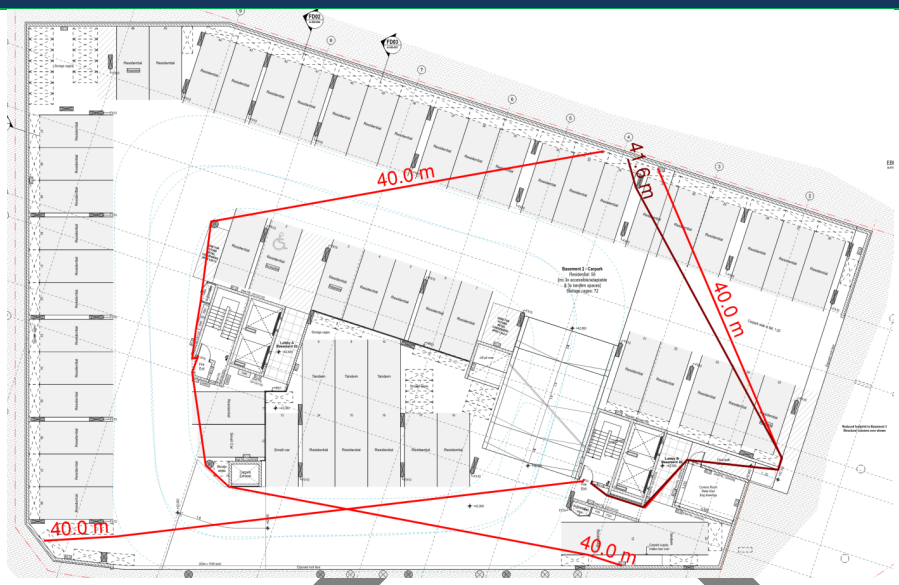
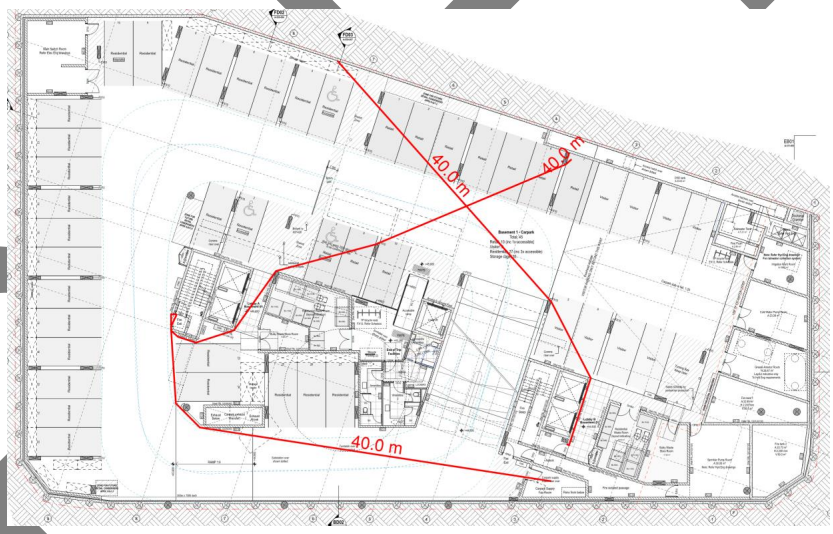
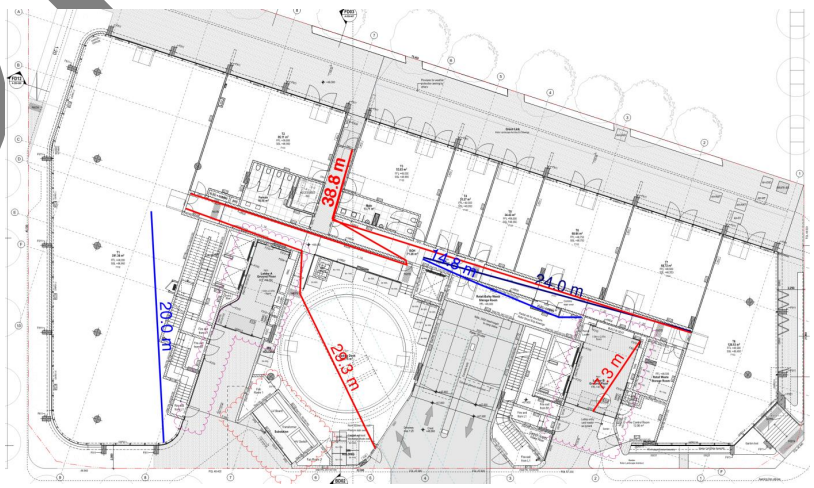


Basement 2



Basement 1



Ground Floor

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BCA Clause	Deemed-to-Satisfy Provision to be addressed

Level 1

Level 3

Level 5

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BCA Clause	Deemed-to-Satisfy Provision to be addressed
	 Level 15 Level 16
D2D6 Distance between alternative exits [2019: D1.5]	**Basement 3 & 2 – Distance between alternative exits is more than 60m apart, maximum being 73.4m**

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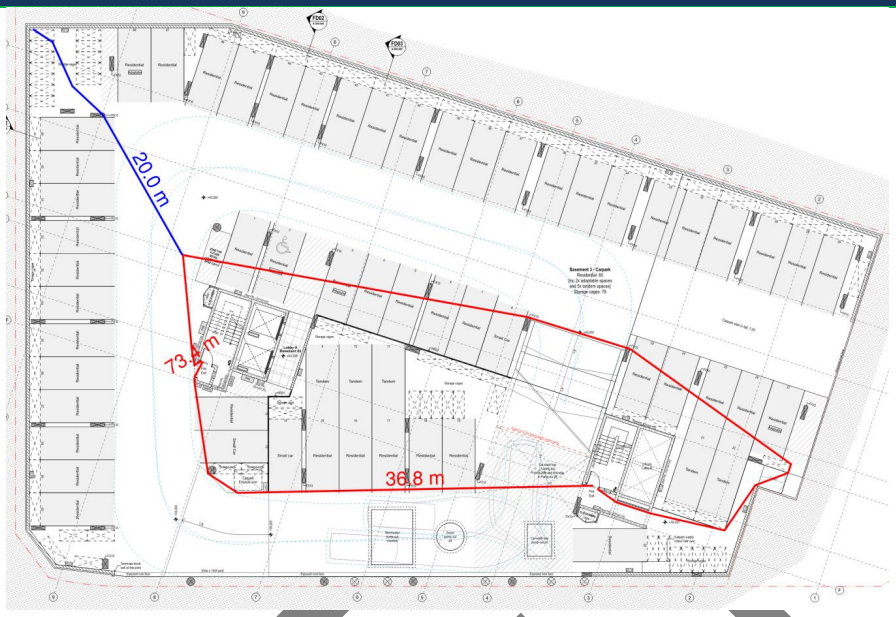
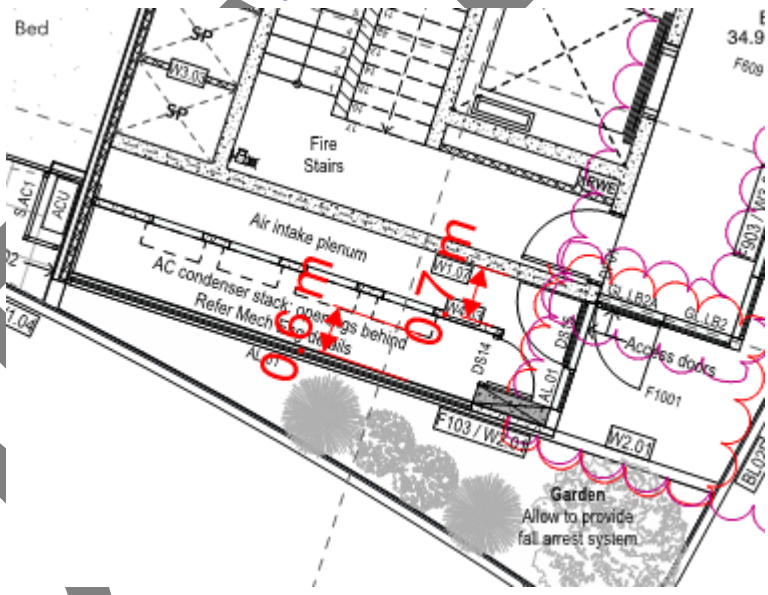
BCA Clause	Deemed-to-Satisfy Provision to be addressed
	 Basement 3
NSW D2D8 Width of exits and paths of travel to exits [2019: D1.6(b), (c), (d) and (e)]	**Paths of travel within plant areas is less than 1m in width.** 
D2D12 Travel via fire-isolated exits [2019: D1.7]	**South western - Discharge into covered area** **Perimeter of covered area = 39.4m** **Required to be open = 13.1m** **Proposed to be open = 12.6m (31.9%) open** ***It is recommended this is addressed by a Fire Engineered Performance Solution.***

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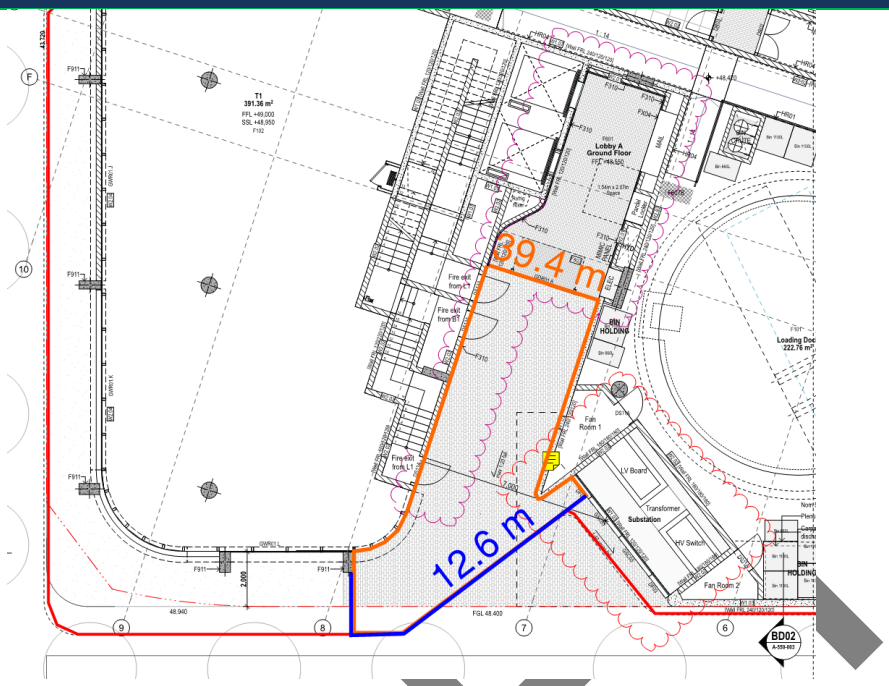
BCA Clause	Deemed-to-Satisfy Provision to be addressed

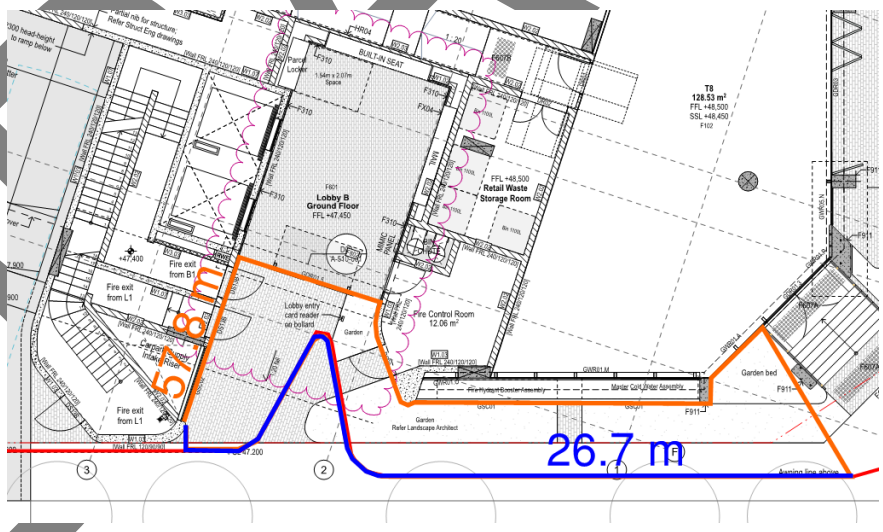


North eastern - Discharge into covered area

Perimeter of covered area = 57.8m

Required to be open = 19.3m

Proposed to be open = 26.7 (46.2%) open



North eastern - Discharge into covered area (driveway)

Perimeter of covered area = 46.8m

Required to be open = 15.6m

Proposed to be open = 13.6m (29%) open

It is recommended this is addressed by a Fire Engineered Performance Solution.

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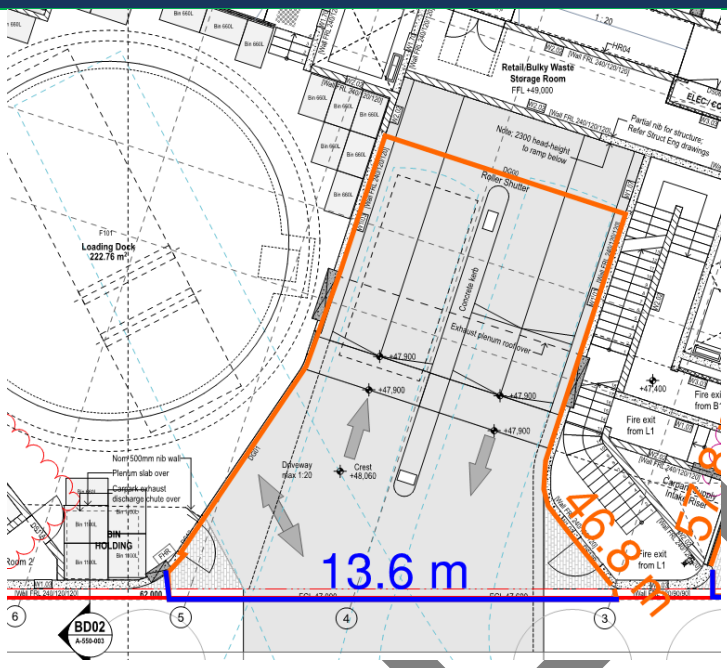
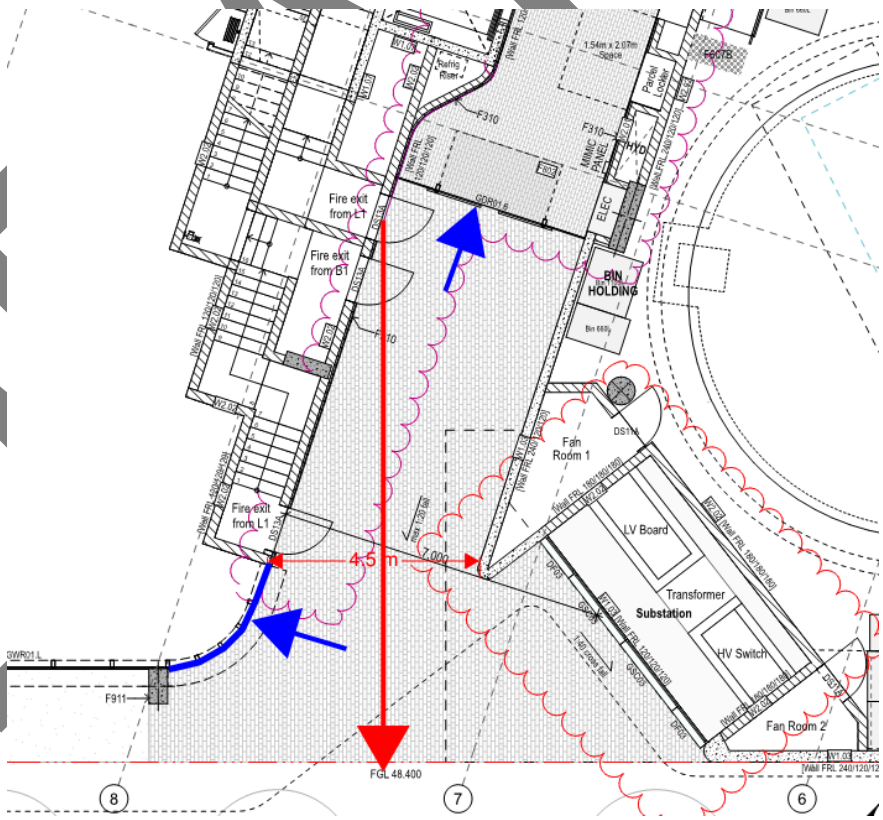
BCA Clause	Deemed-to-Satisfy Provision to be addressed



- **The following external doorways within 6m from the path of travel to the road.**

South western



North western

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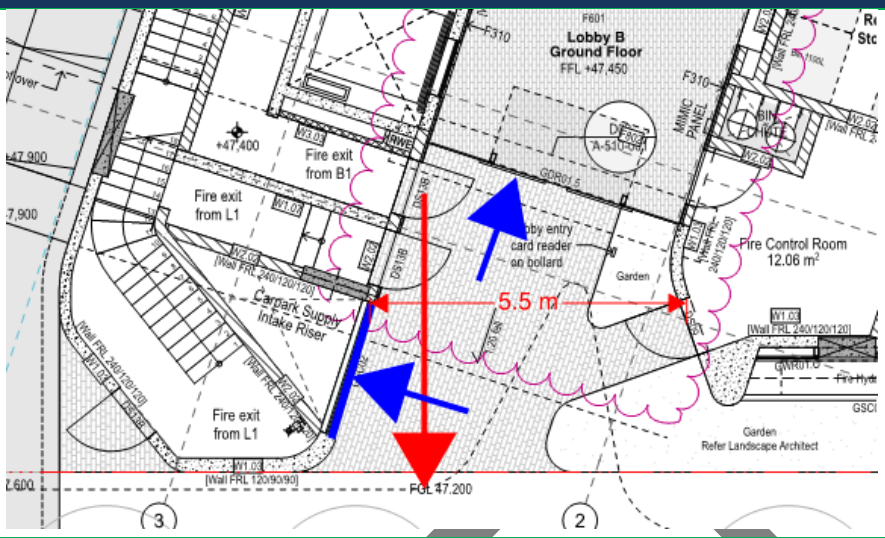
BCA Clause	Deemed-to-Satisfy Provision to be addressed
	
D2D17 Non-required stairways, ramps or escalators [2019: D1.12]	**The "Forest Rooms" are atriums in accordance with Part G3 but have not been designed to comply with the BCA DTS provisions.** ***It is recommended these atriums be addressed by a Fire Engineered Performance Solution.***
NSW D2D18 Number of persons accommodated [2019: D1.13]	**Ground Floor – based on each tenancy used as shop.** **Please note, where tenancies are used as food and beverage tenancies, the occupant numbers increase significantly.**

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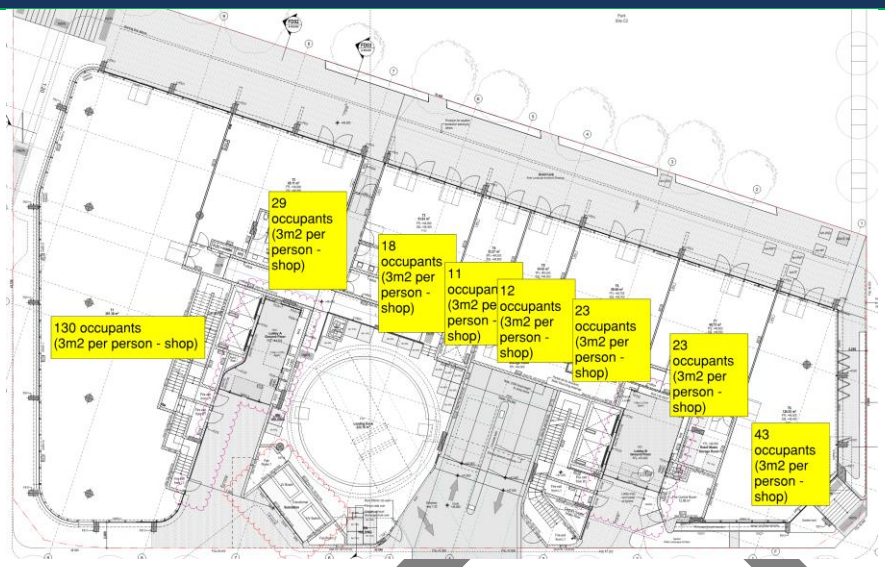
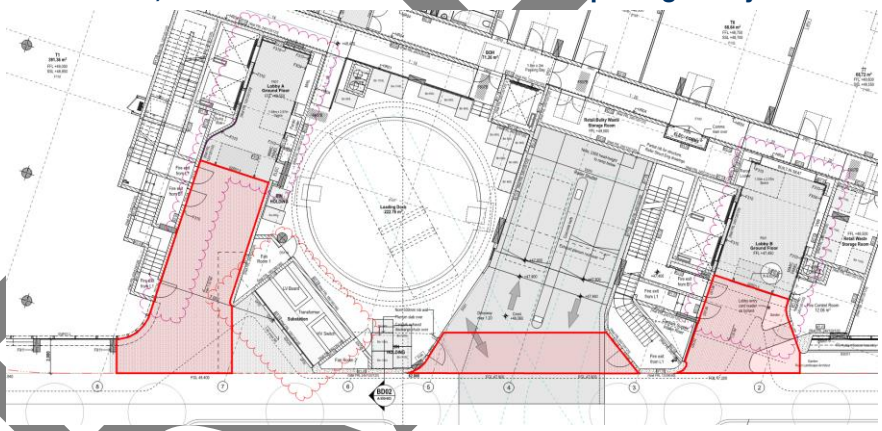
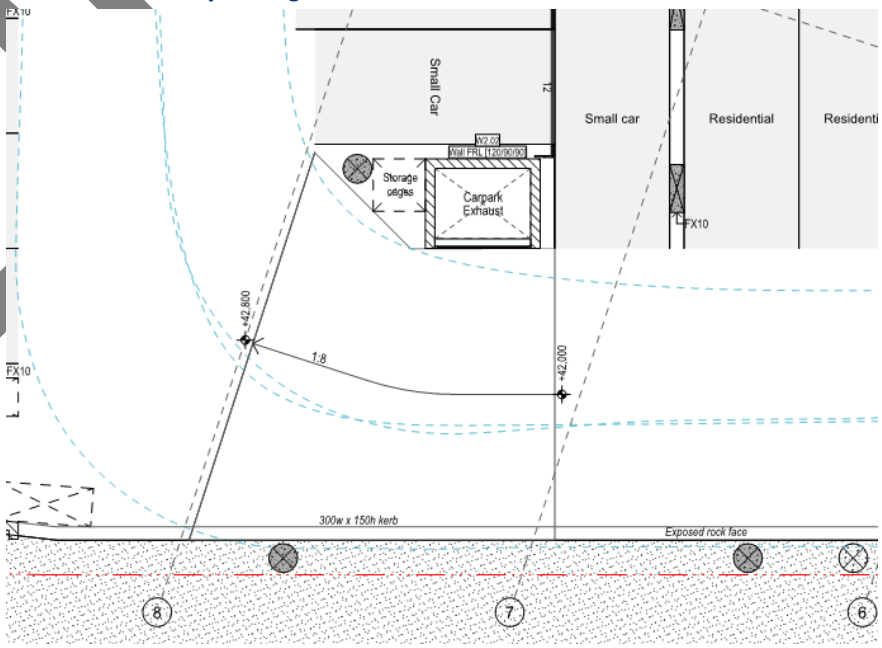
BCA Clause	Deemed-to-Satisfy Provision to be addressed
	
D3D13 Roof as open space [2019: D2.12]	**Architectural plans to detail openings within the roof of the basement.** **Please note, floor wastes for stormwater are openings subject to this provision.** 
D3D22 Handrails [2019: D2.17]	• **Basement 3-1 – Ramps serving slip level must be provided with a handrail for occupant egress to at least one side.** 

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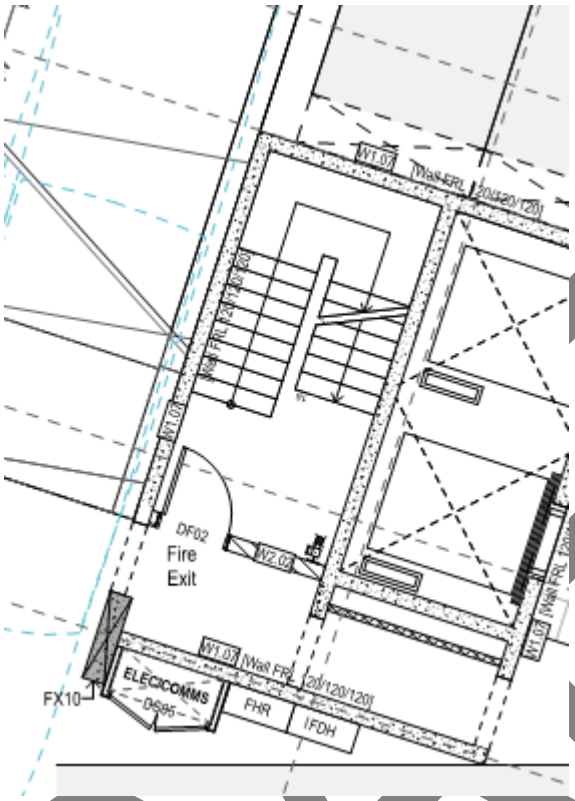
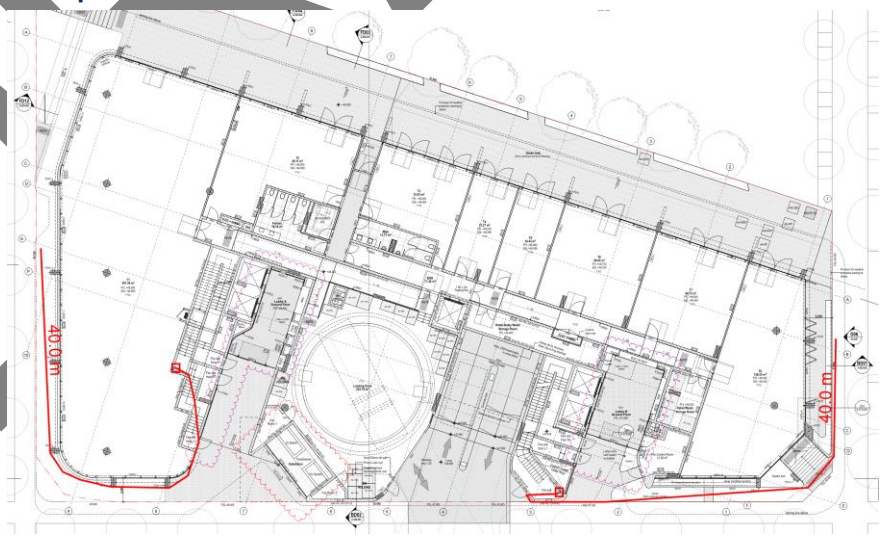
BCA Clause	Deemed-to-Satisfy Provision to be addressed
	• **No handrails are detailed for the fire-isolated stairways serving the basement levels.** 
E1D2 Fire hydrants [2019: E1.3]	**Valves:** **Ground Floor – Coverage to all parts of the floor is not provided from the valves located within the fire-isolated stairways.** **Confirmation is required from the Hydraulic Engineer that coverage is provided to all parts of Ground Floor.** 
E1D3 Fire hose reels [2019: E1.4]	**Ground Floor – FHR located within T1 is located more than 4m from an exit.**

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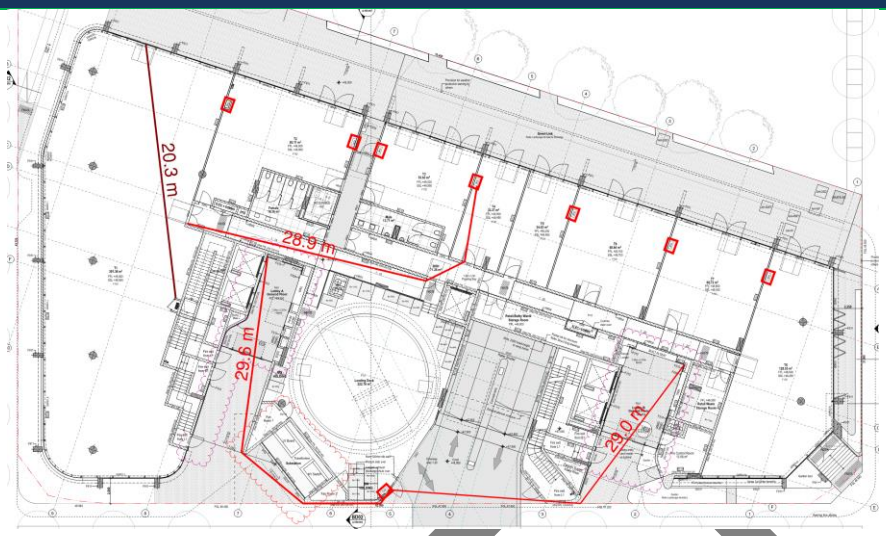
BCA Clause	Deemed-to-Satisfy Provision to be addressed
	 • **Level 15 – no FHR is provided to serve the Class 9b assembly area.**
E1D14 Portable fire extinguishers [2019: E1.6 and Table E1.6]	**Architectural plans to detail the location of the portable fire extinguishers.**

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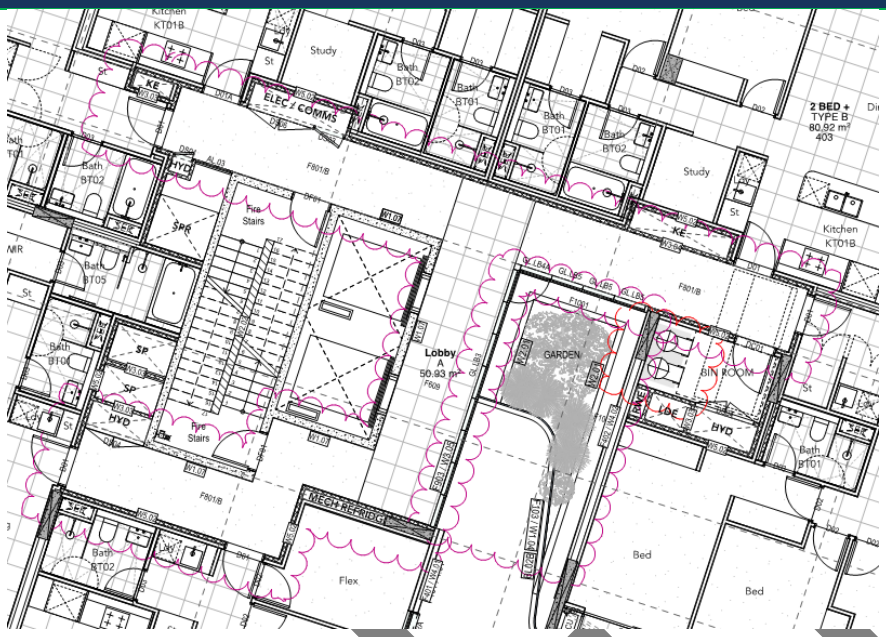
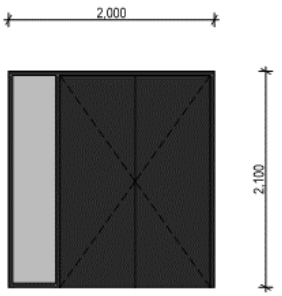
BCA Clause	Deemed-to-Satisfy Provision to be addressed
	
S19C9 Doors to a fire control room [2019: Spec E1.8: 8]	**Fire door serving the fire control room must have an FRL of at least -/120/30.** D09  External Lobby Access Door Hinged 38mm Semi Solid Core Timber Door 2,000×2,100 1,460×2,060 1 --/60/30
F4D4 Facilities in Class 3 to 9 buildings [2019: F2.3]	**Details of the proposed use of each tenancy is required to assess compliance.**

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BCA Clause	Deemed-to-Satisfy Provision to be addressed
F6D3 Methods and extent of natural light [2019: F4.2]	**Study rooms are not provided with natural light.** ***It is recommended this is addressed by a Performance Solution.***
G3D1 Application of Part [2019: G3.1]	**The "Forest Rooms" are atriums in accordance with this Part.** ***It is recommended these atriums be addressed by a Fire Engineered Performance Solution.***

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	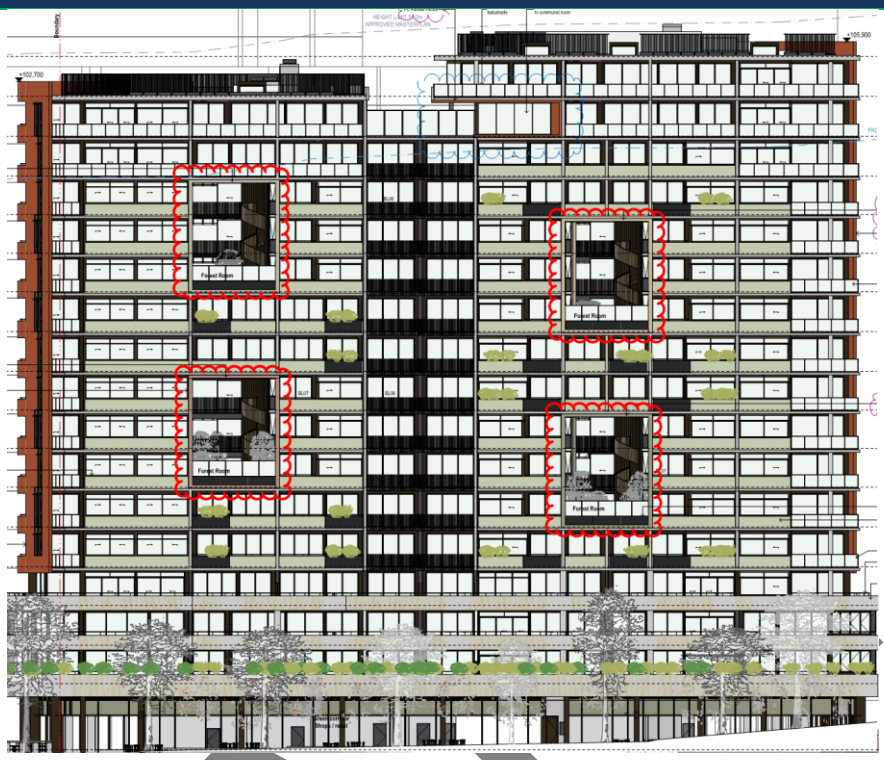

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INTRODUCTION

This report provides a Building Code of Australia (BCA) 2022 assessment of the proposed mixed use building, to be located at Midtown Estate – Lot C3, Epping Road, Macquarie Park..

This report provides a BCA assessment table in Section 4.0 that summarises the identified non-compliance matters and offers specific recommendations.

Basis of Report

The key basis of this report is to address compliance with the Building Code of Australia (BCA) 2022. The scope of services is limited to Sections C – "Fire Resistance", Section D – "Access & Egress", Section E – "Services & Equipment", Section F "Health and Amenity", Section G "Ancillary Provisions" and Section I "Special use Buildings"

This report is based on a desktop assessment of the proposed plans, with specific reference to the following:

Architectural plans prepared by Studio Johnston, Project No. 2101 Drawing Numbers:

Drawing Title	Drawing No.	Revision	Dated
Site Plan	A-100-003	T6	21/03/2023
GA Plans Ground Level	A-110-000	T7	03/07/2023
GA Plans Level 01	A-110-001	T7	03/07/2023
GA Plans Level 02	A-110-002	T7	03/07/2023
GA Plans Level 03	A-110-003	T7	03/07/2023
GA Plans Level 04	A-110-004	T7	03/07/2023
GA Plans Level 05	A-110-005	T7	03/07/2023
GA Plans Level 06	A-110-006	T7	03/07/2023
GA Plans Level 07	A-110-007	T7	03/07/2023
GA Plans Level 08	A-110-008	T7	03/07/2023
GA Plans Level 09	A-110-009	T7	03/07/2023
GA Plans Level 10	A-110-010	T7	03/07/2023
GA Plans Level 11	A-110-011	T7	03/07/2023
GA Plans Level 12	A-110-012	T7	03/07/2023
GA Plans Level 13	A-110-013	T7	03/07/2023
GA Plans Level 14	A-110-014	T7	03/07/2023
GA Plans Level 15	A-110-015	T7	03/07/2023
GA Plans Level 16	A-110-016	T8	13/07/2023
GA Plans Roof Plan	A-110-017	T7	03/07/2023
GA Plans Basement 1	A-110-B01	T6	06/04/2023
GA Plans Basement 2 - Floor area	A-110-B02	T6	06/04/2023

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Drawing Title	Drawing No.	Revision	Dated
GA Plans Basement 2	A-110-B02	T6	06/04/2023
GA Plans Basement 3 - Floor area	A-110-B03	T6	06/04/2023
GA Elevation North Elevation	A-210-001	T8	13/07/2023
GA Elevation South Elevation	A-210-002	T8	13/07/2023
GA Elevation East Elevation	A-210-003	T6	06/04/2023
GA Elevation West Elevation	A-210-004	T6	21/03/2023
GA Sections Section DD	A-310-001	T6	21/03/2023
GA Sections Section EE	A-310-002	T6	06/04/2023
GA Sections Basement Sections 1	A-311-001	T6	06/04/2023
Sections Basement Sections 2	A-311-002	T6	06/04/2023
Balustrade Details	A-565-001	T6	21/03/2023
Wall Type Schedules Wall Type Schedule	A-630-001	T6	06/04/2023

The Building Code of Australia 2022, prepared by the Australian Building Codes Board.

The Guide to the BCA 2019 Amendment 1, prepared by the Australian Building Codes Board.

Purpose of the Report

The purpose of this report is to assess the following:

Assessment under the current Building Code of Australia 2022 and list any departures from the BCA 2022.

Provide recommendations to address identified non-compliances, and/or identify potential performance solutions.

Limitations of the Report

This report does not assess the following:

Structural Provisions of the BCA (Section B) have not been considered. A suitably qualified Structural Engineer should be engaged to determine compliance.

Accessibility Provisions of the BCA (BCA Part D4, BCA Clause E3D7-E3D8 (inclusive), F4D5-F4D7 (inclusive) and F4D12) have not been considered. A suitably qualified Access Consultant should be engaged to determine compliance.

Accessibility Provisions of the BCA have been assessed however compliance with Disability Discrimination Act 1992 (DDA) is outside the scope of this report. It should be noted that BCA compliance does not necessarily meet the requirements of the Disability Discrimination Act (DDA).

Energy Efficiency Provisions of the BCA (Section J) have not been considered. A suitably qualified Energy Consultant should be engaged to determine compliance.

Sections H & I of the BCA have not been considered as part of this assessment.

Reporting on hazardous materials, OH&S matters, or site contamination.

Assessment of any structural elements or geotechnical matters relating to the building, including any structural or other assessment of the existing fire-resistant levels of the building.

Consideration of any fire services operations (including hydraulic, electrical, or other systems).

Assessment of plumbing and drainage installations, including stormwater.

Assessment of mechanical plant operations, electrical systems, or security systems.

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Heritage significance.

Consideration of energy or water authority requirements.

Consideration of Council's local planning policies.

Environmental or planning issues.

Requirements of statutory authorities.

Pest inspection or assessment building damage caused by pests (general/visual pest invasion or damage will be reported, however invasive or intrusive inspections have not been carried out).

Provision of any construction approvals or certification under Part 6 of the Environmental Planning & Assessment Act 1979.

Glazing, shading, lighting calculations and the like required by Section J of the BCA have not been carried out.

BCA 2022 does not directly specify slip-resistance classification(s) for all accessible paths of travel; however, we highlight the need under AS 1428.1-2009 for all accessible paths of travel to have a slip-resistant surface. We recommend you should seek surface finish advice from an independent specialist slip safety consultant.

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BCA ASSESSMENT DATA

The following data is provided in respect to review of the building under the Building Code of Australia 2022 in respect to the compliance assessment of the proposed mixed use building, to be located at Midtown Estate – Lot C3, Epping Road, Macquarie Park..

BCA Building Classifications:	Basement 3: Class 7a (carpark) Basement 2: Class 7a (carpark) Basement 1: Class 7a (carpark) Ground Floor: Class 6 (shops), Class 7a (carpark), Class 7b (storage & loading dock) Level 1- Level 16: Class 2 (residential SOUs) Level 15: Class 2 (residential SOUs) & Class 9b (assembly building)
Building rise in storeys:	17 (determined in accordance with C2D3 of the BCA).
Type of Construction:	Type A (determined in accordance with C2D2 of the BCA)
Effective Height (m):	101.500 – 45.600 = 55.9m (determined in accordance with the definition) To be verified by the Accredited Certifier.
Climate Zone (Thermal Design)	5 (determined in accordance with ABCB Climate Map, Sept 2019)

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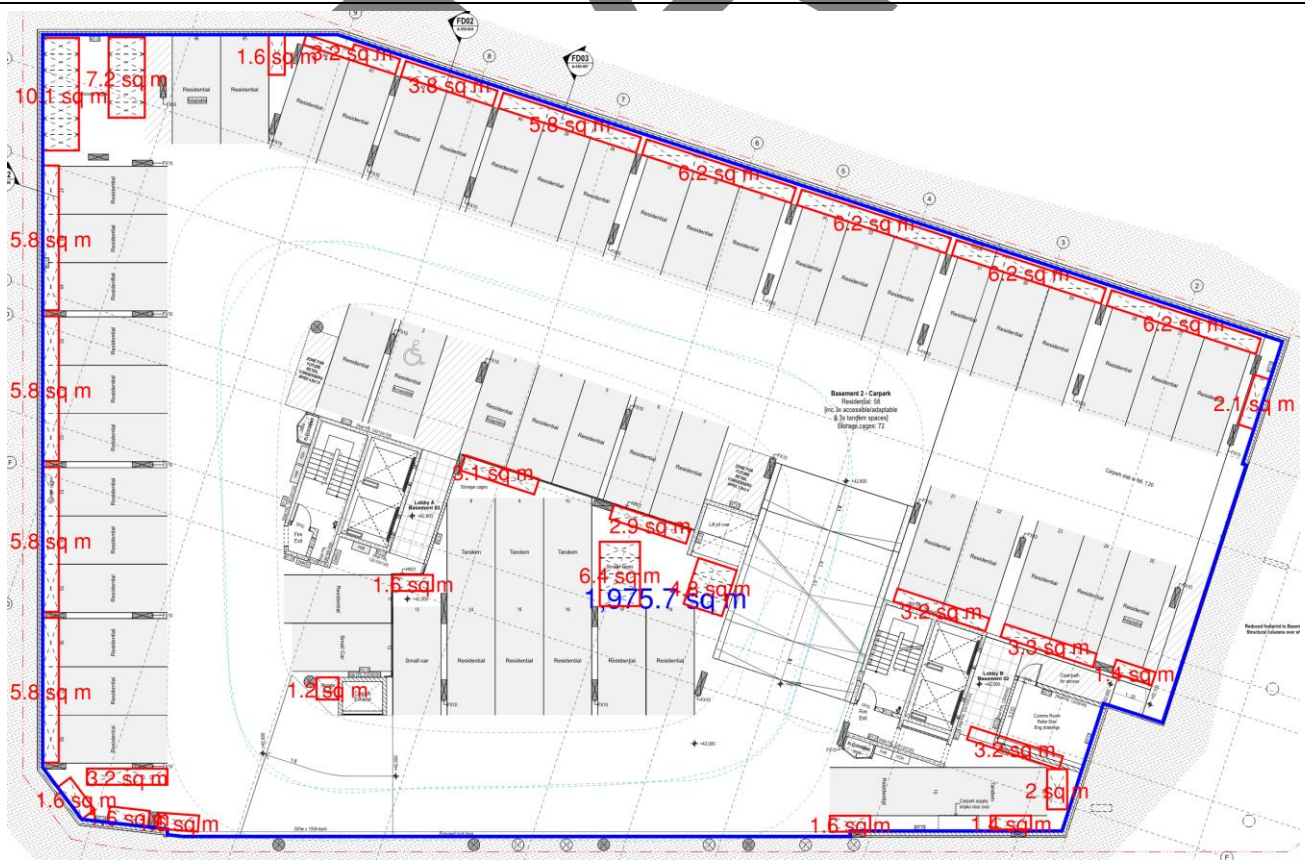
Classification markup

Basement 3: Storage is less than 10% of floor area (being 146m²)



Basement 2: Storage is less than 10% of floor area (being 131.6m²)

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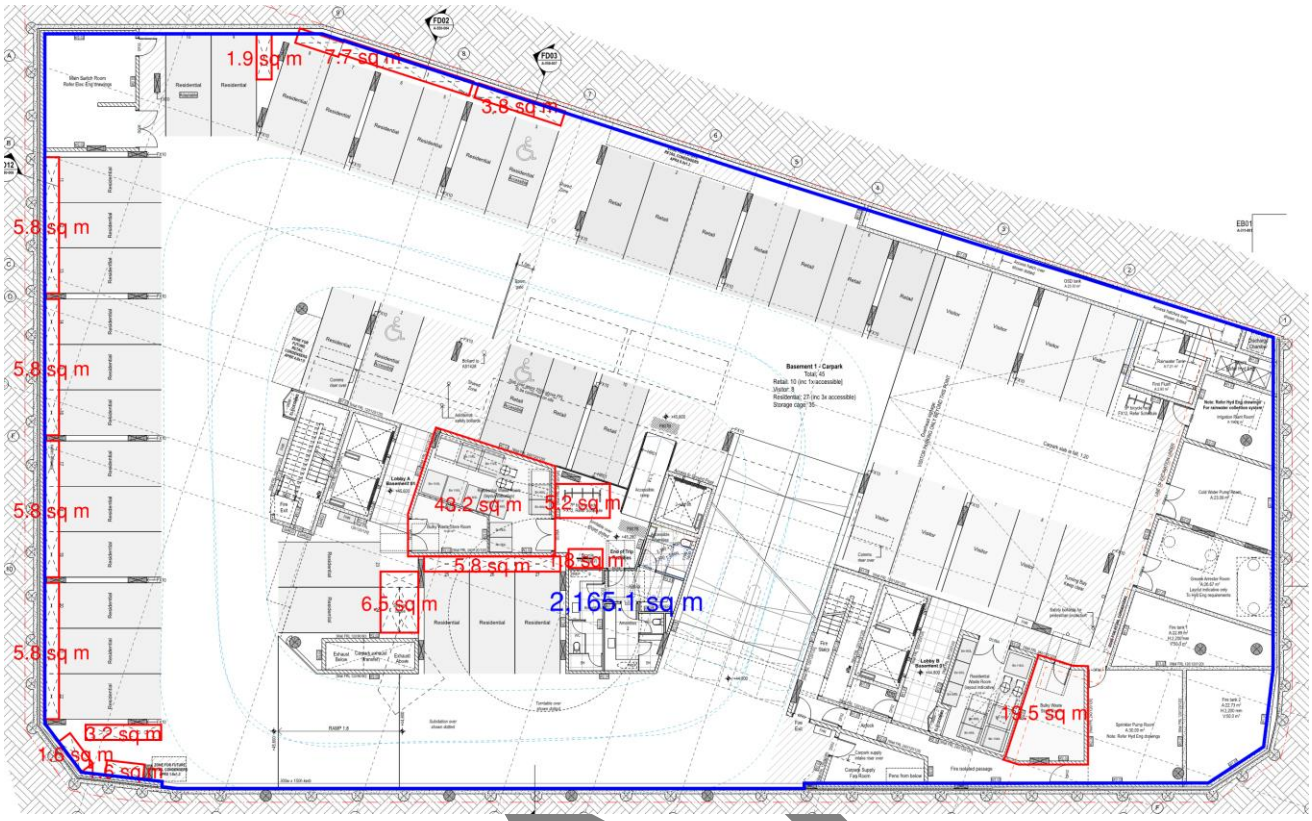
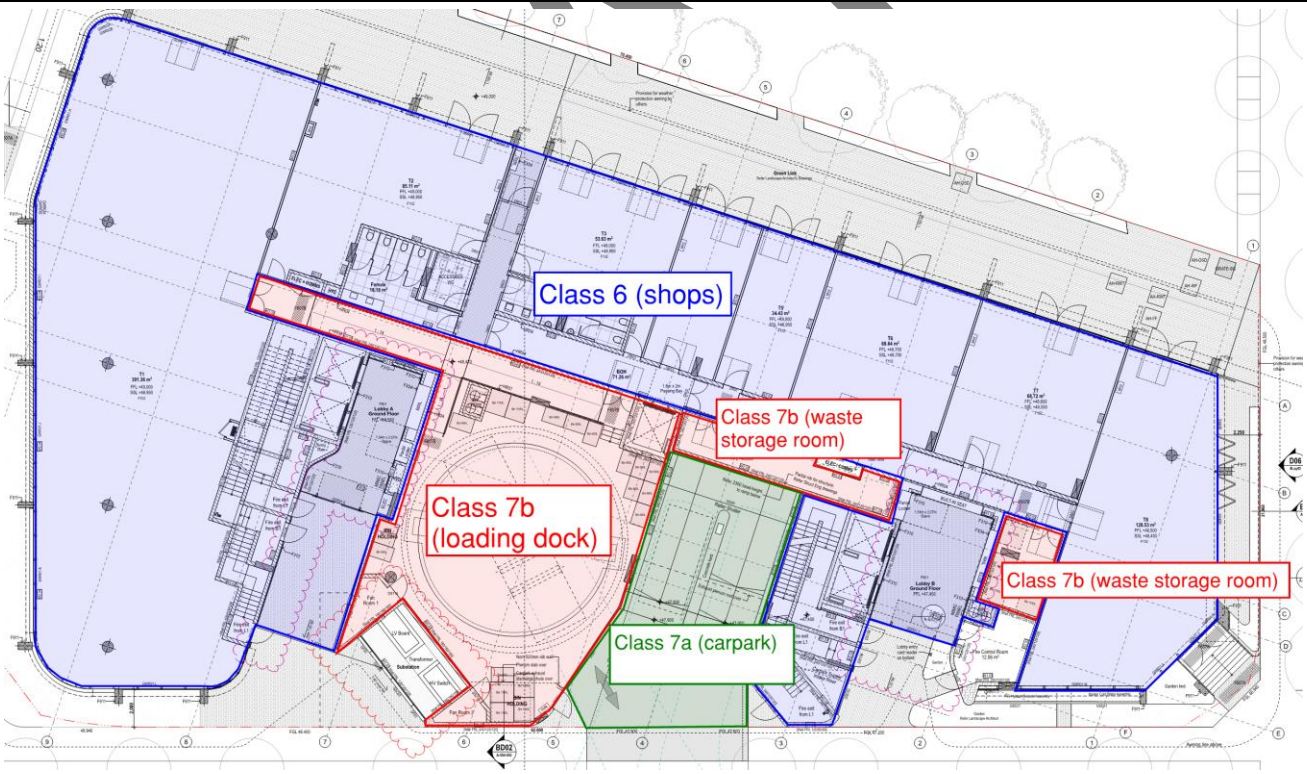


Basement 1: Storage is less than 10% of floor area (being 123.2m²)



Ground Floor

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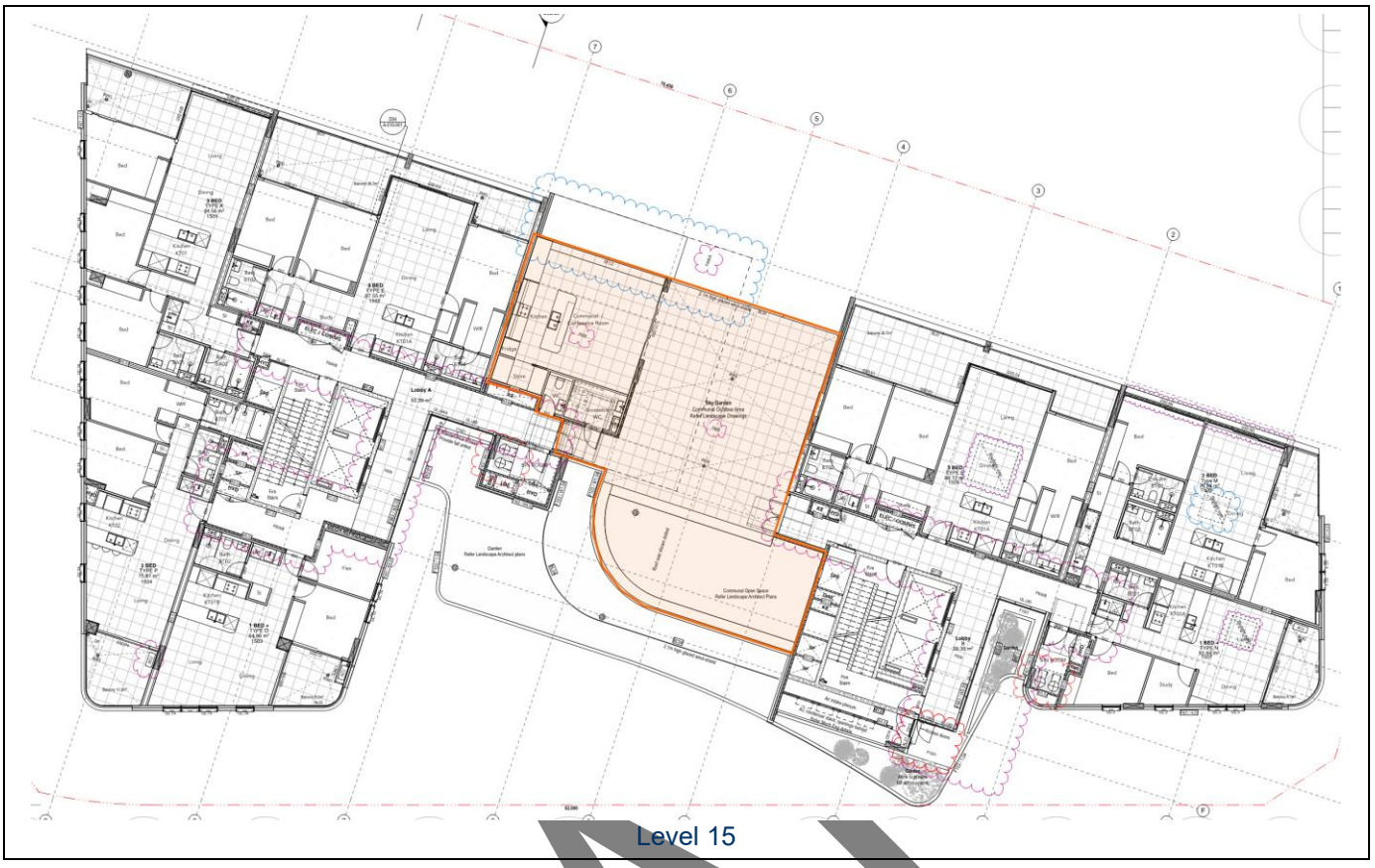

Level 15

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Assessment of Effective Height

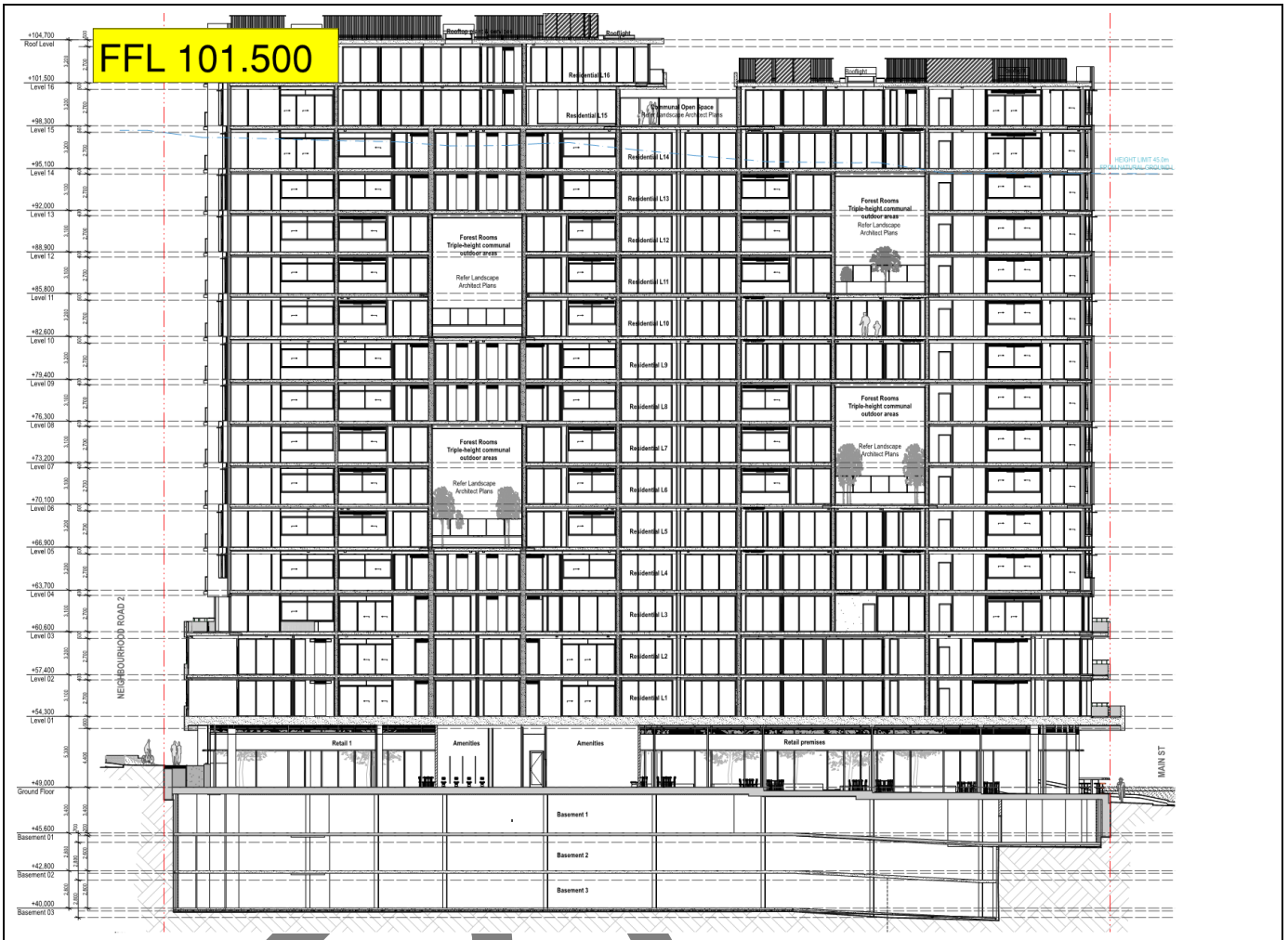

Figure 1: Uppermost storey in the calculation of *effective height*.

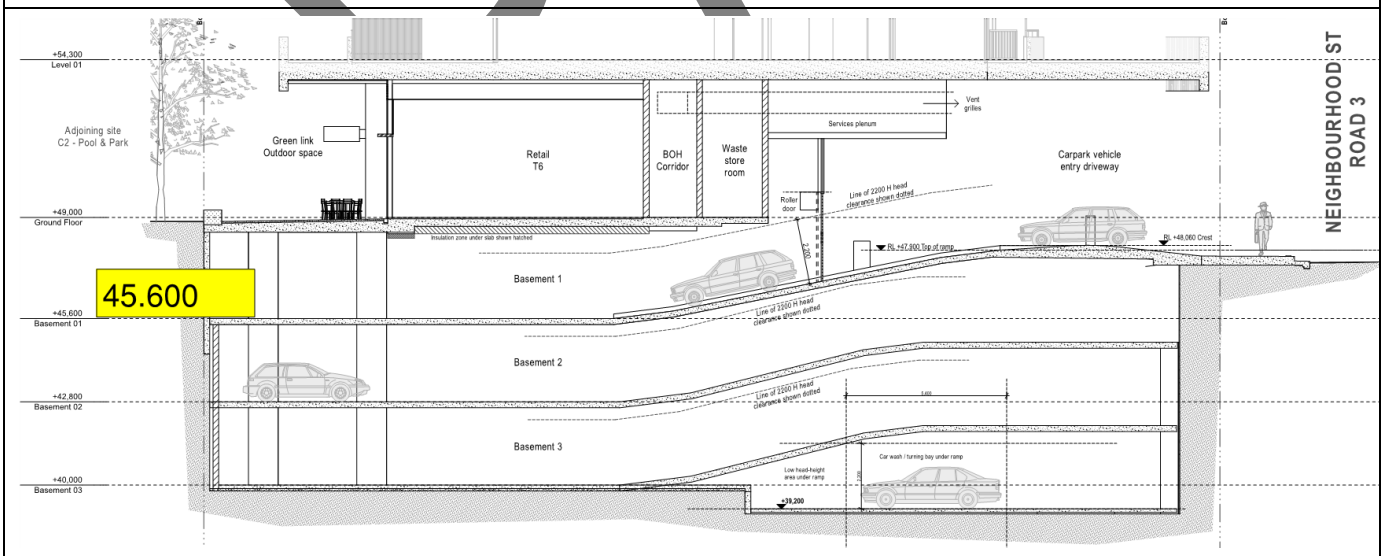

Figure 2: Lowermost storey in the calculation of *effective height*.

Location of Fire Source features

The potential *fire source features* to be considered for this building are the external wall of another building on the allotment which is not a Class 10 building, the side or rear of the allotment boundary or the far side of the road bounding the allotment.

In this instance the following setbacks are determined in respect to the fire source features applicable to the building:

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- North –>3m from the western boundary
- South – Road boundary
- East – Road boundary
- West – Road boundary

Summary of Fire Services Required

Summarised below are the BCA Deemed-to-Satisfy fire services required for the building:

- A fire hydrant system must be provided to serve all parts of the building in accordance with BCA Clause E1D2 and AS 2419.1-2021.
- A fire hose reel system must be provided in accordance with BCA Clause E1D3 and AS 2441-2005.
- A sprinkler system must be provided throughout all parts of the building in accordance with BCA Part E1, BCA Specification 17 and BCA Specification 18, as applicable.
- Portable fire extinguishers must be provided in accordance with BCA Clause E1D14 and must be selected, located, and distributed in accordance with Sections 1, 2, 3 and 4 of AS 2444-2001.
- A fire control centre facility must be provided in accordance with BCA Clause E1D15 and BCA Specification 19.
- An automatic smoke and fire detection must be provided in accordance with BCA Part E2, BCA Specification 20, AS 1670.1-2018 and AS 3786-2014, as applicable.
- Automatic air pressurisation must be provided to fire isolated stairs serving residential & basement levels and the fire control room in accordance with BCA Part E2, BCA Specification 19 and AS 1668.1-2015.
- A zone smoke control system must be provided between vertically separated fire compartments in accordance with BCA Part E2 and 1668.1-2015.
- Mechanical ventilation must be provided to the basement carpark in accordance with BCA Clause E2D2, E2D4, AS 1668.1-2015 and AS 1668.2-2012, incorporating metal fans.
- Emergency lighting must be provided throughout the building in accordance with BCA Clause E4D2, E4D4 and AS 2293.1-2018.
- Exit signage must be provided throughout the building in accordance with BCA Clause E4D5, NSW E4D6, E4D8 and AS 2293.1-2018.
- An emergency warning and intercom system (EWIS) must be provided in accordance with BCA Clause E4D9, and AS 1670.4-2018.
- Signage must be provided to exits in accordance with BCA Clause D3D28 and Section 108 of the Environmental Planning & Assessment (Development Certification and Fire Safety) Regulation 2021.
- Emergency lifts must be provided in accordance with BCA Part E3, BCA Clause E3D5 and C3D11.
- Stretcher facility and fire service controls in the lift must be provided in accordance with BCA Clause E3D3.
- Service penetrations through building elements required to be fire-resisting must be provided with fire sealing in accordance with BCA Clause C4D15, Specification 13 and AS 1540.4-2014.
- Construction joints, spaces and the like in and between building elements required to be fire-resisting with respect to integrity and insulation must be protected in accordance with BCA Clause C4D16.
- Re-entry from fire-isolated exits must be provided in accordance with BCA Clause D3D27.
- In accordance with BCA Clause E2D3, an air-handling system which does not form part of a smoke hazard management system in accordance with clause E2D4 to E2D20 and which recycles air from one fire compartment to another fire compartment or operates in a manner that may unduly contribute to the spread of smoke from one fire compartment to another fire compartment, subject to E2D3(2), must be designed and installed—
    - to operate as a smoke control system in accordance with AS 1668.1; or
    - incorporate smoke dampers where the air-handling ducts penetrate any elements separating the fire compartments served and is arranged such that the air-handling system is shut down and the smoke

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dampers are activated to close automatically by smoke detectors complying with clause 7.5 of AS 1670.1.

- In accordance with BCA Clause NSW E2D16, a building or part of a building used as a Class 9b assembly building must be provided with automatic shutdown of any air-handling system (other than non-ducted individual room units with a capacity not more than 1000 L/s and miscellaneous exhaust air systems installed in accordance with Sections 5 and 6 of AS 1668.1) which does not form part of the smoke hazard management system, on the activation of—
  - smoke detectors installed complying with S20C6; and
  - any other installed fire detection and alarm system, including a sprinkler system (other than a FPAA101D or FPAA101H system) complying with Specification 17.
- Fire walls must be provided in accordance with BCA Clause C3D8 and BCA Specifications 1, 5, and AS 1530.4-2014.
- Fire doors must be provided in accordance with BCA Clause C4D6, C4D9, BCA Specification 12 and AS 1905.1-2015.
- Fire dampers must be provided in accordance with BCA Clause C4D15, AS 1668.1-2015, AS 1682.1-2015 and AS 1682.2-2015.
- Fire-rated lift landing doors must be provided in accordance with BCA Clause C4D11 and AS 1735.11-1986.

Building subject to Design and Building Practitioners Act

The Design and Building Practitioners Act 2020 and Design and Building Practitioners Regulation 2021 (the DBP legislation) were established to raise the standards of building design and building work. This legislation applies to class 2 buildings or buildings with a class 2 part.

Design Practitioners (e.g. architects, engineers) have obligations in relation to preparing and declaring Regulated Designs under the DBP legislation. The obligations under the DBP legislation are in addition to design requirements under other legislation.

For more information, please go to:

Design-Practitioners-Handbook-3.pdf (nsw.gov.au)
Regulated_Design_Guidance_Material.PDF (nsw.gov.au)
Class 2 building industry reforms | NSW Fair Trading

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BCA ASSESSMENT SUMMARY

The following table details the BCA compliance of the assessed design.

BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
Section B Structure					
Part B1 Structural provisions					
B1D1 Deemed-to-Satisfy Provisions [2019: B1.0]			X		(1) Where a Deemed-to-Satisfy Solution is proposed, Performance Requirements B1P1 to B1P4 are satisfied by complying with B1D2 to B1D6. (2) Where a Performance Solution is proposed, the relevant Performance Requirements must be determined in accordance with A2G2(3) and A2G4(3) as applicable.
B1D2 Resistance to actions [2019: B1.1]				X	The resistance of a building or structure must be greater than the most critical action effect resulting from different combinations of actions, where— (a) the most critical action effect on a building or structure is determined in accordance with B1D3 and the general design procedures contained in AS/NZS 1170.0; and (b) the resistance of a building or structure is determined in accordance with B1D4. ***Details demonstrating compliance with this clause must be incorporated into the Structural Engineering plans / specification***
B1D3 Determination of individual actions [2019: B1.2]				X	The magnitude of individual actions must be determined in accordance with the following: (a) Permanent actions: (i) the design or known dimensions of the building or structure; and (ii) the unit weight of the construction; and (iii) AS/NZS 1170.1; and (iv) for a Class 7b building, a notional additional permanent roof load of not less than 0.15 kPa to support the addition of solar photovoltaic panels. (b) Imposed actions: (i) the known loads that will be imposed during the occupation or use of the building or structure; and (ii) construction activity actions; and (iii) AS/NZS 1170.1. (c) Wind, snow and ice and earthquake actions: (i) the applicable annual probability of design event for safety, determined by— (A) assigning the building or structure an Importance Level in accordance with Table B1D3a; and (B) determining the corresponding annual probability of exceedance in accordance with Table B1D3b; and (ii) AS/NZS 1170.2; and (iii) AS/NZS 1170.3 as appropriate; and (iv) AS 1170.4; and

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
					(v) in cyclonic areas, metal roof cladding, its connections and immediate supporting members must comply with Specification 4; and (vi) for the purposes of (v), cyclonic areas are those determined as being located in wind regions C and D in accordance with AS/NZS 1170.2. (d) Actions not covered in (a), (b) and (c) above: (i) the nature of the action; and (ii) the nature of the building or structure; and (iii) the Importance Level of the building or structure determined in accordance with Table B1D3a; and (iv) AS/NZS 1170.1. (e) For the purposes of (d) the actions include but are not limited to— (i) liquid pressure action; and (ii) ground water action; and (iii) rainwater action (including ponding action); and (iv) earth pressure action; and (v) differential movement; and (vi) time dependent effects (including creep and shrinkage); and (vii) thermal effects; and (viii) ground movement caused by— (A) swelling, shrinkage or freezing of the subsoil; and (B) landslip or subsidence; and (C) siteworks associated with the building or structure; and (ix) construction activity actions. ***Details demonstrating compliance with this clause must be incorporated into the Structural Engineering plans / specification***
B1D4 Determination of structural resistance of materials and forms of construction [2019: B1.4]				X	The structural resistance of materials and forms of construction must be determined in accordance with the following, as appropriate: (a) Masonry (including masonry-veneer, unreinforced masonry and reinforced masonry): AS 3700, except— (i) (for piers—isolated or engaged)' is removed from Clause 8.5.1(d); and (ii) where Clause 8.5.1 requires design as for unreinforced masonry in accordance with Section 7, the member must also be designed as unreinforced masonry in accordance with Tables 10.3 and 4.1(a)(i)(C) of AS 3700. (b) Concrete: (i) Concrete construction (including reinforced and prestressed concrete): AS 3600. (ii) Autoclaved aerated concrete: AS 5146.1. (iii) Post-installed and cast-in fastenings: AS 5216. (c) Steel construction: (i) Steel structures: AS 4100.

