Multiplex refers to SSDA 8925 New Sydney fish Market specifically condition B8 Landscape Design. Currently there are Nine (9) sub conditions under condition B8. Multiplex will submit resolution documents for each sub condition separately. In this case Condition 8 (i) which reads:

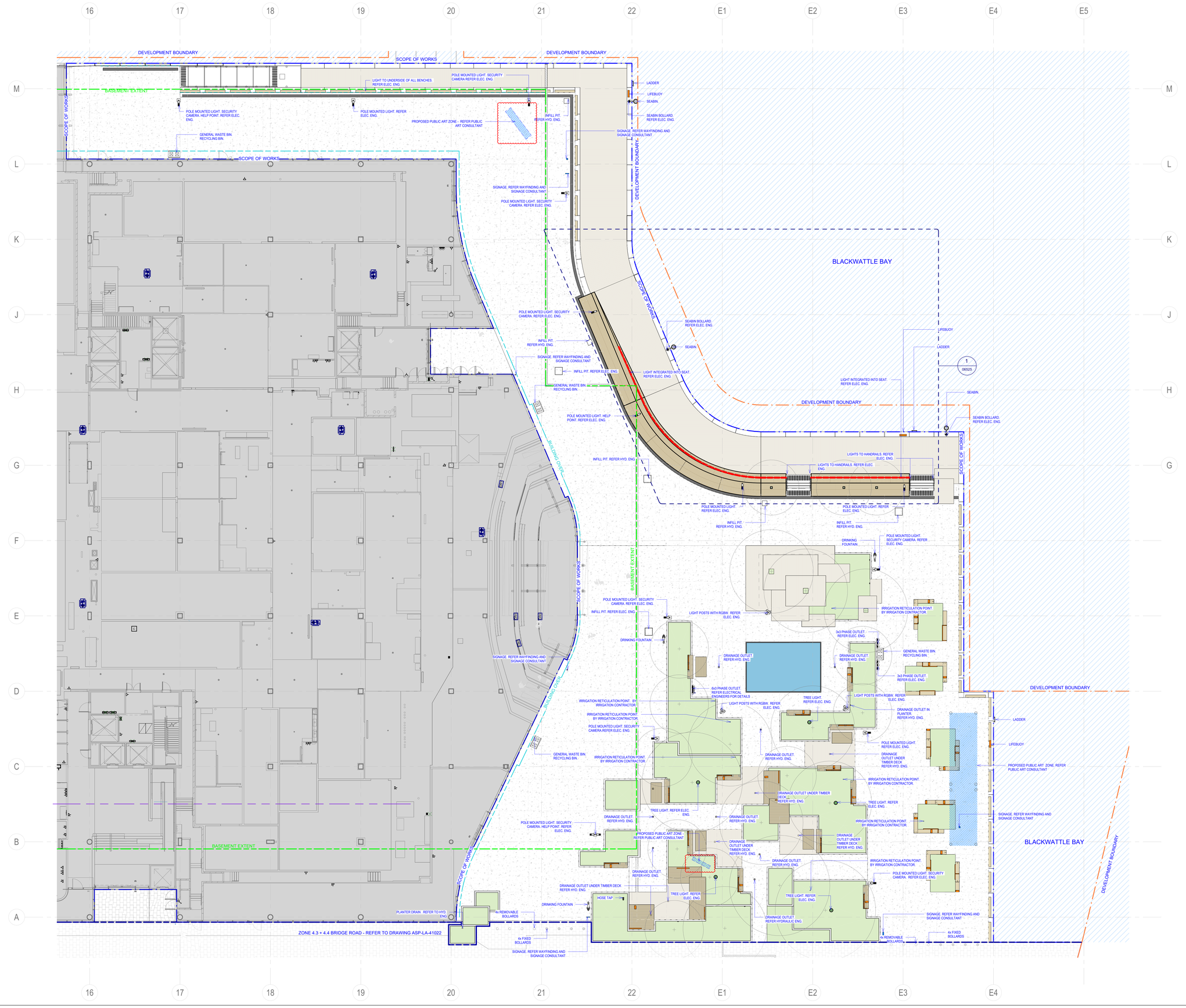
> *"Prior to the issue of the relevant Crown Building Works Certificate a detailed landscape design including plans and details drawn to scale and technical specifications, by a registered landscape architect must be submitted to the Planning Secretary for approval. These documents must include:*
>
> *(i) details of WSUD, drainage, waterproofing and watering systems.*

As per the requirements of the condition, please find attached for your understanding:

- Landscape Design (Aspect Studios)
    - ASP-LA-31021 - General Arrangement - Civic Plaza
    - ASP-LA-41021 to ASP-LA-41022 - General Arrangement - Bridge Road
    - ASP-LA-51021 - General Arrangement - Western Plaza
    - ASP-LA-00024 - Landscape Masterplan
    - ASP-LA-00022 - Planting Schedule
    - ASP-LA-35021 - Planting - Civic Plaza
    - ASP-LA-45021 - Planting - Bridge Road
    - ASP-LA-45023 - Planting - Bridge Road
    - ASP-LA-55021 - Planting - Western Plaza
    - ASP-LA-08020 - Softworks - Planting Details
    - ASP-LA-08021 - Softworks - Tree Details
    - ASP-LA-30521 - Site Sections - Civic Plaza
    - ASP-LA-30522 - Site Sections - Civic Plaza
    - ASP-LA-33011 - Levels + Grading - Civic Plaza
    - ASP-LA-50523 - Site Sections - Western Plaza
    - ASP-LA-53011 - Levels + Grading - Western Plaza
    - ASP-LA-SPC-00001 - Landscape Specification (Section 0254)
- Civil Design (AT&L)
    - ATL-CV-44000 - Overall Stormwater Management Plan
- Hydraulic Design (Planet Plumbing)
    - PPG-HY-30020 - Civic Plaza Garden - Hydraulic Services
    - PPG-HY-50020 - Western Plaza - Hydraulic Services

Multiplex seeks the Department of Planning's endorsement that the requirements of Condition B8(i)are now satisfied by the information contained herein.

On completion of the works, certification of design and construction will be provided by Aspect Studios for confirmation and acceptance by the Crown Certifier.



WARNING

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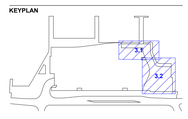
DATE	REV	AMENDMENTS
21/03/2023	B	FOR INFORMATION
28/04/2023	9	DRAFT IFC
12/05/2023	10	FOR INFORMATION
18/05/2023	A	IFC
11/07/2023	B	FOR INFORMATION
24/10/2023	C	UPDATED IFC FOR REVIEW
27/11/2023	D	IFC
16/01/2024	E	PUBLIC DOMAIN SUBMISSION
20/03/2024	F	FOR INFORMATION
02/05/2024	G	FOR INFORMATION
24/06/2024	H	FOR INFORMATION
12/08/2024	I	IFC- PUBLIC ART ZONE

NOTES

All furniture provided with integrated lighting. Refer electrical engineer's documentation for further detail

LEGEND

KEYPLAN



CONSULTANTS

ARCHITECTURE - 3XN
309/19a Boundary St
Sydney NSW 2010
T (45) 7026 2648

CIVIL - AT&L
G153 Walker St
North Sydney NSW 2060
T (02) 9438 1777

ARCHITECTURE - BVN
355 Pitt St
Sydney NSW 2000
T (02) 8297 7000

SERVICES - ECJV
7/38 Brookhollow Ave
Norwest NSW 2153
T (02) 8439 4822

STRUCTURAL - Enstruct
422 Glen St
Milsons Point NSW 2061
T (02) 9964 1444

ELECTRICAL - Stowe
15-13 Clyde St
Rydalmere NSW 2116
T (02) 9848 2111

ASPECT Studios

ASPECT Studios Pty Ltd
Level 1, 78-80 George Street
Redfern NSW 2016
Australia
T 02 9699 7182
www.aspect-studios.com
sydney@aspect-studios.com
ABN 11 120 219 561

PROJECT

NEW SYDNEY FISH MARKET
1B BRIDGE ROAD, GLEBE NSW

CLIENT

MULTIPLEX

NORTH

SCALE A0 1 : 150 DRAWN CHECKED MS
SCALE A2 1 : 300 MP
DESIGNED APPROVED MS LP

Do not scale-use dimensions &calcuts on drawings and schedules. Refer discrepancies to Landscape Architect for clarification.