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
					(ii) Cold-formed steel structures: AS/NZS 4600. (iii) Residential and low-rise steel framing: NASH Standard – Residential and Low-Rise Steel Framing Part 1 or Part 2. (d) Composite steel and concrete: AS/NZS 2327. (e) Aluminium construction: AS/NZS 1664.1 or AS/NZS 1664.2. (f) Timber construction: (i) Design of timber structures: AS 1720.1. (ii) Timber structures: AS 1684.2, AS 1684.3 or AS 1684.4. (iii) Nailplated timber roof trusses: AS 1720.5. (g) Piling: AS 2159. (h) Glazed assemblies: (i) The following glazed assemblies in an external wall must comply with AS 2047: (A) Windows excluding those listed in (ii). (B) Sliding and swinging glazed doors with a frame, including french and bi-fold doors with a frame. (C) Adjustable louvres. (D) Shopfronts. (E) Window walls with one piece framing. (ii) All glazed assemblies not covered by (i) and the following glazed assemblies must comply with AS 1288: (A) All glazed assemblies not in an external wall. (B) Revolving doors. (C) Fixed louvres. (D) Skylights, roof lights and windows in other than the vertical plane. (E) Sliding and swinging doors without a frame. (F) Windows constructed on site and architectural one-off windows, which are not design tested in accordance with AS 2047. (G) Second-hand windows, re-used windows and recycled windows. (H) Heritage windows. (I) Glazing used in balustrades and sloping overhead glazing. (i) Termite Risk Management: Where a primary building element is subject to attack by subterranean termites: AS 3660.1, and— (i) for the purposes of this provision, a primary building element consisting entirely of, or a combination of, any of the following materials is considered not subject to termite attack: (A) Steel, aluminium, or other metals. (B) Concrete. (C) Masonry. (D) Fibre-reinforced cement. (E) Timber — naturally termite resistant in accordance with Appendix C of AS 3660.1.

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					(F) Timber — preservative treated in accordance with Appendix D of AS 3660.1; and (ii) a durable notice must be permanently fixed to the building in a prominent location, such as a meter box or the like, indicating— (A) the termite management system used; and (B) the date of installation of the system; and (C) where a chemical is used, its life expectancy as listed on the appropriate authority's pesticides register label; and (D) the installers or manufacturer's recommendations for the scope and frequency of future inspections for termite activity. (j) Roof construction (except in cyclonic areas): (i) Roof tiling: AS 2050. (ii) Cellulose cement corrugated sheets: AS/NZS 2908.1 with safety mesh installed in accordance with AS/NZS 1562.3 clause 2.4.3.2 except for sub-clause (g)(c)(vii) or plastic sheeting. (iii) Metal roofing: AS 1562.1. (k) Particleboard structural flooring: AS 1860.2. (l) Garage doors and other large access doors in openings not more than 3 m in height in external walls of buildings determined as being located in wind region C or D in accordance with AS/NZS 1170.2: AS/NZS 4505. (m) Lift shafts which are not required to have an FRL, must— (i) except as required by (ii), be completely enclosed with non-perforated material between the bottom of the pit and the ceiling of the lift shaft, other than— (A) at landing doors, emergency doors and pit access doors; and (B) low-rise, low-speed constant pressure lifts; and (C) small-sized, low-speed automatic lifts; and (ii) in atrium and observation areas, be protected with non-perforated material not less than 2.5 m in height— (A) above any places on which a person can stand, which are within 800 mm horizontal reach of any vertical moving lift component including ropes and counterweights; and (B) at the lowest level of the atrium area that the lift serves, on all sides except the door opening, for not less than 2.5 m in height, by enclosure with non-perforated material; and (iii) be of non-brittle material; and (iv) where glazing is used— (A) comply with Table B1D4; or (B) not fail the deflection criteria required by S6C6(c).

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
					Details demonstrating compliance with this clause must be incorporated into the Structural Engineering plans / specification
B1D5 Structural software [2019: B1.5]				X	(1) Structural software used in computer aided design of a building or structure, that uses design criteria based on the Deemed-to-Satisfy Provisions of the BCA, including its referenced documents, for the design of steel or timber trussed roof and floor systems and framed building systems, must comply with the ABCB Protocol for Structural Software. (2) Structural software referred to in (1) can only be used for buildings within the following geometric limits: (a) The distance from ground level to the underside of eaves must not exceed 6 m. (b) The distance from ground level to the highest point of the roof, neglecting chimneys, must not exceed 8.5 m. (c) The building width including roofed verandahs, excluding eaves, must not exceed 16 m. (d) The building length must not exceed five times the building width. (e) The roof pitch must not exceed 35 degrees. (3) The requirements of (1) do not apply to design software for individual frame members such as electronic tables similar to those provided in— (a) AS 1684; or (b) NASH Standard Residential and Low-Rise Steel Framing Part 2. ***Details demonstrating compliance with this clause must be incorporated into the Structural Engineering plans / specification***
B1D6 Construction of buildings in flood hazard areas [2019: B1.6]				X	(1) A building in a flood hazard area must comply with the ABCB Standard for Construction of Buildings in Flood Hazard Areas. (2) The requirements of (1) only apply to a Class 2 or 3 building, Class 9a health-care building, Class 9c building or a Class 4 part of a building. ***Details demonstrating compliance with this clause must be incorporated into the Structural Engineering plans / specification***
Specification 4 Design of buildings in cyclonic areas					
S4C1 Scope [2019: Spec B1.2: 1]			X		Not applicable. Not cyclonic.
S4C2 Roof cladding [2019: Spec B1.2: 2]			X		Not applicable. Not cyclonic.
Section C Fire resistance					
Part C2 Fire resistance and stability					
C2D1 Deemed-to-Satisfy Provisions [2019: C1.0]			X		Where a Deemed-to-Satisfy Solution is proposed, Performance Requirements C1P1 to C1P9 are satisfied by complying with— (a) C2D2 to C2D14, C3D2 to C3D15 and C4D2 to C4D17; and (b) in a building containing an atrium, Part G3;

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
C2D2 Type of construction required [2019: C1.1]				X	(1) The minimum Type of fire-resisting construction of a building must be determined in accordance with Table C2D2, except as allowed for— (a) certain Class 2,buildings in C2D6; (2) Each building element must comply with Specification 5 as applicable.

Rise in storeys	Class of building 2, 3, 9
4 of more	A

C2D3 Calculation of rise in storeys [2019: C1.2]			X		Informational. (1) The rise in storeys is the sum of the greatest number of storeys at any part of the external walls of the building and any storeys within the roof space— (a) above the finished ground next to that part; or (b) if part of the external wall is on the boundary of the allotment, above the natural ground level at the relevant part of the boundary. (2) A storey is not counted if— (a) it is situated at the top of the building and contains only heating, ventilating or lift equipment, water tanks, or similar service units or equipment; or (b) it is situated partly below the finished ground and the underside of the ceiling is not more than 1 m above the average finished level of the ground at the external wall, or if the external wall is more than 12 m long, the average for the 12 m part where the ground is lowest. (3) In a Class 7 or 8 building, a storey that has an average internal height of more than 6 m is counted as— (a) one storey if it is the only storey above the ground; or (b) 2 storeys in any other case. (4) For the purposes of calculating the rise in storeys of a building— (a) a mezzanine is regarded as a storey in that part of the building in which it is situated if its floor area is more than 200 m2 or more than ⅓ of the floor area of the room, whichever is the lesser; and (b) two or more mezzanines are regarded as a storey in that part of the building in which they are situated if they are at or near the same level and have an aggregate floor area more than 200 m2 or more than ⅓ of the floor area of the room, whichever is the lesser.
C2D4 Buildings of multiple classification [2019: C1.3]			X		Informational. (1) In a building of multiple classifications, the Type of construction required for the building is the most fire-resisting Type resulting from the application of Table C2D2 on the basis that the classification applying to the top storey applies to all storeys.
C2D5 Mixed types of construction [2019: C1.4]			X		Not applicable. Type A Construction only.
C2D6			X		Not applicable. Not two storey.

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
Two storey Class 2, 3 or 9c buildings [2019: C1.5]					
C2D7 Class 4 parts of buildings [2019: C1.6]			X		Not applicable. No Class 4
C2D8 Open spectator stands and indoor sports stadiums [2019: C1.7]			X		Not applicable. No open spectator stands and indoor sports stadiums.
C2D9 Lightweight construction [2019: C1.8]				X	(1) Lightweight construction must comply with Specification 6 if it is used in a wall system— (a) that is required to have an FRL; or (b) for a lift shaft, stair shaft or service shaft or an external wall bounding a public corridor including a non-fire-isolated passageway or non-fire-isolated ramp, in a spectator stand, sports stadium, cinema or theatre, railway station, bus station or airport terminal. (2) If lightweight construction is used for the fire-resisting covering of a steel column or the like, and if— (a) the covering is not in continuous contact with the column, then the void must be filled solid, to a height of not less than 1.2 m above the floor to prevent indenting; and (b) the column is liable to be damaged from the movement of vehicles, materials, or equipment, then the covering must be protected by steel or other suitable material. *Lightweight construction*: Construction which incorporates or comprises— (a) sheet or board material, plaster, render, sprayed application, or other material similarly susceptible to damage by impact, pressure or abrasion; or (b) concrete and concrete products containing pumice, perlite, vermiculite, or other soft material similarly susceptible to damage by impact, pressure or abrasion; or (c) masonry having a width of less than 70 mm ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
C2D10 Non-combustible building elements [2019: C1.9]				X	(1) In a building required to be of Type A construction, the following building elements and their components must be non-combustible: (a) External walls and common walls, including all components incorporated in them including the facade covering, framing and insulation. (b) The flooring and floor framing of lift pits. (c) Non-loadbearing internal walls where they are required to be fire-resisting. (2) A shaft, being a lift, ventilating, pipe, garbage, or similar shaft that is not for the discharge of hot products of combustion, that is non-loadbearing, must be of non-combustible construction in—

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
					(a) a building required to be of Type A construction; and (3) A loadbearing internal wall and a loadbearing fire wall, including those that are part of a loadbearing shafts, must comply with Specification 5. (4) The requirements of (1) and (2) do not apply to the following: (a) Gaskets. (b) Caulking. (c) Sealants. (d) Termite management systems. (e) Glass, including laminated glass, and associated adhesives, including tapes. (f) Thermal breaks associated with— (i) glazing systems; or (ii) external wall systems, where the thermal breaks— (A) are no larger than necessary to achieve thermal objectives; and (B) do not extend beyond one storey; and (C) do not extend beyond one fire compartment. (g) Damp-proof courses. (h) Compressible fillers and backing materials, including those associated with articulation joints, closing gaps not wider than 50 mm. (i) Isolated— (i) construction packers and shims; or (ii) blocking for fixing fixtures; or (iii) fixings, including fixing accessories; or (iv) acoustic mounts. (j) Waterproofing materials applied to the external face, used below ground level and up to 250 mm above ground level. (k) Joint trims and joint reinforcing tape and mesh of a width not greater than 50 mm. (l) Weather sealing materials, applied to gaps not wider than 50mm, used within and between concrete elements. (m) Wall ties and other masonry components complying with AS 2699 Part 1 and Part 3 as appropriate, and associated with masonry wall construction. (n) Reinforcing bars and associated minor elements that are wholly or predominately encased in concrete or grout. (o) A paint, lacquer or a similar finish or coating. (p) Adhesives, including tapes, associated with stiffeners for cladding systems. (q) Fire-protective materials and components required for the protection of penetrations. (5) The following materials, when entirely composed of itself, are non-combustible and may be used wherever a non-combustible material is required: (a) Concrete. (b) Steel, including metallic coated steel. (c) Masonry, including mortar.

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
					(d) Aluminium, including aluminium alloy. (e) Autoclaved aerated concrete, including mortar. (f) Iron. (g) Terracotta. (h) Porcelain. (i) Ceramic. (j) Natural stone. (k) Copper. (l) Zinc. (m) Lead. (n) Bronze. (o) Brass. (6) The following materials may be used wherever a non-combustible material is required: (a) Plasterboard. (b) Perforated gypsum lath with a normal paper finish. (c) Fibrous-plaster sheet. (d) Fibre-reinforced cement sheeting. (e) Pre-finished metal sheeting having a combustible surface finish not exceeding 1 mm thickness and where the Spread-of-Flame Index of the product is not greater than 0. (f) Sarking-type materials that do not exceed 1 mm in thickness and have a Flammability Index not greater than 5. (g) Bonded laminated materials where— (i) each lamina, including any core, is non-combustible; and (ii) each adhesive layer does not exceed 1 mm in thickness and the total thickness of the adhesive layers does not exceed 2 mm; and (iii) the Spread-of-Flame Index and the Smoke-Developed Index of the bonded laminated material as a whole do not exceed 0 and 3 respectively; and (iv) when located externally, are fixed in accordance with C2D15. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification*** **COMPLIANCE COMMENTARY** • **Manufacturers specifications and Test Reports (detailing the AS 1530.1 test) are required for the following components:** - **External wall sarking;** - **Insulation within external wall;** - **Insulation within the internal walls required to be fire resisting;** - **External wall cladding**
NSW C2D11				X	(1) The fire hazard properties of the following internal linings, materials and assemblies within a Class 2 to 9 building must comply with Specification 7:

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
Fire hazard properties [2019: C1.10 and NSW C1.10]					(a) Floor linings and floor coverings. (b) Wall linings and ceiling linings. (c) Air-handling ductwork. (d) Lift cars. (f) Escalators, moving walkways and non-required non fire-isolated stairways or pedestrian ramps subject to Specification 14. (g) Sarking-type materials. (h) Attachments to floors, ceilings, internal walls, common walls, fire walls and to internal linings of external walls. (i) Other materials including insulation materials other than sarking-type materials. (2) Paint or fire-retardant coatings must not be used in order to make a material comply with a *required fire hazard property*, except in respect of a material referred to in NSW Specification 7, Table S7C4 and to which Notes 4 and 5 are applicable. (3) The requirements of (1) do not apply to a material or assembly if it is— (a) plaster, cement render, concrete, terrazzo, ceramic tile or the like; or (b) a fire-protective covering; or (c) a timber-framed window; or (d) a solid timber handrail or skirting; or (e) a timber-faced door; or (f) an electrical switch, socket-outlet, cover plate or the like; or (g) a material used for— (i) a roof insulating material applied in continuous contact with a substrate; or (ii) an adhesive; or (iii) a damp-proof course, flashing, caulking, sealing, ground moisture barrier, or the like; or (h) a paint, varnish, lacquer or similar finish, other than nitro-cellulose lacquer; or (i) a clear or translucent roof light of glass fibre-reinforced polyester if— (i) the roof in which it is installed forms part of a single storey building required to be Type C construction; and (ii) the material is used as part of the roof covering; and (iii) it is not closer than 1.5 m from another roof light of the same type; and (iv) each roof light is not more than 14 m2 in area; and (v) the area of the roof lights per 70 m2 of roof surface is not more than 14 m2; or (j) a face plate or neck adaptor of supply and return air outlets of an air handling system; or (k) a face plate or diffuser plate of light fitting and emergency exit signs and associated electrical wiring and electrical components; or (l) a joinery unit, cupboard, shelving, or the like; or (m) an attached non-building fixture and fitting such as— (i) a curtain, blind, or similar decor, other than—

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
					(A) a proscenium curtain required by Specification 32; or (B) in a Class 9b building used as an entertainment venue, a material regulated under NSW Table S7C4; and (ii) a whiteboard, window treatment or the like; or (n) timber treads, risers, landings and associated supporting framework installed in accordance with D3D30 where the Spread-of-Flame Index and the Smoke-Developed Index of the timber does not exceed 9 and 8 respectively; or (o) any other material that does not significantly increase the hazards of fire. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification*** **COMPLIANCE COMMENTARY** **Details of materials to be provided at CC stage.**
C2D12 Performance of external walls in fire [2019: C1.11]			X		Not applicable. Rise in storeys is greater than 2.
C2D13 Fire-protected timber: Concession [2019: C1.13]			X		Not applicable. No fire-protected timber proposed or required.
C2D14 Ancillary elements [2019: C1.14]				X	An ancillary element must not be fixed, installed, attached to or supported by the concealed internal parts or external face of an external wall that is required to be non-combustible unless it is one of the following: (a) An ancillary element that is non-combustible. (b) A gutter, downpipe or other plumbing fixture or fitting. (c) A flashing. A grate, grille or similar cover not more than 2 m^2 (d) in area associated with a building service. (e) An electrical switch, socket-outlet, cover plate or the like. (f) A light fitting. (g) A required sign. (h) A sign other than one provided under (a) or (g) that— (i) achieves a group number of 1 or 2; and (ii) does not extend beyond one storey; and (iii) does not extend beyond one fire compartment; and (iv) is separated vertically from other signs permitted under (h) by at least 2 storeys. (i) An awning, sunshade, canopy, blind or shading hood other than one provided under (a) that— (i) meets the relevant requirements of Table S7C7 as for an internal element; and (ii) serves a storey—

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					(A) at ground level; or (B) immediately above a storey at ground level; and (iii) does not serve an exit, where it would render the exit unusable in a fire. (j) A part of a security, intercom or announcement system. (k) Wiring. (l) Waterproofing material installed in accordance with AS 4654.2 and applied to an adjacent floor surface, including vertical upturn, or a roof surface. (m) Collars, sleeves and insulation associated with service installations. (n) Screens applied to vents, weepholes and gaps complying with AS 3959. (o) Wiper and brush seals associated with doors, windows or other openings. (p) A gasket, caulking, sealant or adhesive directly associated with (a) to (o). ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification*** **COMPLIANCE COMMENTARY** • **Manufacturers specifications and Test Reports (detailing the AS 1530.1 test) are required for the following components:** - **Awnings** - **Batten & signage** - **Vertical screen**
C2D15 Fixing of bonded laminated cladding panels [New for 2022]				X	(1) In a building required to be of Type A construction, externally located bonded laminated cladding panels must have all layers of cladding mechanically supported or restrained to the supporting frame. (2) An externally located bonded laminated cladding panel need not comply with (1) if it is one of the following: (a) A laminated glass system. (b) Layered plasterboard product. (c) Perforated gypsum lath with a normal paper finish. (d) Fibrous-plaster sheet. (e) Fibre-reinforced cement sheeting. A component of a garage door. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
Part C3 Compartmentation and separation					
C3D1 Deemed-to-Satisfy Provisions			X		(1) Where a Deemed-to-Satisfy Solution is proposed, Performance Requirements C1P1 to C1P9 are satisfied by complying with— (a) C2D2 to C2D14, C3D2 to C3D15 and C4D2 to C4D17; and

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[2019: C2.0]					(b) in a building containing an atrium, Part G3; (2) Where a Performance Solution is proposed, the relevant Performance Requirements must be determined in accordance with A2G2(3) and A2G4(3) as applicable.
C3D2 Application of Part [2019: C2.1]			X		(1) C3D3, C3D4 and C3D5 do not apply to a carpark provided with a sprinkler system (other than a FPAA101D or FPAA101H system) complying with Specification 17, an open-deck carpark or an open spectator stand.
C3D3 General floor area and volume limitations [2019: C2.2]	X				(1) The size of any fire compartment or atrium in a Class 5, 6, 7, 8 or 9 building must not exceed the relevant maximum floor area nor the relevant maximum volume set out in Table C3D3 and C3D6 except as permitted in C3D4. (2) A part of a building which contains only heating, ventilating, or lift equipment, water tanks, or similar service units is not counted in the floor area or volume of a fire compartment or atrium if it is situated at the top of the building. (3) In a building containing an atrium, the part of the atrium well bounded by the perimeter of the openings in the floors and extending from the level of the first floor above the atrium floor to the roof covering is not counted in the volume of the atrium for the purposes of this clause.

Classification	Type A construction
5, 9b or 9c	Max floor area—8 000m²
	Max volume—48 000m³
6, 7, 8 or 9a (except for patient care areas)	Max floor area—5 000m²
	Max volume—30 000m³

C3D4 Large isolated buildings [2019 C2.3]			X		Not applicable. Not a large-isolated building.
C3D5 Requirements for open spaces and vehicular access [2019: C2.4]			X		Not applicable. Not a large-isolated building.
C3D6 Class 9 buildings [2019: C2.5]			X		Not applicable. Not a Class 9a, Class 9b early childhood centre or 9c building.
C3D7 Vertical separation of openings in external walls [2019: C2.6]				X	(1) If in a building of Type A construction, any part of a window or other opening in an external wall is above another opening in the storey next below and its vertical projection falls no further than 450 mm outside the lower opening (measured horizontally), the openings must be separated by— (a) a spandrel which— (i) is not less than 900 mm in height; and (ii) extends not less than 600 mm above the upper surface of the intervening floor; and

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					(iii) is of non-combustible material having an FRL of not less than 60/60/60; or (b) part of a curtain wall or panel wall that complies with (a); or (c) construction that complies with (a) behind a curtain wall or panel wall and has any gaps packed with a non-combustible material that will withstand thermal expansion and structural movement of the walling without the loss of seal against fire and smoke; or (d) a slab or other horizontal construction that— (i) projects outwards from the external face of the wall not less than 1100 mm; and (ii) extends along the wall not less than 450 mm beyond the openings concerned; and (iii) is non-combustible and has an FRL of not less than 60/60/60. (2) The requirements of (1) do not apply to— (a) an open-deck carpark; or (b) an open spectator stand; or (c) a building which has a sprinkler system (other than a FPAA101D or FPAA101H system) complying with Specification 17 installed throughout; or (d) openings within the same stairway; or (e) openings in external walls where the floor separating the storeys does not require an FRL with respect to integrity and insulation. (3) For the purposes of C3D7, window or other opening means that part of the external wall of a building that does not have an FRL of 60/60/60 or greater. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification*** **COMPLIANCE COMMENTARY** **Building will be sprinkler protected.**
C3D8 Separation by fire walls [2019: C2.7]				X	(1) Construction — A fire wall must be constructed in accordance with the following: (a) The fire wall has the relevant FRL prescribed by Specification 5 for each of the adjoining parts, and if these are different, the greater FRL, except where S5C19(3)(c)(i), S5C22(3)(c)(i) and S5C25(3)(c)(i) permit a lower FRL on the carpark side. (b) Any openings in a fire wall must not reduce the FRL required by Specification 5 for the fire wall, except where permitted by the Deemed-to-Satisfy Provisions of Part C4. (c) Building elements, other than roof battens with dimensions of 75 mm x 50 mm or less or sarking- type material, must not pass through or cross the fire wall unless the required fire-resisting performance of the fire wall is maintained. (2) Separation of buildings — A part of a building separated from the remainder of the building by a fire wall may be treated as a separate building for the purposes of the Deemed-to-Satisfy Provisions of Sections C, D and E if it is constructed in accordance with (1) and the following:

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					(a) The fire wall extends through all storeys and spaces in the nature of storeys that are common to that part and any adjoining part of the building. (b) The fire wall is carried through to the underside of the roof covering. (c) Where the roof of one of the adjoining parts is lower than the roof of the other part, the fire wall extends to the underside of— (i) the covering of the higher roof, or not less than 6 m above the covering of the lower roof; or (ii) the lower roof if it has an FRL not less than that of the fire wall and no openings closer than 3m to any wall above the lower roof; or (iii) the lower roof if its covering is non-combustible and the lower part has a sprinkler system (other than a FPAA101D or FPAA101H system) complying with Specification 17. (3) Separation of fire compartments — A part of a building separated from the remainder of the building by a fire wall may be treated as a separate fire compartment if it is constructed in accordance with (a) and the fire wall extends to the underside of— (a) a floor having an FRL required for a fire wall; or (b) the roof covering. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
C3D9 Separation of classifications in the same storey [2019: C2.8]				X	(1) If a building has parts of different classifications located alongside one another in the same storey— (a) each building element in that storey must have the higher FRL prescribed in Specification 5 for that element for the classifications concerned; or (b) the parts must be separated in that storey by a fire wall. (2) A fire wall required by (1)(b) must have the FRL prescribed in accordance with Specification 5 as applicable for that element for the Type of construction and the classifications concerned. (3) For the purposes of (2), the FRL in Specification 5 must be either— (a) the higher FRL prescribed in Tables S5C11a to S5C11g or S5C21a to S5C21f; or (b) the FRL prescribed in Tables S5C24a to S5C24e. (4) For the purposes of (1), where one part is a carpark complying with S5C19, S5C22 and S5C25, the parts may be separated by a fire wall complying with the appropriate Clause. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification*** **<u>COMPLANCE COMMENTARY</u>** **Compliance achievable. Fire Engineer may rationalise the FRLs.**
C3D10 Separation of classifications in different storeys [2019: C2.9]				X	If parts of different classification are situated one above the other in adjoining storeys, they must be separated as follows: (a) Type A construction — The floor between the adjoining parts must have an FRL of not less than that prescribed in Specification 5 for the classification of the lower storey.

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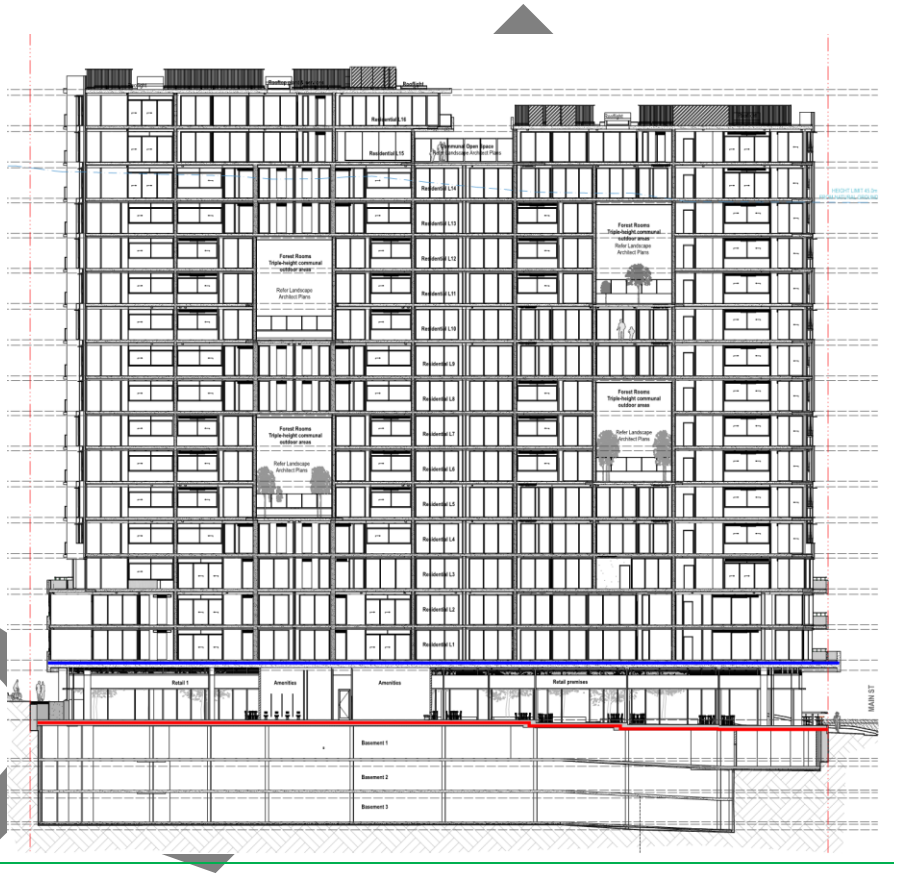
					Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification **COMPLIANCE COMMENTARY** **Separation of storeys to comply with Table S5C11** 
C3D11 Separation of lift shafts [2019: C2.10]				X	(1) Any lift connecting more than 2 storeys, or more than 3 storeys if the building is sprinklered, (other than lifts which are wholly within an atrium) must be separated from the remainder of the building by enclosure in a shaft in which— (a) in a building required to be of Type A construction — the walls have the relevant FRL prescribed by Specification 5; . (3) An emergency lift must be contained within a fire-resisting shaft having an FRL of not less than 120/120/120. (4) Openings for lift landing doors and services must be protected in accordance with the Deemed-to-Satisfy Provisions of Part C4. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification*** **COMPLIANCE COMMENTARY** **Compliance achievable.**

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					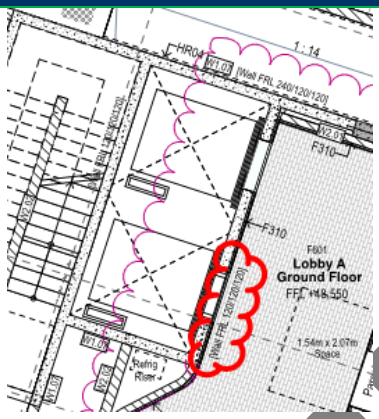 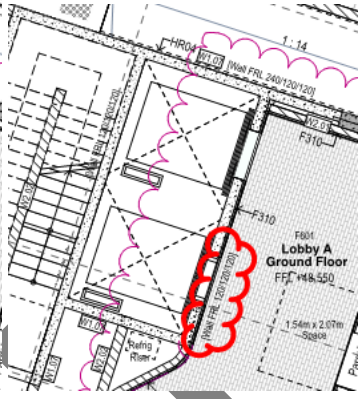
C3D12 Stairways and lifts in one shaft [2019: C2.11]	X				A stairway and lift are not be in the same shaft if either the stairway or the lift is required to be in a fire-resisting shaft.
C3D13 Separation of equipment [2019: C2.12]				X	(1) Equipment other than that described in (2) and (3) must be separated from the remainder of the building with construction complying with (4), if that equipment comprises— (a) lift motors and lift control panels; or (b) emergency generators used to sustain emergency equipment operating in the emergency mode; or (c) central smoke control plant; or (d) boilers; or (e) a battery system installed in the building that has a total voltage of 12 volts or more and a storage capacity of 200 kWh or more. (2) Equipment need not be separated in accordance with (1) if the equipment comprises— (a) smoke control exhaust fans located in the air stream which are constructed for high temperature operation in accordance with Specification 21; or (b) stair pressurising equipment installed in compliance with the relevant provisions of AS 1668.1; or (c) a lift installation without a machine-room; or (d) equipment otherwise adequately separated from the remainder of the building. (3) Separation of on-site fire pumps must comply with the requirements of AS 2419.1. (4) Separating construction must have— (a) except as provided by (b)— (i) an FRL as required by Specification 5, but not less than 120/120/120; and (ii) any doorway protected with a self-closing fire door having an FRL of not less than –/120/30; or (b) when separating a lift shaft and lift motor room, an FRL not less than 120/–/–. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
					COMPLIANCE COMMENTARY **Confirmation is required that the following is not proposed.** **(a) lift motors and lift control panels; or** **(b) emergency generators used to sustain emergency equipment operating in the emergency mode; or** **(c) central smoke control plant; or** **(d) boilers; or** **(e) a battery system installed in the building that has a total voltage of 12 volts or more and a storage capacity of 200 kWh or more**
C3D14 Electricity supply system [2019: C2.13]				X	(1) An electricity substation located within a building must— (a) be separated from any other part of the building by construction having an FRL of not less than 120/120/120; and (b) have any doorway in that construction protected with a self-closing fire door having an FRL of not less than – /120/30. (2) A main switchboard located within the building which sustains emergency equipment operating in the emergency mode must— (a) be separated from any other part of the building by construction having an FRL of not less than 120/120/120; and (b) have any doorway in that construction protected with a self-closing fire door having an FRL of not less than – /120/30. (3) Subject to (4), electrical conductors must— (a) have a classification in accordance with AS/NZS 3013 of not less than— (i) if located in a position that could be subject to damage by motor vehicles — WS53W; or (ii) otherwise — WS52W; or (b) be enclosed or otherwise protected by construction having an FRL of not less than 120/120/120. (4) The requirements of (3) only apply to electrical conductors located within a building that supply— (a) a substation located within the building which supplies a main switchboard covered by (2); or (b) a main switchboard covered by (2). (5) Where emergency equipment is required in a building, all switchboards in the electrical installation, which sustain the electricity supply to the emergency equipment, must be constructed so that emergency equipment switchgear is separated from non-emergency equipment switchgear by metal partitions designed to minimise the spread of a fault from the non-emergency equipment switchgear. (6) For the purposes of (5), emergency equipment includes but is not limited to the following: (a) Fire hydrant booster pumps. (b) Pumps for automatic sprinkler systems, water spray, chemical fluid suppression systems or the like. (c) Pumps for fire hose reels where such pumps and fire hose reels form the sole means of fire protection in the building.

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS

(d) Air handling systems designed to exhaust and control the spread of fire and smoke.

(e) Emergency lifts.

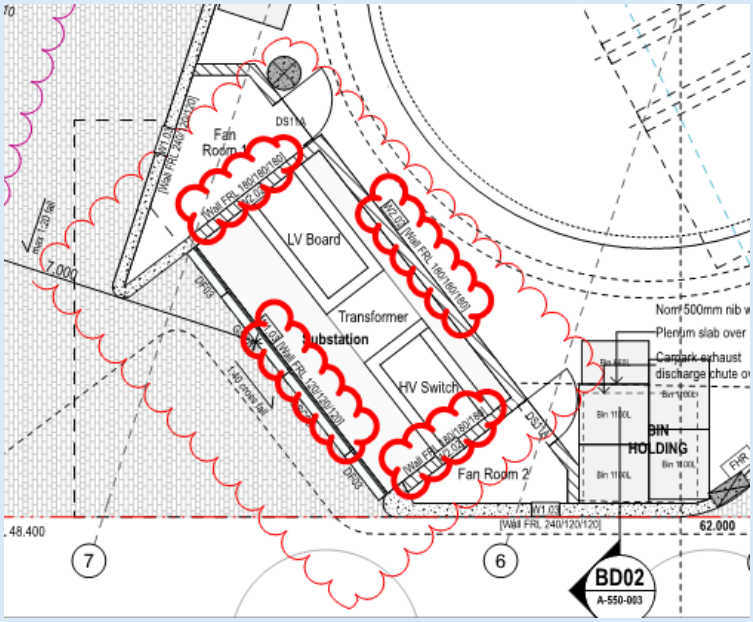
(f) Control and indicating equipment.

(g) Emergency warning and intercom systems.

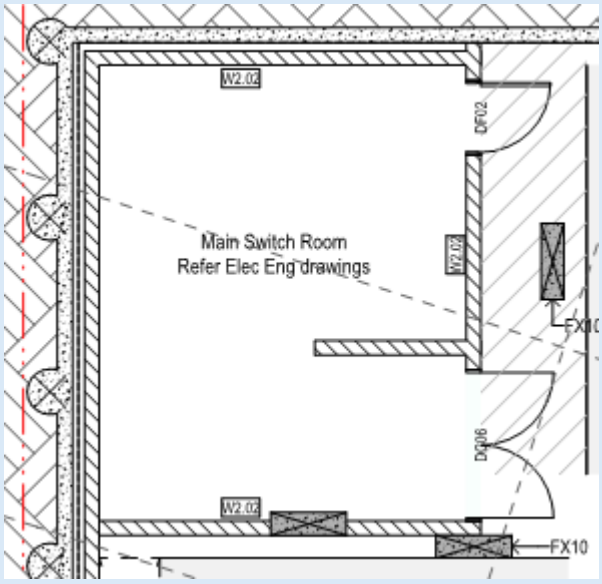
Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification

COMPLIANCE COMMENTARY

Substation – compliance achievable.



Main switchboard – FRLs to be detailed on the architectural plans. FRLs to be 120/120/120.



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C3D15 Public corridors in Class 2 and 3 buildings [2019: C2.14]				X	In a Class 2 or 3 building, a public corridor, if more than 40 m in length, must be divided at intervals of not more than 40 m with smoke-proof walls complying with S11C2. **COMPLIANCE COMMENTARY** **Compliance achievable.**
Part C4 Protection of openings					
C4D1 Deemed-to-Satisfy Provisions [2019: C3.0]			X		(1) Where a Deemed-to-Satisfy Solution is proposed, Performance Requirements C1P1 to C1P9 are satisfied by complying with— (a) C2D2 to C2D14, C3D2 to C3D15 and C4D2 to C4D17; and (b) in a building containing an atrium, Part G3; (2) Where a Performance Solution is proposed the relevant Performance Requirements must be determined in accordance with A2G2(3) and A2G4(3) as applicable.
C4D2 Application of Part [2019: C3.1]			X		(1) The Deemed-to-Satisfy Provisions of this Part do not apply to the following: (a) Control joints, weep holes and the like in external walls of masonry construction and joints between panels in external walls of pre-cast concrete panel construction if, in all cases they are not larger than necessary for the purpose. (b) Non-combustible ventilators for subfloor or cavity ventilation, if each does not exceed 45 000 mm2 in face area and is spaced not less than 2 m from any other ventilator in the same wall. (c) Openings in the vertical plane formed between building elements at the construction edge or perimeter of a balcony or verandah, colonnade, terrace, or the like. (d) In a carpark floor other than a floor that separates a part not used as a carpark, and subject to the following openings in a carpark floor: (i) Service penetrations. (ii) Openings formed by a vehicle ramp. (e) The requirements of (d) only apply where the connected carpark levels comply as a single fire compartment for the

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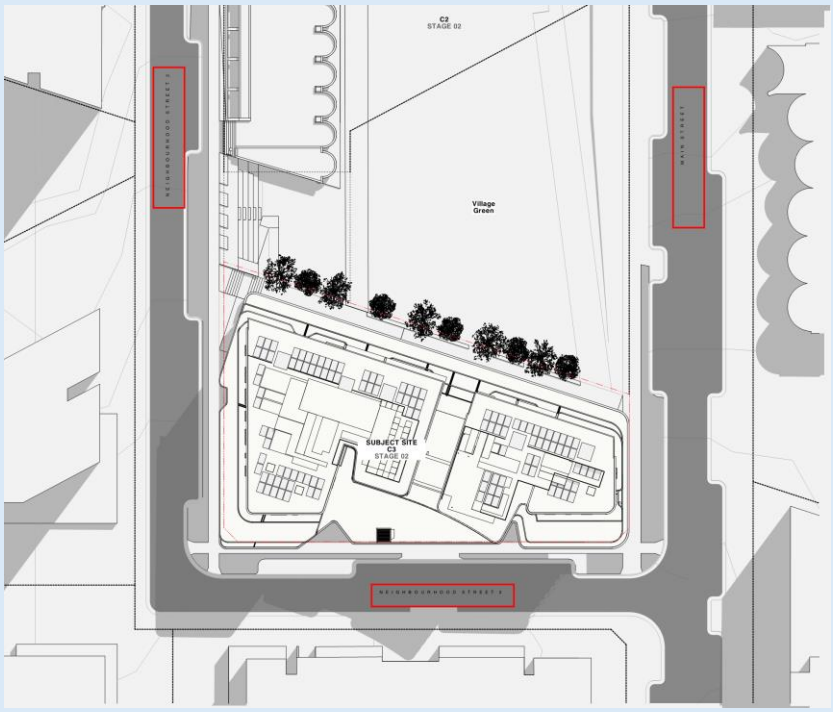
					purposes of all other requirements of the Deemed-to-Satisfy Provisions of Sections C, D and E. (2) For the purposes of the Deemed-to-Satisfy Provisions of this Part, openings in building elements required to be fire-resisting include doorways, windows (including any associated fanlight), infill panels and fixed or openable glazed areas that do not have the required FRL. (3) For the purposes of the Deemed-to-Satisfy Provisions of this Part, openings, other than those covered under (1)(c), between building elements such as columns, beams and the like, in the plane formed at the construction edge or perimeter of the building, are deemed to be openings in an external wall.
C4D3 Protection of openings in external walls [2019: C3.2]				X	(1) Subject to (2), openings in an external wall that is required to have an FRL must be protected in accordance with C4D5, and if wall-wetting sprinklers are used they must be located externally. (2) The requirements of (1) only apply if the distance between the opening and the fire-source feature to which it is exposed is less than— (a) 3 m from a side or rear boundary of the allotment; or (b) 6 m from the far boundary of a road, river, lake or the like adjoining the allotment, if not located in a storey at or near ground level; or (c) 6 m from another building on the allotment that is not Class 10. (3) Openings in an external wall that is required to have an FRL, if required to be protected under (1), must not occupy more than 1/3 of the area of the external wall of the storey in which it is located. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification*** **COMPLIANCE COMMENTARY** **Confirmation is required the "neighbourhood road" are public roads or private roads.** 

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
C4D4 Separation of external walls and associated openings in different fire compartments [2019: C3.3]				X	The distance between parts of external walls and any openings within them in different fire compartments separated by a fire wall must not be less than that set out in Table C4D4, unless— (a) those parts of each wall have an FRL not less than 60/60/60; and (b) any openings protected in accordance with C4D5. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
C4D5 Acceptable methods of protection [2019: C3.4]			X		(1) Where protection is required, doorways, windows and other openings must be protected as follows: (a) Doorways— (i) internal or external wall-wetting sprinklers as appropriate used with doors that are self-closing or automatic closing; or (ii) –/60/30 fire doors that are self-closing or automatic closing. (b) Windows— (i) internal or external wall-wetting sprinklers as appropriate used with windows that are automatic closing or permanently fixed in the closed position; or (ii) –/60/– fire windows that are automatic closing or permanently fixed in the closed position; or (iii) –/60/– automatic closing fire shutters. (c) Other openings— (i) excluding voids — internal or external wall-wetting sprinklers, as appropriate; or (ii) construction having an FRL not less than –/60/–. (2) Fire doors, fire windows and fire shutters must comply with Specification 12.
C4D6 Doorways in fire walls [2019: C3.5]				X	(1) The aggregate width of openings for doorways in a fire wall, which are not part of a horizontal exit, must not exceed ½ of the length of the fire wall, and each doorway must be protected by— (a) 2 fire doors or fire shutters, one on each side of the doorway, each of which has an FRL of not less than ½ that required by Specification 5 for the fire wall except that each door or shutter Must have an insulation level of at least 30; or (b) a fire door on one side and a fire shutter on the other side of the doorway, each of which complies with (a); or (c) a single fire door or fire shutter which has an FRL of not less than that required by Specification 5 for the fire wall except that each door or shutter must have an insulation level of at least 30. (2) A fire door or fire shutter required by (1)(a), (b) or (c) must be self-closing, or automatic closing in accordance with (3) and (4). (3) The automatic closing operation required by (2) must be initiated by the activation of a smoke detector, or any other detector deemed suitable in accordance with AS 1670.1 if smoke detectors are unsuitable in the atmosphere, installed in accordance with the relevant provisions of AS 1670.1 and located on each side of the fire wall not more than 1.5 m horizontal distance from the opening. (4) Where any other required suitable fire alarm system, including a sprinkler system (other than a FPAA101D system) complying with

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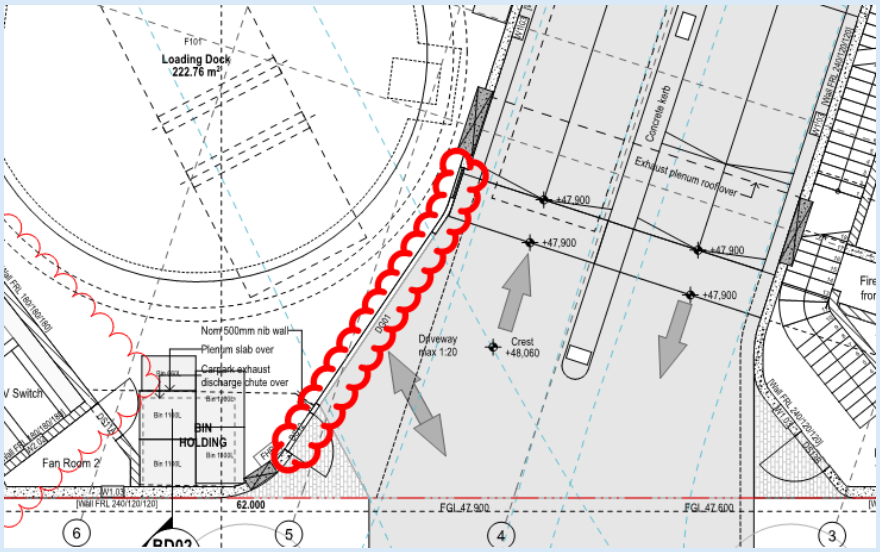
					Specification 17, is installed in the building, activation of the system in either fire compartment separated by the fire wall must also initiate the automatic closing operation. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification*** **COMPLIANCE COMMENTARY** **Doorway separating Class 7b loading dock and the Class 7a carpark driveway must comply with this clause.** 
C4D7 Sliding fire doors [2019: C3.6]			X		Not applicable. No sliding fire doors proposed or required.
C4D8 Protection of doorways in horizontal exits [2019: C3.7]			X		Not applicable. No horizontal exits proposed or required.
C4D9 Openings in fire-isolated exits [2019: C3.8]				X	(1) Doorways that open to fire-isolated stairways, fire-isolated passageways or fire-isolated ramps, and are not doorways opening to a road or open space, must be protected by –/60/30 fire doors that are self-closing, or automatic closing in accordance with (2) and (3). (2) The automatic-closing operation required by (1) must be initiated by the activation of a smoke detector, or any other detector deemed suitable in accordance with AS 1670.1 if smoke detectors are unsuitable in the atmosphere, installed in accordance with the relevant provisions of AS 1670.1 and located not more than 1.5 m horizontal distance from the approach side of the doorway. (3) Where any other required suitable fire alarm system, including a sprinkler system (other than a FPAA101D system) complying with Specification 17, is installed in the building, activation of the system must also initiate the automatic-closing operation. (4) A window in an external wall of a fire-isolated stairway, fire-isolated passageway or fire-isolated ramp must be protected in accordance with

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					C4D5 if it is within 6 m of, and exposed to, a window or other opening in a wall of the same building, other than in the same fire-isolated enclosure. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
C4D10 Service penetrations in fire-isolated exits [2019: C3.9]				X	Fire-isolated exits must not be penetrated by any services other than— (a) electrical wiring permitted by D3D8(6) to be installed within the exit; or (b) ducting associated with a pressurisation system if it— (i) is constructed of material having an FRL of not less than –/120/60 where it passes through any other part of the building; and (ii) does not open into any other part of the building; or (c) for fire services, water supply and test drain pipes. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
C4D11 Openings in fire-isolated lift shafts [2019: C3.10]				X	(1) Doorways — If a lift shaft is required to be fire-isolated, an entrance doorway to that shaft must be protected by – /60/– fire doors that— (a) comply with AS 1735.11; and (b) are set to remain closed except when discharging or receiving passengers, goods or vehicles. (2) Lift indicator panels — A lift call panel, indicator panel or other panel in the wall of a fire-isolated lift shaft must be backed by construction having an FRL of not less than –/60/60 if it exceeds 35 000 mm2 in area. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
NSW C4D12 Bounding construction: Class 2 and 3 buildings and Class 4 parts [2019: C3.11]				X	(1) A doorway in a Class 2 or 3 building must be protected if it provides access from a sole-occupancy unit to— (a) a public corridor, public lobby, or the like; or (b) a room not within a sole-occupancy unit; or (c) the landing of an internal non fire-isolated stairway that serves as a required exit; or (d) another sole-occupancy unit. (2) A doorway in a Class 2 or 3 building must be protected if it provides access from a room not within a sole-occupancy unit to— (a) a public corridor, public lobby, or the like; or (b) the landing of an internal non fire-isolated stairway that serves as a required exit. (4) Except as provided for in NSW C4D12(5), protection for a doorway required under (1), (2) or (3) must be at least— (a) in a building of Type A construction — a self-closing –/60/30 fire door; (6) Other openings in internal walls which are required to have an FRL with respect to integrity and insulation must not reduce the fire-resisting performance of the wall. (7) A door required by (4) or (5) may be automatic-closing in accordance with the following: (a) The automatic-closing operation must be initiated by the activation of a smoke detector, or any other detector deemed suitable in accordance with AS 1670.1 if smoke detectors are

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					unsuitable in the atmosphere, installed in accordance with the relevant provisions of AS 1670.1 and located not more than 1.5 m horizontal distance from the approach side of the doorway. (b) Where any other required suitable fire alarm system, including a sprinkler system (other than a FPAA101D system) complying with Specification 17, is installed in the building, activation of the system must also initiate the automatic- closing operation. (8) The requirements of (9) apply in a Class 2 or 3 building where a path of travel to an exit— (a) does not provide a person seeking egress with a choice of travel in different directions to alternative exits; and (b) is along an open balcony, landing or the like; and (c) passes an external wall of— (i) another sole-occupancy unit; or (ii) a room not within a sole-occupancy unit. (9) The external wall mentioned in (8)(c) must— (a) be constructed of concrete or masonry, or be lined internally with a fire-protective covering; and (b) have any doorway fitted with a self-closing, tight-fitting solid core door not less than 35 mm thick; and (c) have any windows or other openings— (i) protected internally in accordance with C4D5; or (ii) located at least 1.5 m above the floor of the balcony, landing or the like. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
C4D13 Openings in floors and ceilings for services [2019: C3.12]				X	(1) Where a service passes through— (a) a floor that is required to have an FRL with respect to integrity and insulation; or (b) a ceiling required to have a resistance to the incipient spread of fire, the service must be installed in accordance with (2). (2) A service must be protected— (a) in a building of Type A construction, by a shaft complying with Specification 5; or (c) in accordance with C4D15. (3) Where a service passes through a floor which is required to be protected by a fire-protective covering, the penetration must not reduce the fire performance of the covering. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
C4D14 Openings in shafts [2019: C3.13]				X	In a building of Type A construction, an opening in a wall providing access to a ventilating, pipe, garbage or other service shaft must be protected by— (a) if it is in a sanitary compartment — a door or panel which, together with its frame, is non-combustible or has an FRL of not less than –/30/30; or (b) a self-closing –/60/30 fire door or hopper; or (c) an access panel having an FRL of not less than –/60/30; or (d) if the shaft is a garbage shaft — a door or hopper of non-combustible construction.

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					Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification
C4D15 Openings for service installations [2019: C3.15]				X	(1) The requirements of (2) apply where an electrical, electronic, plumbing, mechanical ventilation, air-conditioning or other service penetrates a building element (other than an external wall or roof) that is required to have an FRL with respect to integrity or insulation or a resistance to the incipient spread of fire. (2) An installation mentioned in (1) must comply with any one of the following: (a) Tested systems — the following applies: (i) The service, building element and any protection method at the penetration— (A) are identical with a prototype assembly of the service, building element and protection method which has been tested in accordance with AS 4072.1 and AS 1530.4 and has achieved the required FRL or resistance to the incipient spread of fire; or (B) differ from a prototype assembly of the service, building element and protection method in accordance with Section 4 of AS 4072.1. (ii) It complies with (i) except for the insulation criteria relating to the service if— (A) the service is a pipe system comprised entirely of metal (excluding pipe seals or the like); and (B) any combustible building element is not located within 100mm of the service for a distance of 2 m from the penetration; and (C) combustible material is not able to be located within 100 mm of the service for a distance of 2m from the penetration; and (D) it is not located in a required exit. (iii) The determination of the required FRL must be confirmed in a report from an Accredited Testing Laboratory in accordance with Specifications 1 and 2. (b) Ventilation and air-conditioning — in the case of ventilating or air-conditioning ducts or equipment, the installation is in accordance with AS 1668.1. (c) Compliance with Specification 13 — the following applies: (i) The service is a pipe system comprised entirely of metal (excluding pipe seals or the like) and is installed in accordance with Specification 13 and it— (A) penetrates a wall, floor or ceiling, but not a ceiling required to have a resistance to the incipient spread of fire; and (B) connects not more than 2 fire compartments in addition to any fire-resisting service shafts; and (C) does not contain a flammable or combustible liquid or gas. (ii) The service is sanitary plumbing installed in accordance with Specification 13 and it—

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					(A) is of metal or UPVC pipe; and (B) penetrates the floors of a Class 5, 6, 7, 8 or 9b building; and (C) is in a sanitary compartment separated from other parts of the building by walls with the FRL required by Specification 5 for a stair shaft in the building and a self-closing –/60/30 fire door. (iii) The service is a wire or cable, or a cluster of wires or cables installed in accordance with Specification 13 and it— (A) penetrates a wall, floor or ceiling, but not a ceiling required to have a resistance to the incipient spread of fire; and (B) connects not more than 2 fire compartments in addition to any fire-resisting service shafts. (iv) The service is an electrical switch, outlet, or the like, and it is installed in accordance with Specification 13. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification*** **COMPLIANCE COMMENTARY** **Details of all fire stopping systems are required before issue of CC.**
C4D16 Construction joints [2019: C3.16]				X	(1) Construction joints, spaces and the like in and between building elements required to be fire-resisting with respect to integrity and insulation must be protected in a manner— (a) identical with a prototype tested in accordance with AS 4072.1 and AS 1530.4 to achieve the required FRL; or (b) that differs from a prototype in accordance with Section 4 of AS 4072.1 and achieves the required FRL. (2) The determination of the required FRL must be confirmed in a report from an Accredited Testing Laboratory in accordance with Specifications 1 and 2. (3) The requirements of (1) do not apply where joints, spaces and the like between fire-protected timber elements are provided with cavity barriers in accordance with Specification 9. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification*** **COMPLIANCE COMMENTARY** **Details of all fire stopping systems are required before issue of CC.**
C4D17 Columns protected with lightweight construction to achieve an FRL [2019: C3.17]				X	A column protected by lightweight construction to achieve an FRL which passes through a building element that is required to have an FRL or a resistance to the incipient spread of fire, must be installed using a method and materials identical with a prototype assembly of the construction which has achieved the required FRL or resistance to the incipient spread of fire. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***

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					COMPLIANCE COMMENTARY **Details of all fire stopping systems are required before issue of CC.**
Specification 5 Fire-resisting construction					
S5C1 Scope [2019: Spec C1.1: 1]			X		This Specification contains requirements for the fire-resisting construction of building elements.
S5C2 Exposure to fire-source features [2019: Spec C1.1: 2.1]			X		(1) A part of a building element is exposed to a fire-source feature if any of the horizontal straight lines between that part and the fire-source feature, or vertical projection of the feature, is not obstructed by another part of the building that— (a) has an FRL of not less than 30/–/–; and (b) is neither transparent nor translucent. (2) A part of a building element is not exposed to a fire-source feature if the fire-source feature is— (a) an external wall of another building that stands on the allotment and the part concerned is more than 15 m above the highest part of that external wall; or (b) a side or rear boundary of the allotment and the part concerned is below the level of the finished ground at every relevant part of the boundary concerned. (3) If various distances apply for different parts of a building element— (a) the entire element must have the FRL applicable to that part having the least distance between itself and the relevant fire-source feature; or (b) each part of the element must have the FRL applicable according to its individual distance from the relevant fire source feature. (4) The requirements of (3) do not override or permit any exemption from S5C3.
S5C3 Fire protection for a support of another part [2019: Spec C1.1: 2.2]				X	(1) Where a part of a building required to have an FRL depends upon direct vertical or lateral support from another part to maintain its FRL, that supporting part, subject to (2), must— (a) have an FRL not less than that required by other provisions of this Specification; and (b) if located within the same fire compartment as the part it supports have an FRL in respect of structural adequacy the greater of that required— (i) for the supporting part itself; and (ii) for the part it supports; and (c) be non-combustible— (i) if required by other provisions of this Specification; or (ii) if the part it supports is required to be non-combustible. (2) The following building elements need not comply with (1)(b) and (1)(c)(ii):

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
					(a) An element providing lateral support to an external wall complying with S5C24(1)(b) or C2D12. (b) An element providing support within a carpark and complying with S5C19, S5C22 or S5C25. (c) A roof providing lateral support in a building— (i) of Type A construction if it complies with S5C15(a), (b) or (d); and (ii) of Type B and C construction. (d) A column providing lateral support to a wall where the column complies with S5C6(1) and (2). (e) An element providing lateral support to a fire wall or fire-resisting wall, provided the wall is supported on both sides and failure of the element on one side does not affect the fire performance of the wall. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S5C4 Lintels [2019: Spec C1.1: 2.3]				X	(1) A lintel must have the FRL required for the part of the building in which it is situated. (2) A lintel need not comply with (1) if it does not contribute to the support of a fire door, fire window or fire shutter, and— (a) it spans an opening in— (i) a wall of a building containing only one storey; or (ii) a non-loadbearing wall of a Class 2 or 3 building; or (b) it spans an opening in masonry which is not more than 150 mm thick and— (i) not more than 3m wide if the masonry is non-loadbearing; or (ii) not more than 1.8 m wide if the masonry is loadbearing and part of a solid wall or one of the leaves of a cavity wall. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S5C5 Method of attachment not to reduce the fire-resistance of building elements [2019: Spec C1.1: 2.4]				X	The method of attaching or installing a finish, lining, ancillary element or service installation to the building element must not reduce the fire-resistance of that element to below that required. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S5C6 General concessions [2019: Spec C1.1: 2.5]			X		(1) Steel columns — A steel column, other than one in a fire wall or common wall, need not have an FRL in a building that contains— (a) only 1 storey; or (b) 2 storeys in some of its parts and 1 storey only in its remaining parts if the sum of the floor areas of the upper storeys of its 2 storey parts does not exceed the lesser of— (i) 1/8 of the sum of the floor areas of the 1 storey parts; or (ii) in the case of a building to which one of the maximum floor areas specified in Table C3D3 is applicable — 1/10of that area; or

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					(iii) in the case of a building to which two or more of the maximum floor area specified in Table C3D3 is applicable — 1/10 of the lesser of those areas. (2) Timber columns — A timber column may be used in a single storey building if— (a) in a fire wall or common wall the column has an FRL not less than that listed in the appropriate Tables S5C11a to S5C11g, S5C21a to S5C21f or S5C24a to S5C24e; and (b) in any other case where the column is required to have an FRL in accordance with Tables S5C11a to S5C11g, S5C21a to S5C21f or S5C24a to S5C24e, it has an FRL of not less than 30/–/–. (3) Structures on roofs — A non-combustible structure situated on a roof need not comply with the other provisions of this Specification if it only contains— (a) lift motor equipment; or (b) one or more of the following: (i) Hot water or other water tanks. (ii) Ventilating ductwork, ventilating fans and their motors. (iii) Air-conditioning chillers. (iv) Window cleaning equipment. (v) Other service units that are non-combustible and do not contain flammable or combustible liquids or gases. (4) Curtain walls and panel walls — A requirement for an external wall to have an FRL does not apply to a curtain wall or panel wall which is of non-combustible construction and fully protected by automatic external wall-wetting sprinklers. (5) Balconies and verandahs — A balcony, verandah or the like and any incorporated supporting part, which is attached to or forms part of a building, need not comply with Tables S5C11a to S5C11g, S5C21a to S5C21f and S5C24a to S5C24e if— (a) it does not form part of the only path of travel to a required exit from the building; and (b) in Type A construction— (i) it is situated not more than 2 storeys above the lowest storey providing direct egress to a road or open space; and (ii) any supporting columns are of non-combustible construction.
S5C7 Mezzanine floors: Concession [2019: Spec C1.1: 2.6]			X		Not applicable. No mezzanines proposed.
S5C8 Enclosure of shafts [2019: Spec C1.1: 2.7]				X	(1) Shafts required to have an FRL must be enclosed at the top and bottom by construction having an FRL not less than that required for the walls of a non-loadbearing shaft in the same building. (2) The provisions of (1) need not apply to— (a) the top of a shaft extending beyond the roof covering, other than one enclosing a fire-isolated stairway or ramp; or (b) the bottom of a shaft if it is non-combustible and laid directly on the ground

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					Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification
S5C9 Carparks in Class 2 and 3 buildings [2019: Spec C1.1: 2.8]			X		(1) If a Class 2 building contains not more than 4 storeys of which— (a) one storey is Class 7 used solely for the purpose of parking motor vehicles or for some other purpose that is ancillary to a Class 2; and (b) the remaining storeys are of Class 2, the carpark storey is regarded as Class 2 only for the purpose of determining the relevant fire-resisting requirements of this Specification. (2) If a Class 3 building or a building of Class 2 and 3 contains not more than 3 storeys of which— (a) one storey is Class 7 used solely for the purpose of parking motor vehicles or for some other purpose that is ancillary to the other storeys; and (b) the remaining storeys are of Class 2 or 3, the carpark storey is regarded as Class 2 or 3 only for the purpose of determining the relevant fire-resisting requirements of this Specification.
S5C10 Residential care building: Concession [2019: Spec C1.1: 2.9]			X		Not applicable. Not a residential care building
S5C11 Type A fire-resisting construction — Fire-resistance of building elements [2019: Spec C1.1: 3.1 and Table 3]				X	(1) In a building required to be of Type A construction— (a) each building element listed in Tables S5C11a to S5C11g and any beam or column incorporated in it, must have an FRL not less than that listed in those Tables for the particular Class of building concerned; and (b) any internal wall required to have an FRL with respect to integrity and insulation must extend to— (i) the underside of the floor next above; or (ii) the underside of a roof complying with Tables S5C11a to S5C11g; or (iii) if under S5C15 the roof is not required to comply with Tables S5C11a to S5C11g, the underside of the non-combustible roof covering and, except for roof battens with dimensions of 75 mm x 50 mm or less or sarking-type material, must not be crossed by timber or other combustible building elements; or (iv) a ceiling that is immediately below the roof and has a resistance to the incipient spread of fire to the roof space between the ceiling and the roof of not less than 60 minutes; and (c) a loadbearing internal wall and a loadbearing fire wall (including those that are part of a loadbearing shaft) must be constructed from— (i) concrete; or (ii) masonry; or

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					(iii) subject to (2), fire-protected timber; or (iv) any combination of (i) to (iii); and (d) the FRLs specified in Tables S5C11a to S5C11g for an external column apply also to those parts of an internal column that face and are within 1.5 m of a window and are exposed through that window to a fire-source feature. (2) For the purposes of (1)(c)(iii), fire-protected timber may be used, provided that— (a) the building is— (i) a separate building; or (ii) a part of a building— (A) which only occupies part of a storey, and is separated from the remaining part by a fire wall; or (B) which is located above or below a part not containing fire-protected timber and the floor between the adjoining parts is provided with an FRL not less than that prescribed for a fire wall for the lower storey; and (b) the building has an effective height of not more than 25 m; and (c) the building has a sprinkler system (other than a FPAA101D or FPAA101H system) throughout complying with Specification 17; and (d) any insulation installed in the cavity of the timber building element required to have an FRL is non-combustible; and (e) cavity barriers are provided in accordance with Specification 9. (3) For the purposes of Table S5C11a and Table S5C11b, external wall includes any column and other building element incorporated within it or other external building element. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S5C12 Type A fire-resisting construction — Concessions for floors [2019: Spec C1.1: 3.2]			X		A floor need not comply with Tables S5C11a to S5C11g if— (a) it is laid directly on the ground; or (b) in a Class 2, 3, 5 or 9 building, the space below is not a storey, does not accommodate motor vehicles, is not a storage or work area, and is not used for any other ancillary purpose; or (c) it is a timber stage floor in a Class 9b building laid over a floor having the required FRL and the space below the stage is not used as a dressing room, store room, or the like; or (d) it is within a sole-occupancy unit in a Class 2 or 3 building or Class 4 part of a building; or (e) it is an open-access floor (for the accommodation of electrical and electronic services and the like) above a floor with the required FRL.
S5C13 Type A fire-resisting construction — Floor loading of Class 5 and 9b			X		If a floor in a Class 5 or 9b building is designed for a live load not exceeding 3 kPa— (a) the floor next above (including floor beams) may have an FRL of 90/90/90; or (b) the roof, if that is next above (including roof beams), may have an FRL of 90/60/30.

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buildings: Concession [2019: Spec C1.1: 3.3]					
S5C14 Type A fire-resisting construction — Roof superimposed on concrete slab: Concession [2019: Spec C1.1: 3.4]			X		A roof superimposed on a concrete slab roof need not comply with S5C11 as to fire-resisting construction if— (a) the superimposed roof and any construction between it and the concrete slab roof are non-combustible throughout; and (b) the concrete slab roof complies with Tables S5C11a to S5C11g.
S5C15 Type A fire-resisting construction — Roof: Concession [2019: Spec C1.1: 3.5]			X		A roof need not comply with Tables S5C11a to S5C11g if its covering is non-combustible and the building— (a) has a sprinkler system (other than a FPAA101D or FPAA101H system) complying with Specification 17 installed throughout; or (b) has a rise in storeys of 3 or less; or (c) is of Class 2 or 3; or (d) has an effective height of not more than 25 m and the ceiling immediately below the roof has a resistance to the incipient spread of fire to the roof space of not less than 60 minutes.
S5C16 Type A fire-resisting construction — Roof lights [2019: Spec C1.1: 3.6]				X	If a roof is required to have an FRL or its covering is required to be non-combustible, roof lights or the like installed in that roof must— (a) have an aggregate area of not more than 20% of the roof surface; and (b) be not less than 3 m from— (i) any boundary of the allotment other than the boundary with a road or public place; and (ii) any part of the building which projects above the roof unless that part has the FRL required of a fire wall and any openings in that part of the wall for 6 m vertically above the roof light or the like are protected in accordance with C4D5; and (iii) any roof light or the like in an adjoining sole-occupancy unit if the walls bounding the unit are required to have an FRL; and (iv) any roof light or the like in an adjoining fire-separated section of the building; and (c) if a ceiling with a resistance to the incipient spread of fire is required, be installed in a way that will maintain the level of protection provided by the ceiling to the roof space. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S5C17 Type A fire-resisting construction — Internal columns			X		For a building with an effective height of not more than 25 m and having a roof without an FRL in accordance with S5C15, in the storey immediately below that roof, internal columns other than those referred to in S5C11(1)(d) and internal walls other than fire walls and shaft walls may have—

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and walls: Concession [2019: Spec C1.1:3.7]					(a) in a Class 2 or 3 building: FRL 60/60/60; or (b) in a Class 5, 6, 7, 8 or 9 building— (i) with rise in storeys exceeding 3: FRL 60/60/60; or (ii) with rise in storeys not exceeding 3: no FRL.
S5C18 Type A fire-resisting construction — open spectator stands and indoor sports stadiums: Concession [2019: Spec C1.1: 3.8]			X		Not applicable. Not open spectator stands and indoor sports stadiums
S5C19 Type A fire-resisting construction — carparks [2019: Spec C1.1: 3.9 and Table 3.9]			X		(1) Notwithstanding S5C11, a carpark may comply with this clause if it is an open-deck carpark or is protected with a sprinkler system (other than a FPAA101D or FPAA101H system) complying with Specification 17 and is— (a) a separate building; or (b) a part of a building— (i) which only occupies part of a storey, and is separated from the remaining part by a fire wall; or (ii) which is located above or below another classification, and the floor separating the classifications complies with C3D10; or (iii) which is located above another Class 7 part of the building not used for carparking, and the floor separating the parts complies with Tables S5C11a to S5C11g for a Class 7 part other than a carpark; or (iv) which is located below another Class 7 part of the building not used for carparking, and the floor separating the parts complies with this clause. (2) For the purposes of this clause, a carpark— (a) includes— (i) an administration area associated with the functioning of the carpark; and (ii) where the carpark is sprinklered, is associated with a Class 2 or 3 building and provides carparking for separate sole-occupancy units, each carparking area with an area not greater than 10% of its floor area for purposes ancillary to the sole-occupancy units; but (b) excludes— (i) except for (a), any area of another classification, or other part of a Class 7 building not used for carparking; and (ii) a building or part of a building specifically intended for the parking of trucks, buses, vans and the like. (3) For building elements in a carpark as described in (1) and (2), the following minimum FRLs are applicable: (a) External wall:

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					(i) Less than 3 m from a fire-source feature to which it is exposed: (A) Loadbearing: 60/60/60. (B) Non-loadbearing: –/60/60. (ii) 3 m or more from a fire-source feature to which it is exposed: –/–/–. (b) Internal wall: (i) Loadbearing, other than one supporting only the roof (not used for carparking): 60/–/–. (ii) Supporting only the roof (not used for carparking): –/–/–. (iii) Non-loadbearing: –/–/–. (c) Fire wall: (i) From the direction used as a carpark: 60/60/60. (ii) From the direction not used as a carpark: as required by Tables S5C11a to S5C11g. (d) Columns: (i) Supporting only the roof (not used for carparking) and 3 m or more from a fire-source feature to which it is exposed: –/–/–. (ii) Steel column, other than one covered by (i) and one that does not support a part of a building that is not used as a carpark— (A) 60/–/–; or (B) an ESA/M of not greater than 26m^2 / tonne. (iii) Any other column not covered by (i) or (ii): 60/–/–. (e) Beams: (i) Steel floor beam in continuous contact with a concrete floor slab— (A) 60/–/–; or (B) an ESA/M of not greater than 30m^2/tonne. (ii) Any other beam: 60/–/–. (f) Fire-resisting lift and stair shaft (within the carpark only): 60/60/60. (g) Floor slab and vehicle ramp: 60/60/60. (h) Roof (not used for carparking): –/–/–. (4) For the purposes of subclause (3): (a) ESA/M means the ratio of exposed surface area to mass per unit length. (b) Refer to Specification 17 for special requirements for a sprinkler system in a carpark complying with (3) and located within a multi-classified building.
S5C20 Type A fire-resisting construction — Class 2 and 3 buildings: Concession			X		(1) In a Class 2 or 3 building with a rise in storeys of not more than 3— (a) notwithstanding C2D10(1) and (2) and C3D7, timber framing may be used for— (i) external walls; and (ii) common walls; and (iii) the floor framing of lifts pits; and

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[2019: Spec C1.1: 3.10]					(iv) non-loadbearing internal walls which are required to be fire-resisting; and (v) non-loadbearing shafts, except shafts used for the discharge of hot products of combustion; and (vi) spandrels or horizontal construction provided for the purposes of C3D7; and (b) notwithstanding S5C11(1)(c), for loadbearing internal walls and loadbearing fire walls— (i) timber framing may be used; and (ii) non-combustible materials may be used; and (c) notwithstanding S5C3(1)(c), timber framing may be used for a part of a building that provides support to a part of a building constructed of timber framing or non-combustible material in accordance with S5C20(1)(a) and (b). (2) A Class 2 or 3 building having a rise in storeys of not more than 4 may have the top three storeys constructed in accordance with (1) provided— (a) the lowest storey is used solely for the purpose of parking motor vehicles or for some other ancillary purpose; and (b) the lowest storey is constructed of concrete or masonry including the floor between it and the Class 2 or 3 part of the building above; and (c) the lowest storey and the storey above are separated by construction having an FRL of not less than 90/90/90 with no openings or penetrations that would reduce the fire-resisting performance of that construction except that a doorway in that construction may be protected by a –/60/30 self-closing fire door. (3) In a Class 2 or 3 building complying with (1) or (2) and fitted with a sprinkler system (other than a FPAA101D or FPAA101H system) complying with Specification 17, any FRL criterion prescribed in Tables S5C11a to S5C11g— (a) for any floor and any loadbearing wall, may be reduced to 60, except any FRL criterion of 90 for an external wall must be maintained when tested from the outside; and (b) for any non-loadbearing internal wall, need not apply if— (i) it is lined on each side with 13 mm standard grade plasterboard or similar non-combustible material; and (ii) it extends— (A) to the underside of the floor next above; or (B) to the underside of a ceiling with a resistance to the incipient spread of fire of 60 minutes; or (C) to the underside of a non-combustible roof covering; and (iii) any insulation installed in the cavity of the wall is non-combustible; and (iv) any construction joint, space or the like between the top of the wall and the floor, ceiling or roof is smoke sealed with intumescent putty or other suitable material; and (v) any doorway in the wall is protected by a self-closing, tight fitting, solid core door not less than 35 mm thick.
S5C21			X		Not applicable. Not Type B.

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Type B fire-resisting construction — fire-resistance of building elements [2019: Spec C1.1: 4.1 and Table 4]					
S5C22 Type B fire-resisting construction — carparks [2019: Spec C1.1: 4.2 and Table 4.2]			X		Not applicable. Not Type B.
S5C23 Type B fire-resisting construction — Class 2 and 3 buildings: Concession [2019: Spec C1.1: 4.3]			X		Not applicable. Not Type B.
S5C24 Type C fire-resisting construction — fire-resistance of building elements [2019: Spec C1.1: 5.1 and Table 5]			X		Not applicable. Not Type C.
S5C25 Type C fire-resisting construction — carparks [2019: Spec C1.1: 5.2 and Table 5.2]			X		Not applicable. Not Type C.
Specification 6 Structural tests for lightweight construction					
S6C1 Scope [2019: Spec C1.8: 1]			X		This Specification describes tests to be applied to and criteria to be satisfied by a wall system of lightweight construction.
S6C2 Application [2019: Spec C1.8: 2]			X		A wall system need not be tested in accordance with this Specification for static pressure or impact if it is designed and constructed in accordance with the Deemed-to-Satisfy Provisions of Part B1 to resist the appropriate pressures and impacts defined in this Specification.
S6C3			X		(1) Lightweight construction forming— (a) a wall of a lift shaft and stair shaft; and

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Walls of certain Class 9b buildings [2019: Spec C1.8: 3.1]					(b) an external and internal wall bounding a public corridor, public lobby or the like, including a fire-isolated and non-fire-isolated passageway or ramp, in spectator stand, sports stadium, cinema or theatre, railway or bus station or airport terminal, must be subjected to the tests and must fulfil the criteria set out in (2). (2) For the purposes of (1), the following tests and criteria apply: (a) The materials tests of S6C10(a) and the criteria of S6C11(a). (b) A static test by the imposition of a uniformly distributed load of 1.0 kPa (or its equivalent) in accordance with S6C10(b) and the damage and deflection criteria of S6C11(b) and (c) respectively. (c) A dynamic test by the fall of the impact bag through a height of 350 mm in accordance with S6C10(c) and the damage and deflection criteria of S6C11(b) and (d) respectively. (d) The surface indentation test of S6C10(d) and the surface indentation criterion of S6C11(e).
S6C4 Walls of shafts and fire-isolated exits generally [2019: Spec C1.8: 3.2]			X		A wall of lightweight construction that is required to be fire-resisting and which bounds a lift shaft, stair shaft, or service shaft, fire-isolated passageway or fire-isolated ramp must be subjected to the following tests and must fulfil the following criteria: (a) The materials tests of S6C10(a) and the criteria of S6C11(a). (b) A static test by the imposition of a uniformly distributed load of 0.35 kPa (or its equivalent) in accordance with S6C10(b) and the damage and deflection criteria of S6C11(b) and (c) respectively. (c) A dynamic test by the fall of the impact bag through a height of 150 mm in accordance with S6C10(c) and the damage and deflection criteria of S6C11(b) and (d) respectively. (d) The surface indentation test of S6C10(d) and the surface indentation criterion of S6C11(e).
S6C5 Additional requirements for lift shafts [2019: Spec C1.8: 3.3]			X		(1) In addition to the requirements of S6C3 and S6C4, a wall system for use in a lift shaft that is required to be fire-resisting must be subjected to dynamic test by the imposition of— (a) where the lift car speed is 7 m/s or less — 10^6 cycles of a uniformly distributed load between 0 and 0.2 kPa (or its equivalent); or (b) where the lift car speed is greater than 7 m/s — 10^6 cycles of a uniformly distributed load between 0 and 0.35 kPa (or its equivalent) in accordance with S6C10(e) and must fulfil the damage criteria of S6C11. (2) The wall system must be subjected to the static test in accordance with S6C4(b) after the successful conclusion of the dynamic test specified in (1).
S6C6 Walls generally [2019: Spec C1.8: 3.4]			X		An external and internal wall of lightweight construction that is required to be fire-resisting, other than one covered by S6C3, S6C4 or S6C5, must be subjected to the following tests and must fulfil the following criteria: (a) The materials tests of S6C10(a) and the criteria of S6C11(a). (b) A static test by the imposition of a uniformly distributed load of 0.25 kPa (or its equivalent) in accordance with S6C10(b) and the damage and deflection criteria of S6C11(b) and (c) respectively.

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
					(c) A dynamic test by fall of the impact bag through a height of 100 mm in accordance with S6C10(c) and the damage and deflection criteria of S6C11(b) and (d) respectively. (d) The surface indentation test of S6C10(d) and the surface indentation criterion of S6C11(e).
S6C7 General requirements for testing [2019: Spec C1.8: 4.1]			X		Testing must be carried out on either— (a) construction in-situ; or (b) a laboratory specimen of the construction.
S6C8 Testing in-situ [2019: Spec C1.8: 4.2]			X		If testing is carried out in-situ, it must be done on that part of the construction least likely, because of the particular combination of the height of the walls, the support conditions, and other aspects of the construction, to resist the loads.
S6C9 Testing of specimens [2019: Spec C1.8: 4.3]			X		If a laboratory specimen is tested, the specimen must span only in the direction corresponding to the height of the wall and testing must be done in accordance with either (a) or (b) below: (a) The test specimen— (i) height (or length, if the specimen is tested horizontally) must be identical with the height between supports in the actual construction; and (ii) must be supported at the top and bottom (or at each end if tested horizontally) by components identical with, and in a manner identical with, the actual construction. (b) If the distance between supports of the actual construction is more than 3 m, then a smaller specimen may be tested but— (i) the distance between supports must be not less than 3 m; and (ii) forces, reactions and support conditions must be modelled so as to reproduce the behaviour of the actual construction if it were tested in-situ.
S6C10 Test methods [2019: Spec C1.8: 5]			X		Tests must be carried out in accordance with the following: (a) Material tests — The methods specified for the constituent materials of the construction of the standards adopted by reference in the NCC. (b) For resistance to static pressure — The provisions for testing walls under transverse load in ASTM E72-15, except that— (i) support conditions must be as specified in S6C9; and (ii) equivalent load shall mean the quarter-point load that produces the same deflection or central moment as appropriate; and (iii) the timber species nominated in that standard may be substituted with a different species. (c) For resistance to impact — The provisions for testing wall systems in ASTM E695-03, except that— (i) the point of impact must be set 1.5 m above finished floor level or 1.5 m above the part of the specimen that corresponds to finished floor level; and

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					(ii) the impact bag must be not less than 225 mm in diameter and not more than 260 mm in diameter and have a mass of not less than 27.2 kg or more than 27.3 kg; and (iii) the mass must be achieved by putting loose, dry sand into the bag and must be adjusted before each series of impact tests; and (iv) where the impact bag and suspension cannot be vertical at the instant of impact on a curved surface or an inclined surface, the height of drop is the net height at the point of impact. (d) For resistance to surface indentation — The test for resistance to surface indentation must be carried out at three points on the surface of an undamaged sample sheet as follows: (i) A steel ball of 10 mm diameter with a load of 150 N must be placed gently on the surface of the sheet and allowed to \ remain in position for 5 minutes. (ii) The ball and load must then be removed and the diameter of each impression of the ball on the surface measured. (e) For resistance of lift shaft construction to repetitive load — As for (b) except that— (i) it is sufficient to test one specimen with the pressure applied from the side of the construction on which the lift will operate; and (ii) the load must be applied dynamically at a frequency not less than 1 Hz and not more than 3 Hz; and (iii) equivalent load shall mean the quarter-point load that produces the same central moment as the distributed load.
S6C11 Criteria for compliance [2019: Spec C1.8: 6]			X		The wall system or the specimen of it must fulfil the following criteria: (a) Materials — Materials must comply with the applicable standard adopted by reference in the NCC. (b) Damage — There must be no crack, penetration or permanent surface-deformation to a depth of more than 0.5 mm or any other non-elastic deformation or fastener failure. (c) Deflection — Static pressure — Under static pressure the deflection must not be more than— (i) 1/240th of the height between supports; or (ii) for construction other than a lift shaft — 30 mm; or (iii) for a lift shaft — 20 mm. (d) Deflection — Impact — Under impact the instantaneous deflection must not be more than— (i) 1/120th of the height of the wall between supports; or (ii) for construction other than a lift shaft — 30 mm; or (iii) for a lift shaft— 20 mm. (e) Surface indentation — No impression must be more than 5 mm in diameter.
Specification 7 Fire Hazard Properties					

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
S7C1 Scope [2019: Spec C1.10: 1]			X		This Specification sets out requirements in relation to the fire hazard properties of linings, materials and assemblies in Class 2 to 9 buildings as set out in Table S7C2.
S7C2 Application [2019: Spec C1.10: 2]			X		Linings, materials and assemblies must comply with the appropriate requirement described in Table S7C2.
S7C3 Floor linings and floor coverings [2019: Spec C1.10: 3]				X	A floor lining or floor covering must have— (a) a critical radiant flux not less than that listed in Table S7C3; and (b) in a building not protected by a sprinkler system (other than a FPAA101D or FPAA101H system) complying with Specification 17, a maximum smoke development rate of 750 percent-minutes; and (c) a group number complying with S7C6(b), for any portion of the floor covering that is continued more than 150 mm up a wall. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S7C4 Wall and ceiling linings [2019: Spec C1.10: 4]				X	(1) A wall or ceiling lining system must comply with the group number specified in Table S7C4 and for buildings not fitted with a sprinkler system (other than a FPAA101D or FPAA101H system) complying with Specification 17 have— (a) a smoke growth rate index not more than 100; or (b) an average specific extinction area less than 250 m^2 /kg. (2) A group number of a wall or ceiling lining and the smoke growth rate index or average specific extinction area must be determined in accordance with AS 5637.1. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S7C5 Air-handling ductwork [2019: Spec C1.10: 5]				X	Rigid and flexible ductwork in a Class 2 to 9 building must comply with the fire hazard properties set out in AS 4254.1 and AS 4254.2. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S7C6 Lift cars [2019: Spec C1.10: 6]				X	Materials used as— (a) floor linings and floor coverings must have a critical radiant flux not less than 2.2; and (b) wall and ceiling linings must be a Group 1 material or a Group 2 material in accordance with AS5637.1. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
NSW S7C7 Other materials [2019: Spec C1.10: 7]				X	Materials and assemblies not included in S7C3, S7C4, S7C5 or S7C6 must not exceed the indices set out in NSW Table S7C7. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
Specification 8 Performance of external walls in fire					

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S8C1 Scope [2019: Spec C1.11: 1]			X		Not applicable. C2D12 is not applicable.
S8C2 Application [2019: Spec C1.11: 2]			X		Not applicable. C2D12 is not applicable.
S8C3 General requirements for external wall panels [2019: Spec C1.11: 3]			X		Not applicable. C2D12 is not applicable.
S8C4 Additional requirements for vertically spanning external wall panels adjacent to column [2019: Spec C1.11: 4]			X		Not applicable. C2D12 is not applicable.
Specification 9 Cavity barriers for fire-protected timber					
S9C1 Scope [2019: Spec C1.13: 1]			X		This Specification sets out requirements for cavity barriers in fire-protected timber construction.
S9C2 Requirements [2019: Spec C1.13: 2]			X		Not applicable. C2D13 is not applicable.
Specification 10 Fire-protected timber					
S10C1 Scope [2019: Spec C1.13a: 1]			X		Not applicable. C2D13 is not applicable.
S10C2 General requirements [2019: Spec C1.13a: 2.1]			X		Not applicable. C2D13 is not applicable.
S10C3			X		Not applicable. C2D13 is not applicable.

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Massive timber [2019: Spec C1.13a: 2.2]					
S10C4 Form of test [2019: Spec C1.13a: 3.1]			X		Not applicable. C2D13 is not applicable.
S10C5 Smaller specimen permitted [2019: Spec C1.13a: 3.2]			X		Not applicable. C2D13 is not applicable.
S10C6 Acceptance criteria [2019: Spec C1.13a: 3.3]			X		Not applicable. C2D13 is not applicable.
Specification 11 Smoke-proof walls in healthcare and residential care buildings					
S11C1 Scope [2019: Spec C2.5: 1]			X		Not applicable. C3D6 is not applicable
S11C2 Class 9a health-care buildings [2019: Spec C2.5: 2]			X		Not applicable. C3D6 is not applicable
S11C3 Class 9c buildings [2019: Spec C2.5: 3]			X		Not applicable. C3D6 is not applicable
S11C4 Doorways in smoke-proof walls [2019: Spec C2.5: 4]			X		Not applicable. C3D6 is not applicable
Specification 12 Fire doors, smoke doors, fire windows and shutters					
S12C1 Scope [2019: Spec C3.4: 1]			X		This Specification sets out requirements for the construction of fire doors, smoke doors, fire windows and fire shutters.
S12C2 Fire Doors [2019: Spec C3.4: 2]				X	A required fire door must— (a) comply with AS 1905.1; and (b) not fail by radiation through any glazed part during the period specified for integrity in the required FRL.

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					Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification
S12C3 General requirements for smoke doors [2019: Spec C3.4: 3.1]			X		Not applicable. No smoke doors.
S12C4 Construction Deemed-to-Satisfy [2019: Spec C3.4: 3.2]				X	A smoke door of one or two leaves satisfies S12C3 if it is constructed as follows: (a) The leaves are side-hung to swing— (i) in the direction of egress; or (ii) in both directions. (b) The leaves are solid-core and at least 35 mm thick, or are capable of resisting smoke at 200°C for 30 minutes. (c) The leaves are fitted with smoke seals. (d) The leaves— (i) are normally in the closed position; or (ii) operate such that— (A) they are closed automatically with the automatic closing operation initiated by smoke detectors, installed in accordance with the relevant provisions of AS 1670.1, located on each side of the doorway not more than 1.5 m horizontal distance from the doorway; and (B) in the event of power failure to the door, they will fail-safe in the closed position. (e) The leaves return to the fully closed position after each manual opening. (f) Any glazing incorporated in the door complies with AS 1288. (g) If a glazed panel is capable of being mistaken for an unobstructed exit, the presence of the glass must be identified by an opaque mid-height band, mid-rail, crash-bar or other opaque construction. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S12C5 Fire shutters [2019: Spec C3.4: 4]				X	A required fire shutter must— (a) be a shutter that— (i) is identical with a tested prototype that has achieved the required FRL; and (ii) is installed in the same manner and in an opening that is not larger than the tested prototype; and (iii) did not have a rise in average temperature on the side remote from the furnace of more than 140 K during the first 30 minutes of the test; or (b) be a steel shutter complying with AS 1905.2 if a metallic fire shutter is not prohibited by C4D6. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***

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S12C6 Fire windows [2019: Spec C3.4: 6]				X	A required fire window must be— (a) identical in construction with a prototype that has achieved the required FRL; and (b) installed in the same manner and in an opening that is not larger than the tested prototype. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
Specification 13 Penetration of walls, floors and ceilings by services					
S13C1 Scope [2019: Spec C3.15: 1]			X		This Specification prescribes materials and methods of installation for services that penetrate walls, floors and ceilings required to have an FRL.
S13C2 Application [2019: Spec C3.15: 2]			X		Not applicable. Protection of penetrations will be in accordance with the tested system.
S13C3 Metal pipe systems [2019: Spec C3.15: 3]			X		Not applicable. Protection of penetrations will be in accordance with the tested system.
S13C4 Pipes penetrating sanitary compartments [2019: Spec C3.15: 4]			X		Not applicable. Protection of penetrations will be in accordance with the tested system.
S13C5 Wires and cables [2019: Spec C3.15: 5]			X		Not applicable. Protection of penetrations will be in accordance with the tested system.
S13C6 Electrical switches and outlets [2019: Spec C3.15: 6]			X		Not applicable. Protection of penetrations will be in accordance with the tested system.
S13C7 Fire-stopping [2019: Spec C3.15: 7]			X		Not applicable. Protection of penetrations will be in accordance with the tested system.
Section D Access and Egress					
Part D2 Provision for escape					
D2D1 Deemed-to-Satisfy Provisions			X		(1) Where a Deemed-to-Satisfy Solution is proposed, Performance Requirements D1P1 to D1P6, D1P8 and D1P9 are satisfied by complying with—

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[2019: D1.0]					(a) D2D2 to D2D23, D3D2 to D3D30 and D4D2 to D4D13; and (b) in a building containing an atrium, Part G3; (2) Where a Performance Solution is proposed, the relevant Performance Requirements must be determined in accordance with A2G2(3) and A2G4(3) as applicable. (3) Performance Requirement D1P7 must be complied with if lifts are to be used to assist occupants to evacuate a building.
D2D2 Application of Part [2019: D1.1]			X		The Deemed-to-Satisfy Provisions of this Part do not apply to the internal parts of a sole-occupancy unit in a Class 2 or 3 building or a Class 4 part of a building.
NSW D2D3 Number of exits required [2019: D1.2]				X	(1) All buildings — Every building must have at least one exit from each storey. (2) Class 2 to 8 buildings — (a) In addition to any horizontal exit, not less than 2 exits must be provided from the following: (i) Each storey if the building has an effective height of more than 25 m. (ii) A Class 2 or 3 building subject to C2D6. (b) The requirements of (a)(i) do not apply to a part of a storey that— (i) is provided with direct egress to a road or open space; and (ii) satisfies D2D5 by the provision of 1 exit. (3) Basements — In addition to any horizontal exit, not less than 2 exits must be provided from any storey if egress from that storey involves a vertical rise within the building of more than 1.5 m, unless— (a) the floor area of the storey is not more than 50 m²; and (b) the distance of travel from any point on the floor to a single exit is not more than 20 m. (4) Class 9 buildings — (a) In addition to any horizontal exit, not less than 2 exits must be provided from the following: (i) Each storey if the building has a rise in storeys of more than 6 or an effective height of more than 25 m. (iv) Any storey used as a Class 9b early childhood centre, or any Class 9b early childhood centre which forms part of a storey. (vi) Any storey or mezzanine that accommodates more than 50 persons, calculated under D2D18. (b) The requirements of (a) do not apply to a part of a storey that— (i) is a plant room, machinery room, storeroom, lift-machine room or the like; and (ii) is provided with direct egress to a road, open space or a fire-isolated exit complying with D2D12(2); and (iii) satisfies D2D5 by the provision of 1 exit. (7) Access to exits — Without passing through another sole-occupancy unit every occupant of a storey or part of a storey must have access to— (a) an exit; or

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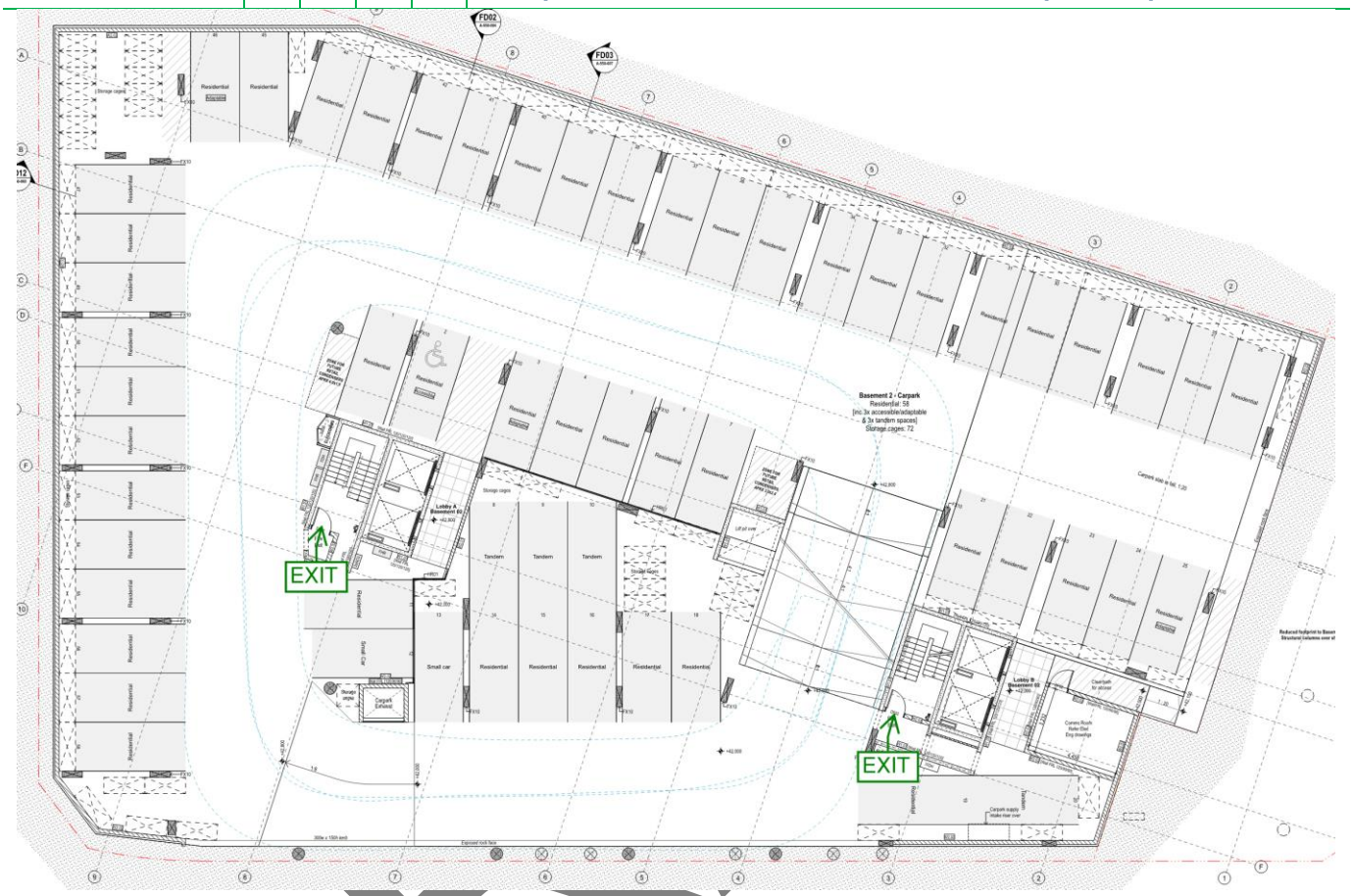
					(b) at least 2 exits if 2 or more exits are required. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***



Basement 2

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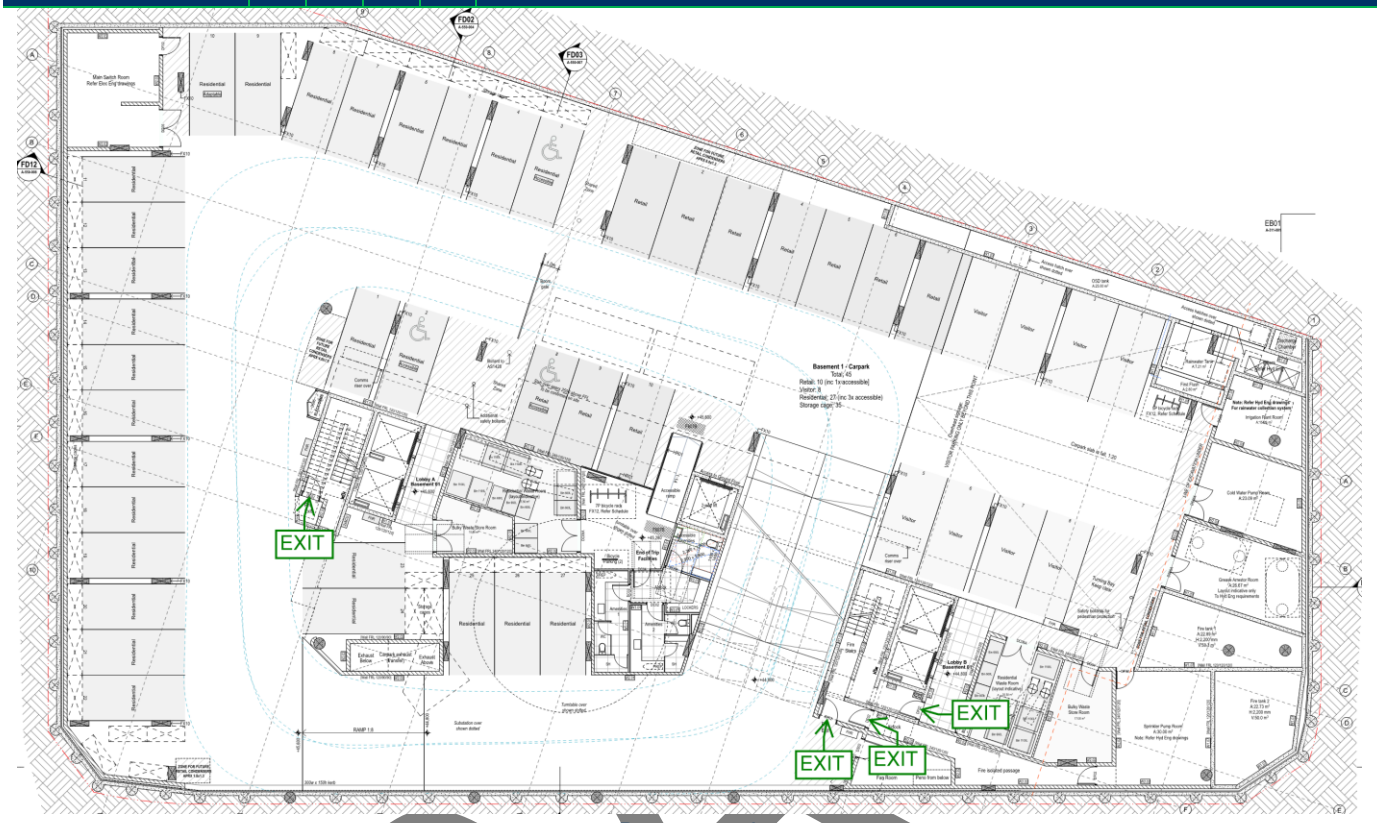
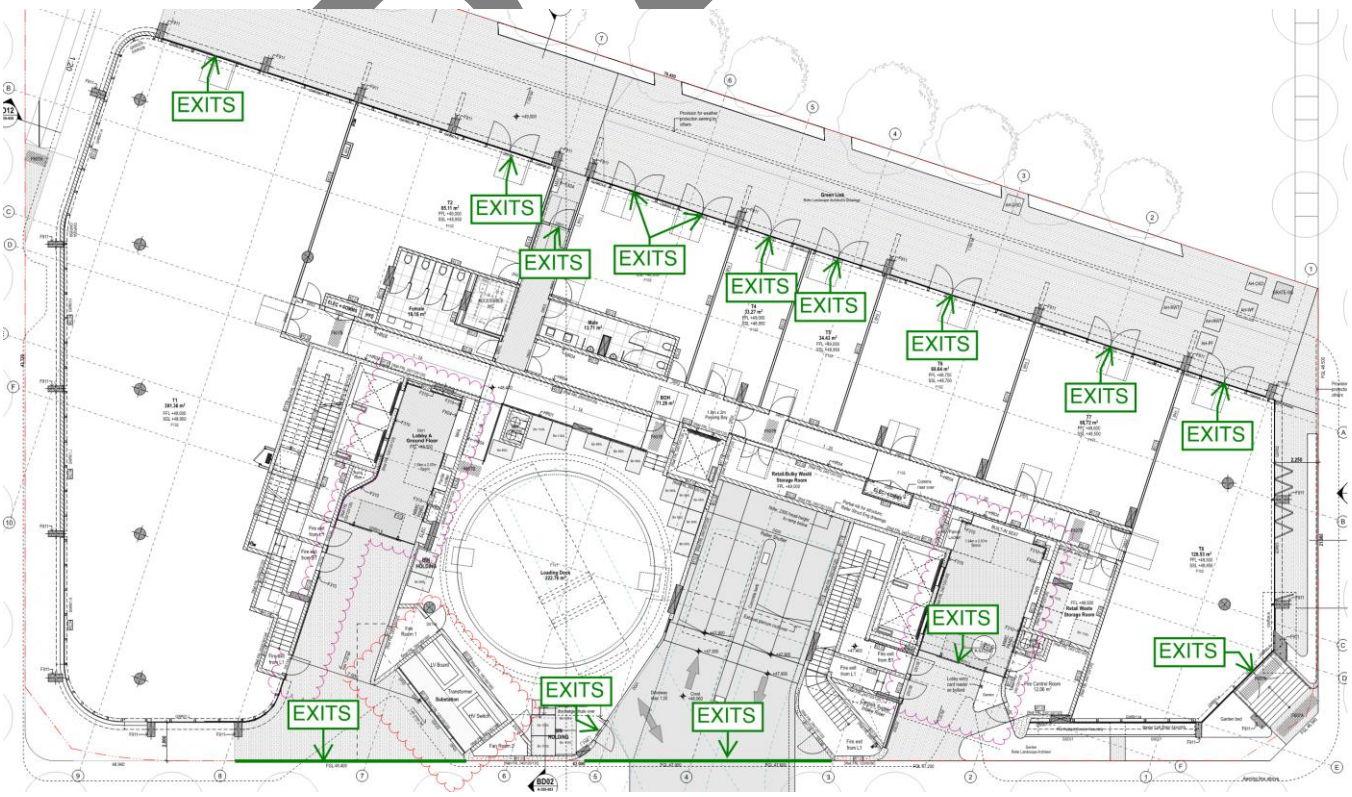


Basement 1



Ground Floor

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
					Level 3 Level 15
D2D4				X	(1) Class 2 and 3 buildings — The following applies:

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
When fire-isolated stairways and ramps are required [2019: D1.3]					(a) Subject to (b), every stairway or ramp serving as a required exit must be fire-isolated unless it connects, passes through or passes by not more than— (i) 3 consecutive storeys in a Class 2 building; or (b) Notwithstanding (a), one extra storey of any classification may be included if— (i) it is only for the accommodation of motor vehicles or for other ancillary purposes; or (ii) the building has a sprinkler system (other than a FPAA101D system) complying with Specification 17 installed throughout; or (iii) the required exit does not provide access to or egress for, and is separated from, the extra storey by construction having— (A) an FRL of –/60/60, if non-loadbearing; and (B) an FRL of 90/90/90, if loadbearing; and (C) no opening that could permit the passage of fire or smoke. (2) Class 5, 6, 7, 8 or 9 buildings — Every stairway or ramp serving as a required exit must be fire-isolated unless— (c) in any other case, it connects, passes through or passes by not more than 2 consecutive storeys and one extra storey of any classification may be included if— (i) the building has a sprinkler system (other than a FPAA101D system) complying with Specification 17 installed throughout; or (ii) the required exit does not provide access to or egress for, and is separated from, the extra storey by construction having— (A) an FRL of –/60/60, if non-loadbearing; and (B) an FRL of 90/90/90 for Type A construction or 60/60/60 for Type B or C construction, if loadbearing; and (C) no opening that could permit the passage of fire or smoke. **COMPLIANCE COMMENTARY** **All stairways are fire-isolated, as required.**
D2D5 Exit travel distances [2019: D1.4]		X			(1) Class 2 and 3 buildings — (a) The entrance doorway of any sole-occupancy unit must be not more than— (i) 6 m from an exit or from a point from which travel in different directions to 2 exits is available; or (ii) 20 m from a single exit serving the storey at the level of egress to a road or open space; and (b) no point on the floor of a room which is not in a sole-occupancy unit must be more than 20 m from an exit or from a point at which travel in different directions to 2 exits is available. (3) Class 5, 6, 7, 8 or 9 buildings — Subject to (4), (5) and (6)—

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					(a) no point on a floor must be more than 20 m from an exit, or a point from which travel in different directions to 2 exits is available, in which case the maximum distance to one of those exits must not exceed 40 m; and (b) in a Class 5 or 6 building, the distance to a single exit serving a storey at the level of access to a road or open space may be increased to 30 m. (6) Assembly buildings — In a Class 9b building, the distance to one of the exits may be 60 m if— (a) the path of travel from the room concerned to that exit is through another area which is a corridor, hallway, lobby, ramp or other circulation space; and (b) the room is smoke-separated from the circulation space by construction having an FRL of not less than 60/60/60 with every doorway in that construction protected by a tight fitting, self-closing, solid-core door not less than 35 mm thick; and (c) the maximum distance of travel does not exceed 40 m within the room and 20 m from the doorway to the room through the circulation space to the exit. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification*** **COMPLIANCE COMMENTARY** **Basement 3 – Point on the floor that exceeds 40m, being 42.1m** **Basement 2 – Point on the floor that exceeds 40m, being 41.6m** **Ground Floor - point on the floor of a room which is not in a sole-occupancy unit must be more than 20 m from a point at which travel in different directions to 2 exits is available, being 24m.** **Level 1 – Level 14 - The entrance doorway of any sole-occupancy unit is more than 6 m from an exit or from a point from which travel in different directions to 2 exits is available, maximum being 7.4m.** **Level 16- The entrance doorway of any sole-occupancy unit is more than 6 m from an exit or from a point from which travel in different directions to 2 exits is available, maximum being 6.9m.**

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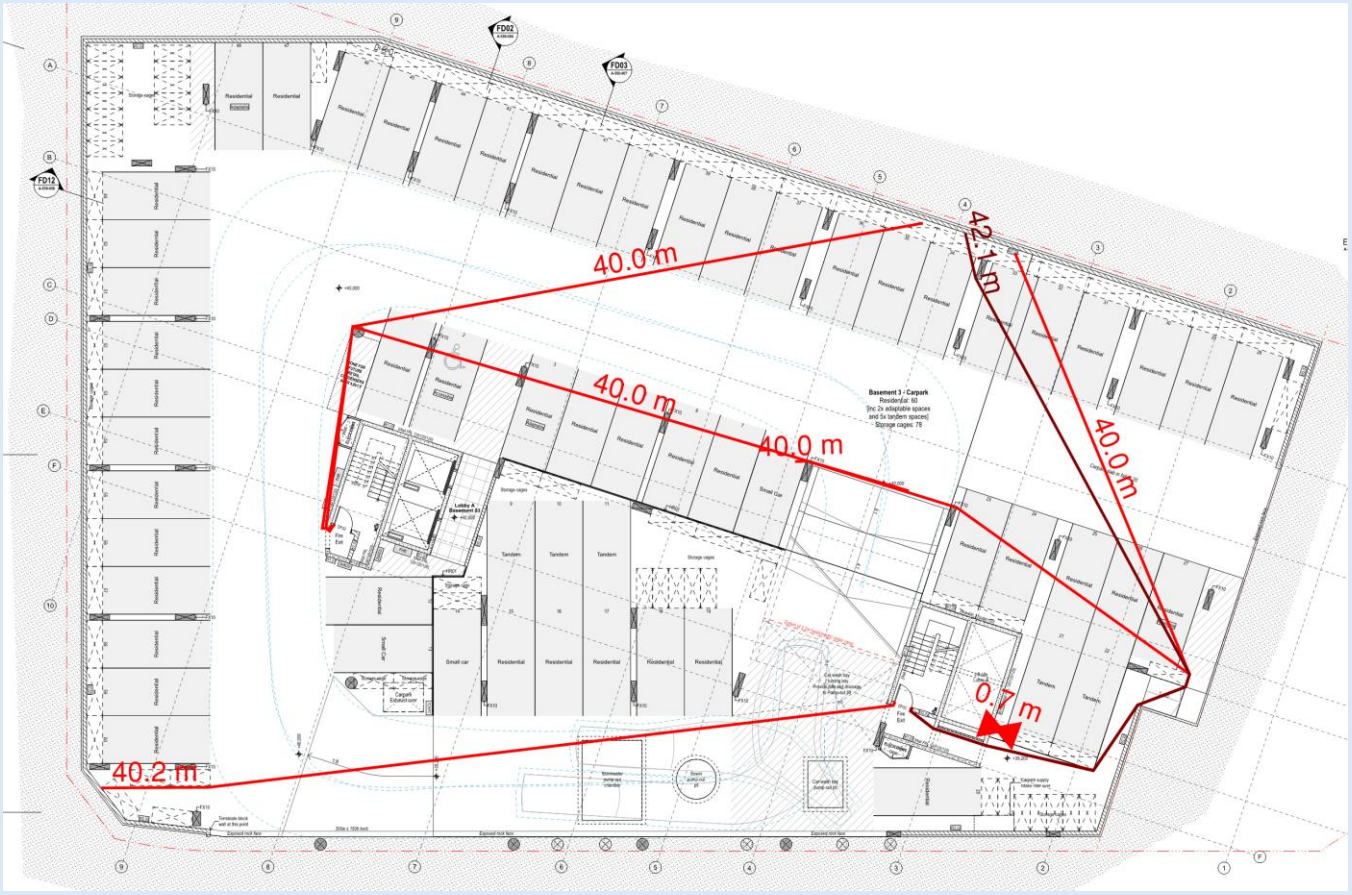
BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS



Basement 3

DRAFT

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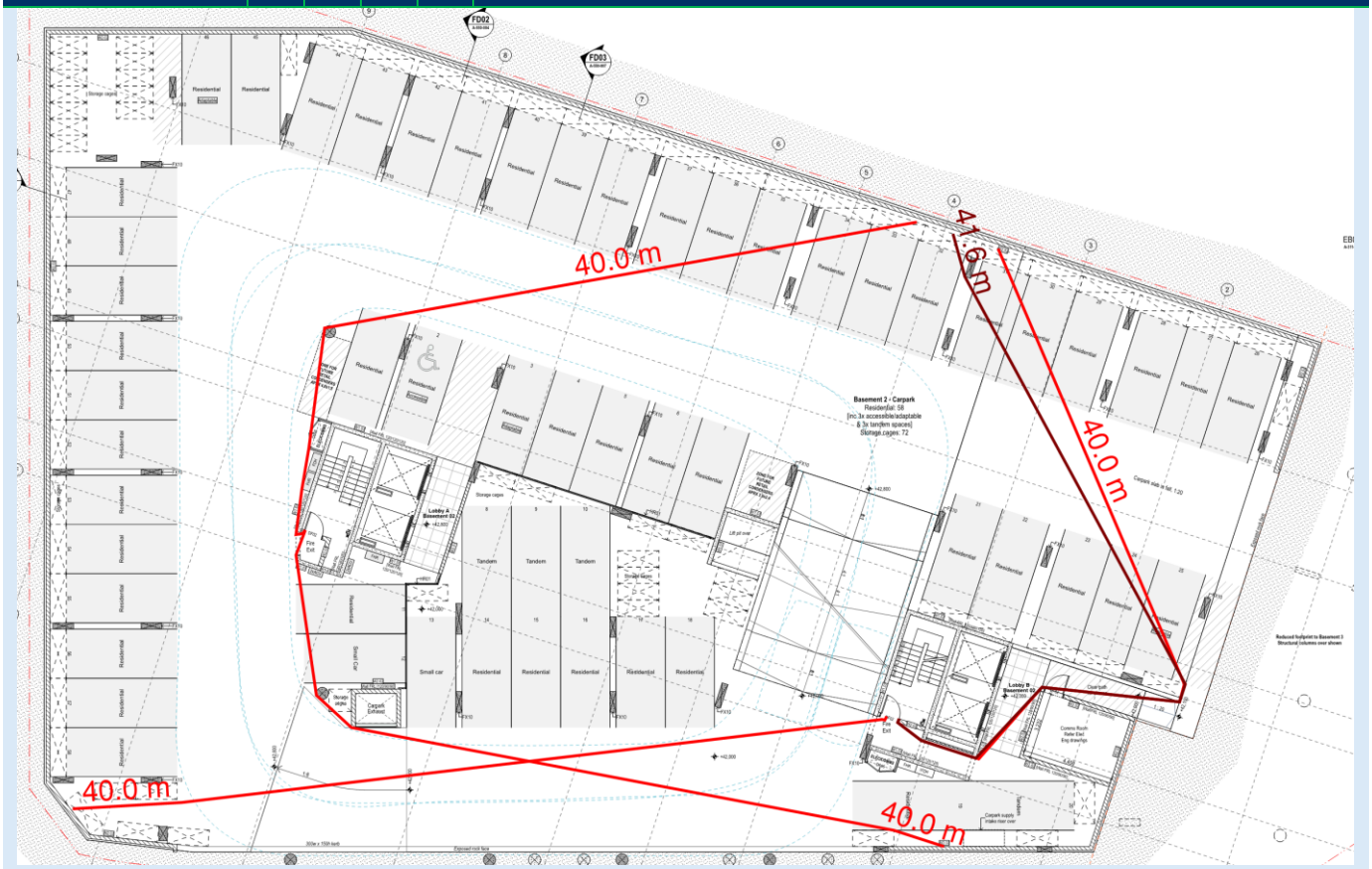
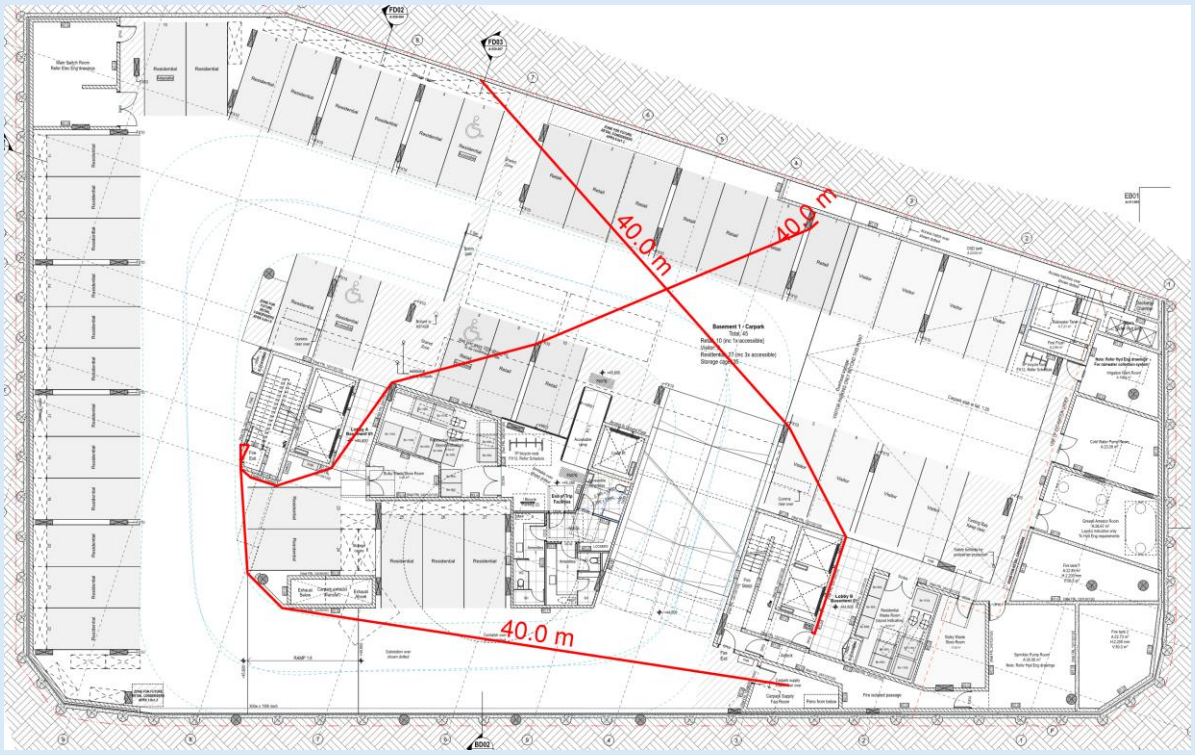


Basement 2



Basement 1

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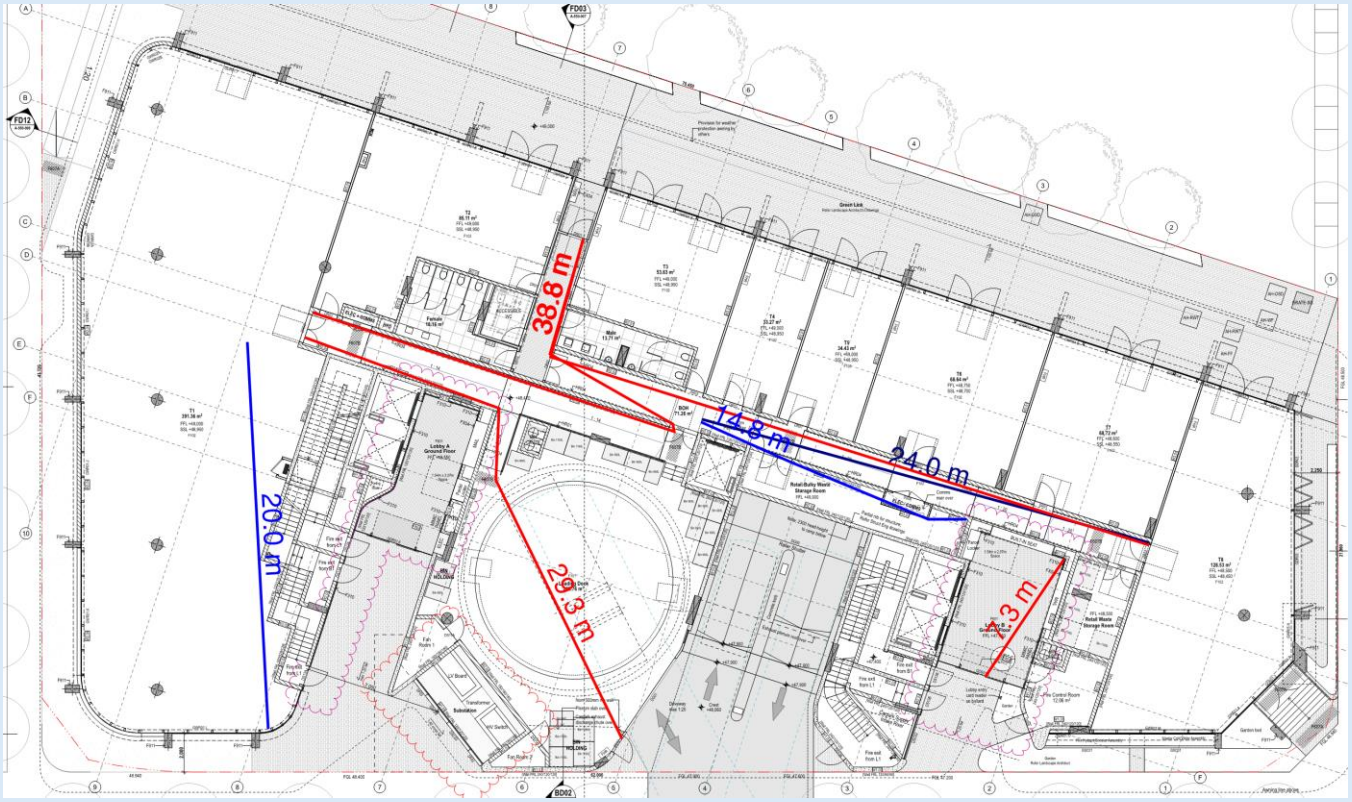

Ground Floor

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS

Level 1

Level 3

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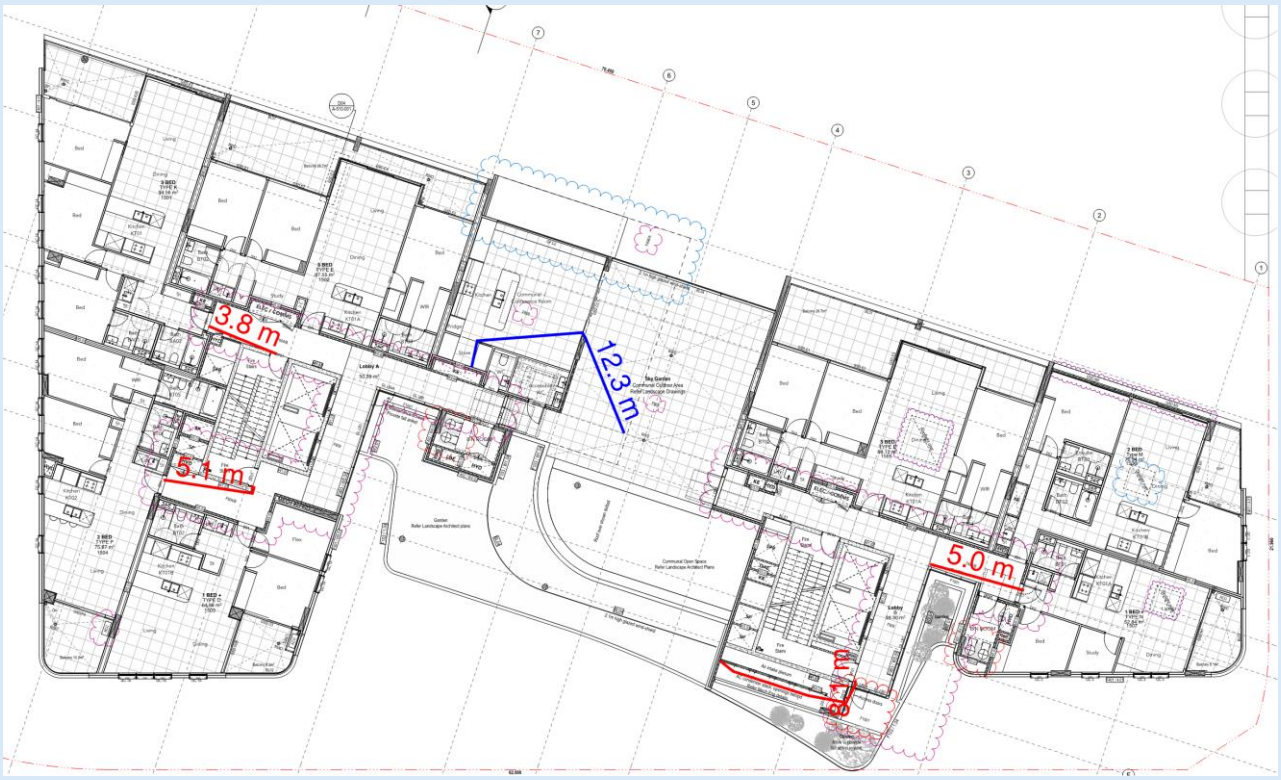
BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS

Level 5



Level 15

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
Level 16					
D2D6 Distance between alternative exits [2019: D1.5]		X			Exits that are required as alternative means of egress must be— (a) distributed as uniformly as practicable within or around the storey served and in positions where unobstructed access to at least 2 exits is readily available from all points on the floor including lift lobby areas; and (b) not less than 9 m apart; and (c) not more than— (i) in a Class 2 or 3 building — 45 m apart; or (iii) in all other cases — 60 m apart; and (d) located so that alternative paths of travel do not converge such that they become less than 6m apart. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification*** **COMPLIANCE COMMENTARY** **Basement 3 & 2 – Distance between alternative exits is more than 60m apart, maximum being 73.4m**

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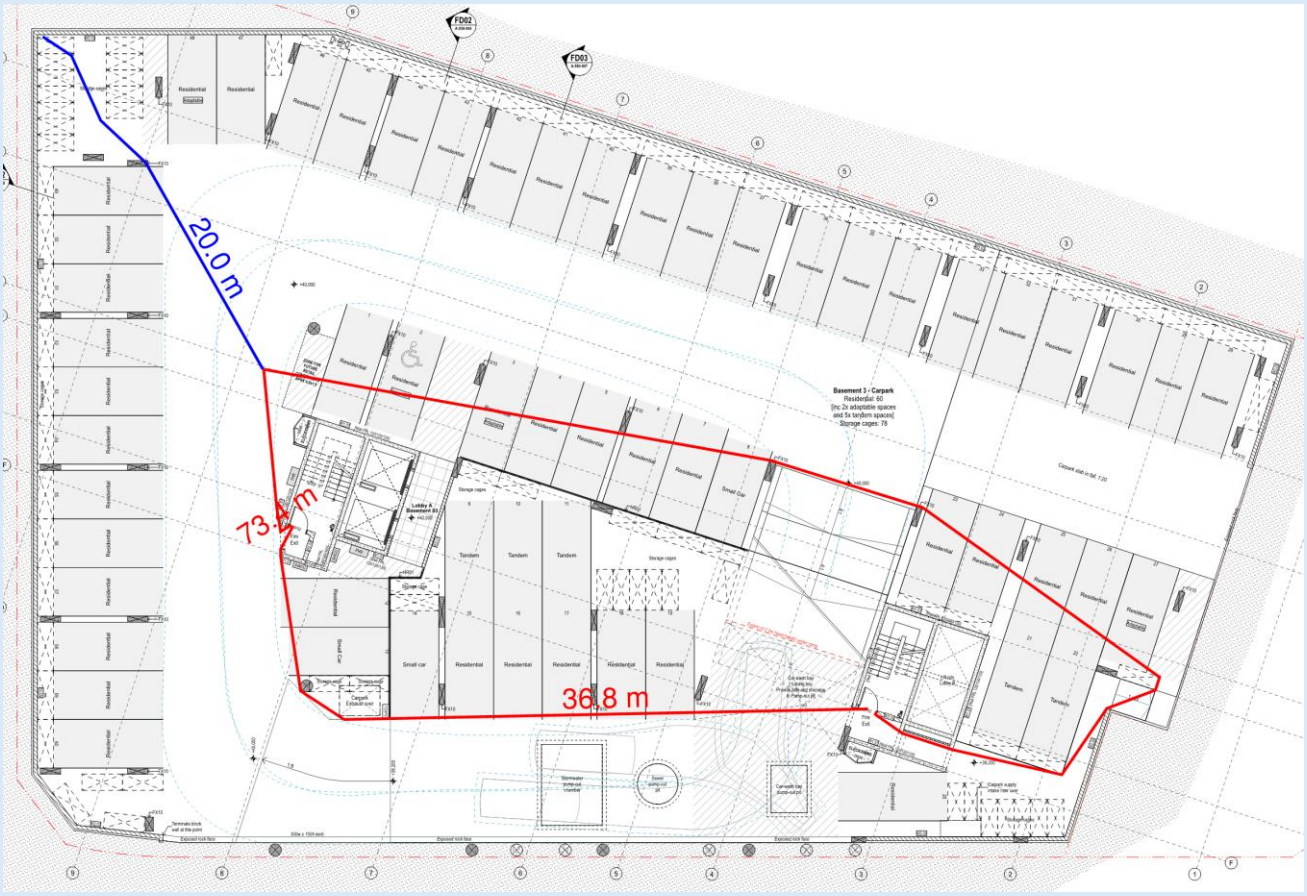

Basement 3

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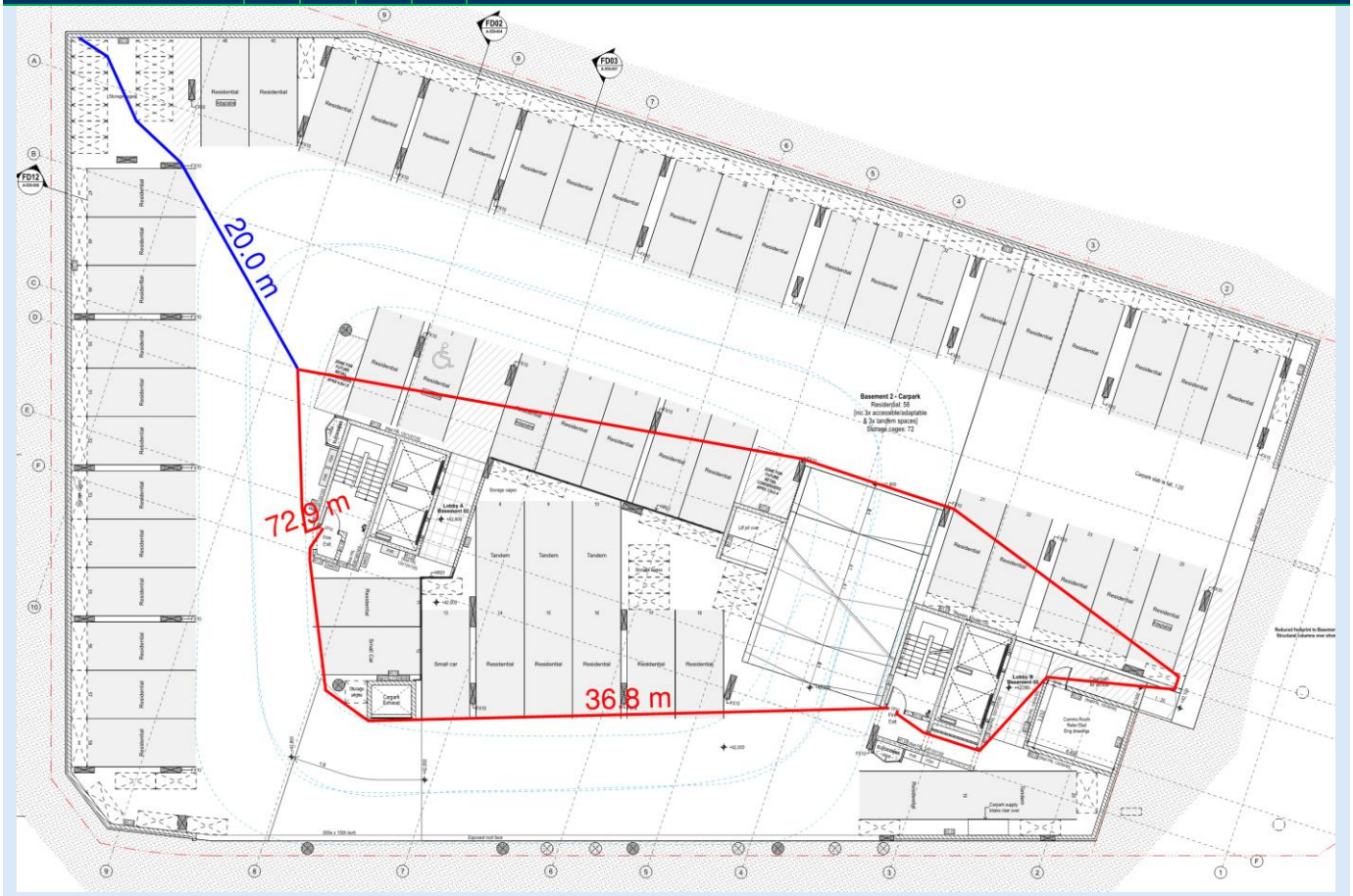

Basement 2

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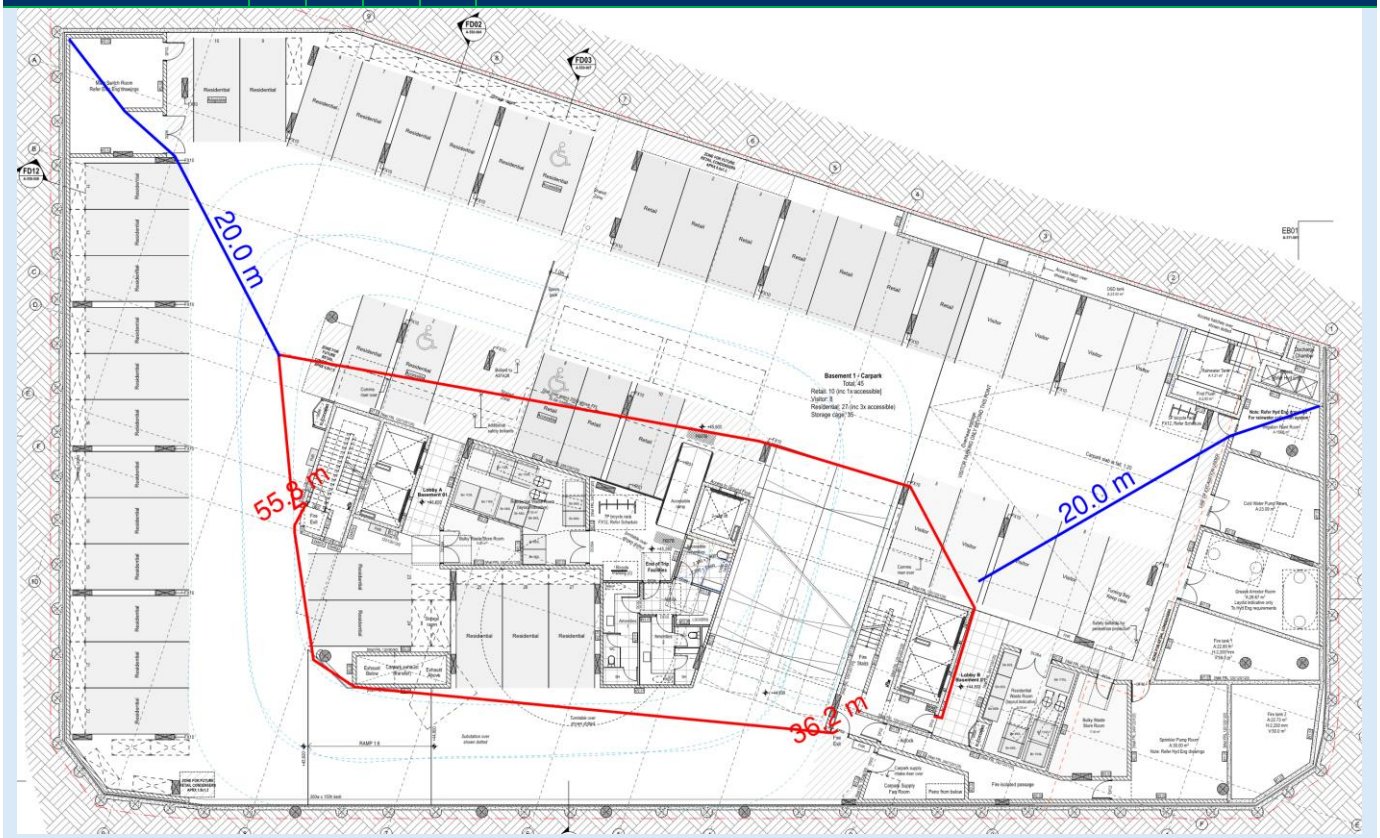
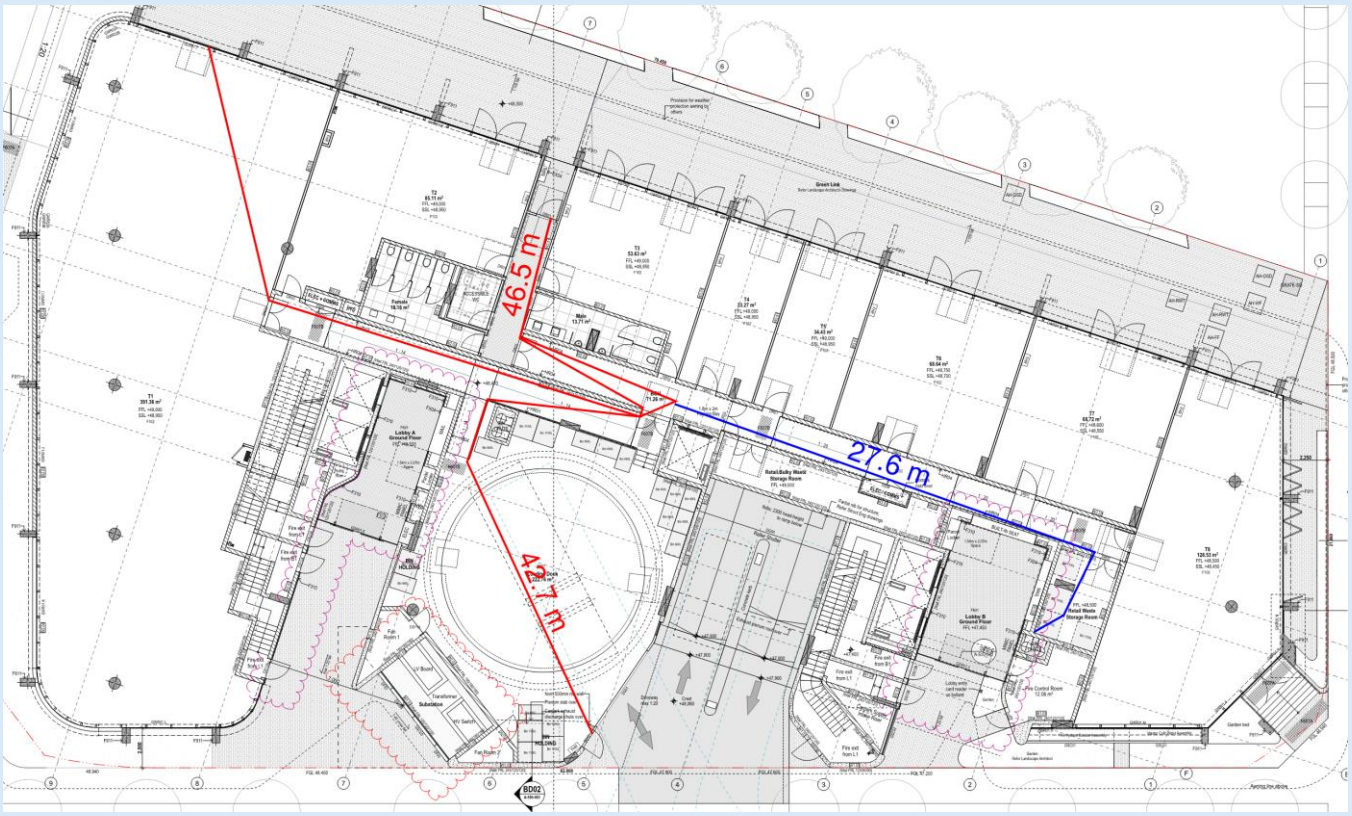