STATUS

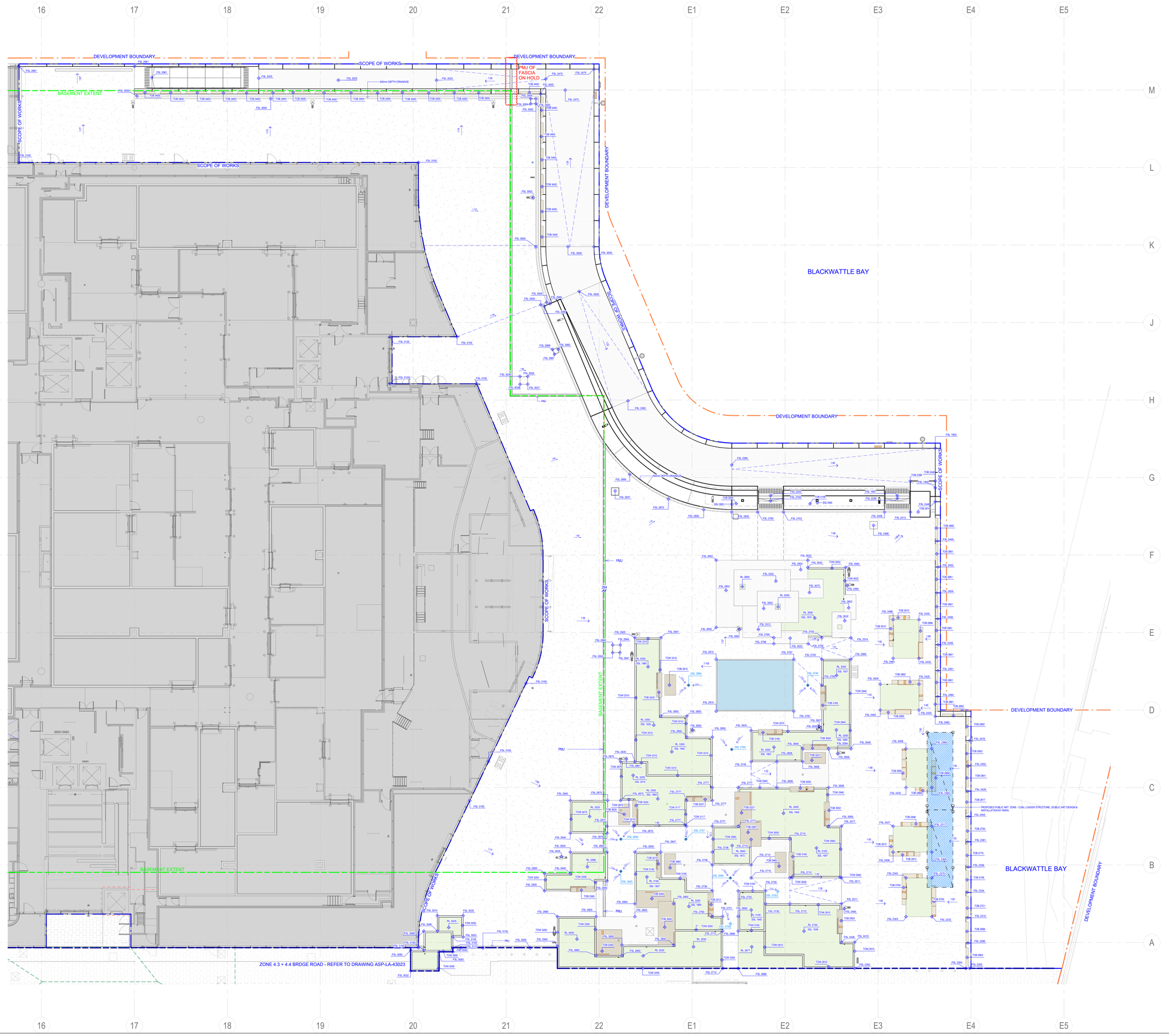
FOR CONSTRUCTION

DRAWING

GENERAL ARRANGEMENT - CIVIC PLAZA
CIVIC PLAZA - ZONE 3.1

DRAWING NO. **REVISION**

ASP-LA-31021 **I**



WARNING

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DATE	REV	AMENDMENTS
28/10/2022	14	Package 4 - Landlord's Works to AFC
31/10/2022	15	FOR INFORMATION
25/11/2022	16	100% SUBMISSION
28/04/2023	17	DRAFT IFC
18/05/2023	A	IFC
05/07/2023	B	FOR INFORMATION
11/07/2023	C	FOR INFORMATION
08/09/2023	D	FOR INFORMATION
24/10/2023	E	UPDATED IFC FOR REVIEW
27/11/2023	F	IFC
02/05/2024	G	FOR INFORMATION
24/06/2024	H	FOR INFORMATION

NOTES

NO CROSS FALL TO BE HIGHER THAN 1:40 & LESS THAN 1:100.
CONTRACTOR MUST COMPLY TO AS.

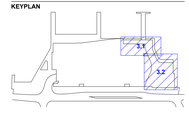
DRAWINGS INFORMATION HAS BEEN PROVIDED AND CERTIFIED BY CIVIL AND STRUCTURAL ENG. CONFIRMING COMPLIANCE WITH RELEVANT AUSTRALIAN STANDARDS

PREVIOUS DRAWING NUMBER: ASP-LA-33021

LEGEND

TOB	TOP OF BENCH
TOW	TOP OF WALL
DSL	DRAINAGE SURFACE LEVEL
DIL	DRAINAGE INVERT LEVEL
FSL	FINISHED SURFACE LEVEL
SSL	STRUCTURAL SLAB LEVEL
SUBL	SUBSTRUCTURAL SLAB LEVEL
1000	CONCRETE JOINTS SETOUTS PERMANENT MOVEMENTS JOINTS SETOUTS SETDOWN EDGES SETOUTS SLAB SETOUTS
1000	WALL SETOUTS
1000	LIGHTPOLE PEDESTAL SETOUTS SIGNAGE FOOTING SETOUTS INFILL ELECTRICAL PITS SETOUTS