Basement 1 – DTS compliant



Ground

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS

Level 1

Level 2

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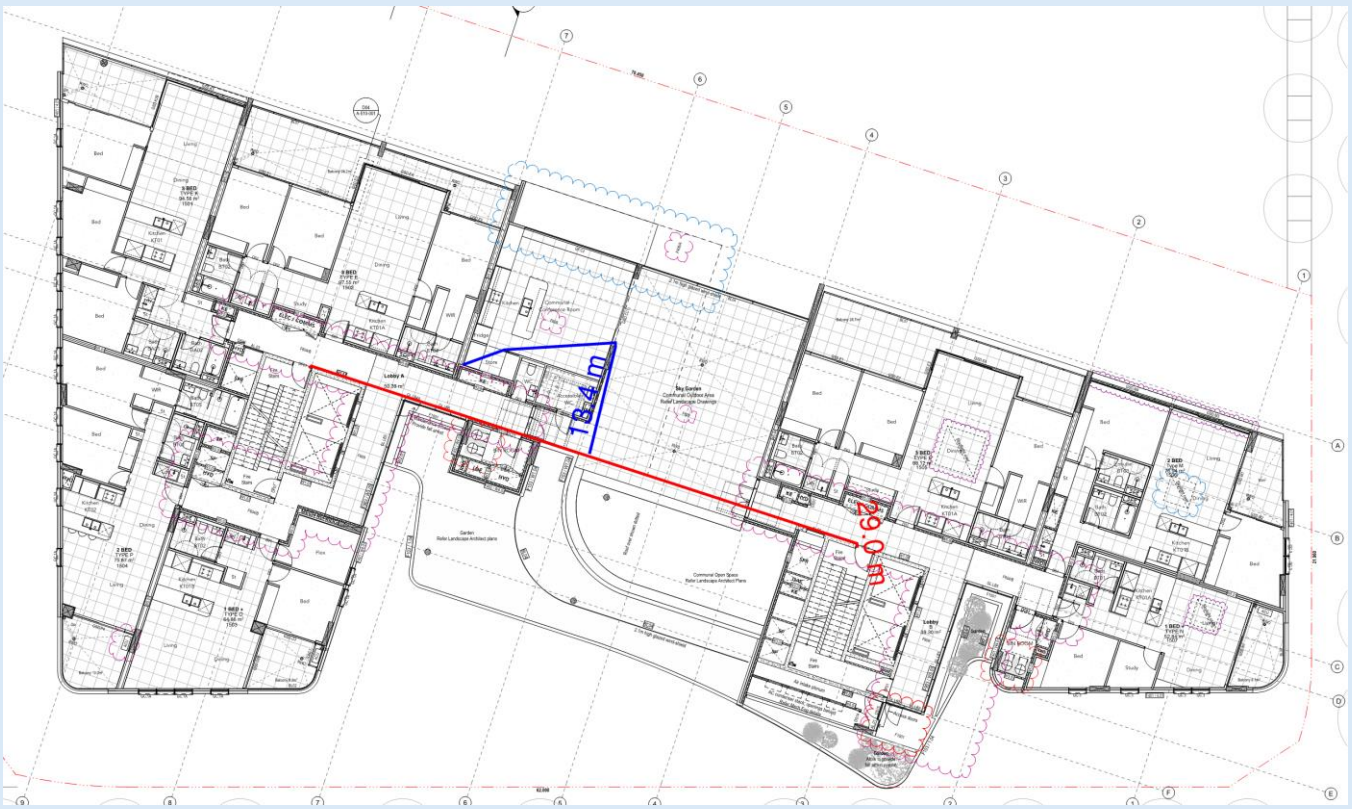

Level 15

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
D2D7 Height of doorways in exits and paths of travel to exits [2019: D1.6(a)]				X	In a required exit or path of travel to an exit the unobstructed height throughout must be not less than 2 m, except the unobstructed height of any doorway may be reduced to not less than 1980 mm. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
NSW D2D8 Width of exits and paths of travel to exits [2019: D1.6(b), (c), (d) and (e)]		X			(1) The unobstructed width of each required exit or path of travel to an exit, except for ladders provided in accordance with D2D21, D3D23 or I3D5, and doorways, must be not less than— (a) 1 m; ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification*** **COMPLIANCE COMMENTARY** **Paths of travel within plant areas is less than 1m in width.**
NSW D2D9 Width of doorways in exits or paths of travel to exits [2019: D1.6, NSW D1.6(f)(vi)]				X	In a required exit or path of travel to an exit, the unobstructed width of a doorway must be not less than— (f) in any other case except where it opens to a sanitary compartment or bathroom — 750 mm wide. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
D2D10 Exit width not to diminish in direction of travel [2019: D1.6(g)]				X	The unobstructed width of a required exit must not diminish in the direction of travel to a road or open space, except where the width is increased in accordance with D2D8(1)(b) or D2D9(a)(i). ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
D2D11 Determination and measurement				X	For the purposes of D2D7 to D2D10 the following apply: (a) The required width of a stairway or ramp in a required exit or path of travel to an exit must—

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of exits and paths of travel to exits [2019: D1.6(h) and (i)]					(i) be measured clear of all obstructions such as handrails projecting parts of barriers and the like; and (ii) extend without interruption, except for ceiling cornices, to a height not less than 2m vertically above a line along the nosings of the treads or the floor surface of the ramp or landing. (b) To determine the aggregate unobstructed width, the number of persons accommodated must be calculated according to D2D18. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
D2D12 Travel via fire-isolated exits [2019: D1.7]		X			(1) A doorway from a room must not open directly into a stairway, passageway or ramp that is required to be fire-isolated unless it is from— (a) a public corridor, public lobby or the like; or (b) a sole-occupancy unit occupying all of a storey; or (c) a sanitary compartment, airlock or the like. (2) Each fire-isolated stairway or fire-isolated ramp must provide independent egress from each storey served and discharge directly, or by way of its own fire-isolated passageway— (a) to a road or open space; or (b) to a point— (i) in a storey or space, within the confines of the building, that is used only for pedestrian movement, car parking or the like and is open for at least ⅔ of its perimeter; and (ii) from which an unimpeded path of travel, not further than 20 m, is available to a road or open space; or (c) into a covered area that— (i) adjoins a road or open space; and (ii) is open for at least ⅓ of its perimeter; and (iii) has an unobstructed clear height throughout, including the perimeter openings, of not less than 3 m; and (iv) provides an unimpeded path of travel from the point of discharge to the road or open space of not more than 6 m. (3) Where a path of travel from the point of discharge of a fire-isolated exit necessitates passing within 6 m of any part of an external wall of the same building, measured horizontally at right angles to the path of travel, the following applies: (a) That part of the wall must have— (i) an FRL of not less than 60/60/60; and (ii) any openings protected internally in accordance with C4D5; and (b) The protection required by (a) must extend for a distance of 3 m above or below, as appropriate, the level of the path of travel, or for the height of the wall, whichever is the lesser. (4) If more than 2 access doorways, not from a sanitary compartment or the like, open to a required fire-isolated exit in the same storey— (a) a smoke lobby in accordance with D3D7 must be provided; or (b) the *exit* must be pressurised in accordance with AS 1668.1. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***

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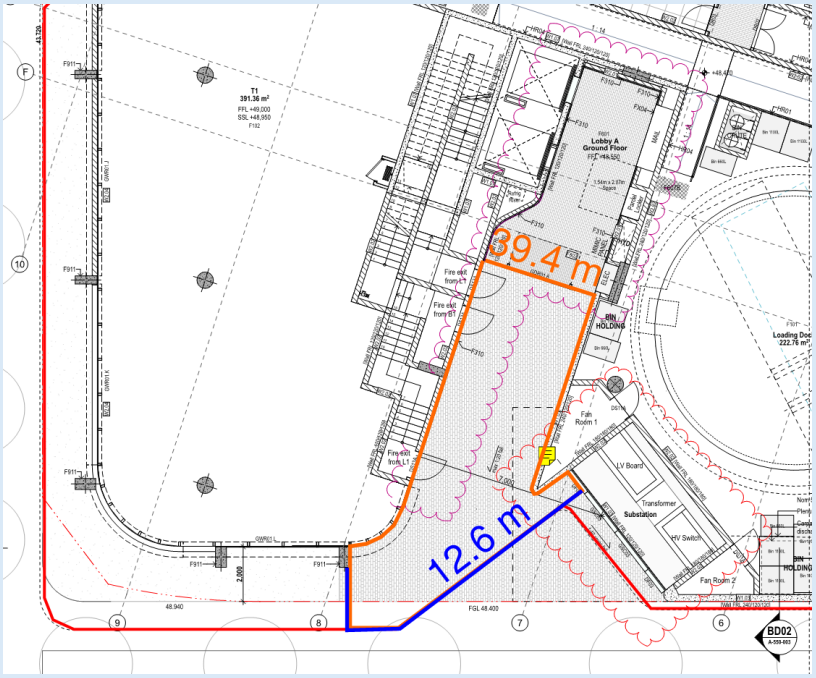
BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
					COMPLIANCE COMMENTARY **South western - Discharge into covered area** **Perimeter of covered area = 39.4m** **Required to be open = 13.1m** **Proposed to be open = 12.6m (31.9%) open** ***It is recommended this is addressed by a Fire Engineered Performance Solution.***  **North eastern - Discharge into covered area** **Perimeter of covered area = 57.8m** **Required to be open = 19.3m** **Proposed to be open = 26.7 (46.2%) open**

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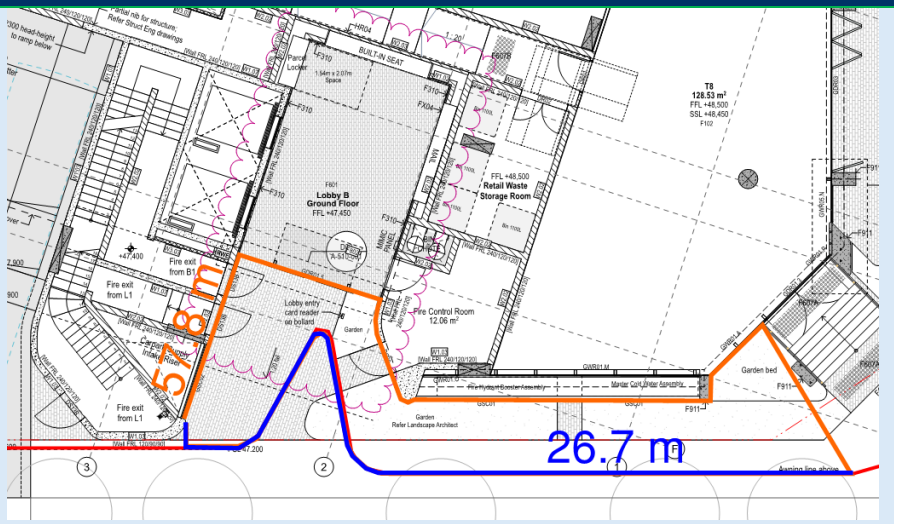
					

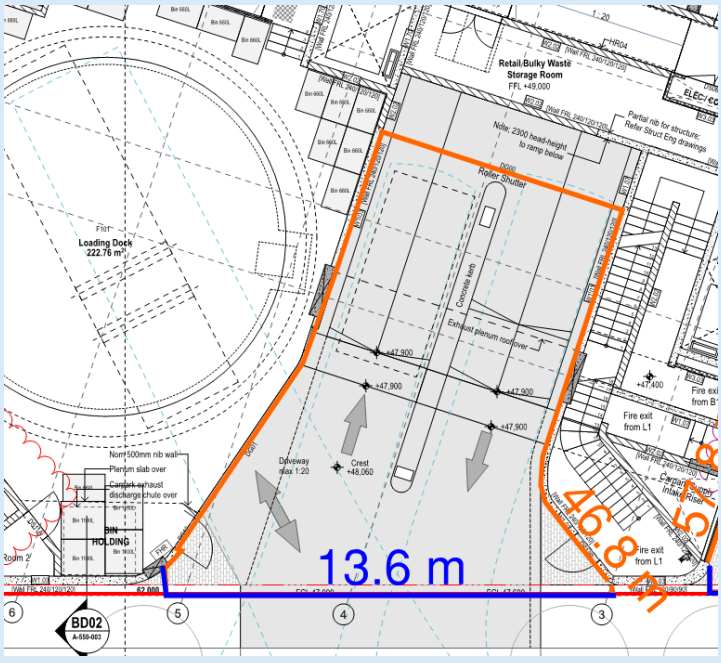
North eastern - Discharge into covered area (driveway)

Perimeter of covered area = 46.8m

Required to be open = 15.6m

Proposed to be open = 13.6m (29%) open

It is recommended this is addressed by a Fire Engineered Performance Solution.



- **The following external doorways within 6m from the path of travel to the road.**

South western

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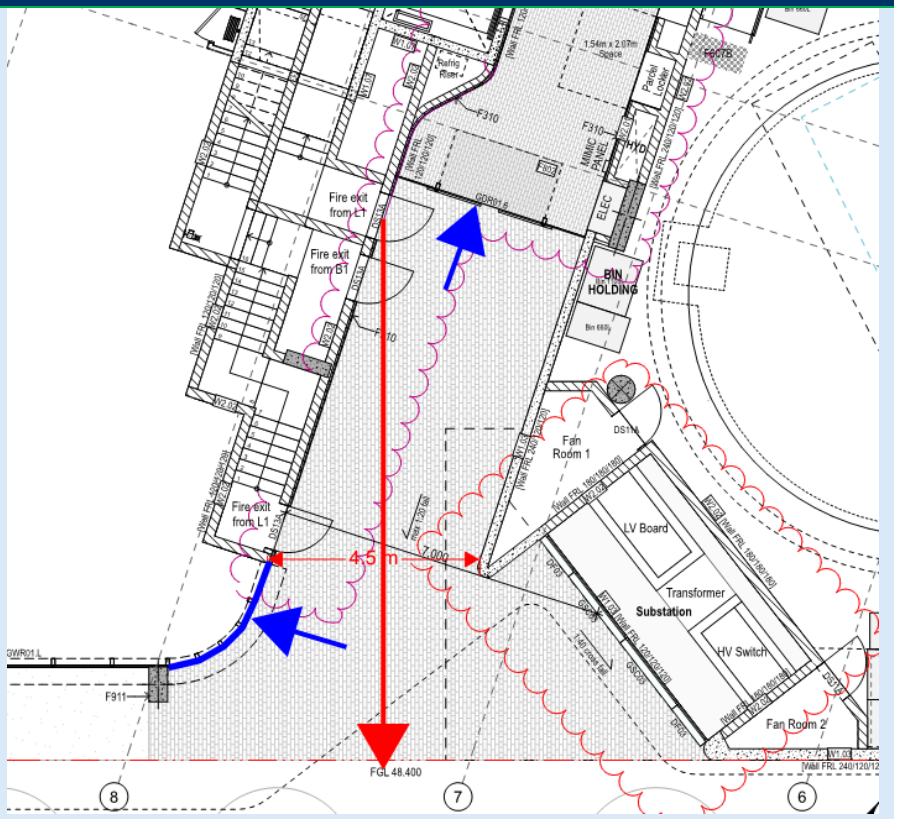
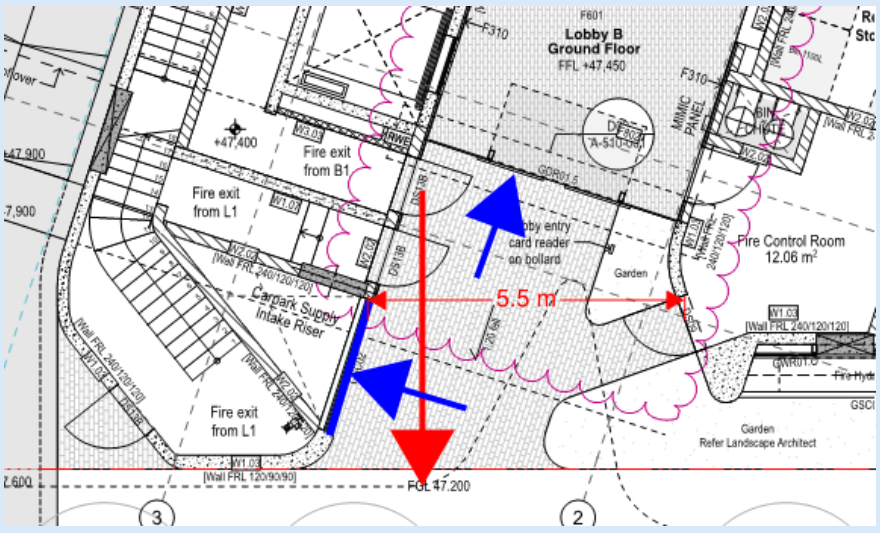
					 **North western** 
D2D13 External stairways or ramps in lieu of fire-isolated exits [2019: D1.8]			X		Not applicable. No external stairways or ramps in lieu of fire-isolated exits proposed.
D2D14			X		Not applicable. No non-fire-isolated stairways or ramp proposed.

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
Travel by non-fire-isolated stairways or ramps [2019: D1.9]					
NSW D2D15 Discharge from exits [2019: D1.10]				X	(1) An exit must not be blocked at the point of discharge and where necessary, suitable barriers must be provided to prevent vehicles from blocking the exit, or access to it. (2) If a required exit leads to an open space, the path of travel to the road must have an unobstructed width throughout of not less than— (a) the minimum width of the required exit; or (b) 1 m, whichever is the greater. (3) If an exit discharges to open space that is at a different level than the public road to which it is connected, the path of travel to the road must be by— (a) a ramp or other incline having a gradient not steeper than 1:8 at any part, or not steeper than 1:14 if required by the Deemed-to-Satisfy Provisions of Part D4; or (b), a stairway complying with the Deemed-to-Satisfy Provisions of the BCA. (4) The discharge point of alternative exits must be located as far apart as practical. (7) The number of persons accommodated must be calculated according to D2D18. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
D2D16 Horizontal exits [2019: D1.11]			X		Not applicable. No horizontal exits.
D2D17 Non-required stairways, ramps or escalators [2019: D1.12]		X			An escalator, moving walkway or non-required non fire-isolated stairway or pedestrian ramp— (b) may connect any number of storeys if it is— (ii) in a carpark or an atrium; or (iii) outside a building; or (c) except where permitted in (b) must not connect more than— (i) 3 storeys if each of those storeys is provided with a sprinkler system (other than a FPAA101D system) complying with Specification 17 throughout; or (ii) 2 storeys, provided that in each case, those storeys must be consecutive, and one of those storeys is situated at a level at which there is direct egress to a road or open space; and (d) except where permitted in (b) or (c), must not connect, directly or indirectly, more than 2 storeys at any level in a Class 5, 6, 7, 8 or 9 building and those storeys must be consecutive. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification*** **COMPLIANCE COMMENTARY**

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					The "Forest Rooms" are atriums in accordance with Part G3 but have not been designed to comply with the BCA DTS provisions. ***It is recommended these atriums be addressed by a Fire Engineered Performance Solution.***
NSW D2D18 Number of persons accommodated [2019: D1.13]			X		For the purposes of the Deemed-to-Satisfy Provisions, the number of persons accommodated in a storey, room or mezzanine must be determined with consideration to the purpose for which it is used and the layout of the floor area by— (a) calculating the sum of the numbers obtained by dividing the floor area of each part of the storey by the number of square metres per person listed in Table D2D18 according to the use of that part, excluding spaces set aside for— (i) lifts, stairways, ramps and escalators, corridors, hallways, lobbies and the like; and (ii) service ducts and the like, sanitary compartments or other ancillary uses; or (b) reference to the seating capacity in an assembly building or room; or (c) any other suitable means of assessing its capacity. **<u>COMPLIANCE COMMENTARY</u>** **Ground Floor – based on each tenancy used as shop.** **Please note, where tenancies are used as food and beverage tenancies, the occupant numbers increase significantly.**

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					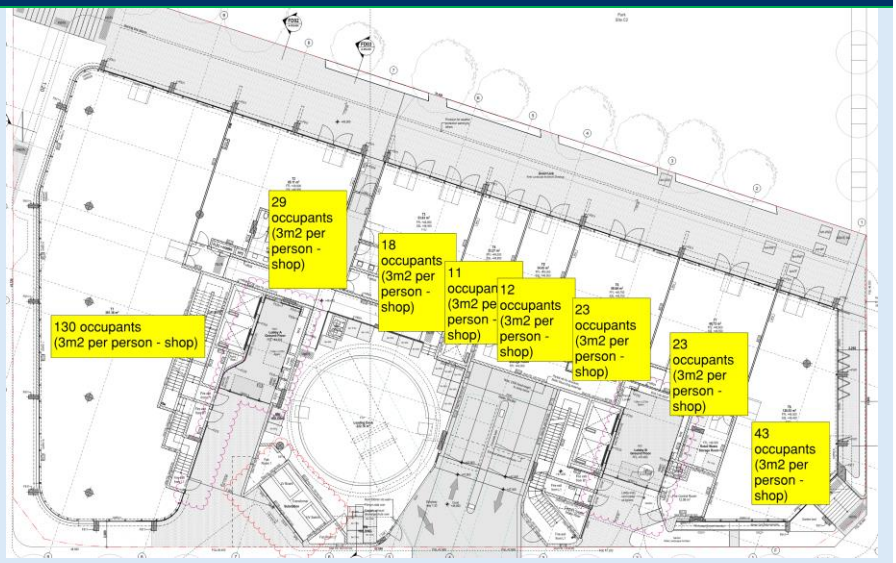
D2D19 Measurement of distances [2019: D1.14]			X		Informational. The nearest part of an exit means in the case of— (a) a fire-isolated stairway, fire-isolated passageway, or fire-isolated ramp, the nearest part of the doorway providing access to them; and (b) a non-fire-isolated stairway, the nearest part of the nearest riser; and (c) a non-fire-isolated ramp, the nearest part of the junction of the floor of the ramp and the floor of the storey; and (d) a doorway opening to a road or open space, the nearest part of the doorway; and (e) a horizontal exit, the nearest part of the doorway
D2D20 Method of measurement [2019: D1.15]			X		Informational. The following rules apply: (a) In the case of a room that is not a sole-occupancy unit in a Class 2 or 3 building or Class 4 part of a building, the distance includes the straight-line measurement from any point on the floor of the room to the nearest part of a doorway leading from it, together with the distance from that part of the doorway to the single required exit or point from which travel in different directions to 2 required exits is available. (b) Subject to (d), the distance from the doorway of a sole-occupancy unit in a Class 2 or 3 building or a Class 4 part of a building is measured in a straight line to the nearest part of the required single exit or point from which travel in different directions to 2 required exits is available. (c) Subject to (d), the distance between exits is measured in a straight line between the nearest parts of those exits. (d) Only the shortest distance is taken along a corridor, hallway, external balcony or other path of travel that curves or changes direction. (e) If more than one corridor, hallway, or other internal path of travel connects required exits, for the purposes of D2D6(c) the measurement is along the path of travel through the point at which

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					travel in different directions to those exits is available, as determined in accordance with D2D5. (f) If a wall (including a demountable internal wall) that does not bound a room, corridor, hallway or the like causes a change of direction in proceeding to a required exit, the distance is measured along the path of travel past that wall. (g) If permanent fixed seating is provided, the distance is measured along the path of travel between the rows of seats. (h) In the case of a non-fire-isolated stairway or non-fire-isolated ramp, the distance is measured along a line connecting the nosings of the treads, or along the slope of the ramp, together with the distance connecting those lines across any intermediate landings.
D2D21 Plant rooms, lift machine rooms and electricity network substations: Concession [2019: D1.16]			X		(1) A ladder may be used in lieu of a stairway to provide egress from— (a) a plant room with a floor area of not more than 100 m^2; or (b) all but one point of egress from a plant room, a lift machine room or a Class 8 electricity network substation with a floor area of not more than 200 m^2. (2) A ladder permitted under (1)— (a) may— (i) form part of an exit provided that in the case of a fire-isolated stairway it is contained within the shaft; or (ii) discharge within a storey in which case it must be considered as forming part of the path of travel; and (b) for a plant room or a Class 8 electricity network substation, must comply with AS 1657; and (c) for a lift machine room, where access is provided from within a machine room to a secondary floor, a fixed rung type ladder complying with AS 1657 may be used, provided that— (i) the height between the floors is not more than 2800 mm; and (ii) the ladder is inclined at an angle to the horizontal not less than 65 degrees nor more than 75 degrees; and (iii) the distance between the front face of the ladder and any adjacent obstruction is not less than— (A) 960 mm, where the ladder is inclined 65 degrees to the horizontal; or (B) 760 mm, where the ladder is inclined 75 degrees to the horizontal; or (C) a distance that is determined by interpolating the values in (A) and (B), where the ladder is inclined at any angle between 65 degrees and 75 degrees to the horizontal; and (iv) a clear space not less than 600 mm exists between the foot of the ladder and any equipment.
D2D22 Access to lift pits [2019: D1.17]			X		Not applicable. No lift pits proposed.
D2D23			X		Not applicable. Not a primary school.

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Egress from primary schools [2019: D1.18]					
Part D3 Construction of exits					
D3D1 Deemed-to-Satisfy Provisions [2019: D2.0]			X		(1) Where a Deemed-to-Satisfy Solution is proposed, Performance Requirements D1P1 to D1P6, D1P8 and D1P9 are satisfied by complying with— (a) D2D2 to D2D23, D3D2 to D3D30 and D4D2 to D4D13; and (b) in a building containing an atrium, Part G3; (2) Where a Performance Solution is proposed the relevant Performance Requirements must be determined in accordance with A2G2(3) and A2G4(3) as applicable. (3) Performance Requirement D1P7 must be complied with if lifts are to be used to assist occupants to evacuate a building.
NSW D3D2 Application of Part [2019: NSW D2.1(c)]			X		(1) Except for— (a) D3D14, D3D15(a), D3D17, D3D18, D3D19, D3D20, D3D22(5), D3D22(6), D3D26 and D3D29, the Deemed-to-Satisfy Provisions of this Part do not apply to the internal parts of a sole-occupancy unit in a Class 3 building; and (b) D3D14, D3D15(a), D3D17, D3D18, D3D19, D3D20, D3D22(5), D3D22(6), D3D23 and D3D29, the Deemed-to-Satisfy Provisions of this Part do not apply to the internal parts of a sole-occupancy unit in a Class 2 building or Class 4 part of a building. (1) In a Class 9b building used as an entertainment venue— (a) Clauses NSW D3D14(1)(i), (j), and (k), NSW D3D16(d), NSW D3D18(1)(d), and NSW D3D24(2)(e) apply to only those parts of the building used by the public; and (b) the general requirements of Part D3 apply to all other parts of the building.
D3D3 Fire-isolated stairways and ramps [2019: D2.2]				X	A stairway or ramp (including any landings) that is required to be within a fire-resisting shaft must be constructed— (a) of non-combustible materials; and (b) so that if there is local failure it will not cause structural damage to, or impair the fire-resistance of, the shaft. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans, Structural Engineering Plans & specification***
D3D4 Non-fire-isolated stairways and ramps [2019: D2.3]			X		Not applicable. No non-fire-isolated stairways and ramps
D3D5 Separation of rising and descending stair flights [2019: D2.4]	X				If a stairway serving as an exit is required to be fire-isolated— (a) there must be no direct connection between— (i) a flight rising from a storey below the lowest level of access to a road or open space; and (ii) a flight descending from a storey above that level; and

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					(b) any construction that separates or is common to the rising and descending flights must be— (i) non-combustible; and (ii) smoke proof in accordance with S11C2 **COMPLIANCE COMMENTARY** Compliance achievable.
D3D6 Open access ramps and balconies [2019: D2.5]			X		Not applicable. No open access ramp or balcony is provided to meet the smoke hazard management requirements of E2D4 to E2D13 proposed or required.
D3D7 Smoke lobbies [2019: D2.6]				X	A smoke lobby required by D2D12 must— (a) have a floor area not less than 6 m^2; and (b) be separated from the occupied areas in the storey by walls which are impervious to smoke, and— (i) have an FRL of not less than 60/60/– (which may be fire-protective grade plasterboard, gypsum block with set plaster, face brickwork, glass blocks or glazing); and (ii) extend from slab to slab, or to the underside of a ceiling with a resistance to the incipient spread of fire of 60 minutes which covers the lobby; and (iii) any construction joints between the top of the walls and the floor slab, roof or ceiling must be smoke sealed with intumescent putty or other suitable material; and (c) at any opening from the occupied areas, have smoke doors complying with S12C3 and S12C4 except that the smoke sensing device need only be located on the approach side of the opening; and (d) be pressurised as part of the exit if the exit is required to be pressurised under E2D3. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
D3D8 Installations in exits and paths of travel [2019: D2.7]				X	(1) Access to service shafts and services other than to fire-fighting or detection equipment as permitted in the Deemed-to-Satisfy Provisions of Section E, must not be provided from a fire-isolated stairway, fire-isolated passageway or fire-isolated ramp. (2) An opening to any chute or duct intended to convey hot products of combustion from a boiler, incinerator, fireplace or the like, must not be located in any part of a required exit or any corridor, hallway, lobby or the like leading to a required exit. (3) Gas or other fuel services must not be installed in a required exit. (4) Except for in a fire-isolated exit specified in (1), services or equipment enclosed in accordance with (5) may be installed in a required exit, or in any corridor, hallway, lobby or the like leading to a required exit, where that service or equipment comprises— (a) electricity meters, distribution boards or ducts; or (b) central telecommunications distribution boards or equipment; or

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					(c) electrical motors or other motors serving equipment in the building. (5) An enclosure for the purposes of (4) must be suitably sealed against smoke spreading from the enclosure and be— (a) non-combustible construction; or (b) a fire-protective covering. (6) Electrical wiring may be installed in a fire-isolated exit if the wiring is associated with— (a) a lighting, detection, or pressurisation system serving the exit; or (b) a security, surveillance or management system serving the exit; or (c) an intercommunication system or an audible or visual alarm system in accordance with D3D27; or (d) the monitoring of hydrant or sprinkler isolating valves. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
D3D9 Enclosure of space under stairs and ramps [2019: D2.8]			X		Not applicable. No enclosure of space under stairs and ramps proposed.
D3D10 Width of required stairways and ramps [2019: D2.9]			X		Not applicable. No stairways or ramps required to be 2m in width.
D3D11 Pedestrian ramps [2019: D2.10]				X	(2) A ramp serving as a required exit must— (a) where the ramp is also serving as an accessible ramp under Part D4, be in accordance with AS 1428.1; or (b) in any other case, have a gradient not steeper than 1:8. (3) The floor surface of a ramp must have a slip-resistance classification not less than that listed in Table D3D15 when tested in accordance with AS 4586. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
D3D12 Fire-isolated passageways [2019: D2.11]				X	(1) The enclosing construction of a fire-isolated passageway must have an FRL when tested for a fire outside the passageway in another part of the building of— (a) if the passageway discharges from a fire-isolated stairway or ramp — not less than that required for the stairway or ramp shaft; or (b) in any other case — not less than 60/60/60. (2) Notwithstanding (1)(b), the top construction of a fire-isolated passageway need not have an FRL if the walls of the fire-isolated passageway extend to the underside of— (a) a non-combustible roof covering; or (b) a ceiling having a resistance to the incipient spread of fire of not less than 60 minutes separating the roof space or ceiling space

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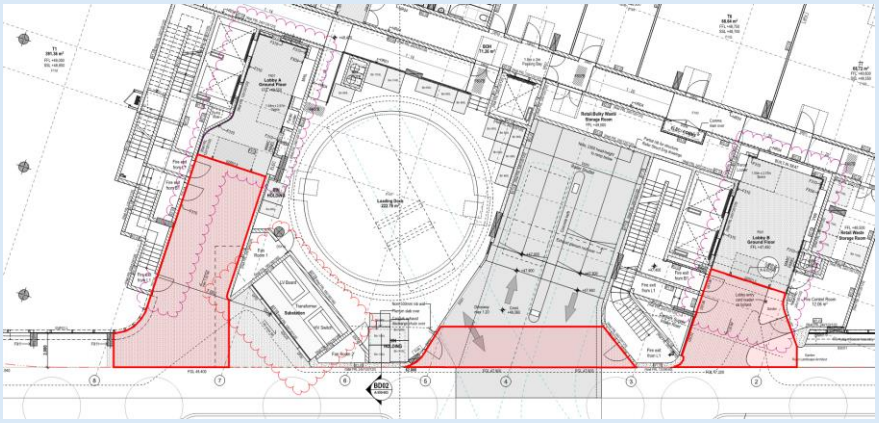
					in all areas surrounding the passageway within the fire compartment. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
D3D13 Roof as open space [2019: D2.12]				X	If an exit discharges to a roof of a building, the roof must— (a) have an FRL of not less than 120/120/120; and (b) not have any roof lights or other openings within 3 m of the path of travel of persons using the exit to reach a road or open space. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification*** **COMPLIANCE COMMENTARY** **Architectural plans to detail openings within the roof of the basement.** **Please note, floor wastes for stormwater are openings subject to this provision.** 
NSW D3D14 Goings and risers [2019: D2.13]				X	(1) A stairway must have— (a) not more than 18 and not less than 2 risers in each flight; and (b) going (G), riser (R) and quantity (2R + G) in accordance with Table D3D14, except as permitted by (2) and (3); and (c) constant goings and risers throughout each flight, except as permitted by (2) and (3), and the dimensions of goings (G) and risers (R) in accordance with (1)(b) are considered constant if the variation between— (i) adjacent risers, or between adjacent goings, is no greater than 5 mm; and (ii) the largest and smallest riser within a flight, or the largest and smallest going within a flight, does not exceed 10 mm; and (d) risers which do not have any openings that would allow a 125 mm sphere to pass through between the treads; and (e) treads which have— (i) a surface with a slip-resistance classification not less than that listed in Table D3D15 when tested in accordance with AS 4586; or

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					(ii) a nosing strip with a slip-resistance classification not less than that listed in Table D3D15 when tested in accordance with AS 4586; and (f) treads of solid construction (not mesh or other perforated material) if the stairway is more than 10 m high or connects more than 3 storeys; and (g) in a Class 9b building, not more than 36 risers in consecutive flights without a change in direction of at least 30°; and (h) in the case of a required stairway, no winders in lieu of a landing; and (2) In the case of a non-required stairway— (a) the stairway must have— (i) not more than 3 winders in lieu of a quarter landing; and (ii) not more than 6 winders in lieu of a half landing; and (b) the going of all straight treads must be constant throughout the same flight and the dimensions of goings (G) is considered constant if the variation between— (i) adjacent goings, is no greater than 5 mm; and (ii) the largest and smallest going within a flight, does not exceed 10 mm; and (c) the going of all winders in lieu of a quarter or half landing may vary from the going of the straight treads within the same flight provided that the going of all such winders is constant. (3) Where a stairway discharges to a sloping public walkway or public road— (a) the riser (R) may be reduced to account for the slope of the walkway or road; and (b) the quantity (2R+G) may vary at that location. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
D3D15 Landings [2019: D2.14]				X	In a stairway— (a) landings having a maximum gradient of 1:50 may be used in any building to limit the number of risers in each flight and each landing must— (i) be not less than 750 mm long, and where this involves a change in direction, the length is measured 500 mm from the inside edge of the landing; and (ii) have— (A) a surface with a slip-resistance classification not less than that listed in Table D3D15 when tested in accordance with AS 4586; or (B) a strip at the edge of the landing with a slip-resistance classification not less than that listed in Table D3D15 when tested in accordance with AS 4586, where the edge leads to a flight below; ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
NSW D3D16 Thresholds				X	The threshold of a doorway must not incorporate a step or ramp at any point closer to the doorway than the width of the door leaf unless—

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[2019: D2.15, NSW D2.15(d), (e)]					(c) in a building required to be accessible by Part D4, the doorway— (i) opens to a road or open space; and (ii) is provided with a threshold ramp or step ramp in accordance with AS 1428.1; or (e) In other cases— (i) the doorway opens to a road or open space, external stair landing or external balcony; and (ii) the door sill is not more than 190 mm above the finished surface of the ground, balcony, or the like, to which the doorway opens. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
D3D17 Barriers to prevent falls [2019: D2.16(a), (b) and (c)]				X	(1) A continuous barrier must be provided along the side of— (a) a roof to which general access is provided; and (b) a stairway or ramp; and (c) a floor, corridor, hallway, balcony, deck, verandah, mezzanine, access bridge or the like; and (d) any delineated path of access to a building, if the trafficable surface is 1 m or more above the surface beneath. (2) The requirements of (1) do not apply to— (a) the perimeter of a stage, rigging loft, loading dock or the like; or (b) areas referred to in D3D23; or (c) a retaining wall unless the retaining wall forms part of, or is directly associated with a delineated path of access to a building from the road, or a delineated path of access between buildings; or (d) a barrier provided to an openable window covered by D3D29. (3) A barrier required by (1) must be constructed in accordance with D3D18, D3D19, D3D20 and, if a wire barrier is used, D3D21. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
NSW D3D18 Height of barriers [2019: Table D2.16a]				X	(1) The height of a barrier required by D3D17 must be not less than the following: (a) For stairways or ramps with a gradient of 1:20 or steeper — 865 mm. (b) For landings to a stair or ramp where the barrier is provided along the inside edge of the landing and does not exceed 500 mm in length — 865 mm. (e) For all other locations – 1m. (2) For a barrier provided under (1) — (a) barrier heights are measured vertically from the surface beneath, except that for stairways the height must be measured above the nosing line of the stair treads; and (b) a transition zone may be incorporated where the barrier height changes from 865 mm on a stair flight or ramp to 1 m at a landing or floor.

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					Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification
D3D19 Openings in barriers [2019: Table D2.16a]				X	(1) Except where allowed by (2), openings in a required barrier must not allow a 125 mm sphere to pass through. (2) In a fire-isolated stairway, fire-isolated ramp or other area used primarily for emergency purposes, openings in a required barrier— (a) must not allow a 300 mm sphere to pass through; or (b) where rails are used— (i) a 150 mm sphere must not be able to pass through the opening between the nosing line of the stair treads and the rail or between the rail and the floor of the landing, balcony or the like; and (ii) the opening between rails must not be more than 460 mm. (3) In Class 7 (other than carparks) and Class 8 buildings, openings in a required barrier— (a) must not allow a 300 mm sphere to pass through; or (b) where rails are used— (i) a 150 mm sphere must not be able to pass through the opening between the nosing line of the stair treads and the rail or between the rail and the floor of the landing, balcony or the like; and (ii) the opening between the rails must not be more than 460mm. (4) The requirements of (2) do not apply to external stairways, external ramps, or fire-isolated stairways or fire-isolated ramps serving Class 9b early childhood centres. (5) For a barrier provided under (1), the maximum 125 mm barrier opening for a stairway, such as a non fire-isolated stairway, is measured above the nosing line of the stair treads. (6) Where a required barrier is fixed to the vertical face forming an edge of a landing, balcony, deck, stairway or the like, the opening formed between the barrier and the face must not exceed 40 mm. (7) For the purposes of (6), the opening is measured horizontally from the edge of the trafficable surface to the nearest internal face of the barrier. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
D3D20 Barrier climbability [2019: Table D2.16a]				X	(1) A barrier required by D3D17, located on a floor more than 4 m above the surface beneath, must not incorporate horizontal or near horizontal elements that could facilitate climbing between 150 mm and 760 mm above the floor. (2) The requirements of (1) do not apply to— (a) fire-isolated stairways, fire-isolated ramps and other areas used primarily for emergency purposes, other than— (i) external stairways; and (ii) external ramps; and (b) Class 7 (other than carparks) and Class 8 buildings.

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					Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification
D3D21 Wire barriers [2019: D2.16(d)]			X		Not applicable. No wire barriers proposed.
D3D22 Handrails [2019: D2.17]		X			(1) Except for handrails referred to in D3D23, and subject to (2), handrails must— (a) be located along at least one side of the ramp or flight; and (b) be located along each side if the total width of the stairway or ramp is 2 m or more; and (d) in any other case, be fixed at a height of not less than 865 mm; and (e) be continuous between stair flight landings and have no obstruction on or above them that will tend to break a hand- hold; and (f) in a required exit serving an area required to be accessible, be designed and constructed to comply with clause 12 of AS 1428.1, except that clause 12(d) does not apply to a handrail required by (1)(c)(ii). (2) The height required by (1)(c) and (d) is measured above the nosings of stair treads and the floor surface of the ramp, landing or the like. (4) Handrails required to assist people with a disability must be provided in accordance with D4D4. (5) Handrails to a stairway or ramp within a sole-occupancy unit in a Class 2 or 3 building or Class 4 part of a building must— (a) be located along at least one side of the flight or ramp; and (b) be located along the full length of the flight or ramp, except in the case where a handrail is associated with a barrier, the handrail may terminate where the barrier terminates; and (c) have the top surface of the handrail not less than 865 mm vertically above the nosings of the stair treads or the floor surface of the ramp; and (d) have no obstruction on or above them that will tend to break a handhold, except for newel posts, ball type stanchions, or the like. (6) The requirements of (5) do not apply to— (a) handrails referred to in D3D23; or (b) a stairway or ramp providing a change in elevation of less than 1m; or (c) a landing; or (d) a winder where a newel post is installed to provide a handhold. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification*** **COMPLIANCE COMMENTARY** • **Basement 3-1 – Ramps serving slip level must be provided with a handrail for occupant egress to at least one side.**

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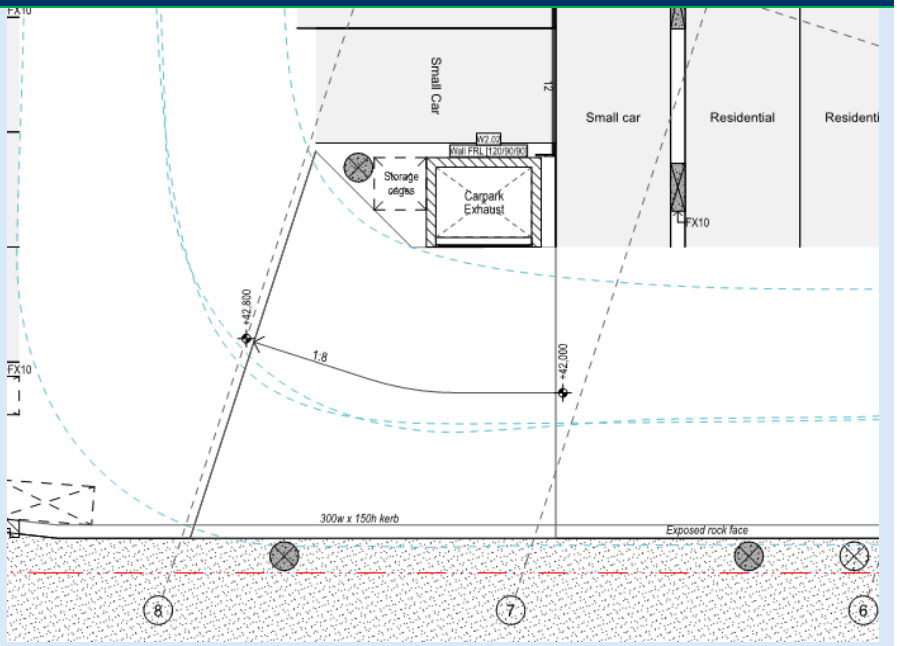
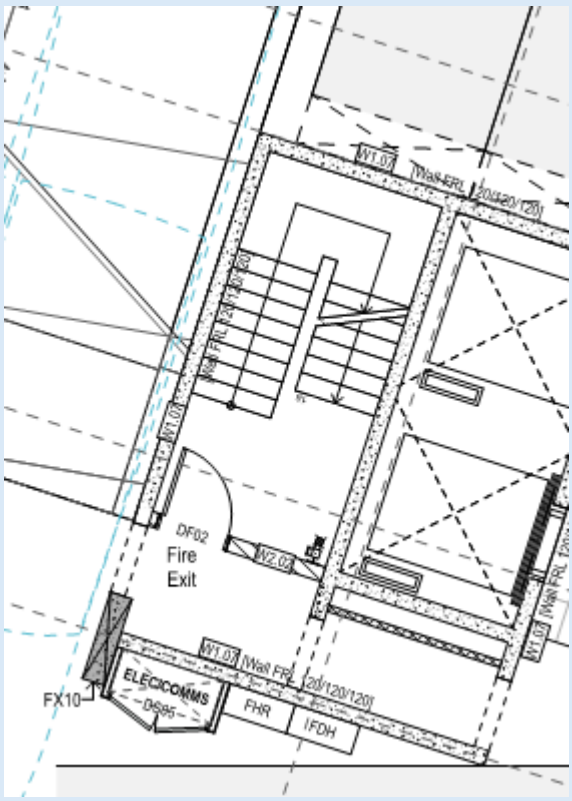
					 • **No handrails are detailed for the fire-isolated stairways serving the basement levels.** 
D3D23 Fixed platforms, walkways, stairways and ladders [2019: D2.18]			X		Not applicable. No fixed platform, walkway, stairway, ladder and any going and riser, landing, handrail or barrier proposed.

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
NSW D3D24 Doorways and doors [2019: D2.19]				X	(2) A doorway serving as a required exit or forming part of a required exit— (a) must not be fitted with a revolving door; and (b) must not be fitted with a roller shutter or tilt-up door unless— (i) it serves a Class 6, 7 or 8 building or part with a floor area not more than 200 m^2; and (ii) the doorway is the only required exit from the building or part; and (iii) it is held in the open position while the building or part is lawfully occupied; and (c) must not be fitted with a sliding door unless— (i) it leads directly to a road or open space; and (ii) the door is able to be opened manually under a force of not more than 110 N; and (d) if fitted with a door which is power-operated— (i) it must be able to be opened manually under a force of not more than 110 N if there is a malfunction or failure of the power source; and (ii) if it leads directly to a road or open space it must open automatically if there is a power failure to the door or on the activation of a fire or smoke alarm anywhere in the fire compartment served by the door; and (3) A power-operated door in a path of travel to a required exit, must be able to be opened manually under a force of not more than 110 N if there is a malfunction or failure of the power source. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification*** **COMPLIANCE COMMENTARY** Compliance achievable.
D3D25 Swinging doors [2019: D2.20]				X	(1) A swinging door in a required exit or forming part of a required exit— (a) must not encroach— (i) at any part of its swing by more than 500 mm on the required width (including any landings) of a required stairway, ramp or passageway if it is likely to impede the path of travel of the people already using the exit; and (ii) when fully open, by more than 100 mm on the required width of the required exit; and (b) must swing in the direction of egress unless— (i) it serves a building or part with a floor area not more than 200m^2, it is the only required exit from the building or part and it is fitted with a device for holding it in the open position; or (ii) it serves a sanitary compartment or airlock (in which case it may swing in either direction); and (c) must not otherwise impede the path or direction of egress. (2) The measurement of encroachment referred to in (1)(a) in each case is to include door handles or other furniture or attachments to the door.

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					Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification
NSW D3D26 Operation of latch [2019: D2.21]				X	(1) A door in a required exit, forming part of a required exit or in the path of travel to a required exit must be readily openable without a key from the side that faces a person seeking egress, by— (a) a single hand downward action on a single device which is located between 900 mm and 1.1 m from the floor and if serving an area required to be accessible by Part D4— (i) be such that the hand of a person who cannot grip will not slip from the handle during the operation of the latch; and (ii) have a clearance between the handle and the back plate or door face at the centre grip section of the handle of not less than 35 mm and not more than 45 mm; or (b) a single hand pushing action on a single device which is located between 900 mm and 1.2 m from the floor. (2) Where the latch operation device referred to in (1)(b) is not located on the door leaf itself— (a) manual controls to power-operated doors must be at least 25 mm wide, proud of the surrounding surface and located— (i) not less than 500 mm from an internal corner; and (ii) for a hinged door, between 1 m and 2 m from the door leaf in any position; and (iii) for a sliding door, within 2 m of the doorway and clear of a surface mounted door in the open position; and (b) braille and tactile signage complying with S15C3 and S15C6 must identify the latch operation device. (3) The requirements of (1) and (2) do not apply to a door that— (a) serves a vault, strong-room, sanitary compartment, or the like; or (b) serves only, or is within— (i) a sole-occupancy unit in a Class 2 building or a Class 4 part of a building; or (ii) a sole-occupancy unit in a Class 3 building (other than an entry door to a sole-occupancy unit of a boarding house, guest house, hostel, lodging house or backpacker accommodation); or (iii) a sole-occupancy unit with a floor area not more than 200 m^2 in a Class 5, 6, 7 or 8 building; or (iv) a space which is otherwise inaccessible to persons at all times when the door is locked; or (d) is fitted with a fail-safe device which automatically unlocks the door upon the activation of any sprinkler system (other than a FPAA101D system) complying with Specification 17 or smoke, or any other detector system deemed suitable in accordance with AS 1670.1 installed throughout the building, and is readily openable when unlocked; or (4) A door referred to in (3)(c) must be able to be immediately unlocked— (a) by operating a fail-safe control switch, not contained within a protective enclosure, to actuate a device to unlock the door; or

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
					(b) by hand by a person or persons, specifically nominated by the owner, properly instructed as to the duties and responsibilities involved and available at all times when the building is lawfully occupied so that persons in the building or part may immediately escape if there is a fire. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
D3D27 Re-entry from fire-isolated exits [2019: D2.22]				X	(1) Doors of a fire-isolated exit must not be locked from the inside as follows: (d) In a fire-isolated exit serving any storey above an effective height of 25 m, throughout the exit. (2) The requirements of (1)(a), (c) and (d) do not apply to a door fitted with a fail-safe device that automatically unlocks the door upon the activation of a fire alarm and— (a) on at least every fourth storey, the doors are not able to be locked and a sign is fixed on such doors stating that re-entry is available; or (b) an intercommunication system, or an audible or visual alarm system, operated from within the enclosure is provided near the doors and a sign is fixed adjacent to such doors explaining its purpose and method of operation. (3) The requirements of (1)(b) do not apply to a door fitted with a fail-safe device that automatically unlocks the door serving the Class 9b early childhood centre upon the activation of a fire alarm. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
D3D28 Signs on doors [2019: D2.23]				X	(1) A sign, to alert persons that the operation of certain doors must not be impaired, must be installed where it can readily be seen on, or adjacent to, in accordance with (2)— (a) a required— (i) fire door providing direct access to a fire-isolated exit, except a door providing direct egress from a sole-occupancy unit in a Class 2 or 3 building or Class 4 part of a building; and (ii) smoke door; and (b) any door which is a— (i) fire door forming part of a horizontal exit; and (ii) smoke door that swings in both directions; and (iii) door leading from a fire isolated exit to a road or open space. (2) A sign required by (1)(a) must be fixed on the side of the door that faces a person seeking egress and, if the door is fitted with a device for holding it in the open position, either a sign must be fixed on the wall adjacent to the doorway, or signs must be fixed to both sides of the door. (3) A sign required by (1)(b) must be fixed on each side of the door. (4) A sign referred to in (1) must be in capital letters not less than 20 mm high in a colour contrasting with the background and state the following: (a) For an automatic door held open by an automatic hold-open device— **FIRE SAFETY DOOR — DO NOT OBSTRUCT**

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
					(a) For a self-closing door— **FIRE SAFETY DOOR** **DO NOT OBSTRUCT** **DO NOT KEEP OPEN** (a) For a door discharging from a fire-isolated exit— **FIRE SAFETY DOOR — DO NOT OBSTRUCT** ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
D3D29 Protection of openable windows [2019: D2.24]				X	(1) A window opening must be provided with protection, if the floor below the window is 2 m or more above the surface beneath in— (a) a bedroom in a Class 2 or 3 building or Class 4 part of a building; or (2) Where the lowest level of the window opening is less than 1.7 m above the floor, a window opening covered by (1) must comply with the following: (a) The openable portion of the window must be protected with— (i) a device capable of restricting the window opening; or (ii) a screen with secure fittings. (b) A device or screen required by (a) must— (i) not permit a 125 mm sphere to pass through the window opening or screen; and (ii) resist an outward horizontal action of 250 N against the— (A) window restrained by a device; or (B) screen protecting the opening; and (iii) have a child resistant release mechanism if the screen or device is able to be removed, unlocked or overridden. (3) A barrier with a height not less than 865 mm above the floor is required to an openable window— (a) in addition to window protection, when a child resistant release mechanism is required by (2)(b)(iii); and (b) where the floor below the window is 4 m or more above the surface beneath if the window is not covered by (1). (4) A barrier covered by (3) except for (5) must not— (a) permit a 125 mm sphere to pass through it; and (b) have any horizontal or near horizontal elements between 150 mm and 760 mm above the floor that facilitate climbing. (5) A barrier required by (3) to an openable window in— (a) fire-isolated stairways, fire-isolated ramps and other areas used primarily for emergency purposes, excluding external stairways and external ramps; and (b) Class 7 (other than carparks) and Class 8 buildings and parts of buildings containing those classes, must not permit a 300 mm sphere to pass through it. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
D3D30 Timber stairways: Concession			X		Not applicable. No timber stairways proposed.

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
[2019: D2.25]					
NSW D3D31 Doors in paths of travel to an entertainment venue [2019: NSW D2.101]			X		Not applicable. No Class 9b building used as an entertainment venue
Part D4 Access for people with a disability – Not assessed in this report.					
Specification 14 Non-required stairways, ramps and escalators					
S14C1 Scope [2019: Spec D1.12: 1]			X		(1) This Specification contains the requirements to allow non-required stairways, ramps or escalators to connect any number of storeys in a Class 5 or 6 building. (2) The requirements do not apply in an atrium or outside a building.
S14C2 Requirements [2019: Spec D1.12: 2]			X		Not applicable. No non-required stairways, ramps and escalators
Specification 15 Braille and tactile signs – Not assessed in this report.					
Specification 16 Accessible water entry/exit from swimming pools – Not assessed in this report.					
Section E Services and equipment					
Part E1 Fire fighting equipment					
E1D1 Deemed-to-Satisfy Provisions [2019: E1.0]			X		(1) Where a Deemed-to-Satisfy Solution is proposed, Performance Requirements E1P1 to E1P6 are satisfied by complying with— (a) E1D2 to E1D16; and (b) in a building containing an atrium, Part G3; (2) Where a Performance Solution is proposed, the relevant Performance Requirements must be determined in accordance with A2G2(3) and A2G4(3) as applicable.
E1D2 Fire hydrants [2019: E1.3]		X			(1) A fire hydrant system must be provided to serve a building— (a) having a total floor area greater than 500 m^2; and (b) where a fire brigade station is— (i) no more than 50 km from the building as measured along roads; and (ii) equipped with equipment capable of utilising a fire hydrant. (2) The fire hydrant system must be installed in accordance with AS 2419.1. (3) Notwithstanding (2), a Class 8 electricity network substation need not comply with clause 4.2 of AS 2419.1 if— (a) it cannot be connected to a town main supply; and (b) one hour water storage is provided for fire-fighting. (4) Where internal fire hydrants are provided, they must serve only the storey on which they are located except that a sole-occupancy unit—

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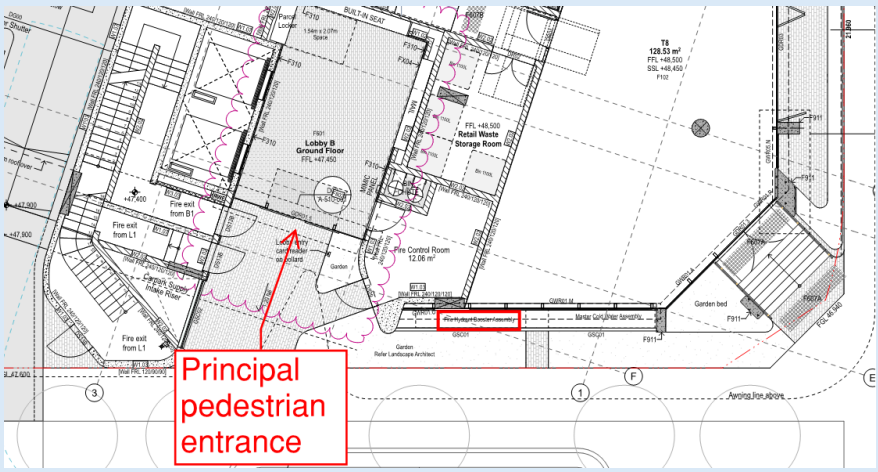
(a) in a Class 2 or 3 building or Class 4 part of a building may be served by a single fire hydrant located at the level of egress from that sole-occupancy unit; or

(b) of not more than 2 storeys in a Class 5, 6, 7, 8 or 9 building may be served by a single fire hydrant located at the level of egress from that sole-occupancy unit provided the fire hydrant can provide coverage to the whole of the sole-occupancy unit.

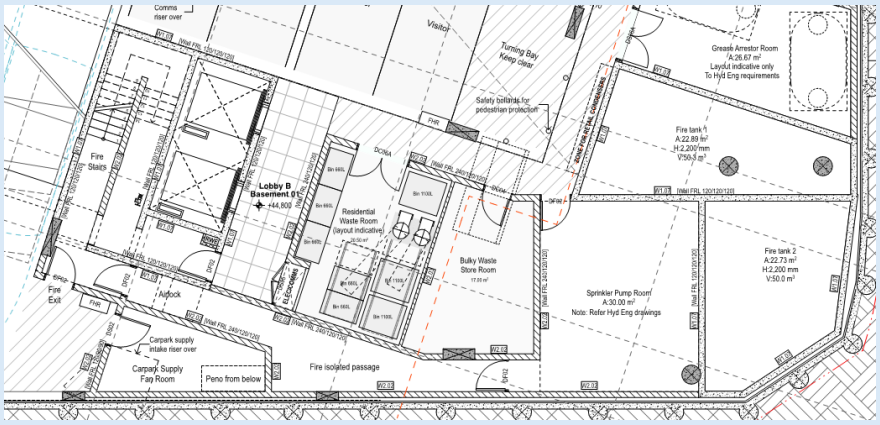
Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification. Relevant fire safety systems are required to be designed and endorsed by an accredited practitioner (fire safety) in accordance with Section 22 of the EP&A (DC&FS) Regulation 2021.

COMPLIANCE COMMENTARY

Booster: Location is satisfactory



Pumps: Pumproom is satisfactory.



Valves:

Ground Floor – Coverage to all parts of the floor is not provided from the valves located within the fire-isolated stairways.

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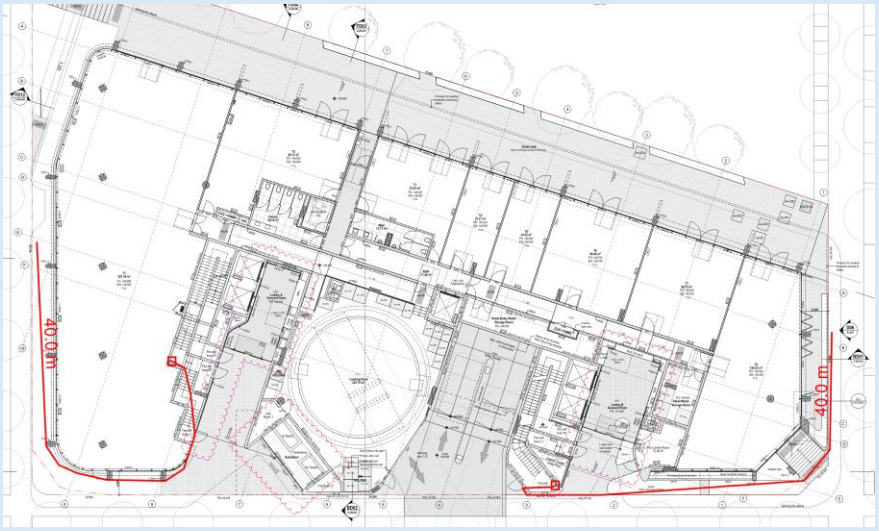
					Confirmation is required from the Hydraulic Engineer that coverage is provided to all parts of Ground Floor. 
E1D3 Fire hose reels [2019: E1.4]		X			(1) E1D3 does not apply to— (a) a Class 2 building; or (2) A fire hose reel system must be provided— (a) to serve the whole building where one or more internal fire hydrants are installed; or (b) where internal fire hydrants are not installed, to serve any fire compartment with a floor area greater than 500 m^2. (3) The fire hose reel system must— (a) have fire hose reels installed in accordance with AS 2441; and (b) provide fire hose reels to serve only the storey at which they are located, except a sole-occupancy unit of not more than 2 storeys in a Class 6, 7, 8 or 9 building may be served by a single fire hose reel located at the level of egress from that sole-occupancy unit provided the fire hose reel can provide coverage to the whole of the sole-occupancy unit. (4) Fire hose reels must be located internally, externally or in combination, to achieve the system coverage specified in AS 2441. (5) In achieving system coverage, one or a combination of the following criteria for individual internally located fire hose reels must be met in determining the layout of any fire hose reel system: (a) Fire hose reels must be located adjacent to an internal fire hydrant (other than one within a fire-isolated exit), except that a fire hose reel need not be located adjacent to every fire hydrant, provided system coverage can be achieved. (b) Fire hose reels must be located within 4 m of an exit, except that a fire hose reel need not be located adjacent to every exit, provided system coverage can be achieved. (c) Where system coverage is not achieved by compliance with (a) and (b), additional fire hose reels may be located in paths of travel to an exit to achieve the required coverage. (6) Fire hose reels must be located so that the fire hose will not need to pass through doorways fitted with fire or smoke doors, except—

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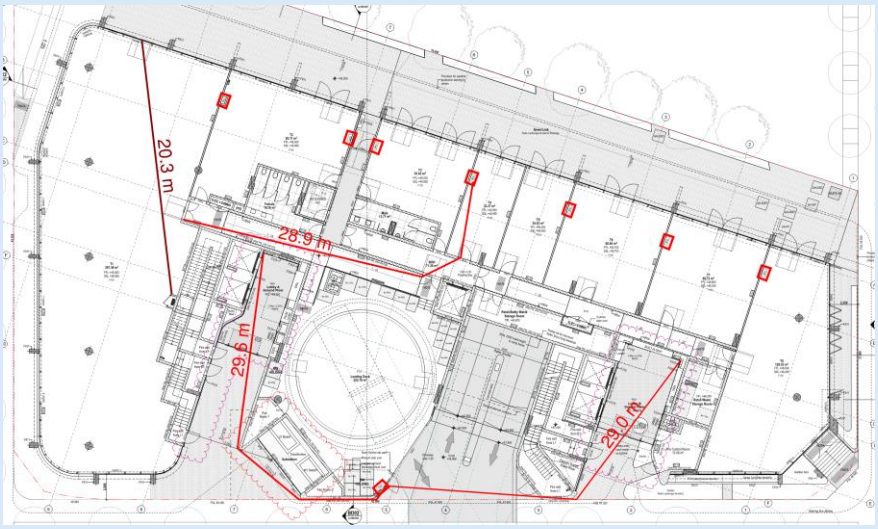
BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
					(a) doorways in walls referred to in C3D6(1)(e) in a Class 9a building and C3D6(5)(d) in a Class 9c building, separating ancillary use areas of high potential fire hazard; and (b) doorways in walls referred to in C3D13 or C3D14 separating equipment or electrical supply systems; and (c) doorway openings to shafts referred to in C4D14. (7) Where the normal water supply cannot achieve the flow and pressures required by AS 2441, or is unreliable— (a) a pump; or (b) water storage facility; or (c) both a pump and water storage facility must be installed to provide the minimum flow and pressures required by clause 6.1 of AS 2441. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification. Relevant fire safety systems are required to be designed and endorsed by an accredited practitioner (fire safety) in accordance with Section 22 of the EP&A (DC&FS) Regulation 2021.*** **COMPLIANCE COMMENTARY** **Ground Floor – FHR located within T1 is located more than 4m from an exit.**  • **Level 15 – no FHR is provided to serve the Class 9b assembly area.**

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E1D4 Sprinklers [2019: E1.5]				X	A sprinkler system must— (a) be installed in a building or part of a building when required by E1D5 to E1D13 as applicable; and (b) comply with Specification 17 and Specification 18 as applicable. Notes NSW has requirements for fire sprinkler systems in certain residential aged care facilities. See the Department of Planning and Environment website www.planning.nsw.gov.au. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification. Relevant fire safety systems are required to be designed and endorsed by an accredited practitioner (fire safety) in accordance with Section 22 of the EP&A (DC&FS) Regulation 2021.***
E1D5 Where sprinklers are required: all classifications [2019: Table E1.5]				X	Sprinklers are required throughout all buildings if any part of the building has an effective height of more than 25 m— (a) including an open-deck carpark within a multi-classified building; but (b) excluding— (i) an open-deck carpark being a separate building; and (ii) a Class 8 electricity network substation, with a floor area not more than 200 m^2 located within a multi- classified building. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
E1D6 Where sprinklers are required: Class 2 and 3 buildings other				X	(1) In a Class 2 or 3 building and any other class of building containing a Class 2 or 3 part, sprinklers are required throughout the building if any part of the building has— (a) a rise in storeys of 4 or more; and (b) an effective height of not more than 25 m.

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than residential care buildings [2019: Table E1.5]					(2) The requirements of (1) do not apply to a residential care building. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
E1D7 Where sprinklers are required: Class 3 building used as a residential care building [2019: Table E1.5]			X		Not applicable. Not Class 3.
E1D8 Where sprinklers are required: Class 6 building [2019: Table E1.5]			X		Not applicable. Class 6 building parts are not: (a) A floor area of more than 3 500 m^2. (b) A volume of more than 21 000 m^3.
E1D9 Where sprinklers are required: Class 7a building, other than an open-deck carpark [2019: Table E1.5]				X	In a Class 7a building, other than an open-deck carpark, sprinklers are required in fire compartments where more than 40 vehicles are accommodated. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
E1D10 Where sprinklers are required: Class 9a health-care building used as a residential care building, Class 9c buildings [2019: Table E1.5]			X		Not applicable. Not a Class 9a building.
E1D11 Where sprinklers are required: Class 9b buildings [2019: Table E1.5]			X		Not applicable. Not a Class 9b applicable to Part I1 or early childhood centre,
E1D12 Where sprinklers are required: additional requirements				X	(1) For sprinkler requirements for atriums, see Part G3. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***

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[2019: Table E1.5]					
E1D13 Where sprinklers are required: occupancies of excessive hazard [2019: Table E1.5 (Note 4)]			X		Not applicable Not an excessive hazard
E1D14 Portable fire extinguishers [2019: E1.6 and Table E1.6]				X	(1) Portable fire extinguishers must be— (a) provided as listed in (3) and (4); and (b) for a Class 2, 3 or 5 building or Class 4 part of a building, provided— (i) to serve the whole Class 2, 3 or 5 building or Class 4 part of a building where one or more internal fire hydrants are installed; or (ii) where internal fire hydrants are not installed, to serve any fire compartment with a floor area greater than 500 m^2, and for the purposes of this clause, a sole-occupancy unit in a Class 2 or 3 building or Class 4 part of a building is considered to be a fire compartment; and (c) subject to (2), selected, located and distributed in accordance with Sections 1, 2, 3 and 4 of AS 2444. (2) Portable fire extinguishers provided in a Class 2 or 3 building or Class 4 part of a building must be— (a) an ABE type fire extinguisher; and (b) a minimum size of 2.5 kg; and (c) distributed outside a sole-occupancy unit— (i) to serve only the storey at which they are located; and (ii) so that the travel distance from the entrance doorway of any sole-occupancy unit to the nearest fire extinguisher is not more than 10 m. (3) In Class 2 to 9 buildings (except within sole-occupancy units of a Class 9c building), portable fire extinguishers must be provided as follows: (a) To cover Class AE or E fire risks associated with emergency services switchboards. (b) To cover Class F fire risks involving cooking oils and fats in kitchens. (c) To cover Class B fire risks in locations where flammable liquids in excess of 50 litres are stored or used (not including that held in fuel tanks of vehicles). (d)To cover Class A fire risks in normally occupied fire compartments less than 500 m^2 not provided with fire hose reels (excluding open-deck carparks). (e)To cover Class A fire risks in classrooms and associated corridors in primary and secondary schools not provided with fire hose reels. (f) To cover Class A fire risks associated with a Class 2, 3 or 5 building or Class 4 part of a building.

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
					(4) In addition to the requirements of (3), portable fire extinguishers must be provided to cover Class A and E fire risks in the following occupancies in buildings, or parts of a building: (a) A Class 9a health-care building, including a Class 9a building used as a residential care building. (b) Class 3 parts of detention and correctional occupancies. (c) Class 3 accommodation for children, aged persons and people with disabilities, including a Class 3 building used as a residential care building. (d) A Class 9c building. (5) For the purposes of (3) and (4): (a) Fire risks are defined in accordance with AS 2444. (b) An emergency services switchboard is one which sustains emergency equipment operating in the emergency mode. (c) A Class E fire extinguisher need only be located at each nurses' station, supervisors' station or the like. (d) Additional extinguishers may be required to cover fire risks in relation to special hazards provided for in E1D17. (e) The fire risks in a Class 2 or 3 building or Class 4 part of a building must include risks within any sole-occupancy units, however portable fire extinguishers are not required to be located within a sole-occupancy unit unless the sole-occupancy unit has a floor area greater than 500 m^2. (6) For the purposes of (4), where applicable, a Class E fire extinguisher need only be located at each nurses' station, supervisors' station or the like. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification*** **COMPLIANCE COMMENTARY** **Architectural plans to detail the location of the portable fire extinguishers.**

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E1D15 Fire control centres [2019: E1.8]				X	A fire control centre facility in accordance with Specification 19 must be provided for— (a) a building with an effective height of more than 25 m; ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
E1D16 Fire precautions during construction [2019: E1.9]			X		In a building under construction— (a) not less than one fire extinguisher to suit Class A, B and C fires and electrical fires must be provided at all times on each storey adjacent to each required exit or temporary stairway or exit; and (b) after the building has reached an effective height of 12 m— (i) the required fire hydrants and fire hose reels must be operational in at least every storey that is covered by the roof or the floor structure above, except the 2 uppermost storeys; and (ii) any required booster connections must be installed.
E1D17 Provision for special hazards [2019: E1.10]			X		Suitable additional provision must be made if special problems of fighting fire could arise because of— (a) the nature or quantity of materials stored, displayed or used in a building or on the allotment; or (b) the location of the building in relation to a water supply for fire-fighting purposes. Note: Electric Vehicle (EV) charging stations are deemed to be a special hazard and will require assessment by a suitably qualified fire engineer against this clause.
Part E2 Smoke hazard management					
E2D1 Deemed-to-Satisfy Provisions [2019: E2.0]			X		(1) Where a Deemed-to-Satisfy Solution is proposed, Performance Requirements E2P1 to E2P2 are satisfied by complying with— (a) E2D2 to E2D21; and (b) in a building containing an atrium, Part G3; and

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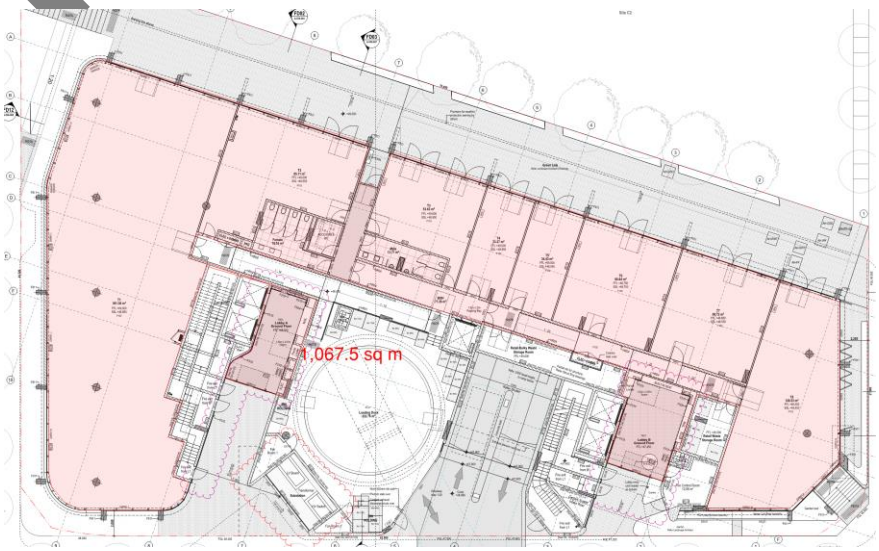
BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
					(c) in a building in an alpine area, Part G4; and (d) for additional requirements for Class 9b buildings, Part I1. (2) Where a Performance Solution is proposed, the relevant Performance Requirements must be determined in accordance with A2G2(3) and A2G4(3) as applicable.
E2D2 Application of Part [2019: E2.1]			X		(2) In addition to the Deemed-to-Satisfy Provisions of E2D3 to E2D13, the following specific Deemed-to-Satisfy Provisions apply to the following Class 6 and Class 9b buildings: (a) For Class 6 buildings, in fire compartments more than 2000 m^2— (i) not containing an enclosed common walkway or mall serving more than one Class 6 sole- occupancy unit — must comply with E2D14; or (ii) containing an enclosed common walkway or mall serving more than one Class 6 sole-occupancy unit — must comply with E2D15. (b) For Class 9b assembly buildings— (i) nightclubs, discotheques and the like — must comply with E2D16; and (ii) exhibition halls — must comply with E2D17; and (iii) theatres and public halls — must comply with E2D18; and (iv) theatres and public halls (not covered by E2D18) including lecture theatres and cinema/auditorium complexes — must comply with E2D19; and (v) other assembly buildings (not listed in (i) to (iv)) excluding schools — must comply with E2D20. (3) The smoke exhaust and smoke-and-heat vent provisions of this Part do not apply to any area not used by occupants for an extended period of time such as a storeroom with a floor area less than 30 m^2, sanitary compartment, plant room or the like. **COMPLIANCE COMMENTARY** **Class 6 Part less than 2000m2.** 

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
E2D3 General Requirements [2019: E2.2]				X	(1) An air-handling system which does not form part of a smoke hazard management system in accordance with E2D4 to E2D20 and which recycles air from one fire compartment to another fire compartment or operates in a manner that may unduly contribute to the spread of smoke from one fire compartment to another fire compartment must, subject to (2), be designed and installed— (a) to operate as a smoke control system in accordance with AS 1668.1; or (b) such that it— (i) incorporates smoke dampers where the air-handling ducts penetrate any elements separating the fire compartments served; and (ii) is arranged such that the air-handling system is shut down and the smoke dampers are activated to close automatically by smoke detectors complying with clause 7.5 of AS 1670.1. (2) For the purposes of (1), each sole-occupancy unit in a Class 2 or 3 building is treated as a separate fire compartment. (3) Miscellaneous air-handling systems covered by Sections 5 and 6 of AS 1668.1 serving more than one fire compartment (other than a carpark ventilation system) and not forming part of a smoke hazard management system must comply with these Sections of the Standard. (4) A smoke detection system must be installed in accordance with S20C6 to operate AS 1668.1 systems that are provided for zone pressurisation and automatic air pressurisation for fire-isolated exits. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
E2D4 Fire-isolated exits [2019: Table E2.2a]				X	(1) A part of a building listed in (2) must be provided with— (a) an automatic air pressurisation system for fire-isolated exits in accordance with AS 1668.1; or (b) open access ramps or balconies in accordance with D3D6. (2) The requirements of (1) apply to— (a) a required fire-isolated stairway, including any associated fire-isolated passageway or fire- isolated ramp serving— (i) any storey above an effective height of 25 m; or (ii) more than 2 below ground storeys, not counted in the rise in storeys in accordance with C2D3; or (iii) an atrium to which Part G3 applies; or (b) a required fire-isolated passageway or fire-isolated ramp with a length of travel more than 60m to a road or open space. (3) An automatic air pressurisation system for a fire-isolated exit must serve the entire exit. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification*** **COMPLIANCE COMMENTARY** **The calculation of rise in storeys includes basement level 1. Refer to Part "BCA Assessment".**

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E2D5 Buildings more than 25 m in effective height: Class 2 and 3 buildings and Class 4 part of a building [2019: Table E2.2a]				X	An automatic smoke detection and alarm system complying with Specification 20 must be provided to the following: (a) A Class 2 or 3 building which is more than 25 m in effective height. (b) A Class 2 or 3 part of a building, or a Class 4 part of a building, in a building which is more than 25 m in effective height. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
E2D6 Buildings more than 25 m in effective height: Class 5, 6, 7b, 8 or 9b buildings [2019: Table E2.2a]				X	(1) A Class 5, 6, 7b, 8 or 9b building or part of a building must be provided with a zone pressurisation system between vertically separated fire compartments in accordance with AS 1668.1, if the building is more than 25 m in effective height. (2) The requirements of (1) do not apply to a building that has a fire compartment containing a Class 5, 6, 7b, 8 or 9b part (or a combination of these classes in the same fire compartment) where there is only one fire compartment containing these classifications in an otherwise Class 2, 3, 9a or 9c building. (3) For the purposes of (1), 'vertically separated fire compartments' are fire compartments above and below each other, and not fire compartments within the same storey. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
E2D7 Buildings more than 25 m in effective height: Class 9a buildings [2019: Table E2.2a]			X		Not applicable. Not a Class 9a building.
E2D8 Buildings not more than 25 m in effective height: Class 2 and 3 buildings and Class 4 part of a building [2019: Table E2.2a]			X		Not applicable. Effective height more than 25m.
E2D9 Buildings not more than 25 m in effective height: Class 5, 6, 7b, 8 and 9b buildings [2019: Table E2.2a]			X		Not applicable. Effective height more than 25m.
NSW E2D10			X		Not applicable. Effective height more than 25m.

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
Buildings not more than 25 m in effective height: large isolated buildings subject to C3D4 [2019: NSW Table E2.2a]					
E2D11 Buildings not more than 25 m in effective height: Class 9a and 9c buildings [2019: Table E2.2a]			X		Not applicable. Effective height more than 25m.
E2D12 Class 7a buildings [2019: Table E2.2a]				X	A Class 7a building, including a basement, provided with a mechanical ventilation system in accordance with AS 1668.2, must comply with clause 5.5 of AS 1668.1. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
E2D13 Basements (other than Class 7a buildings) [2019: Table E2.2a]			X		Not applicable. Basement is Class 7a.
E2D14 Class 6 buildings – in fire compartments more than 2000 m^2: Class 6 building (not containing an enclosed common walkway or mall serving more than one Class 6 sole-occupancy unit) [2019: Table E2.2b]			X		Not applicable. Class 6 part fire compartment is less than 2000m2
E2D15 Class 6 buildings – in fire compartments more than 2000 m^2: Class 6 building (containing an enclosed common walkway or mall			X		Not applicable. Class 6 part fire compartment is less than 2000m2

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serving more than one Class 6 sole-occupancy unit) [2019: Table E2.2b]					
NSW E2D16 Class 9b – assembly buildings: all [2019: NSW Table E2.2b]				X	The following provisions apply to all Class 9b assembly buildings: (a) A building or part of a building used as an assembly building must be provided with automatic shutdown of any air-handling system (other than non-ducted individual room units with a capacity not more than 1000 L/s and miscellaneous exhaust air systems installed in accordance with Sections 5 and 6 of AS 1668.1) which does not form part of the smoke hazard management system, on the activation of— (i) smoke detectors installed complying with S20C6; and (ii) any other installed fire detection and alarm system, including a sprinkler system (other than a FPAA101D or FPAA101H system) complying with Specification 17. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
NSW E2D17 Class 9b – assembly buildings: exhibition halls [2019: NSW Table E2.2b]			X		Not applicable. Not an exhibition hall.
NSW E2D18 Class 9b – assembly buildings: exhibition halls, museums and art galleries [2019: NSW Table E2.2b]			X		Not applicable. Not an exhibition halls, museums and art galleries
NSW E2D19 Class 9b – assembly buildings: other assembly buildings (not listed in NSW E2D16 to E2D18) [2019: NSW Table E2.2b]			X		Not applicable.
NSW E2D20 Class 9b assembly buildings: other assembly buildings (not				X	This clause has deliberately been left blank. E2D20 does not apply in NSW. This clause is deleted from the BCA in NSW, as requirements for Class 9b – Assembly buildings in NSW are covered under NSW E2D16 to NSW E2D19.

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listed in E2D16 to E2D19)					
E2D21 Provision for special hazards [2019: E2.3]			X		Additional smoke hazard management measures may be necessary due to the— (a) special characteristics of the building; or (b) special function or use of the building; or (c) special type or quantity of materials stored, displayed or used in a building; or (d) special mix of classifications within a building or fire compartment, which are not addressed in E2D4 to E2D20. Note: Electric Vehicle (EV) charging stations are deemed to be a special hazard and will require assessment by a suitably qualified fire engineer against this clause.
Part E3 Lift Installations					
E3D1 Deemed-to-Satisfy Provisions [2019: E3.0]			X		(1) Where a *Deemed-to-Satisfy Solution* is proposed, *Performance Requirements* E3P1 to E3P4 are satisfied by complying with— (a) E3D2 to E3D12; (2) Where a Performance Solution is proposed, the relevant Performance Requirements must be determined in accordance with A2G2(3) and A2G4(3) as applicable.
E3D2 Lift installations [2019: E3.1]				X	An electric passenger lift installation and an electrohydraulic passenger lift installation must comply with Specification 24. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
E3D3 Stretcher facility in lifts [2019: E3.2]					(1) A stretcher facility in accordance with (2) must be provided— (a) in at least one emergency lift required by E3D5; or (b) where an emergency lift is not required, if passenger lifts are installed to serve any storey above an effective height of 12 m, in at least one of those lifts to serve each floor served by the lifts. (2) A stretcher facility must accommodate a raised stretcher with a patient lying on it horizontally by providing a clear space not less than 600 mm wide x 2000 mm long x 1400 mm high above the floor level. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
E3D4 Warning against use of lifts in fire [2019: E3.3]				X	(1) A warning sign must be displayed where it can be readily seen near every call button for a passenger lift or group of lifts throughout a building. (2) The requirements of (1) do not apply to a small lift such as a dumb-waiter or the like that is for the transport of goods only. (3) Each warning sign required by (1) must comply with the details and dimensions of Figure E3D4 and consist of— (a) incised, inlaid or embossed letters on a metal, wood, plastic or similar plate securely and permanently attached to the wall; or (b) letters incised or inlaid directly into the surface of the material forming the wall. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***

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E3D5 Emergency lifts [2019: E3.4]				X	(1) At least one emergency lift complying with (4) must be installed in— (a) a building which has an effective height of more than 25 m; and (2) An emergency lift may be combined with a passenger lift and must serve those storeys served by the passenger lift so that all storeys of the building served by passenger lifts are served by at least one emergency lift. (3) Where two or more passenger lifts are installed and serve the same storeys, excluding a lift that is within an atrium and not contained wholly within a shaft— (a) at least two emergency lifts must be provided to serve those storeys; and (b) if located within different shafts, at least one emergency lift must be provided in each shaft. (4) An emergency lift must— (a) be contained within a fire-resisting shaft in accordance with C3D11; ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
E3D6 Landings [2019: E3.5]				X	Access and egress to and from lift well landings must comply with the Deemed-to-Satisfy Provisions of Parts D2, D3 and D4. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
E3D7 Passenger lift types and their limitations [2019: E3.6, Table E3.6a, Table E3.6b]				X	(1) In an accessible building, every passenger lift must be one of the following lift types, subject to the limitations (if any) of each lift type: (a) There are no limitations on the use of electric passenger lifts, electrohydraulic passenger lifts or inclined lifts. (b) Stairway platform lifts must not— (i) be used to serve a space in a building accommodating more than 100 persons calculated according to D2D18; or (ii) be used in a high traffic public use area such as a theatre, cinema, auditorium, transport interchange, shopping centre or the like; or (iii) be used where it is possible to install another type of passenger lift; or (iv) connect more than 2 storeys; or (v) where more than 1 stairway lift is installed, serve more than 2 consecutive storeys; or (vi) when in the folded position, encroach on the minimum width of a stairway required by D2D8 to D2D11. (c) A low-rise platform lift must not travel more than 1000 mm. (d) A low-rise, low-speed constant pressure lift must not— (i) for an enclosed type, travel more than 4 m; or (ii) for an unenclosed type, travel more than 2 m; or (iii) be used in a high traffic public use areas in buildings such as a theatre, cinema, auditorium, transport interchange, shopping complex or the like. (e) A small-sized, low-speed automatic lift must not travel more than 12 m.

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					(2) A passenger lift referred to in (1) must not rely on a constant pressure device for its operation if the lift car is fully enclosed. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
E3D8 Accessible features required by passenger lifts [2019: Table E3.6a, Table E3.6b]			X		Not assessed in this report.
E3D9 Fire service controls [2019: E3.7]				X	Where lifts serve any storey above an effective height of 12 m, the following must be provided: (a) A fire service recall control switch complying with E3D11 for— (i) a group of lifts; or (ii) a single lift not in a group that serves the storey. (b) A lift car fire service drive control switch complying with E3D12 for every lift. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
E3D10 Residential care buildings [2019: E3.8]			X		Not applicable. Not a residential care building
E3D11 Fire service recall control switch [2019: E3.9]				X	(1) Each group of lifts must be provided with one fire service recall control switch required by E3D9 that activates the fire service recall operation at (6). (2) The switch required by (1) must— (a) be located at the landing nominated by the appropriate authority; and (b) be labelled “FIRE SERVICE” in indelible white lettering on a red background; and (c) have two positions with an “OFF” and an “ON” position identified; and (d) be operable only by the use of a key that is removable in either the “OFF” position or the “ON” position. (3) Adhesive labels must not be used for compliance with (2)(b) and (c). (4) The key in (2)(d) must be able to turn all fire service recall control switches in the building and must have a different key combination to other keys used for lifts in the building. (5) The fire service recall operation must be activated by— (a) switching the fire service recall control switch in (1) to “ON”; or (b) a signal from a fire management system approved by the appropriate authority. (6) The activation of the fire service recall operation at (5) must— (a) cancel all registered car and landing calls; and (b) inactivate all door reopening devices that may be affected by smoke; and

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
					(c) ensure lift cars travelling toward the nominated floor continue to the nominated floor without stopping; and (d) ensure lift cars travelling away from the nominated floor stop at or before the next available floor without opening the doors (either automatically or by the door open button), reverse direction and travel without stopping to the nominated floor; and (e) for lifts stopped at a floor other than the nominated floor, close the doors and travel without stopping to the nominated floor; and (f) ensure that lifts stay at the nominated floor with doors open; and (g) permit all lifts to return to normal service if the fire service recall control switch at (1) is switched to the "OFF" position during or after the fire service recall operation. (7) The requirements of (6) do not apply to lifts on inspection service or when the lift car fire service control switch required by E3D12 is in the "ON" position. (8) Lifts having manual controls must signal an alert to the lift for the lift to return to the nominated floor containing the recall switch that activated the signal. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
E3D12 Lift car fire service drive control switch [2019: E3.10]				X	(1) The lift car fire service drive control switch required by E3D9 must be activated from within the lift car. (2) The switch must— (a) be located between 600 mm and 1500 mm above the lift car floor; and (b) be labelled "FIRE SERVICE" by indelible white lettering on a red background; and (c) have two positions with an "OFF" and an "ON" position identified; and (d) operate only by the use of a key that is removable in either the "OFF" position or the "ON" position. (3) Adhesive labels must not be used for compliance with (2)(b) or (c). (4) When the lift car fire service drive control switch at (1) is turned to the "ON" position, the lift must— (a) not respond to the fire service recall control switch; and (b) cancel all registered lift car and landing calls; and (c) override all lift car call access control systems; and (d) inactivate all door reopening devices that may be affected by smoke; and (e) allow the registration of lift car call by lift car call buttons, however the lift doors must not close in response to the registration of lift car calls; and (f) activate door closing by constant pressure being applied on the "door close" button unless the button is released before the doors are fully closed, in which case the doors must reopen and any registered lift car calls must be cancelled; and (g) when the doors are closed, move the lift in response to registered lift car calls while allowing additional lift car calls to also be registered; and

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					(h) travel to the first possible floor in response to registered lift car calls and cancel all registered lift car calls after the lift stops; and (i) ensure doors do not open automatically, rather by constant pressure being applied on the "door open" button unless the button is released before the doors are fully open, in which case the doors must re-close. (5) The requirements of (4)(a) to (i) do not apply to a lift operating on inspection service. (6) A multi-deck lift installation must have systems in place that— (a) are able to communicate to the fire officer that the fire service drive control switch will not operate until all decks have been cleared of passengers; and (b) ensure there is an appropriate method of clearing all deck landings of passengers; and (c) maintain all doors to deck landings not containing the fire service control switch closed and inoperative while the lift is on fire service drive control. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
Part E4 Visibility in an emergency, exit signs and warning systems					
E4D1 Deemed-to-Satisfy Provisions [2019: E4.0]			X		(1) Where a Deemed-to-Satisfy Solution is proposed, Performance Requirements E4P1 to E4P3 are satisfied by complying with— (a) E4D2 to E4D9; and (b) in a building containing an atrium, Part G3; (2) Where a Performance Solution is proposed, the relevant Performance Requirements must be determined in accordance with A2G2(3) and A2G4(3) as applicable.
E4D2 Emergency lighting requirements [2019: E4.2]				X	An emergency lighting system must be installed— (a) in every fire-isolated stairway, fire-isolated passageway or fire-isolated ramp; and (b) in every storey of a Class 5, 6, 7, 8 or 9 building where the storey has an area more than 300 m²— (i) in every passageway, corridor, hallway, or the like, that is part of the path of travel to an exit; and (ii) in any room having a floor area more than 100 m² that does not open to a corridor or space that has emergency lighting or to a road or open space; and (iii) in any room having a floor area more than 300 m² ; and (c) in every passageway, corridor, hallway, or the like, having a length of more than 6 m from the entrance doorway of any sole-occupancy unit in a Class 2 or 3 building or Class 4 part of a building to the nearest doorway opening directly to— (i) a fire-isolated stairway, fire-isolated passageway or fire-isolated ramp; or (ii) an external stairway serving instead of a fire-isolated stairway under D2D13; or (iii) an external balcony leading to a fire-isolated stairway, fire-isolated passageway or fire-isolated ramp; or (iv) a road or open space; and (d) in every required non-fire-isolated stairway; and

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					(e) in a sole-occupancy unit in a Class 5, 6 or 9 building if— (i) the floor area of the unit is more than 300 m²; and (ii) an exit from the unit does not open to a road or open space or to an external stairway, passageway, balcony or ramp, leading directly to a road or open space; and (f) in every room or space to which there is public access in every storey in a Class 6 or 9b building if— (i) the floor area in that storey is more than 300 m²; or (ii) any point on the floor of that storey is more than 20 m from the nearest doorway leading directly to a stairway, ramp, passageway, road or open space; or (iii) egress from that storey involves a vertical rise within the building of more than 1.5 m, or any vertical rise if the storey concerned does not admit sufficient light; or (iv) the storey provides a path of travel from any other storey required by (i), (ii) or (iii) to have emergency lighting; and (i) in every required fire control centre. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
E4D3 Measurement of distance [2019: E4.3]			X		Informational. Distances, other than vertical rise, must be measured along the shortest path of travel whether by straight lines, curves or a combination of both.
E4D4 Design and operation of emergency lighting [2019: E4.4]				X	Every required emergency lighting system must comply with AS/NZS 2293.1. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
E4D5 Exit signs [2019: E4.5]				X	An exit sign must be clearly visible to persons approaching the exit, and must be installed on, above or adjacent to each— (a) door providing direct egress from a storey to— (i) an enclosed stairway, passageway or ramp serving as a required exit; and (ii) an external stairway, passageway or ramp serving as a required exit; and (iii) an external access balcony leading to a required exit; and (b) door from an enclosed stairway, passageway or ramp at every level of discharge to a road or open space; and (c) horizontal exit; and (d) door serving as, or forming part of, a required exit in a storey required to be provided with emergency lighting in accordance with E4D2. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***

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NSW E4D6 Direction signs [2019: NSW E4.6]				X	If an exit is not readily apparent to persons occupying or visiting the building, then exit signs must be installed— (a) in appropriate positions in corridors, hallways, lobbies, foyers, auditoria, and the like, indicating the direction to a required exit; ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
E4D7 Class 2 and 3 buildings and Class 4 parts: exemptions [2019: E4.7]			X		E4D5 does not apply to— (a) a Class 2 building in which every door referred to is clearly and legibly labelled on the side remote from the exit or balcony— (i) with the word "EXIT" in capital letters 25 mm high in a colour contrasting with that of the background; or (ii) by some other suitable method; and (b) an entrance door of a sole-occupancy unit in a Class 2 or 3 building or Class 4 part of a building.
E4D8 Design and operation of exit signs [2019: E4.8]				X	Every required exit sign must— (a) comply with— (i) AS/NZS 2293.1; or (ii) for a photoluminescent exit sign, Specification 25; and (b) be clearly visible at all times when the building is occupied by any person having the right of legal entry to the building. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
E4D9 Emergency warning and intercom systems [2019: E4.9]				X	An emergency warning and intercom system complying, where applicable, with AS 1670.4 must be installed— (a) in a building with an effective height of more than 25 m; ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
Specification 17 Fire Sprinkler systems					
S17C1 Scope [2019: Spec E1.5: 1]			X		This Specification sets out requirements for the design and installation of fire sprinkler systems.
S17C2 Application of automatic fire sprinkler standards [2019: Spec E1.5: 2]				X	Subject to this Specification, an automatic fire sprinkler system must comply with— (a) for all building classifications: AS 2118.1; ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S17C3 Separation of sprinklered and non-sprinklered areas [2019: Spec E1.5: 3]			X		Not applicable. Whole building will be sprinkler protected.

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S17C4 Protection of openings [2019: Spec E1.5: 4]			X		Not applicable. Whole building will be sprinkler protected.
S17C5 Quick response sprinklers [2019: Spec E1.5: 5]				X	Quick response sprinklers may be installed only if they are suitable for the type of application proposed and it is demonstrated that the sprinkler system is designed to accommodate their use. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S17C6 Sprinkler valve enclosures [2019: Spec E1.5: 6]				X	(1) Sprinkler alarm valves must be located in a secure room or enclosure which has direct egress to a road or open space. (2) All sprinkler valve rooms and enclosures must be secured with a system suitable for use by the fire brigade. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S17C7 Water supply [2019: Spec E1.5: 7]				X	(1) A required sprinkler system must be provided with at least one water supply. (2) A required sprinkler system in a building greater than 25 m in effective height must be provided with dual water supply except that a secondary water supply storage capacity of 25,000 litres may be used if— (a) the storage tank is located at the topmost storey of the building; and (b) the building occupancy is classified as no more hazardous than Ordinary Hazard 2 (OH2) under AS 2118.1; and (c) an operational fire brigade service is available to attend a building fire. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S17C8 Building occupant warning system [2019: Spec E1.5: 8]				X	A required sprinkler system must be connected to and activate a building occupant warning system complying with S20C7. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S17C9 Connection to other systems [2019: Spec E1.5: 9]				X	Where a smoke hazard management system is installed and is actuated by smoke detectors, the sprinkler system must, wherever practicable, be arranged to also activate the smoke hazard management system. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S17C10 Anti-tamper devices [2019: Spec E1.5: 10]				X	(1) Where a sprinkler system is installed— (a) over any stage area in a theatre, public hall or the like, visual and audible status indication of sprinkler valves must be provided at the location normally used by the stage manager; or (b) in a space housing lift electrical and control equipment (including machine rooms, secondary floors and sheave rooms), any valves provided to control sprinklers in these spaces must be located adjacent to the space.

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					(2) Any valves provided to control sprinklers required by (1) must be fitted with anti-tamper monitoring devices connected to a monitoring panel. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S17C11 Sprinkler systems in carparks [2019: Spec E1.5: 11]				X	A sprinkler system protecting a carpark complying with S5C19(3) in a multi-classified building must— (a) be independent of the sprinkler system protecting any part of the building not used as a carpark; or (b) if forming part of a sprinkler system protecting a part of the building not used as a carpark, be designed such that the section protecting the non-carpark part can be isolated without interrupting the water supply or otherwise affecting the effective operation of the section protecting the carpark. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S17C12 Residential care buildings [2019: Spec E1.5: 12]			X		Not applicable. Not a residential care building.
S17C13 Sprinkler systems in lift installations [2019: Spec E1.5: 13]				X	(1) Where sprinklers are installed in a space housing lift electrical and control equipment, including machine rooms, secondary floors and sheave rooms, sprinklers in these spaces must— (a) have heads protected from accidental damage by way of a guard that will not impair the performance of the head; and (b) be capable of being isolated and drained, either separately or collectively, without isolating any other sprinklers within the building. (2) Valves provided to control sprinklers referred to in (1) must be installed in accordance with S17C10(2). ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S17C14 Early childhood centres [New for 2022]			X		Not applicable. Not an early childhood centres.
Specification 18 Class 2 and 3 buildings not more than 25m in effective height					
S18C1 Scope [2019: Spec E1.5a: 1]			X		This Specification sets out requirements for the design and installation of fire sprinkler systems, and concessions for Class 2 and 3 buildings not more than 25 m in effective height with a rise in storeys of 4 or more.
S18C2 Application [2019: Spec E1.5a: 1]			X		Not applicable. Effective height more than 25m.
S18C3			X		Not applicable. Effective height more than 25m.

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System requirements [2019: Spec E1.5a: 2]					
S18C4 Permitted concessions [2019: Spec E1.5a: 3]			X		Not applicable. Effective height more than 25m.
Specification 19 Fire control centres					
S19C1 Scope [2019: Spec E1.8: 1]			X		(1) This Specification describes the construction and content of required fire control centres and rooms. (2) A fire control room is a fire control centre in a dedicated room with additional specific requirements.
S19C2 Application [2019: Spec E1.8: 1]			X		(1) S19C3 to S19C6 apply to fire control centres (including fire control rooms). (2) S19C7 to S19C13 apply additional requirements to fire control rooms.
S19C3 Purpose and content of fire control centre [2019: Spec E1.8: 2]				X	A fire control centre must— (a) provide an area from which fire-fighting operations or other emergency procedures can be directed or controlled; and (b) contain controls, panels, telephones, furniture, equipment and the like associated with the required fire services in the building; and (c) not be used for any purpose other than the control of— (i) fire-fighting activities; and (ii) other measures concerning the occupant safety or security. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S19C4 Location of fire control centre [2019: Spec E1.8: 3]				X	A fire control centre must be so located in a building that egress from any part of its floor, to a road or open space, does not involve changes in level which in aggregate exceed 300 mm. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification*** **COMPLIANCE COMMENTARY** **Change in level is 250mm.**

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					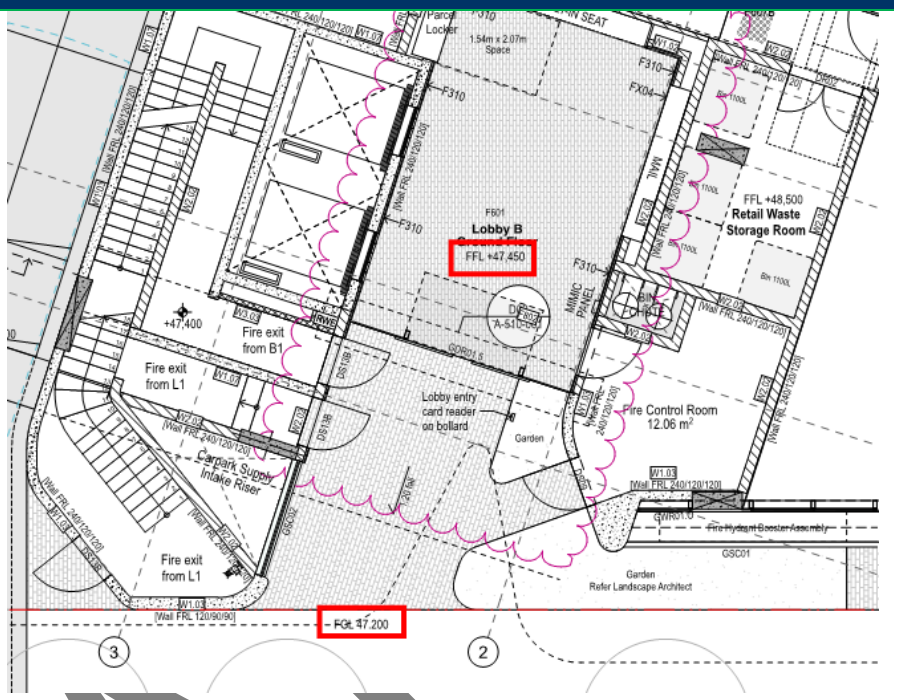
S19C5 Equipment not permitted within a fire control centre [2019: Spec E1.8: 4]				X	An internal combustion engine, pumps, sprinkler control valves, pipes and pipe fittings must not be located in a fire control centre, but may be located in rooms accessed through the fire control centre. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S19C6 Ambient sound level for a fire control centre [2019: Spec E1.8: 5]				X	(1) The ambient sound level within the fire control centre measured when all fire safety equipment is operating in the manner in which it operates in an emergency must not exceed 65 dB(A). (2) The measurement must be taken for a sufficient time to characterise the effects of all sound sources. (3) Where there is not a great variation in noise level, a measurement time of 60 seconds may be used. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S19C7 Construction of a fire control room [2019: Spec E1.8: 6]				X	A fire control centre in a building more than 50 m in effective height must be in a separate room where— (a) the enclosing construction is of concrete, masonry or the like, sufficiently impact resistant to withstand the impact of any likely falling debris, and with an FRL of not less than 120/120/120; and (b) any material used as a finish, surface, lining or the like within the room complies with the requirements of Specification 7; and (c) services, pipes, ducts and the like that are not directly required for the proper functioning of the fire control room do not pass through it; and (d) openings in the walls, floors or ceiling which separate the room from the interior of the building are confined to doorways, ventilation and other openings for services necessary for the proper functioning of the facility.

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					Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification
S19C8 Protection of openings in a fire control room [2019: Spec E1.8: 7]				X	Openings permitted by S19C7 must be protected as follows: (a) Openings for windows, doorways, ventilation, service pipes, conduits and the like, in an external wall of the building that faces a road or open space, must be protected in accordance with the Deemed-to-Satisfy Provisions of Part C4. (b) Openings in the floors, ceilings and internal walls enclosing a fire control room must, except for doorways, be protected in accordance with the Deemed-to-Satisfy Provisions of Part C4. (c) A door opening in the internal walls enclosing a fire-control room, must be fitted with a self- closing –/120/30 smoke sealed fire door. (d) Openings associated with natural or mechanical ventilation must— (i) not be made in any ceiling or floor immediately above or below the fire control room; and (ii) be protected by a –/120/– fire damper if the opening is for a duct through a wall required to have an FRL, other than an external wall. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S19C9 Doors to a fire control room [2019: Spec E1.8: 8]		X			(1) Required doors to a fire control room must open into the room, be lockable and located so that persons using escape routes from the building will not obstruct or hinder access to the room. (2) The fire control room must be accessible via two paths of travel— (a) one from the front entrance of the building; and (b) one direct from a public place or fire-isolated passageway which leads to a public place and has a door with an FRL of not less than –/120/30 ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification*** **COMPLIANCE COMMENTARY** Compliance achievable.

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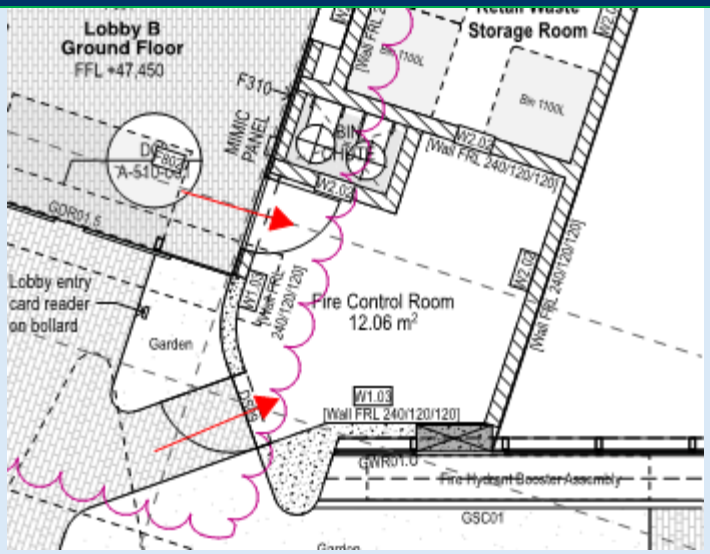
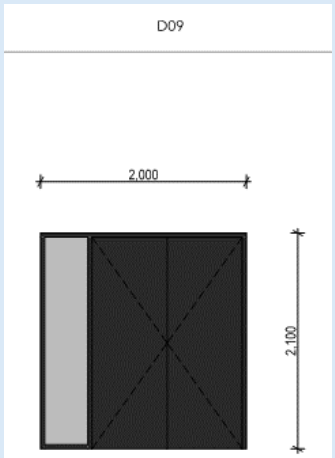
					 **Fire door serving the fire control room must have an FRL of at least -/120/30.** 
S19C10 Size and contents of a fire control room [2019: Spec E1.8: 9]				X	(1) A fire control room must contain— (a) a Fire Indicator Panel and necessary control switches and visual status indication for all required fire pumps, smoke control fans and other required fire safety equipment installed in the building; and

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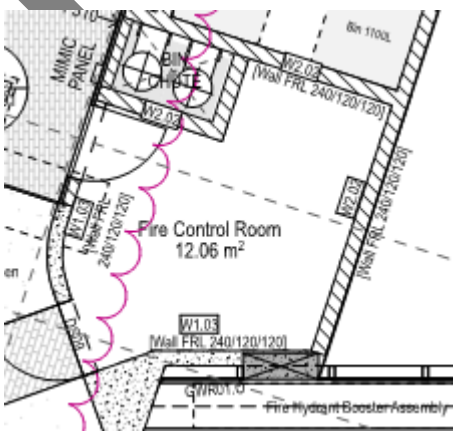
					(b) a telephone directly connected to an external telephone exchange; and (c) a blackboard or whiteboard not less than 1200 mm wide x 1000 mm high; and (d) a pin-up board not less than 1200 mm wide x 1000 mm high; and (e) a raked plan layout table of a size suitable for laying out the plans provided under (f); and (f) colour-coded, durable, tactical fire plans. (2) In addition, a fire control room may contain— (a) master emergency control panels, lift annunciator panels, remote switching controls for gas or electrical supplies and emergency generator backup; and (b) building security, surveillance and management systems if they are completely segregated from all other systems. (3) A fire control room must— (a) have a floor area of not less than 10 m^2 and the length of any internal side must be not less than 2.5 m; and (b) if only the minimum prescribed equipment is installed — have a net floor area of not less than 8 m2 with a clear space of not less than 1.5 m2 in front of the Fire Indicator Panel; and (c) if additional equipment is installed — have an additional area of not less than 2 m2 net floor area for each additional facility and a clear space of not less than 1.5 m2 in front of each additional control or indicator panel; and (d) be constructed such that the area required for any path of travel through the room to other areas is provided in addition to the requirements (b) and (c). ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification*** **COMPLIANCE COMMENTARY** **Compliance achievable.** 
S19C11 Ventilation and power supply for a fire control room				X	(1) A fire control room must be ventilated by— (a) natural ventilation from a window or doorway in an external wall of the building which opens directly into the fire control room from a road or open space; or

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[2019: Spec E1.8: 10]					(b) a pressurisation system that only serves the fire control room, and— (i) is installed in accordance with AS 1668.1 as though the room is a fire-isolated stairway; and (ii) is activated automatically by operation of the fire alarm, or sprinkler system complying with Specification 17, installed in the building and manually by an over-riding control in the room; and (iii) provides a flow of fresh air through the room of not less than 30 air changes per hour when the system is operating and any door to the room is open; and (iv) has fans, motors and ductwork that form part of the system but not contained within the fire control room protected by enclosing construction with an FRL of not less than 120/120/120; and (v) has any electrical supply to the fire control room or equipment necessary for its operation connected to the supply side of the main disconnection switch for the building. (2) No openable devices other than necessary doorways, pressure controlled relief louvres and windows that are openable by a key, must be constructed in the fire control room. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S19C12 Sign for a fire control room [2019: Spec E1.8: 11]				X	The external face of the door to the fire control room must have a sign with the words— **FIRE CONTROL ROOM** in letters not less than 50 mm high and of a colour which contrasts with that of the background. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S19C13 Lighting for a fire control room [2019: Spec E1.8: 12]				X	Emergency lighting in accordance with the Deemed-to-Satisfy Provisions of Part E4. must be provided in a fire control room, except that an illumination level of not less than 400 lux must be maintained at the surface of the plan table. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
Specification 20 Smoke detection and alarm systems					
S20C1 Scope [2019: Spec E2.2a: 1]			X		This Specification describes the installation and operation of automatic smoke detection and alarm systems.
S20C2 Type of system [2019: Spec E2.2a: 2]				X	A required automatic smoke detection and alarm system must be provided in accordance with the following: (a) Class 2 buildings and Class 4 parts of a building— (i) a smoke alarm system complying with S20C3; or (ii) a smoke detection system complying with S20C4; or

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
					(iii) a combination of a smoke alarm system and a smoke detection system complying with S20C5. (c) Class 5, 6, 7, 8, 9b and 9c buildings — a smoke detection system complying with S20C4 ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S20C3 Smoke alarm system [2019: Spec E2.2a: 3]				X	(1) In all Class 2 - 9 buildings provided with a smoke alarm system, the following applies: (a) A smoke alarm system must— (i) consist of smoke alarms complying with AS 3786; and (ii) be powered from the consumer mains source. (b) In kitchens and other areas where the use of the area is likely to result in smoke alarms causing spurious signals, subject to (c)— (i) any other alarm deemed suitable in accordance with AS 1670.1 may be installed provided that smoke alarms are installed elsewhere in the sole-occupancy unit in accordance with (2)(a) and (2)(b); or (ii) an alarm acknowledgement facility may be installed. (c) Where a kitchen or other area referred to in (b) is in a building protected with a sprinkler system complying with Specification 17 (other than a FPAA101D system), alarms need not be installed in the kitchen or other area likely to result in spurious signals. (2) In a Class 2 or 3 building or Class 4 part of a building provided with a smoke alarm system, the following applies: (a) Alarms must be installed within each sole-occupancy unit, and located on or near the ceiling in any storey— (i) containing bedrooms— (A) between each part of the sole-occupancy unit containing bedrooms and the remainder of the sole occupancy unit; and (B) where bedrooms are served by a hallway, in that hallway; and (ii) not containing any bedrooms, in egress paths. (b) Where there is more than one alarm installed within a sole-occupancy unit, alarms must be interconnected within that sole-occupancy unit. (c) Subject to (d), alarms must be— (i) installed in public corridors and other internal public spaces, located in accordance with the requirements for smoke detectors in AS 1670.1; and (ii) connected to activate a building occupant warning system in accordance with S20C7. (d) In a Class 2 or 3 building or Class 4 part of a building protected with a sprinkler system complying with Specification 17 (other than a FPAA101D system), alarms are not required in public corridors and other internal public spaces. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S20C4				X	(1) In all Class 2 - 9 buildings provided with a smoke detection system, the following applies:

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
Smoke detection system [2019: Spec E2.2a: 4]					(a) A smoke detection system must— (i) subject to (2) and (3), comply with AS 1670.1; and (ii) activate a building occupant warning system in accordance with S20C7. (b) In kitchens and other areas where the use of the area is likely to result in smoke detectors causing spurious signals, subject to (c)— (i) any other detector deemed suitable in accordance with AS 1670.1 may be installed provided that smoke detectors are installed elsewhere in the sole-occupancy unit in accordance with the requirements for alarms in S20C3(2)(a) and (2)(b); or (ii) an alarm acknowledgement facility may be installed. (c) Where a kitchen or other area referred to in (b) is in a building protected with a sprinkler system complying with Specification 17 (other than a FPAA101D or FPAA101H system), detectors need not be installed in the kitchen or other areas likely to result in spurious signals. (2) In a Class 2 or 3 building or Class 4 part of a building provided with a smoke detection system, the following applies: (a) Smoke detectors must be installed— (i) within each sole-occupancy unit, in accordance with the requirements for alarms in S20C3(2)(a) and (2)(b); and (ii) subject to (b), in public corridors and other internal public spaces. (b) In a Class 2 or 3 building or Class 4 part of a building protected with a sprinkler system complying with Specification 17 (other than a FPAA101D or FPAA101H system), smoke detectors are not required in public corridors and other internal public spaces. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S20C5 Combined smoke alarm and smoke detection system [2019: Spec E2.2a: 5]				X	(1) A Class 2 or 3 building or Class 4 part of a building provided with a combination of a smoke alarm system and smoke detection system in accordance with S20C2 must— (a) be provided with a smoke alarm system complying with S20C3 within sole-occupancy units; and (b) subject to (2), be provided with a smoke detection system complying with S20C4 in areas not within sole-occupancy units. (2) In a Class 2 or 3 building or Class 4 part of a building protected with a sprinkler system complying with Specification 17 (other than a FPAA101D or FPAA101H system), smoke detectors are not required in public corridors and other internal public spaces. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S20C6 Smoke detection for smoke control systems [2019: Spec E2.2a: 6]				X	(1) Smoke detectors required to activate air pressurisation systems for fire-isolated exits and zone pressurisation systems must— (a) be installed in accordance with AS 1670.1; and (b) have additional smoke detectors installed adjacent to each bank of lift landing doors set back horizontally from the door openings by a distance of not more than 3 m. (2) Smoke detectors required to activate—

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
					(a) automatic shutdown of air-handling systems in accordance with E2D14 to E2D20; or (b) a smoke exhaust system in accordance with Specification 21, must comply with the requirements of (3). (3) Smoke detectors referred to in (2) must— (a) be spaced— (i) not more than 20 m apart and not more than 10 m from any wall, bulkhead or smoke curtain; and (ii) in enclosed malls and walkways in a Class 6 building not more than 15 m apart and not more than 7.5 m from any wall, bulkhead or curtain; and (b) have a sensitivity— (i) in accordance with AS 1670.1 in areas other than a multi-storey walkway and mall in a Class 6 building; and (ii) not exceeding 0.5% smoke obscuration per metre with compensation for external airborne contamination as necessary, in a multi-storey walkway and mall in a Class 6 building. (4) Smoke detectors provided to activate a smoke control system must— (a) either— (i) form part of a building fire or smoke detection system complying with AS 1670.1; or (ii) be a separate dedicated system incorporating control and indicating equipment complying with AS 1670.1; and (b) activate a building occupant warning system complying with S20C7, except that smoke detectors provided solely to initiate automatic shutdown of air-handling systems in accordance with (2)(a) need not activate a building occupant warning system. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S20C7 Building occupant warning system [2019: Spec E2.2a: 7]				X	Subject to E4D9, a building occupant warning system provided as part of a smoke hazard management system must comply with clause 3.22 of AS 1670.1 to sound through all occupied areas except— (a) in a Class 2 building provided with a smoke alarm system in accordance with S20C3(2)(c)— (i) the sound pressure level need not be measured within a sole-occupancy unit if a level of not less than 85 dB(A) is provided at the door providing access to the sole-occupancy unit; and (ii) the inbuilt sounders of the smoke alarms may be used to wholly or partially meet the requirements; and (b) in a Class 2 and 3 building or Class 4 part of a building provided with a smoke detection system in accordance with S20C4(2), the sound pressure level from a building occupant warning system need not be measured within a sole-occupancy unit if a level of not less than 100 dB(A) is provided at the door providing access to the sole-occupancy unit; and (c) in a Class 3 building used as a residential care building, the system— (i) must be arranged to provide a warning for occupants; and

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					(ii) in areas used by residents, may have its alarm adjusted in volume and content to minimise trauma consistent with the type and condition of residents; and (d) in a Class 9a health-care building, in a patient care area, the system— (i) must be arranged to provide a warning for occupants; and (ii) in a ward area, may have its alarm adjusted in volume and content to minimise trauma consistent with the type and condition of the patients; and (e) in a Class 9c building, the system— (i) must be arranged to provide a warning for occupants; and (ii) must notify staff caring for the residents of the building; and (iii) in areas used by residents, may have its alarm adjusted in volume and content to minimise trauma consistent with the type and condition of residents. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
NSW S20C8 System monitoring [2019: NSW Spec E2.2a: 8]				X	Not applicable. Not a Class 3 9a 9c building or a smoke detection in accordance with S20C6 provided to activate a smoke exhaust system in accordance with Specification 21; or smoke-and-heat vents in accordance with Specification 22.
Specification 21 Smoke exhaust systems					
S21C1 Scope [2019: Spec E2.2b: 1]			X		This Specification describes the requirements for mechanical smoke exhaust systems.
S21C2 Smoke exhaust capacity [2019: Spec E2.2b: 2]			X		Not applicable. A mechanical smoke exhaust systems is not required.
S21C3 Smoke exhaust fans [2019: Spec E2.2b: 3]			X		Not applicable. A mechanical smoke exhaust systems is not required.
S21C4 Smoke reservoirs [2019: Spec E2.2b: 4]			X		Not applicable. A mechanical smoke exhaust systems is not required.
S21C5 Smoke exhaust fan and vent location			X		Not applicable. A mechanical smoke exhaust systems is not required.

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[2019: Spec E2.2b: 5]					
S21C6 Make-up air [2019: Spec E2.2b: 6]			X		Not applicable. A mechanical smoke exhaust systems is not required.
S21C7 Smoke exhaust system control [2019: Spec E2.2b: 7]			X		Not applicable. A mechanical smoke exhaust systems is not required.
S21C8 Smoke detection [2019: Spec E2.2b: 8]			X		Not applicable. A mechanical smoke exhaust systems is not required.
Specification 22 Smoke-and-heat vents					
S22C1 Scope [New for 2022]			X		This Specification contains requirements for automatic smoke-and-heat vents.
S22C2 Adoption of AS 2665 [2019: Spec E2.2c: 1]			X		Not applicable. Automatic smoke-and-heat vents is not required.
S22C3 Controls [2019: Spec E2.2c: 2]			X		Not applicable. Automatic smoke-and-heat vents is not required.
Specification 23 Residential fire safety					
S23C1 Scope [2019: Spec E2.2d: 1]			X		This Specification describes the requirements for residential fire safety systems referenced in Specification 18.
S23C2 Application [2019: Spec 2.2d: 1]			X		Not applicable. Effective height more than 25m.
S23C3 General requirements [2019: Spec 2.2d: 2(a)]			X		Not applicable. Effective height more than 25m.
S23C4			X		Not applicable. Effective height more than 25m.

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Local fire indicator panel [2019: Spec 2.2d: 2(b)]					
S23C5 Smoke alarms [2019: Spec E2.2d: 2(c)]			X		Not applicable. Effective height more than 25m.
S23C6 Signal isolation interface units [2019: Spec E2.2d: 2(d)]			X		Not applicable. Effective height more than 25m.
S23C7 Wiring [2019: Spec E2.2d: 2(e)]			X		Not applicable. Effective height more than 25m.
S23C8 Connection to monitoring service [2019: Spec E2.2d: 3(a)]			X		Not applicable. Effective height more than 25m.
S23C9 Indication at the fire indicator panel [2019: Spec E2.2d: 3(b)]			X		Not applicable. Effective height more than 25m.
Specification 24 Lift installations					
S24C1 Scope [2019: Spec E3.1: 1]			X		This Specification contains requirements for electric passenger lift installations and electrohydraulic passenger lift installations.
S24C2 Lift cars exposed to solar radiation [2019: Spec E3.1: 2]				X	(1) A lift car exposed to solar radiation directly, or indirectly by re-radiation, must have — (a) mechanical ventilation at a rate of one air change per minute; or (b) mechanical cooling. (2) A 2 hour alternative power source for ventilation or mechanical cooling at (1) must be provided in the event of normal power loss. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S24C3 Lift car emergency lighting				X	A lift car must have an emergency lighting system designed— (a) to come on automatically upon failure of the normal lighting supply; and (b) to provide at least 20 lux of lighting for 2 hours on the alarm initiation button.

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[2019: Spec E3.1: 3]					***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S24C4 Cooling of lift shaft [2019: Spec E3.1: 4]				X	While a lift in a lift shaft is in service, the cooling of the lift shaft must— (a) ensure that the dry bulb air temperature in the lift shaft does not exceed 40°C; and (b) if the cooling is by a ventilation system, be provided with an air change rate determined using a temperature rise of no more than 5 K. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S24C5 Lift foyer access [2019: Spec E3.1: 5]				X	Where there is a security foyer in a building, access may be via locked security doors provided— (a) security doors revert to the unlocked state in the event of— (i) power failure; or (ii) fire alarm; and (b) locked foyer areas are monitored by closed circuit television and intercom system to a 24 hour staffed location. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S24C6 Emergency access doors in a single enclosed lift shaft [2019: Spec E3.1: 6]				X	(1) Where a lift is installed in a single enclosed lift shaft having a distance between normal landing entrances greater than 12.2 m, emergency access doors must be provided and constructed as follows: (a) The clear opening size of emergency doors must be not less than 600 mm wide x 980 mm high. (b) Hinged doors must not open towards the interior of the lift shaft. (c) Doors must be self-closing and self-locking. (d) Doors must be marked on the landing side with the letters not less than 35 mm high: **DANGER LIFTWELL ACCESS** **KEEP FURNITURE AND FIXTURES CLEAR** (e) Doors from the landing side must only be openable by a tool. (f) Each emergency door must be provided with a positive breaking electrical contact, wired into the control circuit to prevent movement of the lift until the emergency door is both closed and locked. (2) Emergency egress from the lift car must be provided in single enclosed lift shafts where— (a) ropes are installed; and (b) the vertical distance between the lift car sill and the landing door head is less than 600 mm; and (c) the counterweight is resting on its fully compressed buffer. (3) Emergency egress required by (2) must be in the form of an interlocked door with clear opening dimensions not less than 600 mm x 600 mm, accessible from the lift car entrance or the lift car roof (where the door is located in the wall of the lift shaft). ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
Specification 25 Photoluminescent exit signs					

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S25C1 Scope [2019: Spec E4.8: 1]			X		This Specification contains requirements for photoluminescent exit signs.
S25C2 Application [2019: Spec E4.8: 2]				X	A photoluminescent exit sign must comply with Section 5 and Appendix D of AS/NZS 2293.1, except where varied by this Specification. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S25C3 Illumination [2019: Spec E4.8: 3]				X	A photoluminescent exit sign must— (a) be maintained in a continuously charged state by a minimum illumination of 100 lux at the face of the sign by a dedicated light source with a colour temperature not less than 4000 K; and (b) in the event of a power failure, continue to provide a minimum luminance of 30 mcd/m^2 for not less than 90 minutes; and (c) have its performance verified by testing in accordance with ASTM E2073-10, except the activation illumination in clause 8.3 is replaced with 54 lux. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S25C4 Pictorial elements [2019: Spec E4.8: 4]				X	Pictorial elements on a photoluminescent exit sign must— (a) where the colour white is used, be replaced with a photoluminescent material; and (b) be not less than 1.3 times larger than that specified in Table 5.1 of AS/NZS 2293.1; and (c) have a border of photoluminescent material that extends not less than 15 mm beyond the pictorial elements. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S25C5 Viewing distance [2019: Spec E4.8: 5]				X	The maximum viewing distance in clause 5.6 of AS/NZS 2293.1 must not be more than 24 m. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S25C6 Smoke control systems [2019: Spec E4.8: 6]				X	Smoke control systems required by clause 5.3 of AS/NZS 2293.1 do not apply to a photoluminescent exit sign. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
Section F Health and Amenity					
Part F1 External waterproofing, rainwater management and rising damp					
F1D1 Deemed-to-Satisfy Provisions [2019: F1.0]			X		(1) Where a Deemed-to-Satisfy Solution is proposed, Performance Requirements F1P1 to F1P4 are satisfied by complying with F1D2 to F1D8. (2) Where a Performance Solution is proposed, the relevant Performance Requirements must be determined in accordance with A2G2(3) and A2G4(3) as applicable.
F1D2 Application of Part			X		(1) F1D4 and F1D5 do not apply to a roof with a covering complying with F3D2(a) to (d).

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[New for 2022]					(2) F1D3 to F1D5 do not apply to a balcony, podium or similar horizontal surface part of a building— (a) where the flooring is of timber decking or other perforated flooring; or (b) which is located directly above ground.
F1D3 Stormwater Drainage [2019: F1.1]				X	Stormwater drainage must be designed and constructed in accordance with AS/NZS 3500.3. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
F1D4 Exposed Joints [New for 2022]				X	Exposed joints in the drainage surface on a roof, balcony, podium, or similar horizontal surface part of a building must— (a) be protected in accordance with Section 2.9 of AS 4654.2; and (b) not be located beneath or run through a planter box, water feature or similar part of the building. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
F1D5 External waterproofing membranes [2019: F1.4]				X	A roof, balcony, podium, or similar horizontal surface part of a building must be provided with a waterproofing membrane— (a) consisting of materials complying with AS 4654.1; and (b) designed and installed in accordance with AS 4654.2. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
F1D6 Damp-proofing [2019: F1.9]				X	(1) Except for a building covered by (3), moisture from the ground must be prevented from reaching— (a) the lowest floor timbers and the walls above the lowest floor joists; and (b) the walls above the damp-proof course; and (c) the underside of a suspended floor constructed of a material other than timber, and the supporting beams or girders. (2) Where a damp-proof course is provided, it must consist of— (a) a material that complies with AS/NZS 2904; or (b) impervious sheet material in accordance with AS 3660.1. (3) The following buildings need not comply with (1): (a) A Class 7 or 8 building where in the particular case there is no necessity for compliance. (b) A garage, tool shed, sanitary compartment, or the like, forming part of a building used for other purposes. (c) An open spectator stand or open-deck carpark. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
F1D7 Damp-proofing of floors on the ground [2019: F1.10]				X	(1) If a floor of a room is laid on the ground or on fill, moisture from the ground must be prevented from reaching the upper surface of the floor and adjacent walls by the insertion of a vapour barrier in accordance with AS 2870. (2) The requirements of (1) do not apply where— (a) weatherproofing is not required; or (b) the floor is the base of a stair, lift or similar shaft which is adequately drained by gravitation or mechanical means.

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					Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification
F1D8 Subfloor ventilation [2019: F1.12]			X		Not applicable. No subfloor proposed.
Part F2 Wet areas and overflow protection					
F2D1 Deemed-to-Satisfy Provisions [New for 2022]			X		(1) Where a Deemed-to-Satisfy Solution is proposed, Performance Requirements F2P1 and F2P2 are satisfied by complying with F2D2 to F2D4. (2) Where a Performance Solution is proposed, the relevant Performance Requirements must be determined in accordance with A2G2(3) and A2G4(3) as applicable.
F2D2 Wet area construction [2019: F1.7(a) and (b)]				X	(1) In a Class 2 building, building elements in wet areas must— (a) be water resistant or waterproof in accordance with Specification 26; and (b) comply with AS 3740. (2) In a Class 5, 6, 7, 8 or 9 building, building elements in a bathroom or shower room, a slop hopper or sink compartment, a laundry or sanitary compartment must— (a) be water resistant or waterproof in accordance with Specification 26; and (b) comply with AS 3740, as if they were in a Class 2 or 3 building or a Class 4 part of a building. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
F2D3 Rooms containing urinals [2019: F1.7(c), (d) and (e)]				X	(1) Where a slab or stall type urinal is installed— (a) the floor surface of the room containing the urinal must be an impervious material; and (i) where no step is installed, must— (A) be graded to the urinal channel for a distance of 1.5 m from the urinal channel; and (B) have the remainder of the floor graded to a floor waste; and (ii) where a step is installed— (A) the step must have an impervious surface and be graded to the urinal channel; and (B) the floor behind the step must be graded to a floor waste; and (b) the junction between the floor surface and the urinal channel must be impervious. (2) Where a wall hung urinal is installed— (a) the wall must be surfaced with impervious material extending from the floor to the top of the urinal and not less than 225 mm on each side of the urinal; and (b) the floor must be surfaced with an impervious material and be graded to a floor waste. (3) In a room with timber or steel-framed walls and containing a urinal—

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
					(a) the wall must be surfaced with an impervious material extending from the floor to not less than 100 mm above the floor surface; and (b) the junction of the floor surface and the wall surface must be impervious. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
F2D4 Floor wastes [2019: F1.11]				X	(1) In a Class 2 or 3 building or Class 4 part of a building, a bathroom or laundry located at any level above a sole occupancy unit or public space must have a floor waste. (2) Where a floor waste is installed— (a) the minimum continuous fall of a floor plane to the waste must be 1:80; and (b) the maximum continuous fall of a floor plane to the waste must be 1:50. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
Part F3 Roof and wall cladding					
F3D1 Deemed-to Satisfy Provisions [New for 2022]			X		(1) Where a Deemed-to-Satisfy Solution is proposed, Performance Requirement F3P1 is satisfied by complying with F3D2 to F3D5. (2) Where a Performance Solution is proposed, the relevant Performance Requirements must be determined in accordance with A2G2(3) and A2G4(3) as applicable.
F3D2 Roof coverings [2019: F1.5]				X	A roof must be covered with— (e) an external waterproofing membrane complying with F1D5. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
F3D3 Sarking [2019: F1.6]				X	Sarking-type material used for weatherproofing of roofs and walls must comply with AS 4200.1 and AS 4200.2. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
F3D4 Glazed assembles [2019: F1.13]				X	(1) Subject to (2) and (3), the following glazed assemblies in an external wall, must comply with AS 2047 requirements for resistance to water penetration: (a) Windows. (b) Sliding and swinging glazed doors with a frame, including French and bi-fold doors with a frame. (c) Adjustable louvres. (d) Shopfronts. (e) Window walls with one piece framing. (2) The following buildings need not comply with (1): (a) A Class 7 or 8 building where in the particular case there is no necessity for compliance. (b) A garage, tool shed, sanitary compartment, or the like, forming part of a building used for other purposes, except where the construction of the garage, tool shed, sanitary compartment or the like contributes to the weatherproofing of the other part of the building.

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					(c) An open spectator stand or open-deck carpark. (3) The following glazed assemblies need not comply with (1): (a) All glazed assemblies not in an external wall. (b) Revolving doors. (c) Fixed louvres. (d) Skylights, roof lights and windows in other than the vertical plane. (e) Sliding and swinging glazed doors without a frame. (f) Windows constructed on site and architectural one-off windows, which are not design tested in accordance with AS 2047. (g) Second-hand windows, re-used windows and recycled windows. (h) Heritage windows. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
F3D5 Wall cladding [New for 2022]				X	(1) External wall cladding must comply with one or a combination of the following: (a) Masonry, including masonry veneer, unreinforced and reinforced masonry: AS 3700. (b) Autoclaved aerated concrete: AS 5146.3. (c) Metal wall cladding: AS 1562.1. (2) The following buildings need not comply with (1): (a) A Class 7 or 8 building where in the particular case there is no necessity for compliance. (b) A garage, tool shed, sanitary compartment, or the like, forming part of a building used for other purposes, except where the construction of the garage, tool shed, sanitary compartment or the like contributed to the weatherproofing of another part of the building that is required to be weatherproofed. (c) An open spectator stand or open deck carpark. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
Part F4 Sanitary and other facilities					
F4D1 Deemed-to-Satisfy Provisions [2019: F2.0]			X		(1) Where a Deemed-to-Satisfy Solution is proposed, Performance Requirements F4P1 to F4P6 are satisfied by complying with— (a) F4D2 to F4D12; (2) Where a Performance Solution is proposed, the relevant Performance Requirements must be determined in accordance with A2G2(3) and A2G4(3) as applicable.
F4D2 Facilities in residential buildings [2019: F2.1]				X	(1) For facilities in Class 2 buildings, the following applies: (a) Within each sole-occupancy unit, provide— (i) a kitchen sink and facilities for the preparation and cooking of food; and (ii) a bath or shower; and (iii) a closet pan; and (iv) a washbasin. (b) For laundry facilities, provide either—

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
					(i) in each sole-occupancy unit— (A) clothes washing facilities, comprising at least one washtub and a space for a washing machine; and (B) clothes drying facilities comprising clothes line or a hoist with not less than 7.5 m of line, or space for one heat operated drying cabinet or appliance in the same room as the clothes washing facilities; or (ii) a separate laundry for each 4 sole-occupancy units, or part thereof, that must comprise— (A) clothes washing facilities, comprising at least one washtub and a space for a washing machine; and (B) clothes drying facilities comprising clothes line or a hoist with not less than 7.5 m of line per sole occupancy unit, or space for one heat operated drying cabinet or appliance. (c) For the purposes of (a) and (b), a kitchen sink or washbasin must not be counted as a laundry washtub. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
F4D3 Calculation of number of occupants and facilities [2019: F2.2]			X		(1) The number of persons accommodated must be calculated according to D2D18 if it cannot be more accurately determined by other means. (2) Unless the premises are used predominantly by one sex, sanitary facilities must be provided on the basis of equal numbers of males and females. (3) In calculating the number of sanitary facilities to be provided under F4D2 and F4D4, a unisex facility required for people with a disability (other than a facility provided under F4D12) may be counted once for each sex. (4) For the purposes of this Part, a unisex facility comprises one closet pan, one washbasin and means for the disposal of sanitary products.
F4D4 Facilities in Class 3 to 9 buildings [2019: F2.3]				X	(1) Except where permitted by (3), (4), (7), F4D5(a) and F4D5(b), separate sanitary facilities for males and females must be provided for Class 3, 5, 6, 7, 8 or 9 buildings in accordance with Tables F4D4a to F4D4l, as appropriate. (2) In Tables F4D4a to F4D4l— (a) 'Number' means the number of facilities required; and (b) '>' means greater than; and (c) a hyphen means no data (refer to the row above for the highest value applicable); and (d) 'N/A' means not applicable; and (e) a reference to— (i) employees includes owners and managers using the building; and (ii) add 1 per 100 or 150, 250, 500" etc. includes any part of that number. (3) If not more than 10 people are employed, a unisex facility may be provided instead of separate facilities for each sex.

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					(4) If the majority of employees are of one sex, not more than 2 employees of the other sex may share toilet facilities if the facilities are separated by means of walls, partitions and doors to afford privacy. (5) Employees and the public may share the same facilities in a Class 6 and 9b building (other than a school or early childhood centre) provided the number of facilities provided is not less than the total number of facilities required for employees plus those required for the public. (6) Adequate means of disposal of sanitary products must be provided in sanitary facilities for use by females. (11) Not less than one washbasin must be provided where closet pans or urinals are provided. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification*** **COMPLIANCE COMMENTARY** **Details of the proposed use of each tenancy is required to assess compliance.**
F4D5 Accessible sanitary facilities [2019: F2.4]			X		Not assessed in this report.
F4D6 Accessible unisex sanitary compartments [2019: Table F2.4a]			X		Not assessed in this report.
F4D7 Accessible unisex showers [2019: Table F2.4b]			X		Not assessed in this report.
F4D8				X	(1) Other than in an early childhood centre, sanitary compartments must have doors and partitions that separate adjacent compartments and extend—

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Construction of sanitary compartments [2019: F2.5]					(a) from floor level to the ceiling in the case of a unisex facility; or (b) to a height of not less than 1.5 m above the floor if primary school children are the principal users; or (c) 1.8 m above the floor in all other cases. (2) The door to a fully enclosed sanitary compartment must— (a) open outwards; or (b) slide; or (c) be readily removable from the outside of the sanitary compartment, unless there is a clear space of at least 1.2 m, measured in accordance with Figure F4D8, between the closet pan within the sanitary compartment and the doorway. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
F4D9 Interpretation: urinals and washbasins [2019: F2.6]			X		(1) A urinal may be— (a) an individual stall or wall-hung urinal; or (b) each 600 mm length of a continuous urinal trough; or (c) a closet pan used in place of a urinal. (2) A washbasin may be— (a) an individual basin; or (b) a part of a hand washing trough served by a single water tap.
F4D11 Waste management [2019: F2.8]			X		Not applicable. Not a Class 9a or 9c building.
F4D12 Accessible adult change facilities [2019: F2.9]			X		Not assessed in this report.
Part F5 Room heights					
F5D1 Deemed-to-satisfy Provisions [2019: F3.0]			X		(1) Where a Deemed-to-Satisfy Solution is proposed, Performance Requirement F5P1 is satisfied by complying with— (a) F5D2; (2) Where a Performance Solution is proposed, the relevant Performance Requirements must be determined in accordance with A2G2(3) and A2G4(3) as applicable.
F5D2 Height of rooms and other spaces [2019: F3.1]				X	(1) The height of rooms and other spaces in a Class 2 or 3 building or Class 4 part of a building must be not less than— (a) for a kitchen, laundry, or the like — 2.1 m; and (b) for a corridor, passageway or the like — 2.1 m; and (c) for a habitable room excluding a kitchen — 2.4 m; and (d) in a habitable room, or space within a habitable room, with a sloping ceiling or projections below the ceiling line— (i) in an attic — a height of not less than 2.2 m for not less than two-thirds of the floor area of the room or space; and (ii) in other rooms — a height of not less than 2.4 m for not less than two-thirds of the floor area of the room or space; and

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
					(e) in a non-habitable room, or space within a non-habitable room, with a sloping ceiling or projections below the ceiling line — a height of not less than 2.1 m for not less than two-thirds of the floor area of the room or space. (2) For the purposes of (1), when calculating the floor area of a room or space, any part that has a ceiling height of less than 1.5 m is not included. (3) The height of rooms and other spaces in a Class 5, 6, 7 or 8 building must be not less than— (a) except as allowed in (b) and (8) — 2.4 m; and (b) a corridor, passageway, or the like — 2.1 m. (5) The height of rooms and other spaces in a Class 9b building must be not less than— (a) for a school classroom or other assembly building or part that accommodates not more than 100 persons — 2.4 m; and (b) for a theatre, public hall or other assembly building or part that accommodates more than 100 persons — 2.7 m; and (c) for a corridor— (i) that serves an assembly building or part that accommodates not more than 100 persons — 2.4 m; or (ii) that serves an assembly building or part that accommodates more than 100 persons — 2.7 m. (6) For the purposes of (5) the number of persons accommodated must be calculated according to D2D18. (8) The height of rooms and other spaces in any building must be not less than— (a) for a bathroom, shower room, sanitary compartment, other than an accessible adult change facility, airlock, tea preparation room, pantry, store room, garage, car parking area, or the like — 2.1 m; and (b) for a commercial kitchen — 2.4 m; and (c) above a stairway, ramp, landing or the like — 2 m measured vertically above the nosing line of stairway treads or the floor surface of the ramp, landing or the like; and (d) for a required accessible adult change facility — 2.4 m. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
Part F6 Light and Ventilation					
F6D1 Deemed-to-Satisfy Provisions [2019: F4.0]			X		(1) Where a Deemed-to-Satisfy Solution is proposed, Performance Requirements F6P1 to F6P5 are satisfied by complying with— (a) F6D2 to F6D12; (2) Where a Performance Solution is proposed, the relevant Performance Requirements must be determined in accordance with A2G2(3) and A2G4(3) as applicable.
F6D2 Provision of natural light [2019: F4.1]				X	Natural light must be provided in: (a) A Class 2 building to all habitable rooms. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
F6D3		X			(1) Required natural light must be provided by—

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
Methods and extent of natural light [2019: F4.2]					(a) windows, excluding roof lights, that— (i) have an aggregate light transmitting area measured exclusive of framing members, glazing bars or other obstructions of not less than 10% of the floor area of the room; and (ii) are open to the sky or face a court or other space open to the sky or an open verandah, carport or the like; or (b) roof lights, that— (i) have an aggregate light transmitting area measured exclusive of framing members, glazing bars or other obstructions of not less than 3% of the floor area of the room; and (ii) are open to the sky; or (c) a proportional combination of windows and roof lights required by (a) and (b) (2) In a Class 2, building, a required window that faces a boundary of an adjoining allotment or a wall of the same building or another building on the allotment must not be less than a horizontal distance from that boundary or wall that is the greater of— (a) generally — 1 m; and (c) 50% of the square root of the exterior height of the wall in which the window is located, measured in metres from its sill. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification*** **COMPLIANCE COMMENTARY** **Study rooms are not provided with natural light.** ***It is recommended this is addressed by a Performance Solution.***
F6D4 Natural light borrowed from adjoining room [2019: F4.3]				X	(1) Natural light to a room in a Class 2 building or Class 4 part of a building or in a sole-occupancy unit of a Class 3 building, may come through one or more glazed panels or openings from an adjoining room (including an enclosed verandah) if— (a) both rooms are within the same sole-occupancy unit or the enclosed verandah is on common property; and

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					(b) the glazed panels or openings have an aggregate light transmitting area of not less than 10% of the floor area of the room to which it provides light; and (c) the adjoining room has— (i) windows, excluding roof lights, that— (A) have an aggregate light transmitting area of not less than 10% of the combined floor areas of both rooms; and (B) are open to the sky or face a court or other space open to the sky or an open verandah, carport or the like; or (ii) roof lights, that— (A) have an aggregate light transmitting area of not less than 3% of the combined floor areas of both rooms; and (B) are open to the sky; or (iii) a proportional combination of windows and roof lights required by (i) and (ii). (2) The areas specified in (1)(b) and (c) may be reduced as appropriate if direct natural light is provided from another source. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
F6D5 Artificial lighting [2019: F4.4]				X	(1) Artificial lighting must be provided— (a) in required stairways, passageways, and ramps; and (b) if natural light of a standard equivalent to that required by F6D3 is not available, and the periods of occupation or use of the room or space will create undue hazard to occupants seeking egress in an emergency, in— (ii) a Class 2 building — to sanitary compartments, bathrooms, shower rooms, airlocks, laundries, common stairways and other spaces used in common by the occupants of the building; and (iii) Class 6, 7,and 9 buildings — to all rooms that are frequently occupied, all spaces required to be accessible, all corridors, lobbies, internal stairways, other circulation spaces and paths of egress. (2) The artificial lighting system must comply with AS/NZS 1680.0. (3) The system may provide a lesser level of illumination to the following spaces during times when the level of lighting would be inappropriate for the use: (a) A theatre, cinema or the like, when performances are in progress, with the exception of aisle lighting required by Part I1. (b) A museum, gallery or the like, where sensitive displays require low lighting levels. (c) A discotheque, nightclub or the like, where to create an ambience and character for the space, low lighting levels are used. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
NSW F6D6				X	A habitable room, office, shop, factory, workroom, sanitary compartment, bathroom, shower room, laundry and any other room occupied by a person for any purpose must have—

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
Ventilation of rooms [2019: F4.5]					(a) natural ventilation complying with F6D7; or (b) a mechanical ventilation or air-conditioning system complying with AS 1668.2. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
F6D7 Natural ventilation [2019: F4.6]				X	(1) Natural ventilation provided in accordance with F6D6(a) must consist of openings, windows, doors or other devices which can be opened— (a) with a ventilating area not less than 5% of the floor area of the room required to be ventilated; and (b) open to— (i) a suitably sized court, or space open to the sky; or (ii) an open verandah, carport, or the like; or (iii) an adjoining room in accordance with F6D8. (2) The requirements of (1)(a) do not apply to a Class 8 electricity network substation. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
F6D8 Ventilation borrowed from adjoining room [2019: F4.7]				X	Natural ventilation to a room may come through a window, opening, door or other device from an adjoining room (including an enclosed verandah) if both rooms are within the same sole-occupancy unit or the enclosed verandah is common property, and— (a) in a Class 2 building, a sole-occupancy unit of a Class 3 building or Class 4 part of a building— (i) the room to be ventilated is not a sanitary compartment; and (ii) the window, opening, door or other device has a ventilating area of not less than 5% of the floor area of the room to be ventilated; and (iii) the adjoining room has a window, opening, door or other device with a ventilating area of not less than 5% of the combined floor areas of both rooms; and (b) in a Class 5, 6, 7, 8 (except a Class 8 electricity network substation) or 9 building— (i) the window, opening, door or other device has a ventilating area of not less than 10% of the floor area of the room to be ventilated, measured not more than 3.6 m above the floor; and (ii) the adjoining room has a window, opening, door or other device with a ventilating area of not less than 10% of the combined floor areas of both rooms; and (c) the ventilating areas specified in (a) and (b) may be reduced as appropriate if direct natural ventilation is provided from another source. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
F6D9 Restriction on location of sanitary compartments	X				A sanitary compartment must not open directly into— (a) a kitchen or pantry; or (d) a room used for public assembly (which is not an early childhood centre, primary school or open spectator stand);

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[2019: F4.8]					
F6D10 Airlocks [2019: F4.9]			X		Not applicable. No airlocks are proposed or required.
F6D11 Carparks [2019: F4.11]				X	Every storey of a carpark, except an open-deck carpark, must have— (a) a system of mechanical ventilation complying with AS 1668.2; or (b) a system of natural ventilation complying with Section 4 of AS 1668.4 ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
F6D12 Kitchen local exhaust ventilation [2019: F4.12]			X		Not applicable. No commercial kitchen proposed.
Part F7 Sound transmission and insulation					
F7D1 Deemed-to-Satisfy Provisions [2019: F5.0]			X		(1) Where a Deemed-to-Satisfy Solution is proposed, Performance Requirements F7P1 to F7P4 are satisfied by complying with F7D2 to F7D8. (2) Where a Performance Solution is proposed, the relevant Performance Requirements must be determined in accordance with A2G2(3) and A2G4(3) as applicable.
F7D2 Application of Part [2019: F5.1]			X		The Deemed-to-Satisfy Provisions of this Part apply to Class 2 buildings.
F7D3 Determination of airborne sound insulation ratings [2019: F5.2]				X	A form of construction required to have an airborne sound insulation rating must— (a) have the required value for weighted sound reduction index (R_w) or weighted sound reduction index with spectrum adaptation term ($R_w + C_{tr}$) determined in accordance with AS/NZS ISO 717.1 using results from laboratory measurements; or (b) comply with Specification 28. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
F7D4 Determination of impact sound insulation ratings [2019: F5.3]				X	(1) A floor in a building required to have an impact sound insulation rating must— (a) have the required value for weighted normalised impact sound pressure level ($L_{n,w}$) determined in accordance with AS ISO 717.2 using results from laboratory measurements; or (b) comply with Specification 28. (2) A wall in a building required to have an impact sound insulation rating must— (a) for a Class 2 or 3 building be of discontinuous construction and (3) For the purposes of this Part, discontinuous construction means a wall having a minimum 20 mm cavity between 2 separate leaves, and— (a) for masonry, where wall ties are required to connect leaves, the ties are of the resilient type; and

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
					(b) for other than masonry, there is no mechanical linkage between leaves except at the periphery. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
F7D5 Sound insulation rating of floors [2019: F5.4]				X	(1) A floor in a Class 2 or 3 building must have an $R_w + C_{tr}$ (airborne) not less than 50 and an $L_{n,w}$ (impact) not more than 62 if it separates— (a) sole-occupancy units; or (b) a sole-occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby or the like, or parts of a different classification. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
F7D6 Sound insulation rating of walls [2019: F5.5]				X	(1) A wall in a Class 2 or 3 building must— (a) have an $R_w + C_{tr}$ (airborne) not less than 50, if it separates sole-occupancy units; and (b) have an R_w (airborne) not less than 50, if it separates a sole-occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby or the like, or parts of a different classification; and (c) comply with F7D4(2) if it separates— (i) a bathroom, sanitary compartment, laundry or kitchen in one sole-occupancy unit from a habitable room (other than a kitchen) in an adjoining unit; or (ii) a sole-occupancy unit from a plant room or lift shaft. (2) A door may be incorporated in a wall in a Class 2 or 3 building that separates a sole-occupancy unit from a stairway, public corridor, public lobby or the like, provided the door assembly has an R_w not less than 30. (5) Where a wall required to have sound insulation has a floor above, the wall must continue to— (a) the underside of the floor above; or (b) a ceiling that provides the sound insulation required for the wall. (6) Where a wall required to have sound insulation has a roof above, the wall must continue to— (a) the underside of the roof above; or (b) a ceiling that provides the sound insulation required for the wall. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
F7D7 Sound insulation rating of internal services [2019: F5.6]				X	(1) If a duct, soil, waste or water supply pipe, including a duct or pipe that is located in a wall or floor cavity, serves or passes through more than one sole-occupancy unit, the duct or pipe must be separated from the rooms of any sole-occupancy unit by construction with an $R_w + C_{tr}$ (airborne) not less than— (a) 40 if the adjacent room is a habitable room (other than a kitchen); or (b) 25 if the adjacent room is a kitchen or non-habitable room. (2) If a stormwater pipe passes through a sole-occupancy unit, it must be separated in accordance with (1)(a) and (b). ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***

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F7D8 Sound isolation of pumps [2019: F5.7]				X	A flexible coupling must be used at the point of connection between the service pipes in a building and any circulating or other pump. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
Part F8 Condensation management					
F8D1 Deemed-to-Satisfy Provisions [2019: F6.0]			X		(1) Compliance with Performance Requirement F8P1 is satisfied by complying with Deemed-to-Satisfy Provisions F8D2 to F8D5. (2) Where a Performance Solution is proposed, the relevant Performance Requirements must be determined in accordance with A2G2(3) and A2G4(3) as applicable.
F8D2 Application of Part [2019: F6.1]			X		The Deemed-to-Satisfy Provisions of this Part only apply to a sole-occupancy unit of a Class 2 building.
F8D3 External wall construction [2019: F6.2]				X	(1) Where a pliable building membrane is installed in an external wall, it must— (a) comply with AS 4200.1; and (b) be installed in accordance with AS 4200.2; and (c) be located on the exterior side of the primary insulation layer of wall assemblies that form the external envelope of a building. (2) Where a pliable building membrane, sarking-type material or insulation layer is installed on the exterior side of the primary insulation layer of an external wall it must have a vapour permeance of not less than— (a) in climate zones 4 and 5, 0.143 µg/N.s; and (b) in climate zones 6, 7 and 8, 1.14 µg/N.s. (3) Except for single skin masonry and single skin concrete, where a pliable building membrane is not installed in an external wall, the primary water control layer must be separated from water sensitive materials by a drained cavity. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
F8D4 Exhaust systems [2019: F6.3]				X	(1) An exhaust system installed in a kitchen, bathroom, sanitary compartment or laundry must have a minimum flow rate of— (a) 25 L/s for a bathroom or sanitary compartment; and (b) 40 L/s for a kitchen or laundry. (2) Exhaust from a kitchen, kitchen range hood, bathroom, sanitary compartment or laundry must discharge directly or via a shaft or duct to outdoor air. (3) Where space for a clothes drying appliance is provided in accordance with F4D2(1)(b), space must also be provided for ducting from the clothes drying appliance to outdoor air. (4)(3) does not apply if a condensing-type clothes drying appliance is installed. (5) An exhaust system that is not run continuously and is serving a bathroom or sanitary compartment that is not ventilated in accordance with F6D7 must— (a) be interlocked with the room's light switch; and (b) include a run-on timer so that the exhaust system continues to operate for 10 minutes after the light switch is turned off.

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					(6) Except for rooms that are ventilated in accordance with F6D7, a room with space for ducting a clothes drying appliance to outdoor air in accordance with (3) must be provided with make-up air in accordance with AS 1668.2 ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
F8D5 Ventilation of roof spaces [2019: F6.4]			X		Not applicable. Climate zone 5.
Specification 26 Waterproofing and water-resistance requirements for building elements in wet areas					
S26C1 Scope [2019: Table F1.7]			X		This Specification sets out requirements for building elements in wet areas that are required to be— (a) water resistant; or (b) waterproof.
S26C2 Application [2019: Table F1.7]			X		(1) The requirements of this Specification apply to— (a) shower areas (enclosed and unenclosed); and (b) areas outside a shower area; and (c) areas adjacent to baths and spas; and (d) other areas as set out in clause S26C7. (2) Where a shower is above a bath or spa, use requirements for a shower.
S26C3 Shower area (enclosed and unenclosed) [2019: Table F1.7]				X	(1) For a shower area with a hob, step-down or level threshold, the following applies: (a) The floor of the shower area must be waterproof, including any hob or step-down; and (b) The walls of the shower area must be waterproof not less than 1800 mm above the floor substrate. (c) Wall junctions and joints within the shower area must be waterproof. (d) Wall/floor junctions within the shower area must be waterproof. (e) Penetrations within the shower area must be waterproof. (2) A shower with a preformed shower base must also comply with the requirements of (1), except for (a) which is not applicable. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S26C4 Area outside shower area [2019: Table F1.7]				X	(1) For concrete, compressed fibre-cement and fibre-cement sheet flooring, the floor of the room must be water resistant. (2) For timber floors including particleboard, plywood and other timber based flooring materials, the floor of the room must be waterproof. (3) Wall/floor junctions must be waterproof ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S26C5 Areas adjacent to baths and spas without showers [2019: Table F1.7]				X	(1) For areas adjacent to a bath and spa, the following applies: (a) For concrete, compressed fibre-cement and fibre-cement sheet flooring, the floor of the room must be water resistant.

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					(b) For timber floors including particleboard, plywood and other timber based flooring materials, the floor of the room must be waterproof. (c) Tap and spout penetrations must be waterproof where they occur in horizontal surfaces. (2) For areas adjacent to a non-freestanding bath and spa, the following applies: (a) Walls must be water resistant— (i) to a height of not less than 150 mm above the vessel, for the extent of the vessel, where the vessel is within 75 mm of a wall; and (ii) to all exposed surfaces below vessel lip. (b) Wall junctions and joints must be water resistant within 150 mm above a vessel for the extent of the vessel. (c) Wall/floor junctions must be waterproof for the extent of the vessel. (3) For inserted baths and spas, the following applies: (a) For floors and horizontal surfaces: (i) Any shelf area adjoining the bath or spa must be waterproof and include a waterstop under the vessel lip. (ii) There are no requirements for the floor under a bath or spa. (b) For walls: (i) Waterproof to not less than 150 mm above the lip of a bath or spa. (ii) There are no requirements for walls beneath the lip of a bath or spa. (c) For wall junctions and joints: (i) Waterproof junctions within 150 mm of a bath or spa. (ii) There are no requirements for junctions and joints in walls beneath the lip of a bath or spa. (d) Tap and spout penetrations must be waterproof where they occur in horizontal surfaces. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S26C6 Other areas [2019: Table F1.7]				X	(1) For walls adjoining other types of vessels (e.g. sink, basin or laundry tub), the following applies: (a) Walls must be water resistant to a height of not less than 150 mm above the vessel, for the extent of the vessel, where the vessel is within 75 mm of a wall. (b) Waterproof wall junctions where a vessel is fixed to a wall. (c) Waterproof tap and spout penetrations where they occur in surfaces required to be waterproof or water resistant. (2) For laundries and WCs, other than WCs as described in (3), the following applies: (a) Water resistant floor of the room. (b) Water resistant wall/floor junctions. (c) Waterproof penetrations where they occur in surfaces required to be waterproof.

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					(3) For WCs with a handheld bidet spray installation, the following applies: (a) Waterproof floor of the room. (b) Walls must be— (i) waterproof within a 1500 mm radius from the wall connection of the handheld bidet spray device to a height of not less than 150 mm above the floor substrate; and (ii) water resistant within a 1500 mm radius from the wall connection of the handheld bidet spray device to a height of not less than 1200 mm above the finished floor level of the WC. (c) Waterproof wall junctions within the WC area within 1500 mm radius from the wall connection of the handheld bidet spray device. (d) Waterproof wall/floor junctions within the WC area within 1500 mm radius from the wall connection of the handheld bidet spray device. (e) Waterproof penetrations in WC area. (4) For bathrooms and laundries required to be provided with a floor waste by F2D4, the following applies: (a) Waterproof floor of the room. (b) Waterproof wall/floor junctions. (c) Waterproof penetrations where they occur through the floor. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
Specification 27 Accessible adult change facilities					
S27C1 Scope [2019: Spec F2.9: 1]			X		This Specification contains the requirements for accessible adult change facilities.
S27C2 General requirements [2019: Spec F2.9: 2]			X		Not assessed in this report.
S27C3 Hoist [2019: Spec F2.9: 3]			X		Not assessed in this report.
S27C4 Toilet pan, seat, backrest and grabrails [2019: Spec F2.9: 4]			X		Not assessed in this report.
S27C5 Washbasin and tap [2019: Spec F2.9: 5]			X		Not assessed in this report.

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S27C6 Fixtures and fittings [2019: Spec F2.9: 6]			X		Not assessed in this report.
S27C7 Change table [2019: Spec F2.9: 7]			X		Not assessed in this report.
S27C8 Changing rails [2019: Spec F2.9: 8]			X		Not assessed in this report.
S27C9 Door and door controls [2019: Spec F2.9: 9]			X		Not assessed in this report.
S27C10 Signage [2019: Spec F2.9: 10]			X		Not assessed in this report.
S27C11 Operating instructions [2019: Spec F2.9: 11]			X		Not assessed in this report.
Specification 28 Sound insulation for building elements					
S28C1 Scope [2019: Spec F5.2: 1(a)]			X		This Specification lists the weighted sound reduction index RW for some common forms of construction.
S28C2 Discontinuous construction [2019: Spec F5.2: 1(b)]				X	Wall systems listed in S28C4 to S28C7 having a minimum 20 mm cavity between 2 separate leaves are deemed to be discontinuous construction if— (a) for masonry, where wall ties are required to connect leaves, the ties are of the resilient type; and (b) for other than masonry, there is no mechanical linkage between leaves except at the periphery. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S28C3 Construction Deemed-to-Satisfy [2019: Spec F5.2: 2]				X	(1) The forms of wall construction described in S28C4 to S28C7 and floor construction described in S28C8 to S28C10, are considered to have the R_w, $R_w + C_{tr}$ and $L_{n,w}$ stated in those clauses. (2) The forms of construction referred to in (1) must be installed as follows: (a) Masonry units must be laid with all joints filled solid, including those between the masonry and any adjoining construction.

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					(b) Joints between concrete slabs or panels and any adjoining construction must be filled solid. (c) For sheeting materials— (i) if one layer is required on both sides of a wall, it must be fastened to the studs with joints staggered on opposite sides; and (ii) if two layers are required, the second layer must be fastened over the first layer so that the joints do not coincide with those of the first layer; and (iii) joints between sheets or between sheets and any adjoining construction must be taped and filled solid. (d) Timber or steel-framed construction — perimeter framing members must be securely fixed to the adjoining structure and— (i) bedded in resilient compound; or (ii) the joints must be caulked so that there are no voids between the framing members and the adjoining structure. (e) Services must not be chased into concrete or masonry elements. (f) A door or panel required to have a certain $R_w + C_{tr}$ that provides access to a duct, pipe or other service must— (i) not open into any habitable room (other than a kitchen); and (ii) be firmly fixed so as to overlap the frame or rebate of the frame by not less than 10 mm, be fitted with a sealing gasket along all edges and be constructed of— (A) wood, particleboard or blockboard not less than 33 mm thick; or (B) compressed fibre-reinforced cement sheeting not less than 9 mm thick; (C) or other suitable material with a mass per unit area not less than 24.4 kg/m^2 (g) A water supply pipe must— (i) only be installed in the cavity of discontinuous construction; and (ii) in the case of a pipe that serves only one sole-occupancy unit, not be fixed to the wall leaf on the side adjoining any other sole-occupancy unit and have a clearance not less than 10 mm to the other wall leaf. (h) Electrical outlets must be offset from each other— (i) in masonry walling, not less than 100 mm; and (ii) in timber or steel-framed walling, not less than 300 mm. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S28C4 Acceptable forms of construction for walls — masonry [2019: Spec F5.2: Table 2]				X	(1) Acceptable forms of construction for masonry walls are set out in (2) to (9). (2) Two leaves of 110 mm clay brick masonry with— (a) a cavity of not less than 50 mm between leaves; and (b) 50 mm thick glass wool insulation with a density of 11 kg/m^3 or 50 mm thick polyester insulation with a density of 20 kg/m^3 in the cavity,

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					has an $R_w + C_{tr}$ of not less than 50 and an R_w of not less than 50, if constructed as shown in Figure S28C4a. (3) Two leaves of 110 mm clay brick masonry with— (a) a cavity of not less than 50 mm between leaves; and (b) 13 mm cement render on each outside face, has an $R_w + C_{tr}$ of not less than 50 and an R_w of not less than 50, when constructed as shown in Figure S28C4b. (4) A single leaf of 110 mm clay brick masonry with— (a) a row of 70 mm x 35 mm timber studs or 64 mm steel studs at 600 mm centres, spaced 20 mm from the masonry wall; and (b) 50 mm thick glass or mineral wool insulation with a density of 11 kg/m^3 c positioned between studs; and (c) one layer of 13 mm plasterboard fixed to outside face of studs and outside face of masonry, has an $R_w + C_{tr}$ of not less than 50 and an R_w of not less than 50, if constructed as shown in Figure S28C4c. (5) A single leaf of 90 mm clay brick masonry with— (a) a row of 70 mm x 35 mm timber studs or 64 mm steels studs at 600 mm centres, spaced 20 mm from each face of the masonry wall; and (b) 50 mm thick mineral insulation or glass wool insulation with a density of 11 kg/m3 positioned between studs in each row; and (c) one layer of 13 mm plasterboard fixed to studs on each outside face, has an $R_w + C_{tr}$ of not less than 50 and an R_w of not less than 50, if constructed as shown in Figure S28C4d. (6) A single leaf of 150 mm brick masonry with 13 mm cement render on each face has an R_w of not less than 50 if constructed as shown in Figure S28C4e. (7) A single leaf of 220 mm brick masonry with 13 mm cement render on each face has an $R_w + C_{tr}$ of not less than 50 and an R_w of not less than 50, if constructed as shown in Figure S28C4f. (8) 110 mm thick brick masonry with 13 mm cement render on each face has an Rw of not less than 45 if constructed as shown in Figure S28C4g. (9) 110 mm thick concrete brickwork has an R_w of not less than 45 if constructed as shown in Figure S28C4h. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S28C5 Acceptable forms of construction for walls — concrete [2019: Spec F5.2: Table 2]				X	(1) Acceptable forms of construction for concrete walls are set out in (3) to (12). (2) For the purposes of this clause, the term 'concrete panel' is a reference to a solid in-situ concrete panel or solid pre-cast concrete panel. (3) A 150 mm thick concrete panel has an $R_w + C_{tr}$ of not less than 50 and an R_w of not less than 50, if constructed as shown in Figure S28C5a. (4) A 150 mm thick concrete panel with one layer of 10 mm plasterboard fixed to 28 mm metal furring channels on each face, has an R_w of not less than 50, if constructed as shown in Figure S28C5b. (5) A 200 mm thick concrete panel with one layer of 13 mm plasterboard or 13 mm cement render on each face has an $R_w + C_{tr}$ of not less than 50 and an R_w of not less than 50, if constructed as shown in Figure S28C5c.

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					(6) A 100 mm thick concrete panel with— (a) a row of 64 mm steel studs at 600 mm centres, spaced 25 mm from the concrete panel; and (b) 80 mm thick polyester insulation or 50 mm thick glass wool insulation with a density of 11kg/m3 , positioned between studs; and (c) two layers of 13 mm plasterboard fixed to outside face of studs and one layer of 13 mm plasterboard fixed to outside face of concrete panel, has an with an $R_w + C_{tr}$ of not less than 50 and an R_w of not less than 50, if constructed in accordance with Figure S28C5d. (7) A 125 mm thick concrete panel with— (a) a row of 64 mm steel studs at 600 mm centres, spaced 20 mm from the concrete panel; and (b)70 mm polyester insulation with a density of 9 kg/m3, positioned between studs; and (c) one layer of 13 mm plasterboard fixed to the outside face of the studs, has an with an $R_w + C_{tr}$ of not less than 50 and an R_w of not less than 50, if constructed in accordance with Figure S28C5e. (8) A 125 mm thick concrete panel has an R_w of not less than 50, if constructed as shown in Figure S28C5f. (9) A 100 mm concrete panel with 13 mm cement render or one layer of 13 mm plasterboard on each face has an R_w of not less than 50, if constructed as shown in Figure S28C5g. (10) A 190 mm thick concrete blockwork has an R_w of not less than 45, if constructed as shown in Figure S28C5h. (11) A 140 mm thick concrete blockwork, the face shell thickness of the blocks being not less than 44 mm and with— (a) 50 mm x 50 mm timber battens spaced at not more than 610 mm centres screw-fixed on one face of the blocks into resilient plugs with rubber inserts between battens and the wall; and (b) the face of the battens clad with 13 mm plasterboard, has an R_w of not less than 45, if constructed as shown in Figure S28C5i. (12) A concrete panel, 100 mm thick, has an R_w of not less than 45, if constructed as shown in Figure S28C5j. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S28C6 Acceptable forms of construction for walls — autoclaved aerated concrete [2019: Spec F5.2: Table 2]				X	(1) Acceptable forms of construction for autoclaved aerated concrete walls are set out in (2) to (5). (2) A 75 mm thick autoclaved aerated concrete wall panel with— (a) a row of 64 mm steel studs at 600 mm centres, spaced 20 mm from the autoclaved aerated concrete wall panel; and (b)75 mm thick glass wool insulation with a density of 11 kg/m3 positioned between studs; and (c) one layer of 10 mm moisture resistant plasterboard or 13 mm fire protective grade plasterboard fixed to outside face of studs and outside face of autoclaved aerated concrete wall panel,

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					has an $R_w + C_{tr}$ of not less than 50 and an R_w of not less than 50, if constructed as shown in Figure S28C6a. (3) A 75 mm thick autoclaved aerated concrete wall panel with— (a) a row of 64 mm steel studs at 600 mm centres, spaced 35 mm from the autoclaved aerated concrete panel wall; and (b) 28 mm metal furring channels fixed to the outside face of the autoclaved aerated concrete wall panel, with 50 mm thick polyester insulation with a density of 9 kg/m3 positioned between furring channels and one layer of 13 mm fire protective grade plasterboard fixed to furring channels; and (c) 105 mm thick glass wool insulation with a density of 7 kg/m3 positioned between studs; and (d) one layer of 13 mm fire protective grade plasterboard fixed to the outside face of the studs, has an $R_w + C_{tr}$ of not less than 50 and an R_w of not less than 50, if constructed as shown in Figure S28C6b. 4) Two leaves of 75 mm autoclaved aerated concrete wall panel with— (a) a cavity not less than 30 mm between panels containing 50 mm glass wool insulation with a density of 11 kg/m3; and (b) one layer of 10 mm plasterboard fixed to outside face of each panel, has an $R_w + C_{tr}$ of not less than 50 and an R_w of not less than 50, if constructed as shown in Figure S28C6c. (5) A 75 mm thick autoclaved aerated concrete wall panel with— (a) one layer of 10 mm moisture resistant plasterboard on one face; (b) 28 mm metal furring channels and resilient mounts, 75 mm polyester insulation with a density of 9 kg/m3 and 13 mm fire-protective grade plasterboard fixed to the other face, has an R_w of not less than 50, if constructed as shown in Figure S28C6d. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S28C7 Acceptable forms of construction for walls — timber and steel framing [2019: Spec F5.2: Table 2]				X	(1) Acceptable forms of construction for timber and steel framing wall are set out in (2) to (11). (2) Two rows of 70 x 35 mm timber studs at 450 mm centres with— (a) an air gap not less than 20 mm between the rows of studs; and (b) 75 mm thick glass or mineral wool insulation with a density of 8 kg/m³ or 60 mm thick polyester insulation with a density of 11 kg/m³ positioned between one row of studs; and (c) two layers of 13 mm fire protective grade plasterboard or one layer of 6 mm fibre-cement sheet and one layer of 13 mm fire protective grade plasterboard, fixed to outside face of studs, has an $R_w + C_{tr}$ of not less than 50 and an R_w of not less than 50, if constructed as shown in Figure S28C7a. (3) One row of 70 mm x 35 mm staggered timber studs, without noggings between adjacent studs, at not less than 450 mm centres, fixed to 90 mm x 35 mm wall plates with— (a) 75 mm thick glass or mineral wool insulation with a minimum density of 8 kg/m³ positioned between studs; and

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
					(b) two layers of 13 mm fire-protective grade plasterboard fixed to outside face of studs, has an R_w of not less than 50, if constructed as shown in Figure S28C7b. (4) One row of 70 mm x 35 mm timber studs at not less than 600 mm centres with— (a) 75 mm thick glass or mineral wool insulation with a minimum density of 8 kg/m³ positioned between studs; and (b) two layers of 13 mm fire-protective grade plasterboard fixed to outside face of studs, has an R_w of not less than 45, if constructed as shown in Figure S28C7c. (5) One row of 70 mm x 35 mm timber studs at not less than 450 mm centres with— (a) 28 mm furring channels installed horizontally on one side; and (b) two layers of 13 mm fire-protective plasterboard fixed on each face, has an R_w of not less than 45, if constructed as shown in Figure S28C7d. (6) Two rows of 64 mm steel studs at 600 mm centres with— (a) an air gap not less than 20 mm between the rows of studs; and (b) 50 mm thick glass wool insulation or 60 mm thick polyester insulation with a density of 11kg/m³ positioned between one row of studs; and (c) two layers of 13 mm fire-protective grade plasterboard or one layer of 6 mm fibre-cement sheet and one layer of 13 mm fire-protective grade plasterboard, fixed to outside face of studs, has an $R_w + C_{tr}$ of not less than 50 and an R_w of not less than 50, if constructed as shown in Figure S28C7e. (7) Two rows of 64 mm steel studs at 600 mm centres with— (a) an air gap not less than 80 mm between the rows of studs; and (b) 200 mm thick polyester insulation with a density of 14 kg/m3 positioned between studs; and (c) one layer of 13 mm fire-protective grade plasterboard and one layer 13 mm plasterboard on one outside face and one layer of 13 mm fire-protective grade plasterboard on the other outside face, has an $R_w + C_{tr}$ of not less than 50 and an R_w of not less than 50, if constructed as shown in Figure S28C7f. (8) One row of 92 mm steel studs at 600 mm centres with— (a) 50 mm thick glass wool insulation with a density of 11 kg/m3 or 60 mm thick polyester insulation with a density of 8 kg/m3, positioned between studs; and (b) two layers of 13 mm fire-protective grade plasterboard or one layer of 6 mm fibre-cement sheet and one layer of 13 mm fire-protective grade plasterboard, fixed to each face, has an R_w of not less than 50, if constructed as shown in Figure S28C7g. (9) One row of 64 mm steel studs with 2 layers of 16 mm fire-protective grade plasterboard fixed to each face has an R_w of not less than 45, if constructed as shown in Figure S28C7h. (10) One row of 64 mm steel studs with—

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
					(a) one layer of 16 mm fire-protective grade plasterboard fixed to one face; and (b) 50 mm thick glass or mineral wool insulation with a density of 11 kg/m3 positioned between the studs; and (c) two layers of fire-protective grade plasterboard fixed to the other face, the inner layer being 16mm thick and the outer layer being 13 mm, has an R_w of not less than 45, if constructed as shown in Figure S28C7i. (11) One row of 64 mm steel studs with two layers of 13 mm plasterboard on each face has an R_w of not less than 45, if constructed as shown in Figure S28C7j. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S28C8 Acceptable forms of construction for floors — concrete [2019: Spec F5.2: Table 3]				X	(1) Acceptable forms of construction for concrete floors are set out in (2) to (4). (2) 150 mm thick concrete slab with— (a) 28 mm metal furring channels and isolation mounts fixed to underside of slab, at 600 mm centres; and (b) 65 mm thick polyester insulation with a density of 8 kg/m3, positioned between furring channels; and (c) one layer of 13 mm plasterboard fixed to furring channels, has an R_w + Ctr of not less than 50, an $L_{n,w}$ of not more than 62 and an R_w of not less than 50, if constructed as shown in Figure S28C8a. (3) 200 mm thick concrete slab with carpet on underlay has an R_w + Ctr of not less than 50, an $L_{n,w}$ of not more than 62 and an R_w of not less than 50, if constructed as shown in Figure S28C8b. (4) 100 mm thick concrete slab has an R_w + Ctr of not less than 45 and an R_w of not less than 45, if constructed as shown in Figure S28C8c. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S28C9 Acceptable forms of construction for floors — autoclaved aerated concrete [2019: Spec F5.2: Table 3]				X	(1) An acceptable form of construction for autoclaved aerated concrete floors is set out in (2). (2) 75 mm thick autoclaved aerated concrete floor panel with— (a) 8 mm ceramic tiles with flexible adhesive and waterproof membrane, located above the slab; and (b) timber joists at 600 mm centres; and (c) R1.5 glass wool insulation positioned between timber joists; and (d) 28 mm metal furring channels and resilient mounts fixed to underside of joists; and (e) two layers of 13 mm plasterboard fixed to furring channels, has an R_w + C_{tr} of not less than 50, an $L_{n,w}$ of not more than 62 and an R_w of not less than 50, if constructed as shown in Figure S28C9. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S28C10				X	(1) Acceptable forms of construction for timber floors are set out in (2) and (3).

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Acceptable forms of construction for floors — timber [2019: Spec F5.2: Table 3]					(2) 19 mm thick particleboard floor sheeting with— (a) 190 mm x 45 mm timber joists at 450 mm centres; and (b) R2.5 glass or mineral wool insulation positioned between timber joists; and (c) 28 mm metal furring channels and isolation mounts fixed to underside of joists, isolation mounts to be of natural rubber with a dynamic factor of not more than 1.1 and static deflection of not less than 3 mm at actual operating load; and (d) two layers of 16 mm fire-protective grade plasterboard fixed to furring channels, has an $R_w + C_{tr}$ of not less than 50, an $L_{n,w}$ of not more than 62 and an R_w of not less than 50, if constructed as shown in Figure S28C10a. (3) Timber flooring with minimum 8.5 kg/m² mass, over 19 mm thick particleboard floor sheeting with— (a) 190 mm x 45 mm timber joists at not less than 450 mm centres; and (b) R2.5 glass or mineral wool insulation positioned between timber joists; and (c) 28 mm metal furring channels fixed to underside of joists at 600 mm centres by clip or mount; and (d) one layer of 13 mm acoustic grade plasterboard fixed to furring channels, has an $R_w + C$ of not less than 45 and an R_w of not less than 45, if constructed as shown in Figure S28C10b. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
Specification 29 Impact sound- test of equivalence					
S29C1 Scope [2019: Spec F5.5: 1]			X		This Specification describes a method of test to determine the comparative resistance of walls to the transmission of impact sound.
S29C2 Construction to be tested [2019: Spec F5.5: 2]			X		(1) The test is conducted on a specimen of prototype wall construction and on a specimen of one or other of the constructions specified in S28C4 to S28C7. (2) The testing of a construction specified in S28C4 to S28C7 need not be repeated for subsequent comparisons provided complete records of the results, the test equipment and the technique of testing are kept so that identical equipment can be employed and an identical technique can be adopted in the testing of specimens of prototype wall construction.
S29C3 Method [2019: Spec F5.5: 3]			X		(1) The wall constructions to be compared must be tested in accordance with AS 1191. (2) A horizontal steel platform 510 mm x 460 mm x 10 mm thick must be placed with one long edge in continuous and direct contact with the wall to be tested on the side of the wall on which the impact sound is to be generated. (3) A tapping machine complying with ISO 140/6 — 1998 (E) must be mounted centrally on the steel platform.

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
					(4) The sound transmission through the wall must be determined in accordance with AS 1191 except that the tapping machine as mounted on the steel platform must be used as the source of sound. (5) The impact sound pressure levels measured in the receiving room must be converted into normalised levels using a reference equivalent absorption area of 10 m2. Specification 29 Impact sound – test of equivalence Preview D.
Section G Ancillary Provisions					
Part G1 Minor structures and components					
G1D1 Deemed-to-Satisfy Provisions [2019: G1.0]			X		(1) Performance Requirement G1P1 must be complied with. (2) Where a Deemed-to-Satisfy Solution is proposed, Performance Requirements G1P2 to G1P5 are satisfied by complying with G1D2 to G1D4. (3) Where a Performance Solution is proposed, the relevant Performance Requirements must be determined in accordance with A2G2(3) and A2G4(3) as applicable.
NSW G1D2 Swimming pools [2019: G1.1]			X		Not applicable. No swimming pool.
G1D3 Refrigerated chambers, strong-rooms and vaults [2019: G1.2]			X		Not applicable. No refrigerated or cooling chamber, strongroom or vault which is of sufficient size for a person to enter
G1D4 Outdoor play spaces [2019: G1.3]			X		Not applicable. No Class 9b early childhood centre
NSW G1D5 Provision for cleaning windows [2016: NSW G1.101]				X	(1) A building must provide for a safe manner of cleaning any windows located 3 or more storeys above ground level. (2) A building satisfies (1) where— (a) the windows can be cleaned wholly from within the building; or (b) provision is made for the cleaning of the windows by a method complying with the Work Health and Safety Act 2011 and regulations made under that Act. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
Part G2 Boilers, pressure vessels, heating appliances, fireplaces, chimneys and flues					
G2D1 Deemed-to-Satisfy Provisions [2019: G2.0]			X		(1) Where a Deemed-to-Satisfy Solution is proposed, Performance Requirements G2P1 and G2P2 are satisfied by complying with G2D2 to G2D4. (2) Where a Performance Solution is proposed, the relevant Performance Requirements must be determined in accordance with A2G2(3) and A2G4(3) as applicable.
G2D2 Installation of appliances			X		Not applicable. No Boilers, pressure vessels, heating appliances, fireplaces, chimneys and flues proposed.

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
[2019: G2.2]					
G2D3 Open fireplaces [2019: G2.3]			X		Not applicable. No Boilers, pressure vessels, heating appliances, fireplaces, chimneys and flues proposed.
G2D4 Incinerator rooms [2019: G2.4]			X		Not applicable. No Boilers, pressure vessels, heating appliances, fireplaces, chimneys and flues proposed.
Part G3 Atrium Construction					
G3D1 Application of Part [2019: G3.1]			X		This Part does not apply to an atrium which— (a) connects only 2 storeys; or (b) connects only 3 storeys if— (i) each storey is provided with a sprinkler system (other than a FPAA101D or FPAA101H system) complying with Specification 17 throughout; and (ii) one of those storeys is situated at a level at which there is direct egress to a road or open space. **COMPLIANCE COMMENTARY** **The "Forest Rooms" are atriums in accordance with this Part.** ***It is recommended these atriums be addressed by a Fire Engineered Performance Solution.***
G3D2				X	An atrium well must have a width throughout the well that is able to contain a cylinder having a horizontal diameter of not less than 6 m.

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Dimensions of atrium well [2019: G3.2]					***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
G3D3 Separation of atrium by bounding walls [2019: G3.3]				X	An atrium must be separated from the remainder of the building at each storey by bounding walls set back not more than 3.5 m from the perimeter of the atrium well except in the case of the walls at not more than 3 consecutive storeys if— (a) one of those storeys is at a level at which direct egress to a road or open space is provided; and (b) the sum of the floor areas of those storeys that are contained within the atrium is not more than the maximum area that is permitted in Table C3D3. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
G3D4 Construction of bounding walls [2019: G3.4]				X	Bounding walls must— (a) have an FRL of not less than 60/60/60, and— (i) extend from the floor of the storey to the underside of the floor next above or to the underside of the roof; and (ii) have any door openings protected with self-closing or automatic –/60/30 fire doors; or (b) be constructed of fixed toughened safety glass, or wired safety glass in non-combustible frames, with— (i) any door openings fitted with a self-closing smoke door complying with Specification 12; and (ii) the walls and doors protected with wall-wetting systems in accordance with Specification 31; and (iii) a fire barrier with an FRL of not less than –/60/30 installed in any ceiling spaces above the wall. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
G3D5 Construction at balconies [2019: G3.5]				X	If a bounding wall separating an atrium from the remainder of the building is set back from the perimeter of the atrium well, a barrier that is imperforate and non-combustible, and not less than 1 m high must be provided. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
G3D6 Separation at roof [2019: G3.6]				X	In an atrium— (a) the roof must have the FRL prescribed in Tables S5C11a to S5C11g of Specification 5; or (b) the roof structure and membrane must be protected by a sprinkler system (other than a FPAA101D or FPAA101H system) complying with Specification 17. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
G3D7 Means of egress [2019: G3.7]				X	All areas within an atrium must have access to at least 2 exits. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***

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G3D8 Fire and smoke control systems [2019: G3.8]				X	Sprinkler systems, smoke control, fire detection and alarm systems, and emergency warning and intercom systems must be installed in compliance with Specification 31. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
Part G4 Construction in alpine areas					
G4D1 Deemed-to-Satisfy Provisions [2019: G4.0]			X		Not applicable. Not alpine.
G4D2 Application of Part [2019: G4.1]			X		Not applicable. Not alpine.
G4D3 External doors [2019: G4.3]			X		Not applicable. Not alpine.
G4D4 Emergency lighting [2019: G4.4]			X		Not applicable. Not alpine.
G4D5 External trafficable structures [2019: G4.5]			X		Not applicable. Not alpine.
G4D6 Clear space around buildings [2019: G4.6]			X		Not applicable. Not alpine.
G4D7 Fire-fighting services and equipment [2019: G4.8]			X		Not applicable. Not alpine.
G4D8 Fire orders [2019: G4.9]			X		Not applicable. Not alpine.
Part G5 Construction in bushfire prone areas					
G5D1 Deemed-to-Satisfy Provisions [2019: G5.0]			X		Not applicable. Not bushfire prone areas.
NSW G5D2 Application of Part			X		Not applicable. Not bushfire prone areas.

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
[2019: G5.1]					
NSW G5D3 Protection — residential buildings [2019: G5.2]			X		Not applicable. Not bushfire prone areas.
G5D4 Protection — certain Class 9 buildings [New for 2022]			X		Not applicable. Not bushfire prone areas.
Part G6 Occupiable outdoor areas					
G6D1 Application of Part [2019: G6.1]			X		(1) The Deemed-to-Satisfy Provisions of this Part apply to buildings containing an occupiable outdoor area in addition to the other Deemed-to-Satisfy Provisions of NCC Volume One. (2) The Deemed-to-Satisfy Provisions of this Part take precedence where there is a difference to the Deemed-to-Satisfy Provisions of Sections C, D, E, F and G. (3) Except for G6D2, the Deemed-to-Satisfy Provisions of this Part do not apply to— (a) an occupiable outdoor area of a sole-occupancy unit in a Class 2 or 3 building, Class 9c building or Class 4 part of a building; or (b) an occupiable outdoor area with an area less than 10m².
G6D2 Fire hazard properties [2019: G6.2]			X		Not applicable, No occupiable outdoor areas proposed.
G6D3 Fire separation [2019: G6.3]			X		Not applicable, No occupiable outdoor areas proposed.
G6D4 Provision for escape [2019: G6.4]			X		Not applicable, No occupiable outdoor areas proposed.
G6D5 Construction of exits [2019: G6.5]			X		Not applicable, No occupiable outdoor areas proposed.
G6D6 Firefighting equipment [2019: G6.6]			X		Not applicable, No occupiable outdoor areas proposed.
G6D7 Lift installations [2019: G6.7]			X		Not applicable, No occupiable outdoor areas proposed.
G6D8			X		Not applicable, No occupiable outdoor areas proposed.

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Visibility in an emergency, exit signs and warning systems [2019: G6.8]					
G6D9 Light and ventilation [2019: G6.9]			X		Not applicable, No occupiable outdoor areas proposed.
G6D10 Fire Orders [2019: G6.10]			X		Not applicable, No occupiable outdoor areas proposed.
Part G7 Liveable housing design					
NSW Part G7 Liveable housing design			X		This Part has been deliberately left blank. Part G7 does not apply in NSW as liveable housing design requirements do not apply to sole-occupancy units in a Class 2 building in NSW.
Specification 30 Installation of boilers and pressure vessels					
S30C1 Scope [2019: Spec G2.2: 1]			X		This Specification sets out the requirements for the installation of boilers and pressure vessels in buildings.
S30C2 Explosion relief [2019: Spec G2.2: 2.1]			X		Not applicable. No boilers and pressure vessels proposed.
S30C3 Floors and drainage [2019: Spec G2.2: 2.2]			X		Not applicable. No boilers and pressure vessels proposed.
S30C4 Protection from heat [2019: Spec G2.2: 2.3]			X		Not applicable. No boilers and pressure vessels proposed.
Specification 31 Fire and smoke control systems in buildings containing atriums					
S31C1 Scope [2019: Spec G3.8: 1]			X		This Specification sets out the requirements for the design and operation of systems of fire and smoke control in buildings containing an atrium.
S31C2 General requirement – automatic fire sprinkler system				X	A sprinkler system (other than a FPAA101D or FPAA101H system) complying with Specification 17 must be installed in every building containing an atrium, except where varied or superseded by this Specification. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***

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[2019: Spec G3.8: 2.1]					
S31C3 Roof protection [2019: Spec G3.8: 2.2]				X	A roof of an atrium which does not have the FRL prescribed in Specification 5 or the Deemed-to-Satisfy Provisions of Part C3 must be protected by automatic sprinklers arranged to wet both the covering membrane and supporting structure if the roof is— (a) less than 12 m above the floor of the atrium or the floor of the highest storey where the bounding construction is set back more than 3.5 m from the atrium well if a Class 2, 3, 5 or 9 part of a building is open to the atrium; or (b) less than 20 m above the floor of the atrium or the floor of the highest storey where the bounding construction is set back more than 3.5 m from the atrium well if a Class 6, 7 or 8 part of a building is open to the atrium, and the temperature rating of sprinkler heads providing roof protection must be within the range 79°C – 100°C. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S31C4 Atrium floor protection [2019: Spec G3.8: 2.3]				X	The floor of the atrium must be protected by sprinklers with— (a) the use of sidewall pattern sprinkler heads together with overhead sprinklers where dictated by the dimensions of the atrium; and (b) sprinkler heads of the quick response type. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S31C5 Sprinkler systems to glazed walls [2019: Spec G3.8: 2.4.1 – 2.4.5]				X	(1) Where an atrium is separated from the remainder of the building by walls or doors incorporating glazing, a wall wetting system must be provided to protect the glazing as follows: (a) On the atrium side of the glazing — to all glazed walls which are set back more than 3.5 m from the atrium well. (b) On the atrium side of the glazing — to all glazed walls which are not set back, or are set back 3.5 m or less, from the atrium well, for all levels which are less than— (i) 12 m above the floor of an atrium or the floor of the highest storey where the bounding wall is set back more than 3.5 m from the atrium well if a Class 2, 3, 5 or 9 part of the building is open to the atrium; or (ii) 20 m above the floor of an atrium or the floor of the highest storey where the bounding wall is set back more than 3.5 m from the atrium well if a Class 6, 7 or 8 part of the building is open to the atrium. (c) On the side of the glazing away from the atrium well — to all glazing forming part of the bounding wall at each storey. (2) Sprinklers must be located in positions allowing full wetting of the glazing surfaces without wetting adjacent sprinkler heads. (3) Sprinkler heads must be of the quick response type and have a maximum temperature rating of 74°C. (4) The rate of water discharge to protect glazing must be not less than— (a) on the atrium side of the glazing— (i) 0.25 L/s.m² where glazing is not set back from the atrium well; or

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					(ii) 0.167 L/s.m² where glazing is set back from the atrium well; and (b) on the side away from the atrium well — 0.167 L/s.m². (5) In addition to that of the basic sprinkler protection for the building, the water supply to required wall wetting systems must be of adequate capacity to accommodate the following on the atrium side of the glazing: (a) Where the bounding walls are set back less than 3.5 m from the atrium well — wall wetting of a part not less than 6 m long for a height of not less than— (i) 12 m above the floor of an atrium or the floor of the highest storey where the bounding wall is set back more than 3.5 m from the atrium well if a Class 2, 3, 5 or 9 part of the building is open to the atrium; or (ii) 20 m above the floor of an atrium or the floor of the highest storey where the bounding wall is set back more than 3.5 m from the atrium well if a Class 6, 7 or 8 part of the building is open to the atrium. (b) Where the walls are set back 3.5 m or more from the atrium well — wetting of a part not less than 12 m long on one storey. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S31C6 Stop valves [2019: Spec G3.8: 2.5]				X	(1) Basic sprinkler and wall wetting systems protecting a building containing an atrium must be provided with easily accessible and identified stop valves. (2) Sprinkler and wall wetting systems must be provided with independent stop valves. (3) Sprinkler heads protecting the roof of the atrium must be provided with a stop valve. (4) Stop valve to wall wetting and roof sprinklers may be of the gate type. (5) All sprinkler and wall wetting stop valves must be monitored to detect unauthorised closure. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S31C7 General requirements — smoke control system [2019: Spec G3.8: 3.1]				X	Except where varied or superseded by this Specification, mechanical air-handling systems in a building containing an atrium must comply with AS 1668.1. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S31C8 Operation of atrium mechanical air-handling systems [2019: Spec G3.8: 3.2]				X	Mechanical air-handling systems serving an atrium must be designed to operate so that during a fire— (a) a tenable atmosphere is maintained in all paths of travel along balconies to required exits during the period of evacuation; and (b) smoke exhaust fans serving the atrium are only activated when smoke enters the atrium; and (c) central plant systems do not use the atrium as a return air path; and (d) central plant systems which use return air paths remote from the atrium—

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
					(i) cycle to the full outside air mode; and (ii) stop supply air to the fire affected storey or fire compartment; and (iii) continue to fully exhaust the fire affected storey or fire compartment and reduce the exhaust from other storeys or fire compartments by at least 75%; and (iv) continue to supply air to fire compartments or storeys other than the fire affected storey or fire compartment; and (e) fans performing relief or exhaust duty from the atrium stop normal operation; and (f) floor by floor, or unitary, air-handling plant serving a single fire compartment or storey— (i) ceases normal operation in the fire affected storey or fire compartment; and (ii) commences full relief or exhaust from that fire affected storey or fire compartment; and (iii) continue to supply air to fire compartments or storeys other than the fire affected storey or fire compartment. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S31C9 Activation of smoke control system [2019: Spec G3.8: 3.3]				X	(1) The smoke control system must be activated by— (a) operation of an automatic fire alarm; or (b) operation of the sprinkler system; or (c) a manual start switch. (2) All controls for the smoke control system must be located— (a) in the fire control room; or (b) in the emergency control centre (if any); or (c) adjacent to the sprinkler control valves; or (d) incorporated in the Fire Indicator Panel. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S31C10 Smoke exhaust system [2019: Spec G3.8: 3.4]				X	A smoke exhaust system serving an atrium must be designed on the basis of— (a) the sprinkler system limiting the size of a fire to— (i) a heat output of 1.5 MW and perimeter of 7.5 m if a Class 2, 3, 5 or 9 part of the building is open to the atrium; or (ii) a heat output of 5 MW and perimeter of 12 m if a Class 6, 7 or 8 part of the building is open to the atrium; and (b) a smoke plume reaching a level 3 m above the highest storey having a path of travel to a required exit along a balcony bounding the atrium well, and not less than— (i) 12 m above the floor of an atrium or the floor of the highest storey where the bounding wall is set back more than 3.5 m from the atrium well if a Class 2, 3, 5 or 9 part of the building is open to the atrium; or (ii) 20 m above the floor of an atrium or the floor of the highest storey where the bounding construction is set back

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
					more than 3.5 m from the atrium well if a Class 6, 7 or 8 part of the building is open to the atrium; and (c) the smoke exhaust system discharging smoke at a rate of not less than that shown in Figure S31C10 for the appropriate height of smoke plume and fire size— (i) from the top of the atrium; or (ii) horizontally where calculations of wind velocity induced pressure profiles for the building verify that the exhaust system will operate effectively for all wind directions. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S31C11 Upward air velocity [2019: Spec G3.8: 3.5]				X	Notwithstanding S31C10(c), the average upward air velocity in the atrium, due to the required smoke exhaust quantity must— (a) be not less than 0.2 m/s at any level over an 18 m height above the floor of the atrium; and (b) not exceed the following maximum velocities in atriums of constant cross sectional plan area: (i) For occupancy classification qualifying for 1.5 MW fire size — 3.5 m/s. (ii) For occupancy classifications qualifying for 5 MW fire size — 5 m/s. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S31C12 Exhaust fans [2019: Spec G3.8: 3.6]				X	(1) Smoke exhaust must be provided by fans capable of continuous and required operation for a period of not less than 1 hour when handling exhaust gases at 200°C. (2) Where a Class 2, 3 or 9 part of a building adjoins an atrium, the atrium must be provided with a minimum of 3 fans each capable of 50% of the total required smoke exhaust capacity. (3) Atriums other than those referred to in (2) must be provided with a minimum of 2 fans each capable of 50% of the total required smoke exhaust capacity. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S31C13 Smoke and heat vents [2019: Spec G3.8: 3.7]				X	Notwithstanding S31C12, automatic vents complying with AS 2665 may be used, except where a Class 6 part of a building adjoins the atrium, in lieu of exhaust fans provided that— (a) the height from the atrium floor to the bottom of the highest vent is not more than 12 m; and (b) the vents are fitted with a remote manual operation switch located adjacent to the sprinkler control valves or incorporated in the Fire Indicator Panel. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S31C14 Make-up air supply [2019: Spec G3.8: 3.8]				X	(1) Uniformly distributed make-up air must be provided to the atrium exhaust system from— (a) outside the atrium at or near the lowest storey level; and (b) relief air from non-fire storeys.

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
					(2) A discharge volume sufficient to maintain a velocity of not less than 0.1 m/s towards the atrium well must be provided on all storeys where the bounding wall is set back from the atrium well. (3) The requirements of (1)(a) are satisfied if make-up air is provided to the atrium exhaust system in such a manner as to prevent, as far as possible, disturbance of the smoke layer due to turbulence created by the incoming air, through— (a) openings directly from the outside air to the atrium and located as close as practicable to the lowest level of the atrium; or (b) ducts from the outside air to the atrium which deliver air as close as practicable to the lowest level of the atrium and, where passing through any other fire compartment having an FRL of at least 60/60/60; or (c) a combination of (a) or (b). ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S31C15 General requirements—fire detection and alarm system [2019: Spec G3.8: 4.1]				X	Except where superseded by this Specification, automatic fire detection and alarm systems in a building containing an atrium must comply with AS 1670.1. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S31C16 Smoke detection system [2019: Spec G3.8: 4.2]				X	Smoke detection within an atrium— (a) must be provided within all outside air intakes and at individual floor return air intakes of all air-handling systems to initiate automatic fire mode operation, and where applicable, comply with the restart facilities in AS 1668.1; and (b) must operate at an obscuration level not greater than 0.5% per metre with compensation for external airborne contamination as necessary; and (c) must sample air within the atrium and in storeys where the bounding wall is set back more than 3.5 m from the atrium well; and (d) must be calibrated to compensate for smoke dilution where sampling occurs within return air path common to more than one room; and (e) may incorporate beam type detectors to sense smoke in an atrium in a Class 5, 6, 7 or 8 building with an effective height of not more than 25 m if the beam detectors are— (i) located at intervals of not more than 3 storeys; and (ii) arranged to scan at 90 degrees orientation to adjacent beam units. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S31C17 Smoke detection in spaces separated from the atrium by bounding walls				X	Smoke detection systems must be located at all return and relief air openings associated with the building air-handling systems and be— (a) of the sampling type system as required in S31C16; or (b) of the point type photoelectric smoke detector.

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
[2019: Spec G3.8: 4.3]					***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S31C18 Alarm systems [2019: Spec G3.8: 4.4]				X	(1) A break-glass fire alarm point must be provided at each door to a fire-isolated stairway, fire-isolated ramp or fire-isolated passageway. (2) A staged alarm must be provided where an air sampling type smoke detection system is provided for the atrium, and must operate as follows: (a) Alert building management when abnormal smoke levels of 0.03% obscuration per metre are detected. (b) Initiate a second alarm to management and start all smoke control systems including pressurisation of escape routes when smoke levels of 0.07% obscuration per metre are detected. (c) Automatically call the fire brigade, activate the emergency warning and intercom system, and de-activate all plant not necessary for fire safety within the building when smoke levels of 0.09% obscuration per metre are detected. (3) Beam and point type smoke detectors required must simultaneously operate all functions referred to above and activate at the level set out in AS 1670.1. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S31C19 Emergency warning and intercom systems [2019: Spec G3.8: 5]				X	A building containing an atrium must be provided with an emergency warning and intercom system which— (a) complies with AS 1670.4; and (b) incorporates visual warning devices that— (i) operate upon the evacuation signal; and (ii) display the word “EVACUATE” in red with letters conforming with the requirements of the Deemed-to-Satisfy Provisions of Part E4 for exit signs. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S31C20 Standby power system [2019: Spec G3.8: 6]				X	(1) If a required path of travel to an exit is within an atrium, a suitable alternative power supply must be provided to operate required safety systems, including sprinkler systems and fire hydrant pumps, air handling systems, alarms, warning and communication systems and emergency lighting circuits. (2) The alternative power supply must— (a) be connected automatically if the normal power supply fails; and (b) if located within the building, be separated from the remainder of the building by an enclosure with an FRL of at least 120/120/120; and (c) be connected to the safety systems by means of cabling complying with C3D14(3). (3) The requirements of (1) are satisfied by— (a) a single medium voltage supply taken from an electricity substation situated within, or adjacent to, the building concerned where the power supply to the substation consists of two or more high voltage cables each taking electricity from separate transformers; or

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
					(b) two or more medium voltage supplies each taking electricity from separate electricity substations situated— (i) outside the building concerned; and (ii) at a suitable distance from each other; or (c) a single medium voltage supply taken from an electricity substation together with an electricity generating plant capable of— (i) generating a medium voltage supply; and (ii) starting and taking the required electrical load within a period of not more than 30 seconds from the time of normal supply failure. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
S31C21 System for excluding smoke from fire-isolated exits [2019: Spec G3.8: 7]				X	Required fire-isolated exits in a building containing an atrium must be protected from the entry of smoke in accordance with E2D3. ***Details demonstrating compliance with this clause must be incorporated into the construction certificate plans / specification***
Specification 43 Bushfire protection for certain Class 9 buildings					
S43C1 Scope [New for 2022]			X		Not applicable. No bushfire prone area.
S43C2 Separation from classified vegetation [New for 2022]			X		Not applicable. No bushfire prone area.
S43C3 Separation between buildings [New for 2022]			X		Not applicable. No bushfire prone area.
S43C4 Separation from allotment boundaries and carparking areas [New for 2022]			X		Not applicable. No bushfire prone area.
S43C5 Separation from hazards [New for 2022]			X		Not applicable. No bushfire prone area.
S43C6 Non-combustible path around building			X		Not applicable. No bushfire prone area.

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
[New for 2022]					
S43C7 Access pathways [New for 2022]			X		Not applicable. No bushfire prone area.
S43C8 Exposed external areas [New for 2022]			X		Not applicable. No bushfire prone area.
S43C9 Internal tenability [New for 2022]			X		Not applicable. No bushfire prone area.
S43C10 Building envelope [New for 2022]			X		Not applicable. No bushfire prone area.
S43C11 Supply of water for fire-fighting purposes [New for 2022]			X		Not applicable. No bushfire prone area.
S43C12 Emergency power supply [New for 2022]			X		Not applicable. No bushfire prone area.
S43C13 Signage [New for 2022]			X		Not applicable. No bushfire prone area.
S43C14 Vehicular access [New for 2022]			X		Not applicable. No bushfire prone area.
Section I Special use buildings					
Part I1 Class 9b Buildings					
Introduction to this Part This Part provides additional Deemed-to-Satisfy Provisions for certain types of Class 9b buildings where large numbers of people assemble and which contain a stage and backstage area.					
NSW I1D1 Application of Part [2019: H1.1]			X		Not applicable. Not a Class 9b buildings where large numbers of people assemble and which contain a stage and backstage area
I1D2 Separation [2019: H1.2]			X		Not applicable. Not a Class 9b buildings where large numbers of people assemble and which contain a stage and backstage area
I1D3 Proscenium wall construction			X		Not applicable. Not a Class 9b buildings where large numbers of people assemble and which contain a stage and backstage area

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
[2019: H1.3]					
I1D4 Seating area [2019: H1.4]			X		Not applicable. Not a Class 9b buildings where large numbers of people assemble and which contain a stage and backstage area
I1D5 Exits from stages [2019: H1.5]			X		Not applicable. Not a Class 9b buildings where large numbers of people assemble and which contain a stage and backstage area
I1D6 Access to platforms and lofts [2019: H1.6]			X		Not applicable. Not a Class 9b buildings where large numbers of people assemble and which contain a stage and backstage area
I1D7 Aisle lights [2019: H1.7]			X		Not applicable. Not a Class 9b buildings where large numbers of people assemble and which contain a stage and backstage area
Part I2 Public transport buildings					
I2D1 Application of Part [2019: H2.1]			X		Not applicable. Not a public transport building.
I2D2 Accessways [2019: H2.2]			X		Not applicable. Not a public transport building.
I2D3 Ramps [2019: H2.3]			X		Not applicable. Not a public transport building.
I2D4 Handrails and grabrails [2019: H2.4]			X		Not applicable. Not a public transport building.
I2D5 Doorways and doors [2019: H2.5]			X		Not applicable. Not a public transport building.
I2D6 Lifts [2019: H2.6]			X		Not applicable. Not a public transport building.
I2D7 Stairways [2019: H2.7]			X		Not applicable. Not a public transport building.
I2D8 Unisex accessible toilet [2019: H2.8]			X		Not applicable. Not a public transport building.

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
I2D9 Location of accessible toilet [2019: H2.9]			X		Not applicable. Not a public transport building.
I2D10 Symbols and signs [2019: H2.10]			X		Not applicable. Not a public transport building.
I2D11 Tactile ground surface indicators [2019: H2.11]			X		Not applicable. Not a public transport building.
I2D12 Lighting [2019: H2.12]			X		Not applicable. Not a public transport building.
I2D13 Hearing augmentation [2019: H2.13]			X		Not applicable. Not a public transport building.
I2D14 Emergency warning systems [2019: H2.14]			X		Not applicable. Not a public transport building.
I2D15 Controls [2019: H2.15]			X		Not applicable. Not a public transport building.
Part I3 Farm buildings and farm sheds					
I3D1 Application of part [2019: H3.1]			X		Not applicable. Not a farm buildings and farm sheds
I3D2 Fire resistance and separation [2019: H3.2]			X		Not applicable. Not a farm buildings and farm sheds
I3D3 Provision for escape [2019: H3.3]			X		Not applicable. Not a farm buildings and farm sheds
I3D4 Construction of exits [2019: H3.4]			X		Not applicable. Not a farm buildings and farm sheds
I3D5			X		Not applicable. Not a farm buildings and farm sheds

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Fixed platforms, walkways, stairways and ladders [2019: H3.5]					
I3D6 Thresholds [2019: H3.6]			X		Not applicable. Not a farm buildings and farm sheds
I3D7 Swinging doors [2019: H3.7]			X		Not applicable. Not a farm buildings and farm sheds
I3D8 Fire fighting equipment [2019: H3.8]			X		Not applicable. Not a farm buildings and farm sheds
I3D9 Fire hydrants and water supplies [2019: H3.9]			X		Not applicable. Not a farm buildings and farm sheds
I3D10 Fire hose reels [2019: H3.10]			X		Not applicable. Not a farm buildings and farm sheds
I3D11 Portable fire extinguishers [2019: H3.11]			X		Not applicable. Not a farm buildings and farm sheds
I3D12 Emergency lighting requirements [2019: H3.12]			X		Not applicable. Not a farm buildings and farm sheds
I3D13 Exit signs [2019: H3.13]			X		Not applicable. Not a farm buildings and farm sheds
I3D14 Direction signs [2019: H3.14]			X		Not applicable. Not a farm buildings and farm sheds
I3D15 Design and operation of exit signs [2019: H3.15]			X		Not applicable. Not a farm buildings and farm sheds
I3D16 Sanitary facilities [2019: H3.16]			X		Not applicable. Not a farm buildings and farm sheds

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BCA DEEMED-TO-SATISFY PROVISION	COMPLIES	DOES NOT COMPLY	NA or Informational	Compliance Required	COMMENTS
I3D17 Height of rooms and other spaces [2019: H3.17]			X		Not applicable. Not a farm buildings and farm sheds
I3D18 Artificial lighting [2019: H3.18]			X		Not applicable. Not a farm buildings and farm sheds
Specification 32 Construction of proscenium walls - Not applicable.					
NSW Part I4 Class 9b Buildings - Not applicable.					
NSW Part I5 Temporary Structures - Not applicable.					
NSW Part I6 Drive-in theatres- Not applicable.					
Section J Energy Efficiency - Not assessed in this report.					

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CONCLUSION

This report provides a Building Code of Australia 2022 (BCA) assessment of the proposed mixed use building.

The primary purpose of this report was to identify the non-compliance matters contained in the proposed design philosophy against the current Deemed-to-Satisfy (DTS) Provisions of the BCA and to provide compliance recommendations to overcome the DTS non-compliances.

This report provided a BCA assessment table in Section 3.0 that summarises the identified non-compliance matters and offers specific recommendations that are also outlined in the Executive Summary.

Further, if compliance with the deemed-to-satisfy provisions is not achievable or desirable, Alternative Solutions could be further developed and verified by an appropriately qualified BCA Consultant or Fire Safety Engineer.

DRAFT Ben Murrow for AE&D	DRAFT for AE&D

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ATTACHMENT A - INSPECTION & MAINTENANCE

Fire Safety Measures

The fire safety measures within the building must be maintained to ensure correct operation at all times the building is occupied. All firefighting equipment should be tagged when tested/inspected and log books kept up-to-date for all smoke detection, warning systems and sprinkler systems (where installed).

An annual fire safety certificate must be submitted to the local consent authority and the NSW Fire Brigade each year indicating satisfactory performance of the fire safety measures contained within the building. The annual fire safety statement should be displayed in a prominent place within the building (i.e. the main entry foyer)

The correct operation and maintenance of the buildings fire safety measures is critical in affording an adequate level of fire safety.

Good Housekeeping

The ongoing management of the building should ensure good housekeeping procedures. The following matters should be considered by building management:

- Ensure exits and paths of travel to exits remain unobstructed (in particular stairways)
- Avoid storage of materials in unoccupied areas
- Limit storage of flammable/combustible materials to designated and approved areas
- Prevent chocking open fire/smoke doors
- Prevent storage of materials that could hinder access to firefighting equipment

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Receipt No.L0000133464

Levy Receipt

Date: 17/11/2023

Development Applicant

Andrew Alker
LEVEL 2 1C HOMEBUSH BAY DR, RHODES NSW 2138

Development Details

Application Type:	Development Application
Application No.:	SSD15822622
Approving Authority:	CITY OF RYDE COUNCIL
Site Address:	1 IVANHOE PL MACQUARIE PARK NSW 2113

Levy Details

Levy No.:	L0000133464
Cost of Works (incl. GST):	$96,380,228.00
Levy Payable:	$240,950.00
Total Amount Paid (excl. Surcharge):	**$240,950.00**

MAIL TYPE	MAIL NUMBER	REFERENCE NUMBER
General Correspondence	Parkview-GCOR-009034	Parkview-TRANSMIT-001520

Fwd: Initial FEBQ building C3

From	Mr Mohamed Yaccoub - Parkview Constructions
To (2)	Mr Chris Michaels - City Plan Services Mr Safwat Abdelfattah - City Plan Services
Cc (4)	Mr Daniel Leaf - Frasers Property Australia - Residential Mr Joe Avgoustis - Frasers Property Australia - Residential Mr Edward Ottery - Frasers Property Australia - Residential Mr Warwick Davidson - Parkview Constructions
Sent	Friday, 15 March 2024
Action by	**18/03/2024**

MESSAGE

Hi Chris/Saf,

Please see below comments from our fire contractor and our fire engineers response in red regarding items raised in their initial review of the FEBQ. Could you please comment on the items stated below.

Note, we are yet to update the FEBQ in accordance with BCA 2022 but this is a start while we wait for the updated BCA report.

Regards,

Mohamed Yaccoub
Project Engineer

+61 427 520 238
Mohamed.yaccoub@parkview.com.au

Level 7, 60 Union Street, Pyrmont NSW 2009
PO Box R1779 Royal Exchange NSW 1225

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From: C Maiava
Sent: 08/03/2024 12:46:01 PM AEDT (GMT +11:00)
To: Rony Tannous, Mohamed Yaccoub
Cc: Thomas O'Dwyer
Mail Number: I-F-S-GCOR-000490
Subject: Re: Initial FEBQ building C3

Hi Mohamed,

As this project is under NCC 2022 which references the new hydrant standard AS2419-2021, there are some items need to be raised and may require further discussion for inclusion in the FEBQ submission.

Item 1: Primary Water Supply

Clause 4.2.6.6 & Table 4.2.8 (B) - High Rise water storage tank - where a building has an effective height of 50m or more water storage tanks shall serve as the primary supply for the hydrant system.
This project is currently designed to have a Combined Sprinkler & Hydrant System which utilises a Dual water supply in accordance with AS2118.6-2012 (AS2419.1 is a secondary reference to this standard of performance) where the water supplies are duplicated (i.e. Two independent full capacity supplies). The configuration comprises the following configurations

- Primary Supply = Fire Electric Pump & Inexhaustible Towns Main

- Secondary Supply = Fire Diesel Pump + Water Storage Tank + Automatic Tank Infill

This AS2118.6-2012 water supply configuration is an enhancement of the requirements of AS2419.1-2021 which only requires Towns Main + Tank as the Water Source (i.e. not duplicated water supplies). The technical non-compliance is in the wording which requires the primary supply to be the tank source. For a Dual Supply under AS2116-2012 the tank is provided on the Secondary Supply, which in terms of performance (i.e. flows, pressure, duration) is a replica of the primary supply
Note the proposed configuration is compliant AS2118.6-2012 without any departures
This performance solution is simply provided as a technical clarification due to misalignment between AS2118.6-2012 & AS2419.1-2017 & has no impact to the overall performance of Combined Sprinkler & Hydrant system

Affinity - I have not seen this as an issue before. PCA should review and confirm their opinion. I am unsure of the FRNSW stance all be it the above does seem extremely technical and hence unlikely to affect their operations. If required, we can add to the fire engineering (Please have this confirmed with City Plan).

CPS - This is a known contradiction within the standard. Comment/s should be obtained from BCA consultant for our review/consideration.

Item 2: Booster Location

We recommend the booster location be referenced in the FEBQ as we should always give brigade opportunity to comment on the final location to ensure there operational requirements have been considered (standard industry practice) and there is a new informative consideration within AS2419.1-2021 Appendix P around booster location integrated within building facades. Figure P.4.2.2 illustrates the booster cupboard to be positioned a the corner of the building to mitigate the risk of falling objects in the event of an emergency. The hardstand is shown to be safely parked away from the expected drop zone in front of the building. See below for reference.

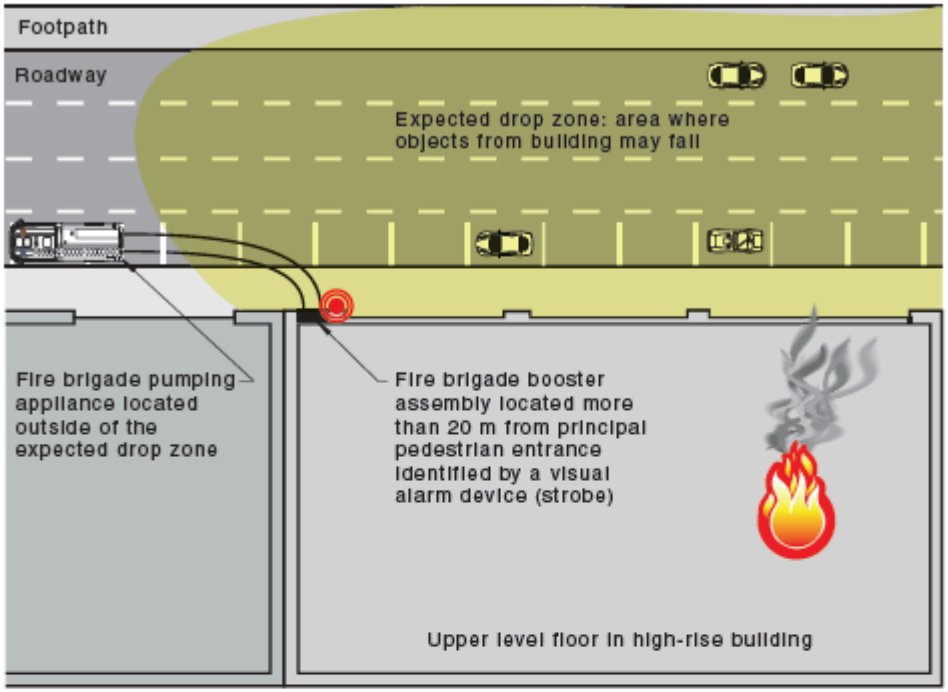

Figure P.4.2.2 — Fire brigade booster assembly serving a high-rise building

P.4.2.3 Summary — Fire brigade booster assembly position and location

Although this appendix is unable to detail the application of the provisions of Clause 7.3.1 for all buildings and circumstances, the examples and preceding text are intended to highlight the following —

(a) The location of a fire brigade booster assembly and other fire brigade infrastructure items such as fire control rooms, control and indicating equipment have a direct impact on the safety of firefighters attending a fire in the building. Safety in design principles should therefore always be applied when considering the location of the fire brigade booster assembly.

(b) The location of any fire brigade booster assembly should consider all the risks within the building and be as remote as possible from the risks associated with the building or site.

(c) The fire brigade booster assembly should be able to be viewed upon approach to the main pedestrian entry of the building

Affinity - The booster location is already documented as a deviation on the BCA and specific to the multiple entrances and hence not being in sight etc. Therefore, the FRNSW will have an opportunity to review. In regard to teh Appendix P, I understand that Appendix P is informative only and this does not represent a non-compliance. PCA should review this understanding and confirm their opinion. (Please have this confirmed with City Plan).

CPS - We concur with Affinity's statement that FRNSW will be given an opportunity to comment on location of booster. If they see it as an issue then it should be addressed via a performance solution.

Item 3: VAD Spacing

The previous edition of AS1670.1 (2015 version) had a prescriptive reference on spacing shown below in yellow (this has been removed in the 2018 version), which allowed VAD's to be spaced at a notional 15.0m which was implemented by most designers. Refer below

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AS1670.4-2015 clause 4.3.9 Visual warning devices

Visual alarm devices and tactile warning devices states:-

In areas where the background A-weighted ambient noise level exceeds 85 dB(A), or the speech intelligibility requirements are not met, or where the wearing of hearing protection devices is required (see AS/NZS 1269.0), or where the emergency management plan excludes audible warning, VWDs and/or V ADs shall be installed.

VWD and or VADs shall be installed and be visible throughout the area of coverage at a viewing position of 1.5m above the floor. This is a similar strategy to spacings for Emergency Exit Lighting

NOW under the 2018 edition, there is a requirement for spacing to be in accordance with 'conformance documentation' (which most designers are interpreting as the manufacturers data sheet); resulting in 7.0m spacings for most manufacturers

AS1670.1-2018 clause 4.6 Visual Alarm Signals

Visual alarm devices shall be installed as follows:

(d) VAD shall be installed in accordance with spacing detailed in the conformance documentation throughout the area of coverage. In car parks the area of coverage is limited to the circulation spaces.

Affinity - I am of the opinion that the VADs should be located as per the manufactures specification in order to ensure they are visible and achieve the testing requirements for the required lux etc. I note that with consideration of the extended travel distances the required smoke detection is likely to need to reduce to a spacing of 7.5m in any case and hence this would align.

CPS - we are in in concurrence with Affinity's statement.

Kind Regards,

Croydon Maiava
Project Manager

Innovative Fire Services Pty Ltd
Clempton Business Park
Unit 13, 20-22 St Albans Road
Kingsgrove NSW 2208

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E cmaiava@innovativefire.com.au
W www.innovativefire.com.au

From: M Yaccoub
Sent: 29/02/2024 9:22:46 AM AEDT (GMT +11:00)
To: Croydon Maiava, Rony Tannous, George Helou, Martin Hadigol, Biljana Stevanovic
Cc: Thomas O'Dwyer
Mail Number: Parkview-TRANSMIT-001520
Subject: Initial FEBQ building C3

Hi All,

Please find attached FEBQ that was submitted at time of tender. Could you please review and comment on what is currently in the FEBQ and if there are any additional non-compliances you believe are required to be addressed. Please provide feedback by COB Monday 4/03.

Regards,

Mohamed Yaccoub
Project Engineer

+61 427 520 238
Mohamed.yaccoub@parkview.com.au

Level 7, 60 Union Street, Pyrmont NSW 2009
PO Box R1779 Royal Exchange NSW 1225

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Fair Trading

Design compliance declaration - single regulated design

This form relates to obligations under the *Design and Building Practitioners Act 2020* and supporting Regulation.
This form is approved under clause 11(1) of the *Design and Building Practitioners Regulation 2021*.

Instructions for completing this form

You must complete all parts of this form.

Please note that under *s77 of the Design and Building Practitioners Act 2020*, Fair Trading has the power to request additional information or records from registered practitioners for an authorised purpose, such as an audit or investigation. You may therefore be requested to provide further information or records to support any declaration made on this form.

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The plan/drawing/specification/report title, number and revision should correspond with the detail in the title block for each design to which this declaration relates.

Part 1. Details

Please insert the building project address to which this declaration relates

1 Ivanhoe Place, Macquarie Park, NSW 2113

For registered body corporates, give full names of registered individuals and the corporation on behalf of which the declaration is made.

Design practitioner name

Thomas Maguer

Registration number of design practitioner

DEP 0000170

Class of registration (applicable to this declaration)

Architectural

Body corporate name (if applicable)

Team2 Architects Pty Ltd

Registration number of body corporate (if applicable)

DEP0000612

Email address

info@team2.com.au

Contact number

02 9437 3166

ABN/ACN

2 104 833 507

Part 1. Details (continued)

Q1. Is this a regulated design prepared for a Ⓟ performance solution for building work?

- ☐ Yes, (also includes a building element, proceed to Question 2)
- ☐ Yes, (only for a performance solution, proceed to Question 3)
- ☑ No, (proceed to Question 2)

Q2. Is this a regulated design prepared for a building element for building work? If yes, please select one

- ☐ Ⓕ Fire safety systems
- ☐ Ⓦ Waterproofing
- ☑ Ⓛ Load-bearing
- ☐ Ⓑ Building enclosure
- ☐ Ⓢ (Building) services

Q3. The design compliance declaration (DCD) number is made up of two parts:

a) the number (starting at DCD-001) is the number of DCD made. Subsequent numbers are DCD-002, DCD-003, etc.
b) the letter denotes what type of design the declaration relates to. Use one of the letters from above (P, F, W, L, B, S) e.g. DCD-001W

DCD-_001_Ⓛ (this is the DCD number)

Q4. Is this a regulated design prepared for an 'architectural / building design general' document by the design practitioner class of architectural for the building element of 'load-bearing' or 'building services?

Refer to Design Practitioners Handbook for explanation of 'architectural / building design general' design document.

- ☐ Yes
- ☑ No

Part 1. Details (continued)

Please group each type of document (e.g. plans/drawings/specifications/reports) together. Note that the information provided in the table should match the title block information.

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6. Stair & Lift B - Details	A-6222	1
7. Stair & Lift B - Details 2	A-6223	1
8. Details - Basement Sections 5	A-7035	1
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Number of attachments to the certificate (if applicable)

Part 2. Declaration matters

I, Thomas Maguer

Insert full name acting on behalf of

Team2 Architects Pty Ltd

Insert registered body corporate name (if relevant)

Architectural

Insert class of registration

have prepared the attached regulated design.
Declare:

1. The regulated design for which this design compliance declaration is being made complies with the requirements of the *Building Code of Australia*.

☑ Yes

☐ No

☐ There are no applicable *Building Code of Australia* requirements

If there are no applicable requirements BCA, please provide further details below

2. The regulated design for which this design compliance declaration is being made integrates details of other aspects of building work to which the design relates, and other regulated designs for the work, as far as is reasonably practicable.

☑ Yes

☐ No

If yes, by providing a brief description, please list the other aspects of building work and the other regulated designs that have been integrated into the regulated design for which this design compliance declaration is being made.

Structural Design - DCD-001L - Mark Robert Ellerington - DEP0000532

3. Standards, codes and requirements (other than the requirements referenced in the B*uilding Code of Australia*) have been applied in preparing the regulated design for which this design compliance declaration is being made. E.g. a requirement under a development consent.

☐ Yes

☑ No

If yes, please list or attach information about the standards, codes or requirements that have been applied.

4. Any building product referred to in preparing the regulated design or which this design compliance declaration is being made would, if used in a manner consistent with the design, achieve compliance with the *Building Code of Australia*.

☐ Yes

☑ No

Part 2. Declaration matters (continued)

5. I have sought and considered specialist advice in preparing the regulated design.

- [ ] Yes
- [x] No

If yes, please provide a brief explanation of the parts of the regulated design which have been based on the specialist advice from another person other than the person making this declaration.

6. The regulated design involves a performance solution.

- [ ] Yes
- [x] No

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7. The regulated design accords with the Regulated Design Guidance Material relevant to the design, as per clause 9(1(c)) of the Design and Building Practitioners Regulation 2021.

- [x] Yes
- [ ] No

Part 3. Signature

Signature

Thomas Maguer

Digitally signed by Thomas Maguer
DN: C=AU, E=thomas@team2.com.au, O=Team2, OU=NSW 10144, CN=Thomas Maguer
Location: Sydney
Reason: I am approving this document
Contact Info: 0422304775
Date: 2025.03.21 16:50:20+11'00'

Date

15/03/2025

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DCD-_001_Ⓦ (this is the DCD number)

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Refer to Design Practitioners Handbook for explanation of 'architectural / building design general' design document.

- ☐ Yes
- ☑ No

Part 1. Details (continued)

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- [x] Yes
- [ ] No
- [ ] There are no applicable *Building Code of Australia* requirements

If there are no applicable requirements BCA, please provide further details below

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- [x] Yes
- [ ] No

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- [ ] Yes
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- [ ] Yes
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- [x] Yes
- [ ] No

If yes, please provide a brief explanation of the parts of the regulated design which have been based on the specialist advice from another person other than the person making this declaration.

WIR-2276.2 C3 Treehouse Basement Waterproofing Detailed Design Report produce by - 'Water proofing Integrity'

6. The regulated design involves a performance solution.

- [ ] Yes
- [x] No

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- [x] Yes
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Digitally signed by Thomas Maguer
DN: C=AU, E=thomas@team2.com.au, O=Team2, OU=NSW 10144, CN=Thomas Maguer
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Body corporate name (if applicable)

Team2 Architects Pty Ltd

Registration number of body corporate (if applicable)

DEP0000612

Email address

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Contact number

02 9437 3166

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DCD-_002_Ⓑ (this is the DCD number)

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Refer to Design Practitioners Handbook for explanation of 'architectural / building design general' design document.

- ☐ Yes
- ☑ No

Part 1. Details (continued)

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Insert full name acting on behalf of

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Insert registered body corporate name (if relevant)

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Insert class of registration

have prepared the attached regulated design.
Declare:

1. The regulated design for which this design compliance declaration is being made complies with the requirements of the *Building Code of Australia*.

- [x] Yes
- [ ] No
- [ ] There are no applicable *Building Code of Australia* requirements

If there are no applicable requirements BCA, please provide further details below

2. The regulated design for which this design compliance declaration is being made integrates details of other aspects of building work to which the design relates, and other regulated designs for the work, as far as is reasonably practicable.

- [x] Yes
- [ ] No

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3. Standards, codes and requirements (other than the requirements referenced in the B*uilding Code of Australia*) have been applied in preparing the regulated design for which this design compliance declaration is being made. E.g. a requirement under a development consent.

- [ ] Yes
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If yes, please list or attach information about the standards, codes or requirements that have been applied.

4. Any building product referred to in preparing the regulated design or which this design compliance declaration is being made would, if used in a manner consistent with the design, achieve compliance with the *Building Code of Australia*.

- [ ] Yes
- [x] No

Part 2. Declaration matters (continued)

5. I have sought and considered specialist advice in preparing the regulated design.

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If yes, please provide a brief explanation of the parts of the regulated design which have been based on the specialist advice from another person other than the person making this declaration.

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7. The regulated design accords with the Regulated Design Guidance Material relevant to the design, as per clause 9(1(c)) of the Design and Building Practitioners Regulation 2021.

- [x] Yes
- [ ] No

Part 3. Signature

Signature

Thomas Maguer

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15/03/2025

This form relates to obligations under the *Design and Building Practitioners Act 2020* and supporting Regulation. For more information visit NSW Fair Trading

21 March 2025 211086/SAAF

Richard Crookes Construction
Level 14, 558 Pacific Highway
St Leonards, NSW 2065

Attention: **Sarah Metcalf**

Ivanhoe Stage 2, Building C3, Midtown Precinct, Macquarie Park
Structural Design Certificate– CC2 Footings and Basement 03

Dear Sarah,

We certify that we have prepared the structural design of Ivanhoe Stage 2, Building C3, Midtown Precinct Macquarie Park – CC2 Footing and B03 Package, as listed below, in accordance with the following Australian Standards:

AS 3600	Concrete Structures
BCA 2022	Building Code of Australia

And the structure shown would be sufficient to carry the relevant loads specified on our drawings and in -

AS 1170.0	Structural design actions – General principles
AS 1170.1	Structural design actions – Permanent, imposed and other actions
AS 1170.2	Structural design actions – Wind actions
AS 1170.4	Structural design actions – Earthquake actions in Australia

Yours faithfully,
TTW (NSW) PTY LTD

HUNG NGUYEN
TECHNICAL DIRECTOR

P:\2021\2110\211086\Certificates\RCC\250321Ivanhoe Bldg C3 Midtown Pct MPark Structural CC2 certificate.docx

Drawing List

Drawing No.	Title	Revision
211086-S1040	Footing Plan	1
211086-S1041	Footing Sections and Details – Sheet 1	1
211086-S1042	Footing Sections and Details – Sheet 2	1
211086-S5001	Basement 03 Outline Plan	1
211086-S6001	Typical Slab On Ground Details – Sheet 1	1
211086-S6011	Basement 03 Sections – Sheet 1	1

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Fair Trading

Design compliance declaration - single regulated design

This form relates to obligations under the *Design and Building Practitioners Act 2020* and supporting Regulation.
This form is approved under clause 11(1) of the *Design and Building Practitioners Regulation 2021*.

Instructions for completing this form

You must complete all parts of this form.

Please note that under *s77 of the Design and Building Practitioners Act 2020*, Fair Trading has the power to request additional information or records from registered practitioners for an authorised purpose, such as an audit or investigation. You may therefore be requested to provide further information or records to support any declaration made on this form.

Where this form indicates that material must be attached to the form, you must number each attachment sequentially and identify the number of that attachment in the relevant answer.

The plan/drawing/specification/report title, number and revision should correspond with the detail in the title block for each design to which this declaration relates.

Part 1. Details

Please insert the building project address to which this declaration relates

Ivanhoe Stage 2, Building C3, Midtown Precinct, Macquarie Park

For registered body corporates, give full names of registered individuals and the corporation on behalf of which the declaration is made.

Design practitioner name

Kevin Peter Berry

Registration number of design practitioner

DEP10001336

Class of registration (applicable to this declaration)

Structural Engineering

Body corporate name (if applicable)

TTW (NSW) Pty Ltd

Registration number of body corporate (if applicable)

DEP0000532

Email address

kevin.berry@ttw.com.au

Contact number

02 8437 7215

ABN/ACN

74 649 974 112 / 649 974 112

Part 1. Details (continued)

Q1. Is this a regulated design prepared for a Ⓟ performance solution for building work?

- ☐ Yes, (also includes a building element, proceed to Question 2)
- ☐ Yes, (only for a performance solution, proceed to Question 3)
- ☑ No, (proceed to Question 2)

Q2. Is this a regulated design prepared for a building element for building work? If yes, please select one

- ☐ Ⓕ Fire safety systems
- ☐ Ⓦ Waterproofing
- ☑ Ⓛ Load-bearing
- ☐ Ⓑ Building enclosure
- ☐ Ⓢ (Building) services

Q3. The design compliance declaration (DCD) number is made up of two parts:

a) the number (starting at DCD-001) is the number of DCD made. Subsequent numbers are DCD-002, DCD-003, etc.
b) the letter denotes what type of design the declaration relates to. Use one of the letters from above (P, F, W, L, B, S) e.g. DCD-001W

DCD-_003_Ⓛ (this is the DCD number)

Q4. Is this a regulated design prepared for an 'architectural / building design general' document by the design practitioner class of architectural for the building element of 'load-bearing' or 'building services?

Refer to Design Practitioners Handbook for explanation of 'architectural / building design general' design document.

- ☑ Yes
- ☐ No

Part 1. Details (continued)

Please group each type of document (e.g. plans/drawings/specifications/reports) together. Note that the information provided in the table should match the title block information.

If you have more than 30 items, please provide on a separate attachment using the same headings in the table below.

	Plan/drawing/specification/report title which is part of the "regulated design" being declared	Plan/drawing/specification/ report reference number	Revision number
1.	FOOTING PLAN	211086 - S1040	1
2.	FOOTING SECTIONS AND DETAILS - SHEET 1	211086 - S1041	1
3.	FOOTING SECTIONS AND DETAILS - SHEET 2	211086 - S1042	1
4.	BASEMENT 03 OUTLINE PLAN	211086 - S5001	1
5.	TYPICAL SLAB ON GROUND DETAILS - SH 1	211086 - S6001	1
6.	BASEMENT 03 SECTIONS - SHEET 1	211086 - S6011	1
7.			
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30.			

Number of attachments to the certificate (if applicable)

Part 2. Declaration matters

I, Kevin Peter Berry

Insert full name acting on behalf of

TTW (NSW) Pty Ltd

Insert registered body corporate name (if relevant)

Structural Engineering

Insert class of registration

have prepared the attached regulated design.
Declare:

1. The regulated design for which this design compliance declaration is being made complies with the requirements of the *Building Code of Australia*.

- [x] Yes
- [ ] No
- [ ] There are no applicable *Building Code of Australia* requirements

If there are no applicable requirements BCA, please provide further details below

2. The regulated design for which this design compliance declaration is being made integrates details of other aspects of building work to which the design relates, and other regulated designs for the work, as far as is reasonably practicable.

- [x] Yes
- [ ] No

If yes, by providing a brief description, please list the other aspects of building work and the other regulated designs that have been integrated into the regulated design for which this design compliance declaration is being made.

Architectural drawings A-1001, A-1100, A-1101, A-0021, A-6221, A-6222, A-6223, A-7035, prepared by Team2 Ar
Geotechnical Report No.86043.06, May 2021, prepared by Douglas Partners

3. Standards, codes and requirements (other than the requirements referenced in the B*uilding Code of Australia*) have been applied in preparing the regulated design for which this design compliance declaration is being made. E.g. a requirement under a development consent.

- [x] Yes
- [ ] No

If yes, please list or attach information about the standards, codes or requirements that have been applied.

AS 3600 - 2018 Concrete Code
AS 1170.0 - 2002 Structural Design Actions
AS 1170.1 - 2002 Minimum Design Loads
AS 1170.2 - 2021 Structural Design Wind Actions
AS 1170.4 - 2007 Structural Design Earthquake Actions

4. Any building product referred to in preparing the regulated design or which this design compliance declaration is being made would, if used in a manner consistent with the design, achieve compliance with the *Building Code of Australia*.

- [ ] Yes
- [x] No

Part 2. Declaration matters (continued)

5. I have sought and considered specialist advice in preparing the regulated design.

- [x] Yes
- [ ] No

If yes, please provide a brief explanation of the parts of the regulated design which have been based on the specialist advice from another person other than the person making this declaration.

Architect - Team2 Architects - Thomas Maguer- Phone (02) 9437 3166
Geotechnical Engineer - Douglas Partners - Peter Hunt - Phone (02) 9809 0666
Main contractor - Richard Crookes - Sarah Metcalf - Phone (02) 9902 4700

6. The regulated design involves a performance solution.

- [ ] Yes
- [x] No

If yes, and the performance solution is not itself the regulated design identified in part 1 of this form, please provide a brief description of the performance solution, the performance solution report identifier (reference number, date and version), and the name and contact details of the person who prepared the performance solution report.

7. The regulated design accords with the Regulated Design Guidance Material relevant to the design, as per clause 9(1(c)) of the Design and Building Practitioners Regulation 2021.

- [x] Yes
- [ ] No

Part 3. Signature

Signature

Kevin Berry Digitally signed by Kevin Berry Date: 2024.02.19 10:59:17 +11'00'

Date

21/03/2025

This form relates to obligations under the *Design and Building Practitioners Act 2020* and supporting Regulation. For more information visit NSW Fair Trading

Fair Trading

Design compliance declaration - single regulated design

This form relates to obligations under the *Design and Building Practitioners Act 2020* and supporting Regulation.
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The plan/drawing/specification/report title, number and revision should correspond with the detail in the title block for each design to which this declaration relates.

Part 1. Details

Please insert the building project address to which this declaration relates

1 Ivanhoe Place, Macquarie Park NSW

For registered body corporates, give full names of registered individuals and the corporation on behalf of which the declaration is made.

Design practitioner name

LEONARDO DIMINO

Registration number of design practitioner

DEP0001273

Class of registration (applicable to this declaration)

DESIGN PRACTITIONER DRAINAGE

Body corporate name (if applicable)

N/A

Registration number of body corporate (if applicable)

N/A

Email address

LEON@SPARKANDPARTNERS.COM.AU

Contact number

02 9891 5033

ABN/ACN

95 161 152 969

Part 1. Details (continued)

Q1. Is this a regulated design prepared for a Ⓟ performance solution for building work?

- ☐ Yes, (also includes a building element, proceed to Question 2)
- ☐ Yes, (only for a performance solution, proceed to Question 3)
- ☑ No, (proceed to Question 2)

Q2. Is this a regulated design prepared for a building element for building work? If yes, please select one

- ☐ Ⓕ Fire safety systems
- ☐ Ⓦ Waterproofing
- ☐ Ⓛ Load-bearing
- ☐ Ⓑ Building enclosure
- ☑ Ⓢ (Building) services

Q3. The design compliance declaration (DCD) number is made up of two parts:

a) the number (starting at DCD-001) is the number of DCD made. Subsequent numbers are DCD-002, DCD-003, etc.
b) the letter denotes what type of design the declaration relates to. Use one of the letters from above (P, F, W, L, B, S) e.g. DCD-001W

DCD-_001_Ⓢ (this is the DCD number)

Q4. Is this a regulated design prepared for an 'architectural / building design general' document by the design practitioner class of architectural for the building element of 'load-bearing' or 'building services?

Refer to Design Practitioners Handbook for explanation of 'architectural / building design general' design document.

- ☑ Yes
- ☐ No

SPARKS +PARTNERS CONSULTING ENGINEERS

Suites 6 & 7, 2-6 Hunter Street
PARRAMATTA NSW 2150

Contact 02 9891 5033
admin@sparksandpartners.com.au

sparksandpartners.com.au

Ref No: 25023
24 March 2025

c/o Richard Crookes Construction
Level 14, 558 Pacific Highway, St Leonards
NSW 2065
metcalfs@richardcrookes.com.au

Re: CONSTRUCTION CERTIFICATE 2 – SOG Hydraulic Inground Services SSD-15822622-MOD-1 [Building C3] [1 Ivanhoe Place, Macquarie Park NSW 2113]

Attention: Sarah,

Pursuant to the provisions of Clause A5G3 (1) (e) of the National Construction Code 2022, we hereby certify that the **hydraulic design** for the above project as detailed on the engineering plans listed below has been undertaken in accordance with normal engineering practice and meets the requirements of the *National Construction Code (NCC) 2022 Volume: 1 Building Code of Australia (BCA) and Volume 3: Plumbing Code of Australia (PCA)*, the *Environmental Planning and Assessment Regulation 2021*, relevant *Australian Standards (AS)* and development consent. In particular, the design is in accordance with the following:

Standards Compliance

- Plumbing Code of Australia 2022
- National Construction Code 2022 – Volume 1
- AS 3500.2:2021 Plumbing and Drainage, Part 2: Sanitary plumbing and drainage
- AS 3500.3:2021 Plumbing and Drainage, Part 3: Stormwater drainage

Engineering Plans

Document Number	Revision	Document Title	Revision Date
H1101	A	COVER PAGE & DRAWING SCHEDULE	21.03.2025
H1201	A	SPECIFICATION SHEET 1	21.03.2025
H1202	A	SPECIFICATION SHEET 2	21.03.2025
H1203	A	SPECIFICATION SHEET 3	21.03.2025
H2101	A	GRAVITY SERVICES PLAN – BASEMENT 3	21.03.2025
H5101	A	DETAILS SHEET 1	21.03.2025
H5102	A	DETAILS SHEET 2	21.03.2025

Part 2. Declaration matters

I, LEONARDO DIMINO

Insert full name acting on behalf of

N/A	DESIGN PRACTITIONER DRAINAGE
Insert registered body corporate name (if relevant)	Insert class of registration

have prepared the attached regulated design.
Declare:

1. The regulated design for which this design compliance declaration is being made complies with the requirements of the *Building Code of Australia*.

- [x] Yes
- [ ] No
- [ ] There are no applicable *Building Code of Australia* requirements

If there are no applicable requirements BCA, please provide further details below

2. The regulated design for which this design compliance declaration is being made integrates details of other aspects of building work to which the design relates, and other regulated designs for the work, as far as is reasonably practicable.

- [x] Yes
- [ ] No

If yes, by providing a brief description, please list the other aspects of building work and the other regulated designs that have been integrated into the regulated design for which this design compliance declaration is being made.

ARCHITECTURAL DRAWINGS BY TEAM 2 ARCHITECHTS
STRUCTURAL DRAWINGS BY TAYLOR THOMSON WHITTING

3. Standards, codes and requirements (other than the requirements referenced in the B*uilding Code of Australia*) have been applied in preparing the regulated design for which this design compliance declaration is being made. E.g. a requirement under a development consent.

- [ ] Yes
- [x] No

If yes, please list or attach information about the standards, codes or requirements that have been applied.

4. Any building product referred to in preparing the regulated design or which this design compliance declaration is being made would, if used in a manner consistent with the design, achieve compliance with the *Building Code of Australia*.

- [x] Yes
- [ ] No

Part 2. Declaration matters (continued)

5. I have sought and considered specialist advice in preparing the regulated design.

- [ ] Yes
- [x] No

If yes, please provide a brief explanation of the parts of the regulated design which have been based on the specialist advice from another person other than the person making this declaration.

GEOTECHNICAL ENGINEERING REPORT - 86043.23 R.004.REV0 - PREAPRED BY DOUGLAS PARTNERS

6. The regulated design involves a performance solution.

- [ ] Yes
- [x] No

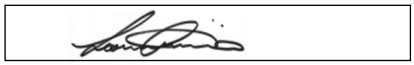
If yes, and the performance solution is not itself the regulated design identified in part 1 of this form, please provide a brief description of the performance solution, the performance solution report identifier (reference number, date and version), and the name and contact details of the person who prepared the performance solution report.

7. The regulated design accords with the Regulated Design Guidance Material relevant to the design, as per clause 9(1(c)) of the Design and Building Practitioners Regulation 2021.

- [x] Yes
- [ ] No

Part 3. Signature

Signature



Date

24.03.2025

This form relates to obligations under the *Design and Building Practitioners Act 2020* and supporting Regulation. For more information visit NSW Fair Trading

SPARKS +PARTNERS CONSULTING ENGINEERS

Suites 6 & 7, 2-6 Hunter Street
PARRAMATTA NSW 2150

Contact 02 9891 5033
admin@sparksandpartners.com.au

sparksandpartners.com.au

Ref No: 25023
24 March 2025

c/o Richard Crookes Construction
Level 14, 558 Pacific Highway, St Leonards
NSW 2065
metcalfs@richardcrookes.com.au

Re: CONSTRUCTION CERTIFICATE 2 – SOG Hydraulic Inground Services SSD-15822622-MOD-1 [Building C3] [1 Ivanhoe Place, Macquarie Park NSW 2113]

Attention: Sarah,

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- National Construction Code 2022 – Volume 1
- AS 3500.2:2021 Plumbing and Drainage, Part 2: Sanitary plumbing and drainage
- AS 3500.3:2021 Plumbing and Drainage, Part 3: Stormwater drainage

Engineering Plans

Document Number	Revision	Document Title	Revision Date
H1101	A	COVER PAGE & DRAWING SCHEDULE	21.03.2025
H1201	A	SPECIFICATION SHEET 1	21.03.2025
H1202	A	SPECIFICATION SHEET 2	21.03.2025
H1203	A	SPECIFICATION SHEET 3	21.03.2025
H2101	A	GRAVITY SERVICES PLAN – BASEMENT 3	21.03.2025
H5101	A	DETAILS SHEET 1	21.03.2025
H5102	A	DETAILS SHEET 2	21.03.2025

☒ I am a **Fair Trading Registered Certifier – Hydraulic (building) APFS** under clause 64 of the *Building and Development Certifiers Regulation 2020* for hydraulic fire safety systems: fire hydrant systems, fire hose reel systems and fire sprinkler systems (including wall-wetting sprinklers or drencher systems), or any automatic fire suppression system of a hydraulic nature.

Full Name: Leon Dimino

Qualifications: Dip Eng (Hydraulic), HCAA Full Member 32824,
Certifier – Hydraulic (building) Registration No: BDC3360 (NSW)
Design Building Practitioner – Registration No: DEP0001273

Email: leon@sparksandpartners.com.au

Signature:

RICHARD CROOKES CONSTRUCTIONS
Level 14, 558 Pacific Highway
St Leonards NSW 2065, Artarmon NSW 2064
Sarah Metcalf
+61 405 968 017

ARCHITECTS
Team 2 Architects Pty Ltd

Lvl1/45 Chandos Street,
St Leonards NSW 2065
T 02 9437 3166

204/9-11 Claremont St,
South Yarra VIC 3123
T 03 8849 9137

E info@team2.com.au
W team2.com.au

ABN 72 104 833 507 I REG. NO. 9940

21/03/2025

F/1199/0401 Design Verification Statement

Your Ref:

Re: **Design Verification Statement**
Project No: 1199
Project Address: C3 Midtown MacPark

DESIGN STATEMENT BY QUALIFIED DESIGNER

Dear Sir or Madam,

The below statement is to address clause 15 of the Environmental Planning and Assessment Regulation 2021.

I, Richard Webster (NSW Reg 9947), hereby confirm that the development:

- achieves the Nine design quality principles (as described in *State Environmental Planning Policy No 65—Design Quality of Residential Apartment Development*).
- achieves compliance with the architectural items of the NCC 2022;
- is consistent with the DA approved architectural plans (SSD-15822622-mod-1, dated 28/11/2022)
- incorporates architectural recommendations that are relevant to the current CC, from Arborist Report, Historical Assessment Report, Geotech Report, Groundwater Management Report, Remediation Action Plan, Statement of Environmental Effects & Utility Services Report.

The present certificate is attached to the following Team2 CC2 DCD's:

DCD-001L, DCD-002B, DCD-001W and relates to the following **Team2 drawings:**

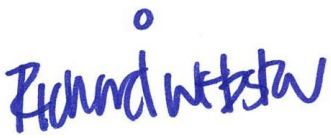
- A-0000-Cover Sheet-3
- A-0021-Detailed Excavation Plan-1
- A-1100-Footings-1
- A-1101-Concrete Setout Plan - Basement 03-1
- A-1401-Waterproofing Plan - Basement 03-1
- A-6221-Stair & Lift A - Details-1
- A-6222-Stair & Lift B - Details-1
- A-6223-Stair & Lift B - Details 2-1
- A-7035-Details - Basement Sections 5-1

Reference Design:

STRUCTURAL *TTW*	• *S1040 [1] FOOTING PLAN.pdf* • *S1041 [1] FOOTING SECTIONS AND DETAILS - SHEET 1.pdf* • *S1042 [1] FOOTING SECTIONS AND DETAILS - SHEET 2.pdf* • *S5001 [1] BASEMENT 03 OUTLINE PLAN.pdf* • *S6001 [1] TYPICAL SLAB ON GROUND DETAILS - SHEET 1.pdf* • *S6011 [1] BASEMENT 03 SECTIONS - SHEET 1.pdf*
HYDRAULIC *SPARKS AND PARTNERS*	• *25023_H1101 [A] COVER PAGE & DRAWING SCHEDULE.pdf* • *25023_H1201 [A] SPECIFICATION SHEET 1.pdf* • *25023_H1202 [A] SPECIFICATION SHEET 2.pdf* • *25023_H1203 [A] SPECIFICATION SHEET 3.pdf* • *25023_H2101 [A] GRAVITY SERVICES PLAN - BASEMENT 3.pdf* • *25023_H5101 [A] DETAILS SHEET 1.pdf* • *25023_H5102 [A] DETAILS SHEET 2.pdf*

Yours faithfully,

For and on behalf of Team2 Architects Pty Ltd



Richard Webster

Director

Case Number: 217397

February 28, 2025

Frasers Property Ivanhoe JV2 Pty Ltd
c/- ROSE ATKINS RIMMER

Letter of conditions for building over/adjacent to a Sydney Water asset Retrospective

Applicant: **Frasers Property Ivanhoe JV2 Pty Ltd**
Your reference: **41/24958**
Property location: **1 Ivanhoe PL, Macquarie Park**
Development Description: **OOS BPA for construction of basement with assets in the dig-zone**
Your application date: **October 15, 2024**

These requirements only relate to the documents/reports, plans and any further requested information sent and held by Sydney Water. If you obtain modification to your development proposal then the requirements detailed in this letter are void and you will need to reapply.

Your application to build at the above location in accordance with the submitted documents/reports, plans is noted as the works have commenced or completed prior/during to this application lodgement and assessment to Sydney Waters and considered retrospective. This application will be kept as a record.

Sydney Water expects building plans to be submitted for approval during the planning stage of any works that may impact our assets. This potentially avoids costly damage to Sydney Water's assets.

We don't object to the reported built structures remaining in their present state. However, we won't accept responsibility for claims for damage to if we need to do any maintenance work on our assets.

You will also need to do the following things:

1. Meet project specific requirements

This letter is confirmation that the development was constructed adjacent to Sydney Water assets **without** meeting Sydney Water's technical requirements for building over/adjacent to our assets. This is **not** an approval from Sydney Water. The building works were completed prior to the approval from Sydney Water.

Adequate maintenance vehicle access (24x7) to be granted to SW Operations and maintenance staff.

Complete The Section 73 Certificate: You must complete the requirements associated with the Section 73 Certificate for this development under application Case Number 214255. Please review your Development Approval for this requirement and consult your WSC if necessary.

END

Memorandum

To:	Parkview Constructions Pty Ltd	Date:	22 February 2024
Attention:	Mohamed Yaccoub	Project No.:	86043.23
Email:	mohamed.yaccoub@parkview.com.au	Reference:	R.006.Rev0
Subject:	Review of Foundation Impacts: Building C3, Ivanhoe Estate, Macquarie Park		

As requested by Parkview Constructions Pty Ltd (Parkview), Douglas Partners Pty Ltd (Douglas) have prepared this letter to assess the impacts of the excavation for Building C3 on the foundations of the neighbouring buildings. We understand that the following letter will support Parkview's CC1 submission to City of Ryde Council.

In an email issued on 23 January 2024 by Mohamed Yaccoub of Parkview, Douglas have been requested to comment on the geotechnical items listed below, as in Condition B41:

"Certification that the civil and structural details of all subsurface structures are designed to:

- *Provide appropriate support and retention to neighbouring property;*
- *Ensure there will be no ground settlement or movement during excavation or after construction (whether by the act of excavation or dewatering of the excavation) sufficient to cause an adverse impact to adjoining property or public infrastructure; and*
- *Ensure that the treatment and drainage of groundwater will be undertaken in a manner which maintains the pre-developed groundwater regime, so as to limit seepage to the public drainage network and structural impacts that may arise from alteration and of the pre-developed groundwater table."*

Based on the supplied drawings[1] for the C3 development, Douglas understand the following:

- Reference to drawings provided by TTW. It is understood that proposed bulk excavation level (BEL) is about RL 39 m to RL 40 m, with respect to the Australian Height Datum (AHD). It is understood that maximum excavation depths, of approximately 12 m below the original ground level is expected. Based on the survey drawing provided[2], the site has been partially stripped down by about 1 m to 1.5 m depth

[1] Job number 211086, Revision 1 dated 21/02/2024, prepared by TTW - "***Shoring and Footing Plan***", Drawing number S1001; "***Shoring Wall Elevations and Sections***", Drawings numbered S1011, S1012, and S1016.

[2] "***C2/C3 Plot Contour and Detail Survey Plan***", Number 9054 dated 6/10/2023, prepared by Total Surveying Solutions

with weathered rock present at surface towards the southwestern end. The basement is shallower at RL 42 at the northeastern end, requiring a maximum depth of cut of about 6 m; and

- It is expected that the excavation will generally be unsupported through the medium strength or better sandstone bedrock. Temporary dowels and shotcrete support (subject to services in the road) are proposed in the soils and weathered rock above the free-standing medium strength sandstone in the short-term with the building providing support in the long-term.

The neighbouring properties relevant to this assessment are:

- The C2 site is located immediately adjacent to Building C3. Construction for Building C2 has not commenced. Reference to the provided drawings[3] indicates the bulk excavation level at the C2 site will be approximately RL 48.5 m, relative to Australian Height Datum (AHD). The C2 site will consist of relatively minor structures within the zone of influence of the C3 building, including an inground pool and landscaped area;
- Building C4 is located to the south-east of Road No.2. Road 2 divides the C3 and C4 buildings. Based on the civil drawings, the C4 is approximately 15 m from the C3 basement and is considered outside the zone of influence;
- The D3/D4 development is approximately 16 m south-west of the C3 excavation. The excavation depth along this area is understood be approximately 12 m below existing surface levels and is considered outside the zone of influence;
- The B2 development to the north-east of the Road 1 is considered to be outside the zone of influence and there not expected to be impacted by the development; and
- The existing roads (Road No. 1 and Road No. 2) and footpaths (i.e., future 'public' areas) adjoining the C3 Building boundaries, are where rock is generally at shallow depth below the existing surface areas. No concentrated loads are understood to be present in these areas. Excavation for the Building C3 basement is up to approximately 12 m below these ground levels.

In responding to the items listed above, DP note that:

- All foundations for each neighbouring building is understood to be taken down to footings bearing on sandstone bedrock, of at least medium strength;
- Temporary retention of the adjacent soils and weathered rock during excavation for the Building C3 basement include dowels and shotcrete in the short-term, with the building providing support in the long-term. The structure is understood to permanently support these faces; and
- The permanent water table is considered to be within bedrock at the Building C3 site, and from observations during site inspections (during bulk excavation of the C1 development). The impact of the development has been outlined in the Dewatering Management Plan (DMP) which is understood to have been approved by Water NSW.

[3] "***Basement Plan A***", Project number 2041, Drawing number A-CD-101 Revision N (70% Tender Issue), dated 3/8/2023, prepared by CHROFI

Monitoring, treatment and drainage management of the groundwater will be carried out in accordance with the Douglas GMP and the DMP.

Given the above, from a geotechnical perspective it is considered that:

- The proposed temporary support and retention (shoring) has been designed to minimise the impact to neighbouring property;
- Building C3 has been designed to not adversely impact the neighbouring properties through subsidence or changes to the water table;
- The final Building C3 structure does not impose loads on the structure of any adjoining property, or any additional hazards given the current adjoining property use;
- Monitoring, treatment and drainage management of the groundwater will be carried out in accordance with the Dewatering Management Plan (DMP). The DMP is understood to have been approved by Water NSW; and
- It is noted that the dowels used during temporary shoring of the Building C3 basement will remain in-ground below the adjacent, future public areas. These will be designed so they do not create any hazard for the existing adjoining property use but may need to be considered in the planning and design of future works on that site.

We trust this meets your current requirements.

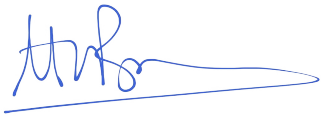
Regards,

Douglas Partners Pty Ltd

David Smith
Associate / Senior Geotechnical Engineer

Reviewed by

Joel Huang
Senior Associate
PRE00000428



Hugh Burbidge
Principal

Limitations:

Douglas Partners (Douglas) has prepared this report for this project at Building C3, Ivanhoe Place, Macquarie Park in accordance with Douglas' proposal dated 30 November 2023 and acceptance received from Antonio Screnci. The work was carried out under Douglas' Engagement Terms. This report is provided for the exclusive use of Parkview Constructions Pty Ltd for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of Douglas, does so entirely at its own risk and without recourse to Douglas for any loss or damage. In preparing this report Douglas has necessarily relied upon information provided by the client and/or their agents.

Douglas' advice is based upon the conditions encountered during previous investigations and inspections carried out within the site. The accuracy of the advice provided by Douglas in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

The assessment of atypical safety hazards arising from this advice is restricted to the (geotechnical / environmental / groundwater) components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. Douglas cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by Douglas. This is because this report has been written as advice and opinion rather than instructions for construction.

Attachments: About this report
Structural Drawings

About this Report

November 2023

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

continued next page

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

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Regulated Design Record				
Project Address:				
Project Title	IVANHOE STAGE 2 BUILDING C3			
Consent No:	DA 2019/00096 S4.55 MOD 2020/0364	**Body Corporate Reg No:**	DEP0000532	
Drawing Title: NOTES SHEET		**Drawing Number:** S-S0001		
Rev	**Date** dd.mm.yy	**Description**	**DP Full Name**	**Reg No**
1	16.02.24	ISSUED FOR CONSTRUCTION	KEVIN BERRY	DEP0001336

IVANHOE STAGE 2 BUILDING C3

This drawing is copyright and is the property of TTW and must not be used without authorisation.

THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT NOTES ON DRAWING NO. S0001

GENERAL NOTES

1. These drawings are for structural purposes only and are to be read in conjunction with the specification, architectural drawings, other contract documentation and the requirements of the relevant authorities.
2. Verify all setting out dimensions with the Architect.
3. Do not obtain dimensions by scaling the structural elements.
4. Should any ambiguity, error, omission, discrepancy, inconsistency or other fault exist or seem to exist in the contract documents, immediately notify in writing to the Superintendent.
5. Maintain the structure in a stable condition during construction. Temporary bracing/shoring shall be provided by the contractor to keep the structure and excavations stable at all times, ensuring that no part of the documented structure becomes overstressed. For all temporary batters obtain geotechnical engineer's recommendations.
6. All workmanship and materials shall be in accordance with the requirements of current Standards Australia codes and the bylaws, ordinances or other requirements of the relevant building authorities.
7. All proprietary items are to be installed and fixed in accordance with the manufacturers specifications and instructions.
8. All work is to be carried out in accordance with all Workcover requirements and occupational health and safety act regulations
9. Construction using these drawings shall not commence until a Construction Certificate is issued by the Principal Certifying Authority.

DESIGN LOADS:

Floor loads : REFER TO LOADING DIAGRAMS

Wind Loads : Vᴿ = 45 Where R = 500 years
Region = A2
Terrain Category = TC3

Earthquake Loads:

Design Category	=	III
Site Sub-soil class	=	B
Hazard Factor Z	=	0.08
Probability Factor kp	=	1.0
Importance Level	=	2

SAFETY IN DESIGN

TTW operates under Safe Work Australia's Code of Conduct for the Safe Design of Structures.
These drawings shall be read in conjunction with the TTW Transfer of Information Letter and Structural Risk and Solutions Register.
Under the Code of Conduct it is the Client's responsibility to provide a copy of the Structural Risk and Solutions Register to the Principal Contractor.
It is the Principal Contractor's responsibility to review the hazards and risks identified during the design process to ensure a safe workplace is maintained for the construction, maintenance and eventual demolition of the structure.

FOOTING NOTES

1. Foundations have been designed for:
   Allowable Bearing Pressure - 3.5 MPa
2. Foundation material is to be inspected and approved by the geotechnical engineer before casting footings.
3. Refer to geotechnical report No. 86043.06 dated May 2021 by Douglas Partners
4. Locate all pipes, retaining walls and excavation outside a 1:2 (vertical:horizontal) zone of influence from the bottom edge of the footing.
5. Where side shear is required to be developed, clean and roughen the sides of the excavation to the satisfaction of the geotechnical engineer.
6. Footings shall be located centrally under walls and columns unless noted otherwise.
7. Footings to be constructed and backfilled as soon as possible following excavation to avoid softening or drying out by exposure.
8. Contractor is to allow for cost of geotechnical inspections and any required certification.

RETAINING WALL NOTES

1. Drainage shall be provided as shown on the drainage drawings.
2. Backfilling shall be carried out after grout or concrete has reached a minimum strength of 0.85 f'c.
   Backfilling shall be approved granular material compacted in layers not exceeding 200mm to 95% Standard compaction unless noted otherwise.
3. Provide waterproofing to back of walls as specified or noted.
4. Where retaining walls rely on connecting structural elements for stability, do not backfill against the wall unless it is adequately propped or the elements have been constructed and have sufficient strength to withstand the loads.
5. For all temporary batters obtain geotechnical engineers recommendations.

SHORING WALL NOTES

1. The design, supply, installation and tensioning of bolts and nails shall be carried out in compliance with the relevant Australian Standards and the Geotechnical Report.
   Anchorage lengths and curing times shall be determined by the Geotechnical Engineer.
2. Bolts and nail holes should be thoroughly cleaned and the bond grout should be allowed to cure before proof stressing.
3. Grouting shall conform to the requirements of AS 3600 and The Concrete Institute of Australia "Recommended Practice Z3 - Grouting of Prestressing Ducts 2007.
4. For proof stressing loads refer to the Geotech Report.
5. Records of all test loadings are to be submitted to the Geotechnical Engineer for review.
6. Modifications to the arrangement shown on the drawings will require recalculation of the required working loads and shall be notified to the Geotechnical Engineer for approval.
7. Safe Working load shown is the force required after all losses of prestress, including draw in.
8. Bolts and nails shall be located so as to avoid all services and pits etc. The contractor is to determine the location of all services etc prior to installation of anchors.
9. Any variation in location or inclination of nails and bolts shall be submitted to the Geotechnical Engineer for approval.
10. For ratio of ultimate load capacity of anchor to safe working load refer to the Specification.
11. For temporary and semi-permanent anchors the length of tendon protruding beyond wedge grip is not to be less than 600mm to enable monitoring.
12. For corrosion protection requirements refer to the Geotechnical Report.
13. Do not destress temporary or semi-permanent anchors until the Geotechnical Engineer's approval has been obtained.

PNEUMATICALLY APPLIED CONCRETE

1. Concrete to shoring walls to be pneumatically applied in one continuous operation. Concrete to be proportioned to achieve a batch target strength of 32MPa.
2. The pneumatically applied concrete shall be cured by keeping continuously wet over a period of not less than 7 days after placement or by other approved means.
3. Pneumatically applied concrete is to be placed by an experienced operator.
4. Pneumatically applied concrete shall conform to the requirements of the Concrete Institute of Australia Recommended Practice Z5 - Shotcreting in Australia 2020.

CONSTRUCTION SEQUENCE

1. Excavate down to first row or anchor.
   Install anchor as per geotechnical specification.
2. Place shotcrete wall as per the drawings.
3. Stress the ground anchors to Design Loads after concrete is a minimum of 4 days old.
4. Continue second stage as above.
   The 2nd and 3rd drop should be on hit and miss panel sequence (refer to Concept Design 86043.23.R.005.Rev1)
5. For anchor specifications (length, diameter of hole, bar type and diameter, inclination from the horizonal, etc.)
   Refer to Geotechnical report 86043.23.R.005.REV1
6. Typical anchor setouts shown indicatively. Geotechnical engineer to confirm retained height and the requirement for the 2 or 3 rows of anchors.
7. Geotechnical Engineer to confirm retained height and the requirement for the 1 or 2 rows of anchors. Where additional row is required the spacing will be staggered. Refer to Concept Design 86043.23.R.005.Rev1.

CONCRETE NOTES

EXPOSURE CLASSIFICATION : External - B1
Internal - A1
Surface of members in contact with ground - A1

CONCRETE
Place concrete of the following characteristic compressive strength f'c as defined in AS 1379.

Location	f'c MPa at 28 days
Piles	S50
Pile Caps, Footing Beams, Pad Footings	S50
Slabs on Ground	S32
Suspended Slabs and Bands	S40
Walls	Refer Schedule
Dincel and/or AFS Walls	Refer Schedule
Columns	Refer Schedule
Stairs	S40

1. Use Type 'GP' cement, unless otherwise specified.
2. All concrete shall be subject to project assessment and testing to AS 1379.
3. Consolidate by mechanical vibration. Cure all concrete surfaces as directed in the Specification.
4. For all falls in slab, drip grooves, reglets, chamfers etc. refer to the architect's drawings and specifications.
5. Unless shown on the drawings, the location of all construction joints shall be submitted to engineer for review.
6. No holes or chases shall be made in the slab without the approval of the Engineer.
7. Conduits and pipes are to be fixed to the underside of the top reinforcement layer.
8. Slurry used to lubricate concrete pump lines is not to be used in any structural members.
9. All slabs cast on ground require sand blinding with a Concrete Underlay
10. ⟨175⟩ Indicates slab or band thickness

FORMWORK

1. The design, certification, construction and performance of the formwork, falsework and backpropping is the responsibility of the contractor.
2. The proposed method of installation and removal of formwork is to be submitted to the Superintendent for comment prior to work being carried out.

SLAB ON GROUND NOTES

Refer to Geotechnical Report No. 86043.06 dated May 2021 by Douglas Partners for all subgrade and subbase/basecourse requirements and unless directed otherwise the following requirements apply.

1. Strip all topsoil from the construction area and remove from the site.

2. Before placing fill, proof roll exposed subgrade with 6 passes of a 10 tonne minimum roller to test subgrade and then remove soft spots (areas with more than 3mm movement under roller). Soft spots to be replaced with select fill as per table:

SELECT FILL

Sieve Aperture (mm) to AS1152	Percentage passed (by mass)
75.0	100
9.50	100 to 50
2.36	100 to 30
0.60	50 to 15
0.075	<25

- Plasticity index to be > or = 2% and < or = 15%
- Non dispersive (a rating of nil as defined by the "dispersion" test AS1289.3.8.1) Submit proposed select fill for Engineers approval.

3. Compact fill areas and subgrade under buildings and pavements to minimum 98% standard maximum dry density in accordance with AS 1289 5.1.1. Compaction under buildings to extend 2m minimum beyond building footprint.

4. All basecourse material to be crushed hard rock or crushed natural gravel capable of being compacted to an even stable surface and complying with the grading and properties listed in the tables below and compacted to minimum 98% modified standard dry density in accordance with AS 1289 5.2.1

NON-FREE DRAINING BASECOURSE

Sieve aperture (mm) to AS1152	Percentage passed (by mass)
26.5	100
19.0	95 to 100
13.2	75 to 90
9.50	60 to 90
4.75	42 to 76
2.36	28 to 60
0.425	10 to 28
0.075	2 to 10

- Plasticity Index: Not greater than 10%
- Liquid Limit: Not greater than 25%
- California Bearing Ratio: Not less than 35%
- Unsound rock: Not greater than 20%
- Nondispersive (a rating of nil as defined by the dispersion test AS1289.3.8.1)
- Submit proposed basecourse for Engineers approval.

FREE DRAINING BASECOURSE

Sieve aperture (mm) to AS1152	Percentage passed (by mass)
9.50	100
6.70	95 to 98
4.75	58 to 78
2.36	37 to 50
1.38	22 to 30
0.425	10 to 17
0.075	2 to 10

- Plasticity Index: Not greater than 3%
- Liquid Limit: Not greater than 25%
- Coefficient of permeability: Not less than 0.1mm/sec
- Nondispersive (a rating of nil as defined by the 'dispersion test' AS1289.3.8.1)
- Submit proposed basecourse for Engineers approval.

5. Place sand blinding to areas where Concrete Underlays are required.

POST-TENSIONED CONCRETE NOTES

GENERAL

1. Submit all test certificates, theoretical extensions, calculations and shop drawing to the Superintendent as required by the specification prior to construction.
2. All reactions from post-tensioning shall be supplied to the formwork contractor for formwork design.
3. Stressing contractor is to pay particular attention to concrete compaction where ducts cross columns and at all tendon anchors and ensure that pump lines are adequately chaired and restrained so as to be kept separate from tendons and reinforcement.
4. Provide mesh over bands where band depth exceeds 350mm or as required by Workcover.
5. Holes cored through post-tensioned slabs must be approved by the structural engineer in writing.

TENDONS

1. All Strands shall be 7 wire ordinary strands with Class 2 relaxation in accordance with AS 4672.1 and AS 4672.2 unless noted otherwise.
2. Bar shall be high-tensile alloy steel bars in accordance with AS 4672.1 and AS 4672.2 with a nominal tensile strength of 1030 MPa unless noted otherwise.
3. Locate and fix tendons and reinforcement as shown on the contractors drawings and co-ordinate with cast in bolts, conduits and penetrations etc. Tendon profiles shall be parabolic unless noted otherwise.
4. Ducting for slab tendons shall be galvanised steel:
   - 70 x 19 for 5 x 12.7dia strand tendons
   - 90 x 19 for 5 x 15.2dia strand tendons
5. Seal off all ducts and securely tape joints to prevent ingress of mortar during concreting.
6. The performance of the post tensioning anchorages is the responsibility of the stressing contractor and they shall provide any additional bursting reinforcement needed to meet the requirements of their post tensioning system.

TENSIONING AND GROUTING

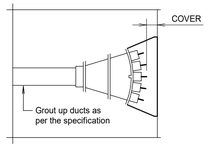
1. Tendons shall be stressed to jacking forces as per the contractors drawings.
2. The first stage of stressing is for 25% of the jacking force to be applied between 18 and 36 hours after concrete placement (f_{cp} = 9 MPa minimum) followed by the remainder of the jacking force at f_{cp} = 22 MPa unless noted otherwise below. Each individual strand or bar shall be tensioned during the first stage unless noted otherwise.
3. Records of net tendon elongation and other aspects of the tensioning operation required by the Specification shall be submitted to the Engineer and approved prior to cutting of tendons and grouting the ducts.
4. All tendons to be grouted in accordance with the specification.
5. Post-tensioning anchorage pockets shall be fully grouted with a polymer modified repair mortar. Minimum cover to any tendons or anchorage plate shall be as for the element in which they are located.
6. Concrete test cylinders used for assessing strength for tensioning are to be site cured in similar conditions to the concrete element being stressed.

ANCHORAGE RECESS GROUTING
NOT EXPOSED TO WEATHER (INTERNAL)
Exposure Class A1 as per AS3600

1. After final stressing and approval of extensions by the engineer, cut off strands to give 30mm minimum cover to ends of strands.
2. Provide records of measured cover at each anchor recess for the engineer to inspect and provide the opportunity for the engineer to inspect recesses.
3. Thoroughly clean anchorage pocket (use high pressure water jet if necessary) to remove all laitance, polystyrene etc.
4. Prime all concrete surfaces with 'Nitobond EP' or approved equivalent.
5. Grout up recess with 3:1 Sand: Cement grout mix or 'Renderoc HB'. Infill is to be finished flush with surrounding concrete surface.
6. The contractor shall provide records that demonstrate steps 3,4 & 5 have been satisfactorily completed at each anchor recess.

ANCHORAGE RECESS GROUTING
EXPOSED TO WEATHER (EXTERNAL)
Exposure Class B1 as per AS3600 - Near Coastal/Industrial
Exposure Class B2 as per AS3600 - Within 1km of coastline

1. After final stressing and approval of extensions by the engineer, cut off strands to give 30mm minimum cover to ends of strands.
2. Provide records of measured cover at each anchor recess for the engineer to inspect and provide the opportunity for the engineer to inspect recesses.
3. Thoroughly clean anchorage recess (use high pressure water jet if necessary) to remove all laitance, polystyrene etc.
4. Prime all metal surfaces with 'Nitoprime Zincrich' or approved equivalent.
5. Prime all concrete surfaces with 'Nitobond EP' or approved equivalent.
6. Grout up recess with 'Renderoc HB40' - applied as per manufacturers instructions. Infill is to be finished flush with surrounding concrete surface to the Superintendents requirements. A test sample is to be submitted for approval and used for acceptance/rejection criteria.
7. The contractor shall provide records that demonstrate steps 3,4,5 & 6 have been satisfactorily completed at each anchor recess.
8. Alternative products may be used as follows:
   SikaTop 110 in lieu of Nitoprime Zincrich and Nitobond EP Sika MonoTop 615 in lieu of Renderoc HB40



REINFORCEMENT NOTES

1. Fix reinforcement as shown on drawings. The type and grade is indicated by a symbol as shown below. On the drawings this is followed by a numeral which indicates the size in millimetres of the reinforcement.

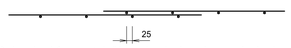
N	Hot rolled ribbed bar	grade D500N
R	Plain round bar	grade R250N
SL	Square mesh	grade 500L
RL	Rectangular mesh	grade 500L

2. Provide bar supports or spacers to give the following concrete cover to all reinforcement unless otherwise noted on drawings.

Footings	-	50 top, 75 bottom, 75 sides.
Slabs	-	25 top, 25 bottom, 25 sides.
	-	30 when exposed to weather or ground.
Beams	-	25 bottom, 25 sides, 25 top to ties.
	-	30 when exposed to weather or ground.
Columns	-	30 to ties and spirals.
	-	30 when exposed to weather or ground.
Walls	-	20 generally.
	-	30 when cast in forms but later exposed to weather or ground.
	-	30 when cast directly in contact with ground.

3. Cover to reinforcement ends to be 50 mm UNO.
4. Provide N12-450 support bars to top reinforcement as required.
   Tension Lap UNO
5. Maintain cover to all pipes, conduits, reglets, drip grooves etc.
6. All cogs to be standard cogs unless noted otherwise.
7. Fabric end and side laps are to be placed strictly in accordance with the manufacturers requirements to achieve a full tensile lap. Fabric shall be laid so that there is a maximum of 3 layers at any location.

FABRIC LAPS



8. Laps in reinforcement shall be made only where shown on the drawings unless otherwise approved. Refer to Reinforcement Lap table below. Gap between lapped bars to be no more than 3 bar diameters as per AS3600 clause 13.2

TENSION LAPS

BAR SIZE	32 MPa CONCRETE: TOP BARS IN BANDS AND BEAMS	HORIZONTAL BARS IN WALLS & TOP BARS IN SLABS > 330 THICK	ALL OTHER BARS
N12	580	620	480
N16	800	920	700
N20	1130	1240	950
N24	1480	1590	1230
N28	1850	1940	1490
N32	2250	2300	1780
N36	2690	2700	2080
N40	3130	3130	2420

BAR SIZE	40 MPa CONCRETE: TOP BARS IN BANDS AND BEAMS	HORIZONTAL BARS IN WALLS & TOP BARS IN SLABS > 330 THICK	ALL OTHER BARS
N12	580	590	480
N16	770	870	670
N20	1050	1150	890
N24	1370	1440	1100
N28	1700	1740	1340
N32	2070	2070	1590
N36	2420	2420	1870
N40	2800	2800	2150

BAR SIZE	50 MPa CONCRETE: TOP BARS IN BANDS AND BEAMS	HORIZONTAL BARS IN WALLS & TOP BARS IN SLABS > 330 THICK	ALL OTHER BARS
N12	580	580	480
N16	770	780	640
N20	950	1040	800
N24	1230	1290	990
N28	1530	1550	1200
N32	1850	1850	1430
N36	2170	2170	1670
N40	2500	2500	1930

COMPRESSION LAPS

BAR SIZE	LAP
N16	640
N20	800
N24	960
N28	1120
N32	1280
N36	1440
N40	1600

Rev	Description	Eng	Draft	Date
1	ISSUED FOR CONSTRUCTION	HN	EGB	21.02.24
AA	ISSUED FOR APPROVAL	HN	EGB	06.02.24

Project
IVANHOE STAGE 2
BUILDING C3

Sheet Subject
NOTES SHEET

Client
PARKVIEW FRASERS PROPERTY

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TEAM2 ARCHITECTS
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Scale : A1	Drawn	Authorised
1 : 1	EGB	KPB

Job No	Drawing No	Revision
211086	S0001	1

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FOR CONSTRUCTION

S0001 1
Printed : 21/02/2024 12:55:07 PM by Rajan MISTRY

TO BE PRINTED IN COLOUR

A1 0 1 2 3 4 5 6 7 8 9 10

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Regulated Design Record				
Project Address:				
Project Title	IVANHOE STAGE 2 BUILDING C3			
Consent No:	DA 2019/00096 S4.55 MOD 2020/0364	**Body Corporate Reg No:**	DEP0000532	
Drawing Title: SHORING AND FOOTING PLAN		**Drawing Number:** S-S1001		

Rev	Date dd.mm.yy	Description	DP Full Name	Reg No
1	16.02.24	ISSUED FOR CONSTRUCTION	KEVIN BERRY	DEP0001336

NOTE:
PAD FOOTINGS AND RETAINING WALLS ARE NOT PART OF CC1 ISSUE

FOOTING PLAN

Scale: 1 : 100

1. TOP OF FOOTINGS TO BE DETERMINED BY THE CONTRACTOR.
2. REFER TO ARCHITECTURAL DRAWINGS FOR LOCATION AND SETOUT OF ALL COLUMNS AND WALLS.
3. ALL LIFT PIT BASES AND WALLS BELOW GROUND LEVEL ARE TO HAVE XYPEX ADMIXTURE.
4. ALLOW ADDITIONAL CLEARANCE TO TOP OF FOOTINGS FOR HYDRAULIC SERVICES WHERE REQUIRED.
5. CONTRACTOR TO ALLOW FOR GEOTECHNICAL ENGINEER TO INSPECT AND CERTIFY THAT THE REQUIRED BEARING CAPACITIES HAVE BEEN ACHIEVED BEFORE CASTING FOOTINGS.
6. ⌖ DENOTES BOREHOLE LOCATIONS. REFER TO GEOTECHNICAL REPORT No. 86043.06 BY DOUGLAS PARTERS DATED MAY 2021.
7. FOR SHOTCRETE RETAINING WALL DESIGN REFER TO GEOTECHNICAL REPORT NO. 86043.23 REFERENCE No. R.005.REV1 DATED FEBRUARY 5 2024 BY DOUGLAS PARTNERS

NOTE:
FOR ANCHOR SPECIFICATIONS (LENGTH, DIAMETER OF HOLE, BAR TYPE AND DIAMETER, INCLINATION FROM THE HORIZONTAL, ETC)
REFER TO GEOTECNICAL REPORT 86043.23.R.005.REV1

WALL LEGEND

DENOTES 200 SHOTCRETE WALL AND SOIL NAIL AT 1500 CTS TO BE INSTALLED DURING EXCAVATION PHASE
REFER TO GEOTECHNICAL REPORT FOR SOIL NAIL DETAILS.
EXTENT TO CONFIRMED AS EXVATION PROGRESSES IN 1.5m DROPS.

Rev	Description	Eng	Draft	Date
1	ISSUED FOR CONSTRUCTION	HN	EGB	21.02.24
AA	ISSUED FOR APPROVAL	HN	EGB	06.02.24

Project
IVANHOE STAGE 2
BUILDING C3

Sheet Subject
SHORING AND FOOTING PLAN

Client
PARKVIEW FRASERS PROPERTY

Architect
TEAM2 ARCHITECTS
www.team2.com.au

Structural Engineer
TTW Structural Civil Traffic Façade
+61 2 9439 7288 | L6 73 Miller Street North Sydney NSW 2065

Scale : A1	Drawn	Authorised
1 : 100	EGB	KPB

Job No	Drawing No	Revision
211086	S1001	1

21/02/2024 12:55:08 PM

S1001 1
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TO BE PRINTED IN COLOUR

A1 0 1 2 3 4 5 6 7 8 9 10

FOR CONSTRUCTION

Regulated Design Record				
Project Address:				
Project Title	IVANHOE STAGE 2 BUILDING C3			
Consent No:	DA 2019/00096 S4.55 MOD 2020/0364	**Body Corporate Reg No:**	DEP0000532	
Drawing Title: SHORING WALL ELEVATIONS - SHEET 1		**Drawing Number:** S-S1011		

Rev	Date dd.mm.yy	Description	DP Full Name	Reg No
1	16.02.24	ISSUED FOR CONSTRUCTION	KEVIN BERRY	DEP0001336

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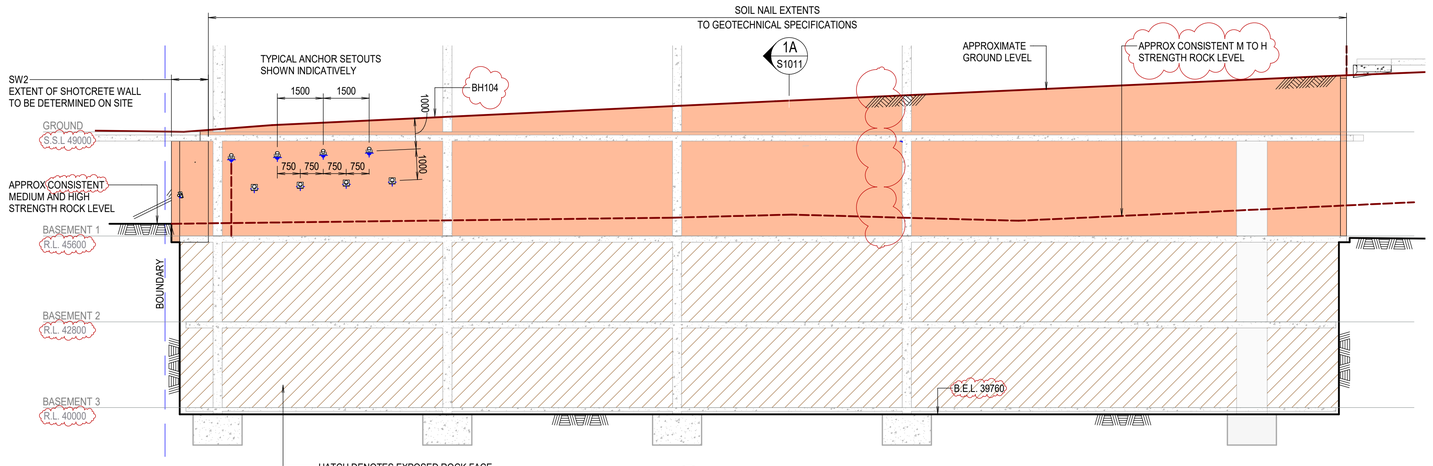
THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT NOTES ON DRAWING NO. S0001

NOTE:
PAD FOOTINGS AND RETAINING WALLS ARE NOT PART OF CC1 ISSUE



2A S1011 **SW1**
Scale: 1 : 100

NOTE:
FOR ANCHOR SPECIFICATIONS (LENGTH, DIAMETER OF HOLE, BAR TYPE AND DIAMETER, INCLINATION FROM THE HORIZONTAL, ETC)
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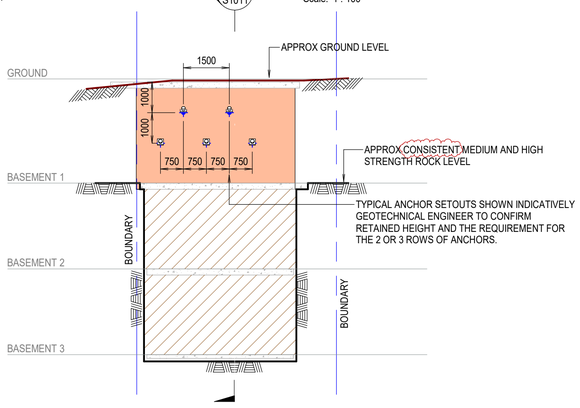
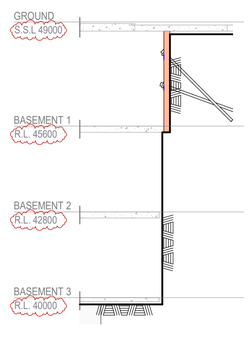
EXTENT TO CONFIRMED AS EXVATION PROGRESSES IN 1.5m DROPS.

GEOTECHNICAL ENGINEER TO CONFIRM RETAINED HEIGHT AND THE REQUIREMENT FOR THE 1 OR 2 ROWS OF ANCHORS. WHERE 1 ROW IS REQUIRED THE SPACING WILL BE STAGGERED.
REFER TO CONCEPT DESIGN 86043.23.R.005.REV1.



SW2
Scale: 1 : 100



SECTION 2A S1011
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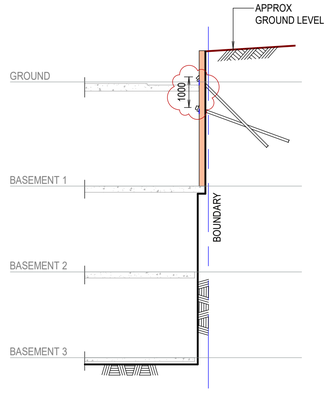

SECTION 1A S1011
Scale 1 : 100

Rev	Description	Eng	Draft	Date
1	ISSUED FOR CONSTRUCTION	HN	EGB	21.02.24
AA	ISSUED FOR APPROVAL	HN	EGB	06.02.24

Project
IVANHOE STAGE 2
BUILDING C3

Sheet Subject
SHORING WALL
ELEVATIONS - SHEET 1

Client
PARKVIEW FRASERS PROPERTY

Architect
TEAM2 ARCHITECTS
www.team2.com.au

Structural Engineer
TTW Structural Civil Traffic Façade
+61 2 9439 7288 | L6 73 Miller Street North Sydney NSW 2065

Scale : A1	Drawn	Authorised
1 : 100	EGB	KPB

Job No	Drawing No	Revision
211086	S1011	1

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S1011 1
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A1 0 1 2 3 4 5 6 7 8 9 10

Regulated Design Record				
Project Address:				
Project Title	IVANHOE STAGE 2 BUILDING C3			
Consent No:	DA 2019/00096 S4.55 MOD 2020/0364	**Body Corporate Reg No:**	DEP0000532	
Drawing Title: SHORING WALL ELEVATIONS - SHEET 2		**Drawing Number:** S-S1012		

Rev	Date dd.mm.yy	Description	DP Full Name	Reg No
1	16.02.24	ISSUED FOR CONSTRUCTION	KEVIN BERRY	DEP0001336

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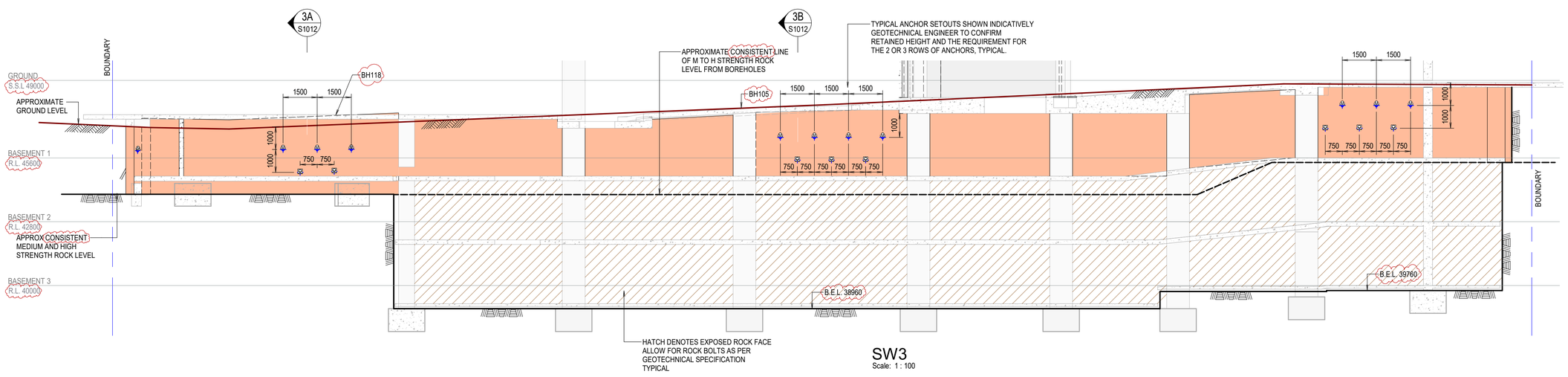
NOTE:
PAD FOOTINGS AND RETAINING WALLS ARE NOT PART OF CC1 ISSUE



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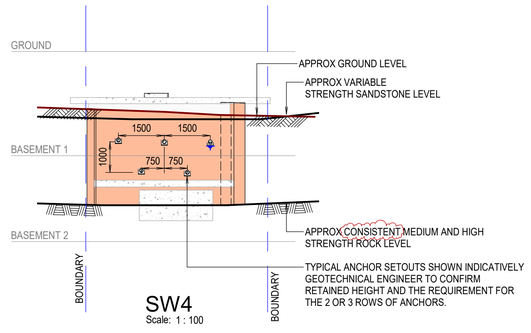
Scale: 1 : 100



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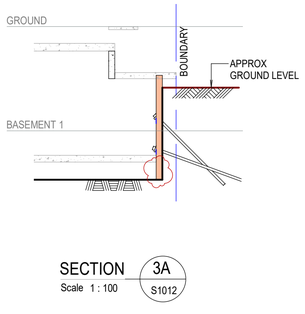
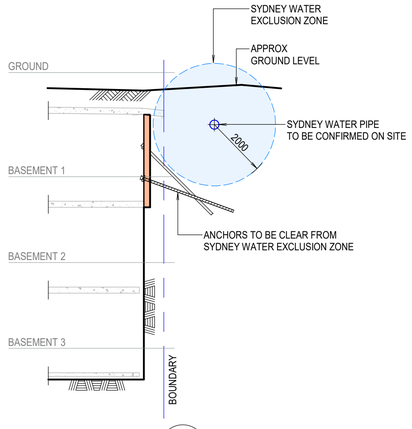
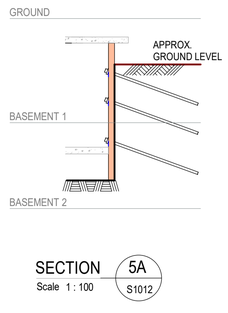
Scale: 1 : 100



SECTION 3A S1012
Scale 1 : 100



SECTION 3B S1012
Scale 1 : 100



SECTION 5A S1012
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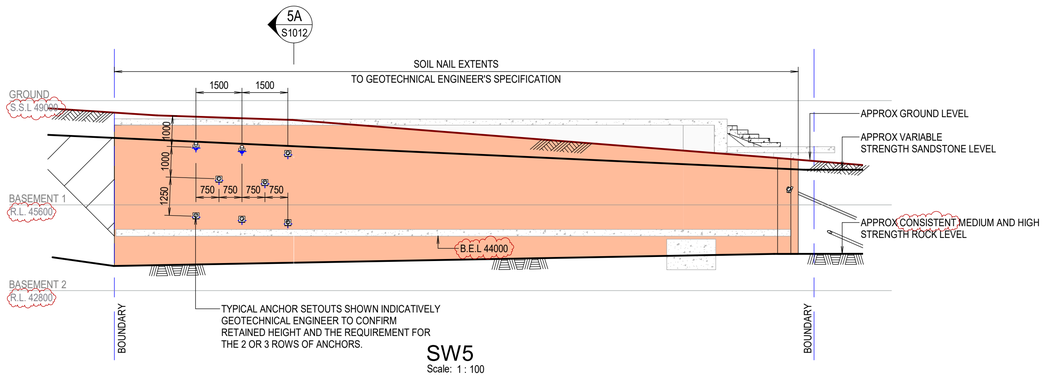

SW5
Scale: 1 : 100

NOTE:
FOR ANCHOR SPECIFICATIONS (LENGTH, DIAMETER OF HOLE, BAR TYPE AND DIAMETER, INCLINATION FROM THE HORIZONTAL, ETC)
REFER TO GEOTECNICAL REPORT 86043.23.R.005.REV1

WALL LEGEND

DENOTES 200 SHOTCRETE WALL AND SOIL NAIL AT 1500 CTS TO BE INSTALLED DURING EXCAVATION PHASE
REFER TO GEOTECHNICAL REPORT FOR SOIL NAIL DETAILS.
EXTENT TO CONFIRMED AS EXVATION PROGRESSES IN 1.5m DROPS.

GEOTECHNICAL ENGINEER TO CONFIRM RETAINED HEIGHT AND THE REQUIREMENT FOR THE 1 OR 2 ROWS OF ANCHORS. WHERE 1 ROW IS REQUIRED THE SPACING WILL BE STAGGERED.
REFER TO CONCEPT DESIGN 86043.23.R.005.REV1.

1	ISSUED FOR CONSTRUCTION	HN	EGB	21.02.24
AA	ISSUED FOR APPROVAL	HN	EGB	06.02.24
Rev	**Description**	**Eng**	**Draft**	**Date**

Project
IVANHOE STAGE 2
BUILDING C3

Sheet Subject
SHORING WALL
ELEVATIONS - SHEET 2

Client
PARKVIEW FRASERS PROPERTY

Architect
TEAM2 ARCHITECTS
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Structural Engineer
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Scale : A1	Drawn	Authorised
1 : 100	EGB	KPB

Job No	Drawing No	Revision
211086	S1012	1

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S1012 1
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A1 0 1 2 3 4 5 6 7 8 9 10

Regulated Design Record				
Project Address:				
Project Title	IVANHOE STAGE 2 BUILDING C3			
Consent No:	DA 2019/00096 S4.55 MOD 2020/0364	**Body Corporate Reg No:**	DEP0000532	
Drawing Title: SHORING WALL ELEVATIONS - SHEET 3		**Drawing Number:** S-S1016		
Rev	**Date** dd.mm.yy	**Description**	**DP Full Name**	**Reg No**
1	16.02.24	ISSUED FOR CONSTRUCTION	KEVIN BERRY	DEP0001336

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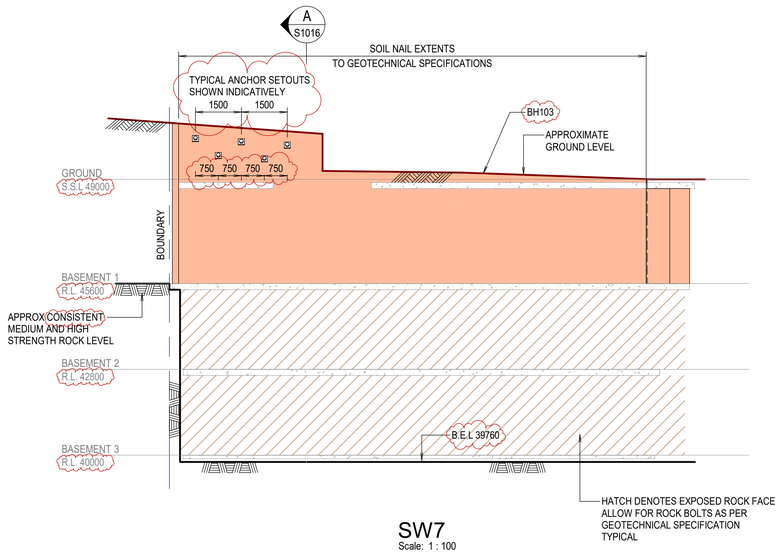
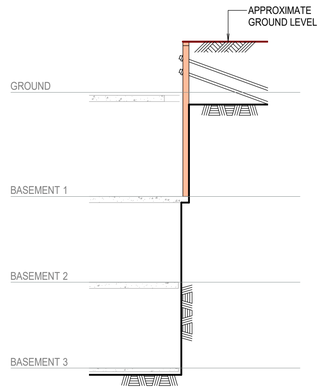
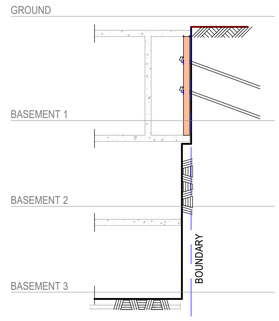
NOTE:
PAD FOOTINGS AND RETAINING WALLS ARE NOT PART OF CC1 ISSUE



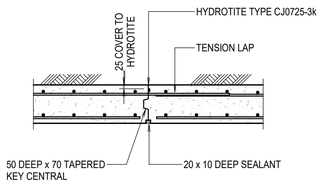
SW7
Scale: 1 : 100



SECTION A
Scale 1 : 100
S1016

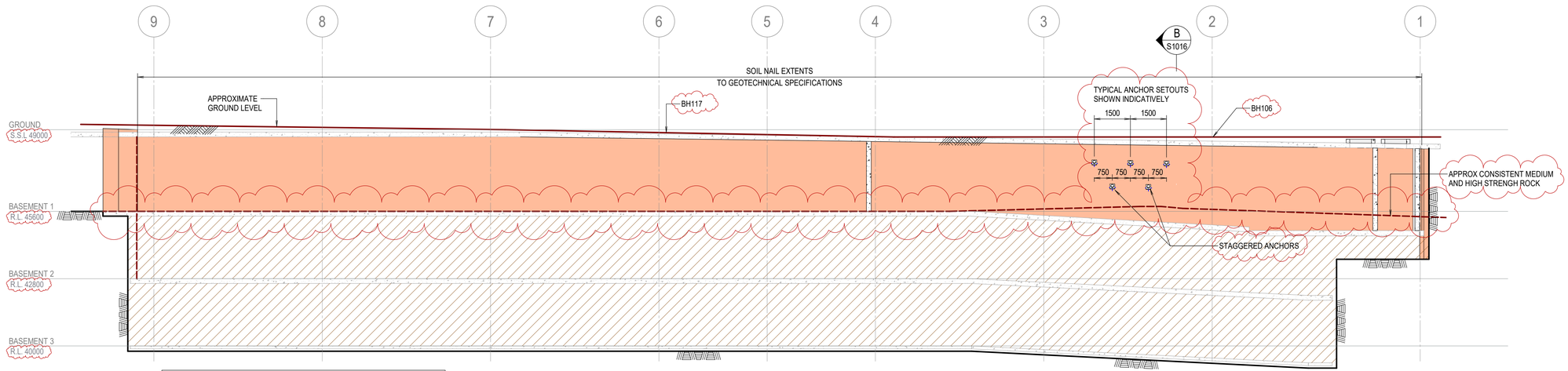


SECTION B
Scale 1 : 100
S1016



CJ - CONSTRUCTION JOINT
SCALE 1:20

NOTES:
1. REFER PLANS AND ELEVATIONS FOR LOCATIONS OF JOINTS. WPJ AND CJ MAY BE INTERCHANGED AT ANY LOCATIONS.
2. WATERSTOPS & SEALANTS (WITH BOND BREAKERS) TO BE INSTALLED IN ACCORDANCE WITH THE SPECIFICATION AND THE MANUFACTURERS INSTRUCTIONS.
3. CJ TO BE AT 8000 MAX CTS. EJ TO BE AT 30m MAX CTS
4. SEALANTS TO HAVE A MINIMUM FIRE RATING EQUIVALENT TO WALL.



SW6
Scale: 1 : 100

NOTE:
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REFER TO GEOTECNICAL REPORT 86043.23.R.005.REV1

WALL LEGEND

DENOTES 200 SHOTCRETE WALL AND SOIL NAIL AT 1500 CTS
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EXTENT TO CONFIRMED AS EXVATION PROGRESSES IN 1.5m DROPS.

GEOTECHNICAL ENGINEER TO CONFIRM RETAINED HEIGHT AND THE REQUIREMENT FOR THE 1 OR 2 ROWS OF ANCHORS. WHERE 1 ROW IS REQUIRED THE SPACING WILL BE STAGGERED.
REFER TO CONCEPT DESIGN 86043.23.R.005.REV1.

Rev	Description	Eng	Draft	Date
1	ISSUED FOR CONSTRUCTION	HN	EGB	21.02.24
AA	ISSUED FOR APPROVAL	HN	EGB	06.02.24

Project
IVANHOE STAGE 2
BUILDING C3

Sheet Subject
SHORING WALL
ELEVATIONS - SHEET 3

Client
PARKVIEW FRASERS PROPERTY

Architect
TEAM ARCHITECTS
www.team2.com.au

Structural Engineer
TTW Structural Civil Traffic Façade
+61 2 9439 7288 | L6 73 Miller Street North Sydney NSW 2065

Scale : A1	Drawn	Authorised
As indicated	EGB	KPB

Job No	Drawing No	Revision
211086	S1016	1

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FOR CONSTRUCTION

S1016 1
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TO BE PRINTED IN COLOUR
A1 0 1 2 3 4 5 6 7 8 9 10

Regulated Design Record				
Project Address:				
Project Title	IVANHOE STAGE 2 BUILDING C3			
Consent No:	DA 2019/00096 S4.55 MOD 2020/0364	**Body Corporate Reg No:**	DEP0000532	
Drawing Title: SHORING DETAILS - SHEET 1		**Drawing Number:** S-S1031		

Rev	Date dd.mm.yy	Description	DP Full Name	Reg No
1	16.02.24	ISSUED FOR CONSTRUCTION	KEVIN BERRY	DEP0001336

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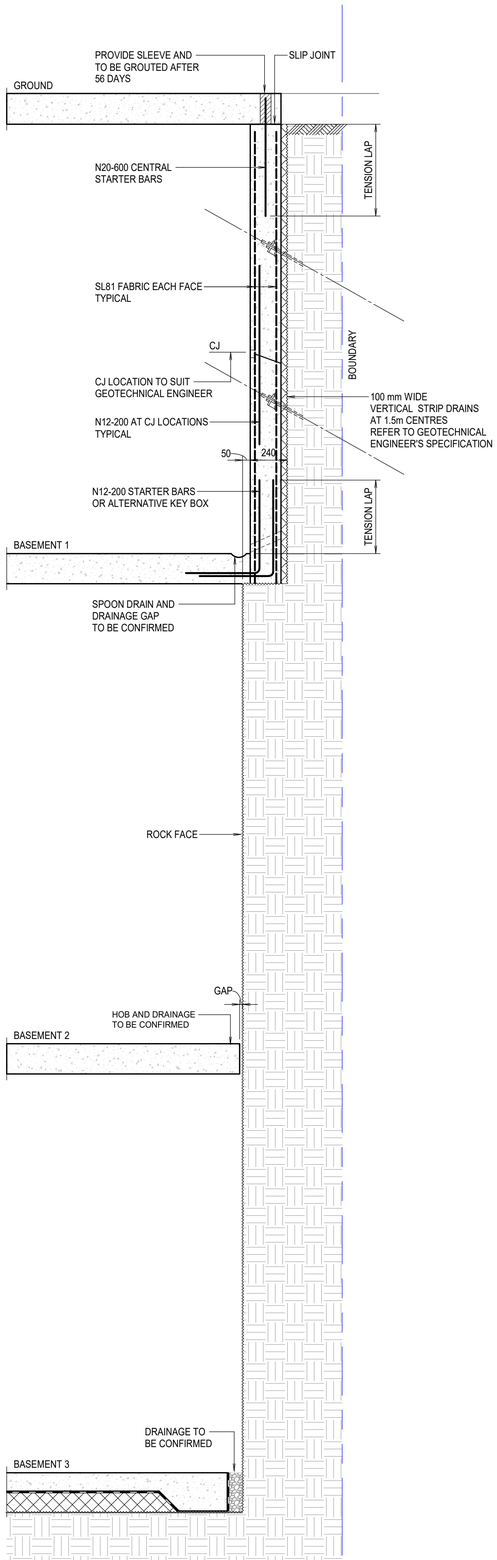
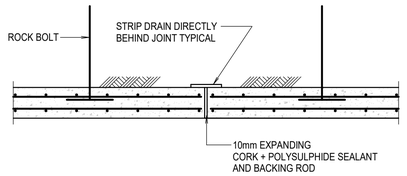
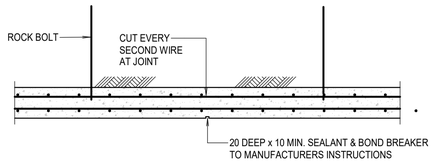


TYPICAL SHOTCRETE WALL SECTION

Scale: 1 : 20



EJ - EXPANSION JOINT



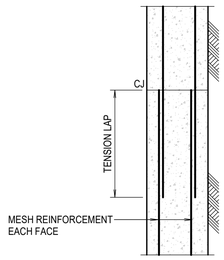
WPJ - WEAKENED PLANE JOINT

TYPICAL WALL JOINT DETAILS

SCALE 1:20

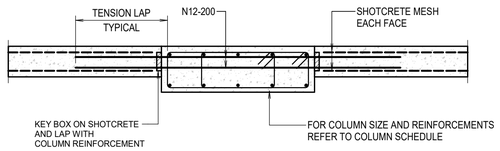
NOTES:

1. REFER TO TYPICAL ROCK BOLT WALL ELEVATION NOTES FOR LOCATIONS OF JOINTS.



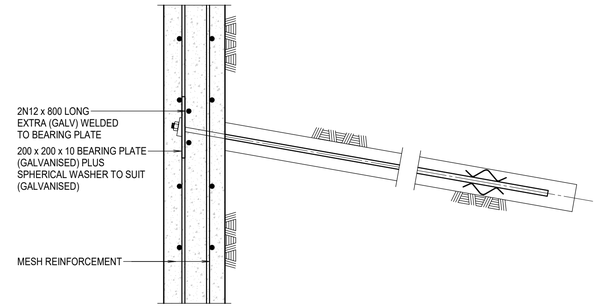
TYPICAL HORIZONTAL CONSTRUCTION JOINT DETAIL

SCALE 1:10



TYPICAL WALL JOINT AT COLUMN

Scale: 1 : 20



TYPICAL ROCK BOLT DETAIL

SCALE 1:10

Rev	Description	Eng	Draft	Date
1	ISSUED FOR CONSTRUCTION	HN	EGB	21.02.24
AA	ISSUED FOR APPROVAL	HN	EGB	06.02.24

Project

IVANHOE STAGE 2
BUILDING C3

Sheet Subject

SHORING DETAILS - SHEET 1

Client

PARKVIEW FRASERS PROPERTY

Architect

TEAM2 ARCHITECTS
www.team2.com.au

Structural Engineer

TTW Structural Civil Traffic Façade
+61 2 9439 7288 | L6 73 Miller Street North Sydney NSW 2065

Scale : A1	Drawn	Authorised
As indicated	EGB	KPB

Job No	Drawing No	Revision
211086	S1031	1

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S1031 1
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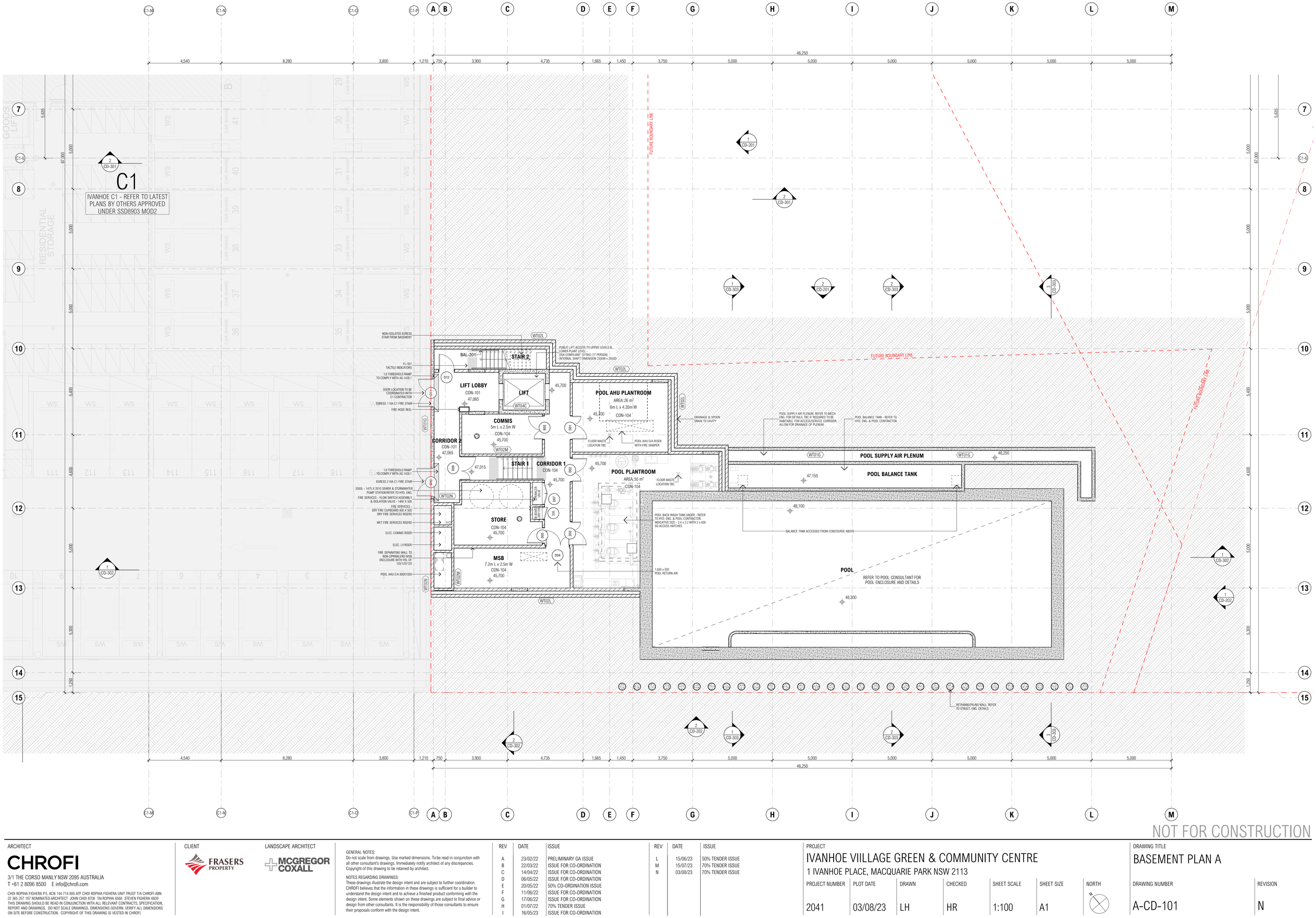
A1 0 1 2 3 4 5 6 7 8 9 10



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ARCHITECT

CHROFI

3/1 THE CORSO MANLY NSW 2095 AUSTRALIA
T +61 2 8096 8500 E info@chrofi.com

CHOI ROPIHA FIGHERA P/L ACN 144 714 885 ATF CHOI ROPIHA FIGHERA UNIT TRUST T/A CHROFI ABN 22 365 257 187 NOMINATED ARCHITECT JOHN CHOI 8706 TAI ROPIHA 6568 STEVEN FIGHERA 6609

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CLIENT

FRASERS PROPERTY

LANDSCAPE ARCHITECT

MCGREGOR COXALL

GENERAL NOTES:
Do not scale from drawings. Use marked dimensions. To be read in conjunction with all other consultant's drawings. Immediately notify architect of any discrepancies. Copyright of this drawing to be retained by architect.

NOTES REGARDING DRAWINGS:
These drawings illustrate the design intent and are subject to further coordination. CHROFI believes that the information in these drawings is sufficient for a builder to understand the design intent and to achieve a finished product conforming with the design intent. Some elements shown on these drawings are subject to final advice or design from other consultants. It is the responsibility of those consultants to ensure their proposals conform with the design intent.

REV	DATE	ISSUE
A	23/02/22	PRELIMINARY GA ISSUE
B	22/03/22	ISSUE FOR CO-ORDINATION
C	14/04/22	ISSUE FOR CO-ORDINATION
D	06/05/22	ISSUE FOR CO-ORDINATION
E	20/05/22	50% CO-ORDINATION ISSUE
F	11/06/22	ISSUE FOR CO-ORDINATION
G	17/06/22	ISSUE FOR CO-ORDINATION
H	01/07/22	70% TENDER ISSUE
I	16/05/23	ISSUE FOR CO-ORDINATION
L	15/06/23	50% TENDER ISSUE
M	15/07/23	70% TENDER ISSUE
N	03/08/23	70% TENDER ISSUE

PROJECT

IVANHOE VIILLAGE GREEN & COMMUNITY CENTRE

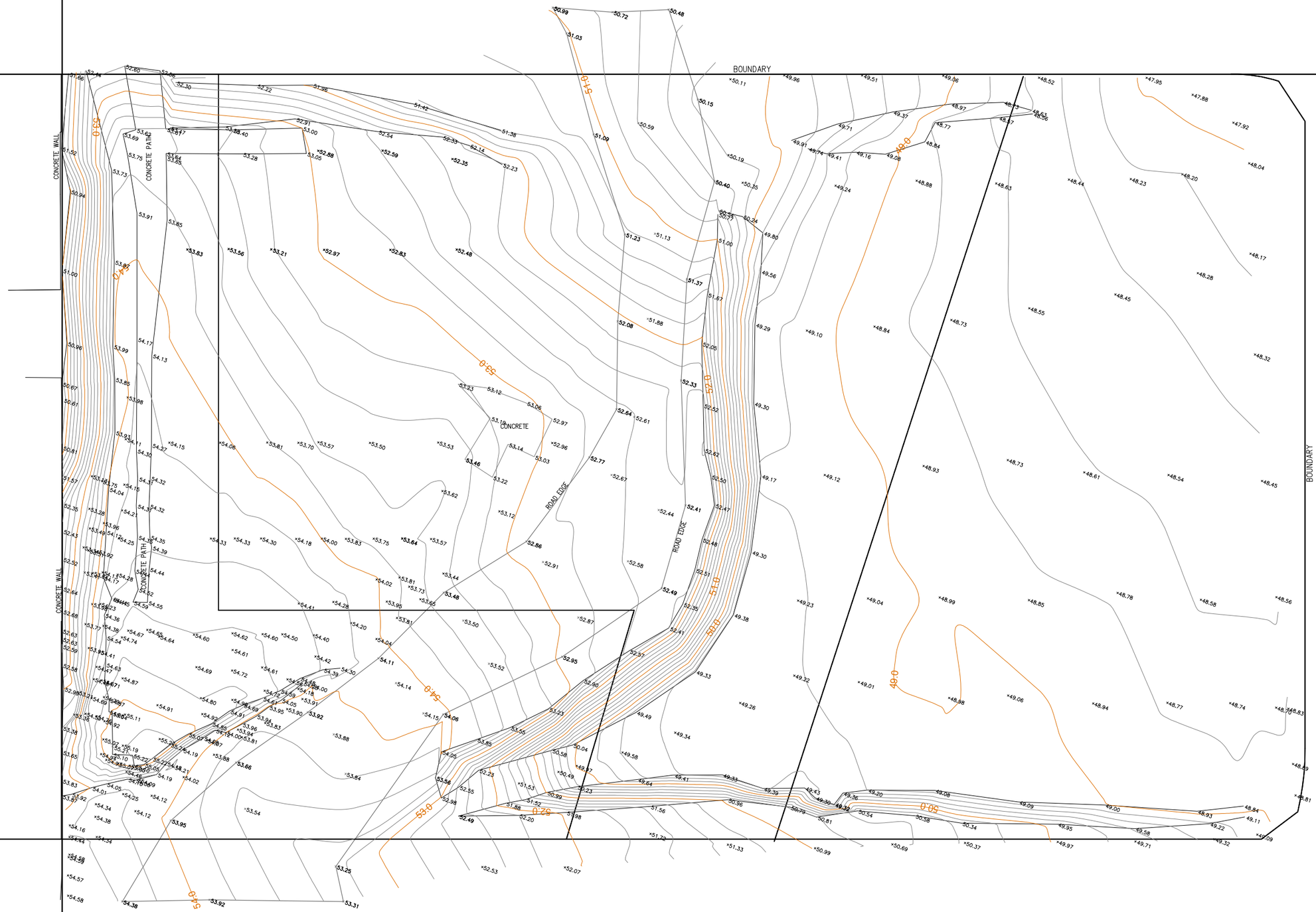
1 IVANHOE PLACE, MACQUARIE PARK NSW 2113

PROJECT NUMBER	PLOT DATE	DRAWN	CHECKED	SHEET SCALE	SHEET SIZE	NORTH
2041	03/08/23	LH	HR	1:100	A1	

DRAWING TITLE

BASEMENT PLAN A

DRAWING NUMBER	REVISION
A-CD-101	N



NOTE:

BOUNDARIES HAVE NOT BEEN DETERMINED BY SURVEY. BOUNDARIES SHOWN FROM PROVIDED DRAWING **C2 C3 Boundaries**.dwg.

PRIOR TO ANY CONSTRUCTION WORK, SURVEY MARKS SHOULD BE PLACED TO DEFINE THE PROPERTY BOUNDARIES.

NO SERVICES HAVE BEEN LOCATED AS PART OF THIS SURVEY.

ONLY GROUND LEVELS, CONCRETE, AND CHANGES OF GRADIENT HAVE BEEN SURVEYED.

LIMITED INFORMATION HAS BEEN GATHERED WHERE SITE SHEDS ARE PRESENT.

LEVELS ARE BASED ON AUSTRALIAN HEIGHT DATUM (AHD) USING PM50023 WITH RL 80.776 (AHD).

CONTOURS SHOWN DEPICT THE TOPOGRAPHY. EXCEPT AT SPOT LEVELS SHOWN THEY DO NOT REPRESENT THE EXACT LEVEL AT ANY PARTICULAR POINT. THE SPOT LEVELS ARE TRUE FOR THEIR POSITION, AND ARE INTENDED TO BE USEFUL TO REPRESENT THE GENERAL TERRAIN. CARE SHOULD BE TAKEN IF EXTRAPOLATING.

TSS TOTAL SURVEYING SOLUTIONS
ARTARMON | CAMDEN | MANLY VALE

DRAWING TITLE
C2/C3 PLOT
CONTOUR AND DETAIL
SURVEY PLAN

CLIENT: CHRISTIE CIVIL
PROJECT: IVANHOE
MACQUARIE PARK
220337

PLAN No.: 9054
DATE: 06/10/23 SCALE: NTS
DRAWN: IM
CHK:
CONT. INT.: 0.2m

DATUM: AHD
ORIGIN PM50023
MGA 94

DATE	REV	COMMENTS
06/10/23	0	FOR INFORMATION

Douglas PARTNERS | GROUNDED EXPERTISE

Parkview Constructions Pty Ltd

Attention: Roben Naamo

Email: roben.namoo@parkview.com.au

Project 86043.23

12 January 2024

R.004.Rev0

CAS/SP

Report on Geotechnical Monitoring Plan
C3 Site
Ivanhoe Estate, Macquarie Park

1. Introduction

This Geotechnical Monitoring Plan (GMP) sets out the proposed geotechnical monitoring requirements during basement excavation works for the proposed C3 Building of the Ivanhoe Estate at Ivanhoe Place, Macquarie Park. This GMP has been prepared to address condition B41(b) of the Development Consent by the Minister for Planning (Ref: SSD 15822622 dated 2022).

The proposed bulk excavation level (BEL) is about RL 39 to RL 40 m AHD, which would require a maximum depth of cut of about 12 m below the original ground level, which, it is understood, has since been partially stripped down by about 1 to 1.5 m depth with rock present at surface towards the southwest end. The basement is shallower at RL 42 at the northeast end, requiring a maximum depth of cut of about 6 m.

It is expected that the excavation will generally be unsupported through sandstone bedrock, except for localised rockbolting (as required). Dowels and shotcrete support (subject to services in the road) is proposed at the northeastern face (SW5), the eastern face (SW4) and up to half-way along the southeastern face (SW3), depending on the ground conditions encountered during excavation. Temporary batters are proposed along the northwestern boundary (RTW2).

A geotechnical investigation was previously carried out by Douglas Partners (DP) at the site for Stage 2 of the development comprising C2, C3 and C4 sites (Ref: 86043.06.R.002.Rev2.C3 dated 4 August 2021). At C3 site, the investigation comprised six rock-cored boreholes to a maximum depth of 17.1 m. As mentioned above, the original ground level has since been lowered which should be taken into account when considering the ground profile information.

The proposed basement footprint is located well inside the Ivanhoe site boundaries, approximately 40 m away from neighbouring structures, and about 80 m from Epping Road to the south-west. Within the site, the nearest structure is C2 building about 60 m to the northwest.

Note that this monitoring plan is a live document and may require updating as the works progress. Also note that Principal Contractor and Builder are used interchangeably and essentially mean the same entity. The term geotechnical engineers means a suitably experienced geotechnical engineer or engineering geologist.

2. Objectives

The objectives of the GMP are to provide a sequence for geotechnical monitoring activities expected during excavation and construction, showing the responsible parties, as well as hold points to manage the geotechnical aspects of the construction processes.

The plan has been separated into the following three sections:

- **Geotechnical** – movement or settlement of temporary and permanent works and structures, excavation support, and adequacy of foundation materials.
- **Hydrogeological** - potential changes of the groundwater;
- **Vibration** – vibration generated by excavation works.

The Principal Contractor for the proposed development is responsible for implementing the measures outlined in this plan. The contractor shall engage the services of suitably qualified and experienced professionals for the required monitoring activities.

3. Geotechnical Monitoring

The key geotechnical aspects which require monitoring on this project are as follows:

- stability of excavations;
- groundwater;
- stability of adjacent existing buildings; and,
- adequacy of the foundation materials to provide support to footings.

The impact of the excavation of any adjacent structures is dependent on the stability of the proposed basement excavation. At this site, there are no adjacent structures within 40 m of the proposed basement footprint.

For monitoring stability of the excavation, visual inspections by a suitably qualified and experienced geotechnical engineer will be carried out at regular intervals, as construction progresses, together with regular instrumented survey of the excavation faces (if required). Following the inspections and/or review of the survey data, installation of temporary or permanent rock face support, comprising rockbolts/anchors, may be required to stabilise potentially unstable blocks of rock (wedges or feather edges) formed at the intersection of joints or of a joint with the excavation face.

The geotechnical engineer is to inspect the excavated base of footings to confirm the bearing capacity of the rock.

3.1 Geotechnical Monitoring Procedure

The steps shown in Table 1 are recommended, with Hold Points identified where information should be provided to the structural or geotechnical engineers prior to continuing with the works. Provided no new structures are built within 15 m of the excavation footprint prior to or during the

course of the basement construction, survey monitoring of the cut faces to measure stress-relief movement in the sandstone is considered unnecessary.

Table 1: Summary of Geotechnical Monitoring Activities

Step	Description	Hold Point
G1. Prior to Commencement of Works		
G1.1	The Principal Contractor and any relevant subcontractors should familiarise themselves with the structural engineer's drawings, the geotechnical reports and this monitoring plan.	
G2. During Excavation		
G2.1	Inspection of 20% (distributed evenly around site) of the shoring system (expected to be dowels and shotcrete in hit and miss panels) by a geotechnical engineer to check ground conditions are as per design assumptions and installation as per design.	Hold Point
G2.2	Builder to carry out daily visual inspections of the excavation crest and faces to check for any signs of ground movement/instability/loose material.	
G2.3	At maximum 1.5 m depth intervals – progressive inspection of cut faces by a geotechnical engineer to identify any adversely inclined geological structures (e.g., joints) or previously undetected conditions and features, which may require support. If the geotechnical engineer considers that additional stabilisation measures are required, then these measures should be implemented to the satisfaction of the geotechnical engineer prior to continuing with the next drop.	Hold Point
G3. After Excavation		
G3.1	Inspection of the base of the excavation at bulk level by the geotechnical engineer to assess the ground conditions prior to detailed excavation.	Hold Point
G3.2	Inspection of the base of all footing excavations by a geotechnical engineer to confirm that the bearing capacity meets the requirements of the design, including spoon testing of the footings (requiring 50 mm diameter core holes to be drilled by the contractor through the base of the footings 24 hours ahead of inspections to 1.5 x the footing width), to check defect spacing and confirm the rock classification. The frequency of spoon testing will be dependent on the design bearing pressure adopted.	Hold Point

3.2 Trigger Levels/Contingency Plans

There are no trigger levels relevant to the monitoring activities in Table 1 other than those described.

If the subsurface conditions encountered during the excavation are different to those indicated in the geotechnical report, both the geotechnical and structural engineers must be immediately informed. The geotechnical and structural engineers should then inspect the site and re-design the excavation support (i.e., shoring), foundations or another feature, as required.

Contingency measures for adverse movement at the excavation crest and the rock face will depend on the nature and extent of the movement. Measures could include backfilling against the shoring wall/rock face, installation of additional anchors, and installation of internal props/bracing.

4. Groundwater

Reference should be made to the overall Stage 2 Dewatering Management Plan (DP Report 86043.06.R.008.Rev0 dated May 2022) for background on groundwater monitoring requirements for Stage 2 development.

Based on the available information, the pre-excavation level of the permanent groundwater table in the vicinity of C3 reduces from approximately RL 45 m AHD up-slope to approximately RL 42 m AHD downslope. Subsequent monitoring at Ivanhoe Estate suggests that these levels may be impacted by more recent basement dewatering at sites external to Ivanhoe Estate.

Note that as part of the dowel and shotcrete support for the upper layers, vertical strip drains should be installed behind the shoring to collect all seepage that may occur and to direct the seepage to the subfloor drainage system, from where it can be removed using "sump-and-pump" methods.

Suitable protection of the wells to be provided by the Builder to ensure safe and continuous access to wells for monitoring and water sampling and reduce the risk of malicious or accidental interference. If it is not possible to access the groundwater monitoring wells, or they are damaged or destroyed during the works or cannot be used for some reason, then the monitoring wells must be replaced within one (1) week. Provided that detailed excavation has been completed for at least one month, then replacement of a monitoring well may not be required if the data already collected indicates no significant groundwater impact.

Table 2 shows the steps recommended, with Hold Points identified, where information should be provided to the structural or geotechnical engineer prior to continuing with the works.

Table 2: Summary of Hydrogeological (Groundwater) Monitoring Activities

Step	Description	Hold Point	Ref
H1. Prior to Excavation below RL 46 m AHD			
H1.1	Builder to obtain a copy of the written permission to discharge into the stormwater system/Shrimpton's Creek from the relevant controlling authority, including any requirements of the controlling body. This information must be provided to the geotechnical engineer for reference purposes.	Hold Point	SSD B65/6
H1.2	Builder to obtain a copy of the Water Access Licence for the Stage 2 site, and written statement of the entitlements available for the C3 basement excavation, based on sub-allocation of the entitlements by Frasers. This information must be provided to the geotechnical engineer for reference purposes.	Hold Point	SSD B67
H1.3	Builder to install three groundwater monitoring wells outside of the basement perimeter extending to at least 3 m below basement level or to the base of any local excavations for measurement of water levels. One well to be installed upslope and two wells downslope at locations to allow triangulation of water flow across the site. Additional wells to be installed if adequate triangulation is not achievable with 3 locations.	Hold Point	DMP

Step	Description	Hold Point	Ref
H1.4	Groundwater sampling on a suitable number of samples from wells, and laboratory testing of samples to evaluate hydrochemistry for potential dewatered groundwater against the requirements of the controlling body (as provided in H1.1). A report to be prepared by the geotechnical engineer nominating likely treatment requirements/exceedances.	Hold Point	SSD C36
H1.5	Groundwater treatment methodology to be prepared by Builder (or their treatment subcontractor) to address actual or potential groundwater discharge treatment requirements, including a schedule of sampling and testing to be undertaken and recorded by the builder. Preliminary monitoring requirements are given in the DMP. Methodology to include daily quality monitoring for first week of groundwater discharge then weekly until the completion of works, and appropriate record keeping.	Hold Point	C37q DMP
H1.6	Methodology, monitoring and recording requirements of H1.4 to be reviewed by the treatment subcontractor or geotechnical engineer, to confirm general suitability.	Hold Point	C37q
H1.7	At least three weeks of daily readings at all wells and geotechnical engineer to establish pre-excavation baseline levels in the wells.	Hold Point	DMP
H1.8	Installation of a rain gauge at a fixed point at the site which is not overshadowed by existing structure or topography. Daily rainfall measurements to be provided to geotechnical engineer as required.	Hold Point	DMP
H2. Excavation below RL 46 m AHD to Bulk and Detailed Level			
H2.1	Daily measurement of water levels in monitoring wells using a datalogger. Data to be uploaded and reviewed by the geotechnical engineer weekly. Monthly reporting by the geotechnical engineer.		C37
H2.2	Daily monitoring of water quality for the first week requiring groundwater discharge to stormwater, then weekly thereafter, in accordance with the monitoring and reporting established by item H1.4.	Hold Point	C37
H2.3	Builder to carry out daily inspection of well surrounds to ensure continuous access and damage free.		
H2.4	Builder to maintain written daily record of: • rainfall (see H1.8); • excavation level; • excavation extent; • location of water pump-out sumps; • time and date of record; and, • estimated inflow, from inflow to sumps of pre-determined size, or collection to secondary tanks using a calibrated flowmeter. The above information to be provided to the geotechnical engineer on a weekly basis.	Hold Point	DMP
H2.5	Both daily and weekly record of volume of discharge to stormwater to be maintained by the Builder using a calibrated flowmeter. Measurements to be recorded in accordance with reporting requirements of the Water Access Licence (WAL). Records to include flowmeter numbers and calibration certificates.		DMP

Step	Description	Hold Point	Ref
H2.6	The discharge volume information from H2.5 is to be provided to Frasers on a monthly basis to meet their reporting obligations for the Stage 2 WAL.	Hold Point	WAL
H2.7	The discharge volume information from H2.5 is to be provided to geotechnical engineer on a weekly basis, together with item H2.3.	Hold Point	B41
H3. Following Completion of Excavation and Commencement of Building Construction			
H3.1	Measurement, monitoring and reporting to continue in line with Step H2, unless otherwise notified in writing by the geotechnical engineer.		
H3.2	Evaluation of information obtained from Steps H1 and H2 by the geotechnical engineer, to determine ongoing frequency of monitoring and reporting given in H1 and H2.	Hold Point	DMP
H3.3	Builder to advise geotechnical engineer when stormwater system effectively separates stormwater collection from groundwater inflow collection.		
H4. Prior to Handover/OCC			
H4.1	Re-evaluation by geotechnical engineer of predicted long term groundwater inflows to basement, based on ongoing records during construction.	Hold Point	DMP
H4.2	Re-evaluation by geotechnical engineer of groundwater inflow quality and treatment, based on long-term inflow quality.	Hold Point	DMP
H4.3	Builder to prepare documentation confirming their compliance with the monitoring and reporting requirements required by this GMP.	Hold Point	
H4.4	Builder to confirm that the as-built groundwater management system includes suitable measures to allow for the long-term groundwater treatment, quality evaluation and volume discharge requirements of the permanent groundwater management system.	Hold Point	DMP

4.1 Trigger Levels/Contingency Plans

4.1.1 Water Quality

If the results of groundwater quality measurements indicate an impact on existing groundwater conditions, or on disposal requirements for the pumped water, a plan must be developed to mitigate any impacts on existing groundwater conditions, and to provide treatment to meet the appropriate groundwater disposal requirements.

4.1.2 Water Level Outside the Basement

Previous groundwater monitoring indicates a natural groundwater fluctuation of approximately 1 m in this area. Groundwater levels that fall by more than 0.5 m below initial levels (taking into fluctuation into account) should trigger an assessment of the records of pumped groundwater volumes, records of pumped groundwater/seepage volumes and weather/climatic factors. A plan may need to be developed to reduce groundwater take if the drawdown is considered to be due to the excavation. This may include localised grouting/sealing such as polymer based emulsion grout etc.).

4.1.3 Groundwater Inflow

If groundwater inflow is assessed as excessive relative to the predicted or allocated inflow (refer DMP Report DP86043.06.R.008.Rev0), reanalysis or re-allocation of the overall Water Access Licence allocation may need to be required to reduce groundwater inflow. This may also include localised grouting/sealing such as polymer-based emulsion grout etc.) as above.

5. Vibration Monitoring

A review of the site features indicated that the nearest existing buildings are not "sensitive structures" and are located at least 60 m away (within the site) or 40 m away (on adjacent properties) from the proposed excavation footprint. Therefore, an allowable vibration limit of 8 mm/s Vector Sum Peak Particle Velocity (VSPPV) at the foundation level of nearby buildings is suggested. The proposed allowable vibration limit at the foundation level of adjacent buildings is also adequate to reduce the risk of structural damage to buildings and road assets on the adjacent properties, including buried services. However, vibration sensitivity of the services should be confirmed with the asset owners prior to excavation. The limit may need to be adjusted to reflect the asset requirements, response of neighbouring structures during excavation and vibration dosage once the neighbouring building is occupied.

The proposed limit takes into account both structural damage and human comfort criteria given in relevant Standards (e.g., ISOAS 2670, EPA guidelines, German DIN4150 Standard and Australian Standard AS 2187-2 (2006)).

A vibration trial may be required to size equipment at the commencement of excavation into rock. The trial may indicate that minimum offset distances are required for the preferred plant, or that alternative excavation methods are required.

5.1 Monitoring Procedures

For this site, due to the distances from existing structures or infrastructure, it is suggested that vibration monitoring be limited to carrying out an initial trial of excavation equipment. If the trial indicates that the vibration limits could be exceeded, then the contractor is to install a permanent monitoring system which will allow 'self-management' of vibration.

If required, geophones should be installed on or near the base of the walls of the neighbouring buildings. The geophones should be firmly attached to the building's structure or footings and should be connected to a data monitor, which is capable of measuring vibrations to 0.5 mm/sec PPVi or less. The monitor shall be set up to record all vibrations which exceed 5 mm/sec. A warning light or sound signal shall be attached to the monitor, which is configured with an alarm threshold of 8 mm/sec PPVi to warn the excavation contractor of vibration exceedances. The system should also automatically send a text message to the site superintendent should an exceedance occur, for the superintendent to investigate.

Table 3 shows the steps recommended, with Hold Points identified, where information should be provided to the structural or geotechnical engineer prior to continuing with the works.

Table 3: Summary of Vibration Monitoring Activities.

Step	Description	Hold Point
V1. Prior to Commencement of Bulk Excavation Works		
V1.1	When excavation encounters medium strength rock, undertake a vibration trial using the largest machine of each equipment category (e.g., rock breaker, bulldozer with ripping tyne, rock saw) to be used in order to determine the minimum buffer distances to neighbouring structures for each equipment type. Geotechnical engineer to advise on whether proposed equipment is likely to exceed allowable vibration levels and whether continuous monitoring is required.	Hold Point
V1.2	If the vibration trial indicates that vibration limits may be exceeded by the proposed works, then geophones and monitors are to be installed and configured to undertake continuous unattended monitoring of vibration. Install geophone at the base of the neighbouring structure closest to the excavation works. Connect geophone to data monitor and install a flashing light or sound warning signal and enable automatic text messaging to the site superintendent. Set warning light to trigger at 8 mm/s VSPPV.	Hold Point
V2. During Excavation		
V2.1	If continuous monitoring is required (see Step 1 above) – data from the monitor is to be uploaded weekly, with direct feedback to site personnel of the number of recorded events exceeding the Allowed Limit. Reports should include a tabulation of times and levels of any events exceeding a recording threshold of 8 mm/s VSPPV, for correlation with site activity records. The weekly vibration monitoring reports should be forwarded to the geotechnical engineer for review.	
V2.2	If the number of exceedances on any day is more than 10 then the respective excavation works shall stop, and the geotechnical engineer shall be notified. The geotechnical engineer will investigate the causes of the exceedances and provide advice on measures to avoid further vibration exceedances.	Hold Point

5.2 Trigger Levels/Contingency Plans

If the vibration trials indicate that continuous monitoring is required, then the monitor shall be configured such that either an SMS message is sent automatically to nominated mobile phones (including the monitoring entity and the site superintendent), or a flashing light or sound signal is triggered when the vibration at the base of the neighbouring structure exceed 8 mm/s VSPPV. If the SMS message is sent or the warning signal is triggered, then the machinery operator should reduce the force generated by his equipment or move further away from the neighbouring structure.

Occasional exceedances may be allowed, however, if a sustained exceedance occurs, an inspection by the structural and geotechnical engineers should be made of the potentially affected building and excavation should only resume if no vibration-induced damage can be seen.

If the warning light is being triggered frequently (e.g., >10 times/day), excavation works are to stop, the geotechnical engineer is to be notified and a site visit carried out by the geotechnical engineer to investigate the cause of the exceedances. A change in excavation method may be recommended as a result of the inspection, or on the basis of recorded vibration data.

6. Limitations

Douglas Partners (Douglas) has prepared this report for this project at Ivanhoe Estate, Macquarie Park in accordance with Douglas' proposal dated 30 November 2023 and acceptance received from Antonio Screnci. The work was carried out under Douglas' Engagement Terms. This report is provided for the exclusive use of Parkview Constructions Pty Ltd for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of Douglas, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report Douglas has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after Douglas' field testing has been completed.

Douglas' advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by Douglas in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

The assessment of atypical safety hazards arising from this advice is restricted to the geotechnical components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed ‘safety in design’ assessment is outside the current scope of this report and requires additional project data and assessment.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. Douglas cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by Douglas. This is because this report has been written as advice and opinion rather than instructions for construction.

Please contact the undersigned if you have any questions on this matter.

Yours faithfully

Douglas Partners Pty Ltd

Reviewed by

Craig Stemp/Sally Peacock
Associate/Senior Associate

Hugh Burbidge
Principal

Attachments: About this Report

About this Report

November 2023

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

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This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

continued next page

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

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Saf Abdelfattah

From: Mohamed Yaccoub <mohamed.yaccoub@parkview.com.au>
Sent: Tuesday, 19 March 2024 11:54 AM
To: Saf Abdelfattah
Subject: FW: B66 contaminated groundwater

Please below

Mohamed Yaccoub
Project Engineer

0427 520 238
mohamed.yaccoub@parkview.com.au

Level 7, 60 Union Street, Pyrmont NSW 2009
PO Box R1779 Royal Exchange NSW 1225

www.parkview.com.au

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From: David Smith <david.smith@douglaspartners.com.au>
Sent: Monday, March 4, 2024 2:54 PM
To: Mohamed Yaccoub <mohamed.yaccoub@parkview.com.au>
Cc: Warwick Davidson <warwick.davidson@parkview.com.au>
Subject: RE: B66 contaminated groundwater

Good afternoon Mohamed,

The DMP and approvals are based on disposal to stormwater. Additionally, the Table 2 in the GMP notes that "Builder to obtain a copy of the written permission to discharge into the stormwater system/Shrimpton's Creek from the relevant controlling authority, including any requirements of the controlling body." This information must be provided to the geotechnical engineer for reference purposes. Reinjenction is not currently part of the DMP or approvals and therefore we do not think B66 is applicable. If additional requirements are imposed by authority in relation to the NEPM 2013, we can assess.

Kind regards,

David Smith | Associate / Senior Geotechnical Engineer

02 9809 0666 +61 412 795 389 david.smith@douglaspartners.com.au

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From: Mohamed Yaccoub <mohamed.yaccoub@parkview.com.au>
Sent: Monday, March 4, 2024 10:39 AM

To: David Smith <david.smith@douglaspartners.com.au>
Cc: Warwick Davidson <warwick.davidson@parkview.com.au>
Subject: B66 contaminated groundwater

Hi David,

We will need to jump onto closing out the unknown condition below and B66 contaminated ground water. Do you require anything from us to get this going? I cannot remember what was done for A1

GROUNDWATER DESIGN

The method of disposal of pumped water shall be nominated (i.e. reinjection, drainage to the stormwater system or discharge to sewer) and a copy of the written permission from the relevant controlling authority shall be provided in

a report to be provided to NRAR with the application for the authorisation. The disposal of any contaminated pumped groundwater (sometimes called "tailwater") must comply with the provisions of the Protection of the Environment Operations Act 1997 and any requirements of the relevant controlling authority.

Details demonstrating compliance must be submitted to the Certifying Authority prior to the issue of the relevant Crown Building Works Certificate or Construction Certificate for each building.

B66. Contaminated groundwater—i.e. constituent concentrations above appropriate National Environment Protection (Assessment of Site Contamination) Measure (NEPM 2013) thresholds—shall not be reinjected into any geological formation. The reinjection system design, if proposed, and treatment methods to remove contaminants shall be nominated and included in a report to be provided to NRAR with the application for the authorisation. The quality of any pumped water that is to be reinjected must be demonstrated to be compatible with, or improve, the intrinsic or ambient groundwater in the vicinity of the reinjection site.

Details demonstrating compliance must be submitted to the Certifying Authority prior to the issue of the relevant Crown Building Works Certificate or Construction Certificate for each building..

Mohamed Yaccoub
Project Engineer

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City Plan Services P/L
30 075 223 353

CONSTRUCTION CERTIFICATE NO. 210791/1

Issued under Part 6 of the Environmental Planning and Assessment Act 1979

APPLICANT

Name of person having benefit of the development consent:	**Daniel Leaf** **Frasers Property Ivanhoe JV2 Pty Ltd**
Address:	**Level 2 Building 1C, Homebush Bay Drive**
Contact Details:	**Phone: 0423 300 698**

DEVELOPMENT CONSENT

Consent Authority/Local Government Area:	**Ryde City Council**
Development Consent No:	**SSD 15822622 & SSD 15822622-Mod-1**
Date of Development Consent:	**28/11/2022 & 14/11/2023**

PROPOSAL

Address of Development:	**Building C3 - 1 Ivanhoe Estate Road, Macquarie Park NSW 2113**
Lot No & DP No:	**Lot 100 & DP1262209**
Building Code of Australia (BCA) Classification:	**Class 2, 6 & 7a**
Applicable version of the BCA:	**BCA 2019 Amdt 1**
Type of Construction:	**Type A**
Description of development:	**Stage 2 development application for the development of the Ivanhoe Estate, including:** ▪ **Excavation and earthworks** ▪ **Construction of a community facilitates building (Building C2) and two residential apartment buildings (Building C3) and Building C4) with basement car parking:** – **Building C3 with 162 dwellings, 163 car parking spaces and ground floor retail** – **Building C4 with 488 dwellings and 396 car parking spaces** ▪ **Construction of Village Green public open space** ▪ **Utilities, services infrastructures and public domain areas.**
Scope of building works covered by this Certificate:	**Stage 1 - Shoring & Excavation associated with Building C3**
Value of Construction Certificate (Incl GST):	**$96,380,228.00 (Total cost of Building C)**
Plans and Specifications approved:	**Schedule 1**
Fire Safety Schedule:	**N/A**
Critical Stage Inspections:	**See attached Notice**
Exclusions:	**Remainder of works**
Conditions (as per Sections 111 & 115-117 of the *Environmental Planning & Assessment (Development Certification & Fire Safety) Regulation 2021*):	**Nil**

PROJECT BUILDING SURVEYOR	Please contact **Safwat Abdelfattah** for any inquiries
CERTIFIER	**Chris Michaels** for and on behalf of **City Plan Services Pty Ltd**
REGISTRATION NUMBER	**BDC1974**

That I, Chris Michaels as the certifier:

a) *certify that the work if completed in accordance with the plans and specifications identified in Schedule 1 (with such modifications verified by the certifying authority as may be shown on that documentation) will comply with the*

requirements of the Environmental Planning & Assessment (Development Certification & Fire Safety) Regulation 2021 as referred to in Part 6 of the Environmental Planning and Assessment Act 1979; and

b) *am satisfied that, in the case where fire safety system plans and specifications have been provided, that such plans and specifications correctly identify both the performance requirements and the deemed-to-satisfy provisions of the Building Code of Australia.*

DATED THIS **23** **February** **2024**

Chris Michaels
Director
NB: Prior to the commencement of work Section 6.6 of the Environment Planning and Assessment Act 1979 must be satisfied.

SCHEDULE 1
APPROVED PLANS

1. Endorsed Architectural plans

Plan Title	Prepared By	Drawing No / Ref	Revision	Date
Cover Sheet	Team 2 Architects	A-0000	E	07/02/24
Grids Setout	Team 2 Architects	A-0010	E	07/02/24
Survey Plan	Team 2 Architects	A-0011	E	07/02/24
Bulk Excavation Plan	Team 2 Architects	A-0020	E	07/02/24
Shoring Elevations 1	Team 2 Architects	A-0040	E	07/02/24
Shoring Elevations 2	Team 2 Architects	A-0041	E	07/02/24

2. Endorsed Structural plans

Plan Title	Prepared By	Drawing No / Ref	Revision	Date
Notes Sheet	Structural Civil Traffic Façade	S0001	AA	06/02/24
Shoring & Footing Plan	Structural Civil Traffic Façade	S1001	AA	06/02/24
Shoring Wall - Elevations - Sheet 1	Structural Civil Traffic Façade	S1011	AA	06/02/24
Shoring Wall Elevations – Sheet 2	Structural Civil Traffic Façade	S1012	AA	06/02/24
Shoring Wall Elevations – Sheet 3	Structural Civil Traffic Façade	S1016	AA	06/02/24
Shoring Details – Sheet 1	Structural Civil Traffic Façade	S1031	AA	06/02/24

3. Other documents relied upon

Title	Prepared By	Reference	Date
CC Application Form	Daniel Leaf - Frasers Property Ivanhoe Pty Limited	CFT-412566	19/02/24
Design Compliance Declaration - Architectural	Team 2 Architects	1	14/02/24
Design Certificate - Structure Engineer	Structural Civil Traffic Facade	1	09/02/24
Geotechnical Report	Douglas Partners	1	11/06/21
Geotechnical Shoring Design Report	Douglas Partners	R.005.Rev 0	16/01/24
Geotechnical Monitoring Plan	Douglas Partners	R.004.Rev 0	12/01/24
Design Compliance Declaration - Structural	Kevin Peter Berry - TTW (NSW) Pty Ltd	DEP10001336	19/02/24
Design Consistent Statement	Team 2 Architects	-	14/02/24
DA Condition A9 & B10.1 - LSL Receipt	Long Service Corporation	L0000133464	17/11/23

Title	Prepared By	Reference	Date
DA Condition A13 - Design Integrity Statement	Studio Johnston	-	-
DA Condition B2 & B3 - Notification to Dept of Planning	Frasers Property	-	-
DA Condition B5 - Compliance Statement	Frasers Property	AustResi-GCOR-006395	-
DA Condition B6 - Pre-Constructions Compliance Report - Ivanhoe Building C3	Parkview	153 – SSD 15822622 Rev B	06/02/24
DA Condition B11 & B12 - Community Consultation Strategy	Frasers Property	Rev 2	07/11/23
DA Condition B14 - Community Consultation Strategy Post Approval Lodgement Form	NSW Government	-	-
DA Condition B14 - Evidence of Submission	Major Projects Planning	-	19/12/23
DA Condition B18 - Pre-Construction Dilap Report	AusDilaps	-	16/11/23
DA Condition B18 - Evidence of Submission of Dilap Report to Council	Mohamed Yaccoub	-	18/01/24
DA Condition B31 - Aboriginal Cultural Heritage Assessment	Urbis	-	06/08/21
DA Condition B35, B38, B39 & B40 - Councils Response to Management Plans	Justine Byrne	-	05/02/24
DA Condition B35, B38, B39 & B40 - Integrated Project Management Plan	Chalouhi	Rev 1	18/01/24
DA Condition B36 - Construction Traffic and Pedestrian Management	Traffix	v03	21/12/23
DA Condition B37 - Construction Noise and Vibration Management Plan	Olivia Moussa	0	08/12/23
DA Condition B41 - Geotechnical Engineer Excavation Impact Certificate	Douglas Partners	R.006.Rev0	22/02/24
DA Condition B44 - Utilities Services	Parkview	AustResi-GCOR-005800	-
DA Condition B49 - Section 73 Application	Sydney Water	-	-
DA Condition B49	Sydney Water	SW-02275959	21/02/24

Title	Prepared By	Reference	Date
- Section 73 Payment Receipt			
DA Condition B67 - Water Access Licence - Title Search	Certificate of Title	WAL44843	21/06/23
DA Condition B79 - Flood & Overflow Protection Letter	ADW Johnson	BMY/LF 300001 (C3)	06/12/23
DA Condition B79 - BMT Report	BMT	L.A11141.002. MidtownStg2_FIA.docx	30/06/21
DA Condition C14 - Site Notice	Parkview	-	-
DA Condition C14 - Site Notice 2	Parkview	-	-
DA Condition C19 - Hoarding	-	-	-
DA Condition C22 - Aboriginal Cultural Heritage Assessment	Urbis	-	06/08/23
DA Condition C32 - Sediment Control	-	-	-
DA Condition C36 - Geotechnical Monitoring	Douglas Partners	86043.23 R.004 Rev 0	12/01/24
DA Condition C36 - Report on Groundwater Quality for Dwatering	Douglas Partners	86043.23 R.008 Rev 0	21/02/24
Post Approval Form	Major Projects Planning	-	15/02/24

INSPECTION REPORT

CC No.	:	210791/2		
DA No.	:	SSD 15822622, SSD 15822622 MOD 1, SSD 15822622 MOD 2, SSD-15822622-MOD-3		
Principal Certifier	:	Chris Michaels BDC1974		
Site Address	:	Lot 100 DP1262209, Building C3 - 1 Ivanhoe Estate, Macquarie Park NSW 2113		
Requested by	:	Richard Crookes Constructions Pty Ltd		
Contact No.	:	.	**Contact email:**	salar.salarvand@fraserspropery.com.au
Inspection Type	:	Inspection of the existing building as per Clause 143B of the EP&A Regs		
Date Inspected	:	01/04/2025	**Time Requested:**	10:00 AM

RESULT OF INSPECTION

1. At the time of the inspection, building works subject to the CC has not commenced on site.

Signature :

Inspected by*	:	Chris Michaels
Registration No.	:	BDC1974
Date	:	01/04/2025

Disclaimer:

- Site inspections were conducted under the agreed scope of service and are based on a visual, non-invasive checks of representative samples of the building and to which safe and reasonable access was available on the date and time of the inspection. Inspections should not be considered as verification that all building components have been visually inspected.
- The contents of this report are true and correct at the time of the inspection.
- The completeness of construction works cannot be reasonably ascertained via inspections alone and reliance is placed on the declarations by the principal contractor, subcontractors, and relevant consultants to confirm building elements, components and installations comply with the relevant codes and standards.
- City Plan undertakes no duty, nor accepts any responsibility, to any third party, who may rely upon this inspection report. City Plan excludes implied warranties and conditions, to the extent legally permissible.
- Any opinions, conclusions and recommendations contained within this inspection report are based on site specific conditions encountered at the time of the inspection.
- City Plan has no responsibility or obligation to update this advice to account for events or changes occurring after the inspection.
- This inspection report shall not be construed as relieving any party of their responsibilities, liabilities, or contractual obligations.