	SAWN CONSTRUCTION JOINT
	FORMED CONSTRUCTION JOINT
	PERMANENT MOVEMENTS JOINTS
	STEP IN SLAB
	STRUCTURE BELOW
	FALL LINE
	LIGHTPOLE PEDESTAL SIGNAGE FOOTING REFER TO STRUCTURAL ENG.
	PITS REFER TO ELECTRICAL ENG. & HYDRAULIC ENG.
	WESTERN PROMENADE EXTERNAL STITCH REFER TO STRUCTURAL ENG.

KEYPLAN



CONSULTANTS

ARCHITECTURE - 3XN
509/19a Boundary St
Darlinghurst NSW 2010
T (45) 7125 2546

CIVIL - AT&L
5/153 Walker St
North Sydney NSW 2060
T (02) 9438 7777

ARCHITECTURE - BVN
355 Pitt St
Sydney NSW 2000
T (02) 8297 7200

SERVICES - ECJV
7/38 Brookhollow Ave
Norwest NSW 2153
T (02) 9439 4922

STRUCTURAL - Enstruct
4/2 Glen St
Milsons Point NSW 2061
T (02) 8904 1444

ELECTRICAL - Stowe
33-15 Clyde St
Rydalmere NSW 2116
T (02) 9848 2111

ASPECT Studios

ASPECT Studios Pty Ltd
Level 1, 78-80 George Street
Redfern NSW 2016
Australia
T (02 9698 7183
www.aspect-studios.com
sydney@aspect-studios.com
ABN 11 120 219 561

PROJECT

NEW SYDNEY FISH MARKET
1B BRIDGE ROAD, GLEBE NSW

CLIENT

MULTIPLEX

NORTH

SCALE A0 As indicated
SCALE A2 1 : 200

DRAWN MP
CHECKED MS
DESIGNED MS
APPROVED LP

Do not scale-use dimensions &calcuts on drawings and schedules. Refer discrepancies to Landscape Architect for clarification

STATUS

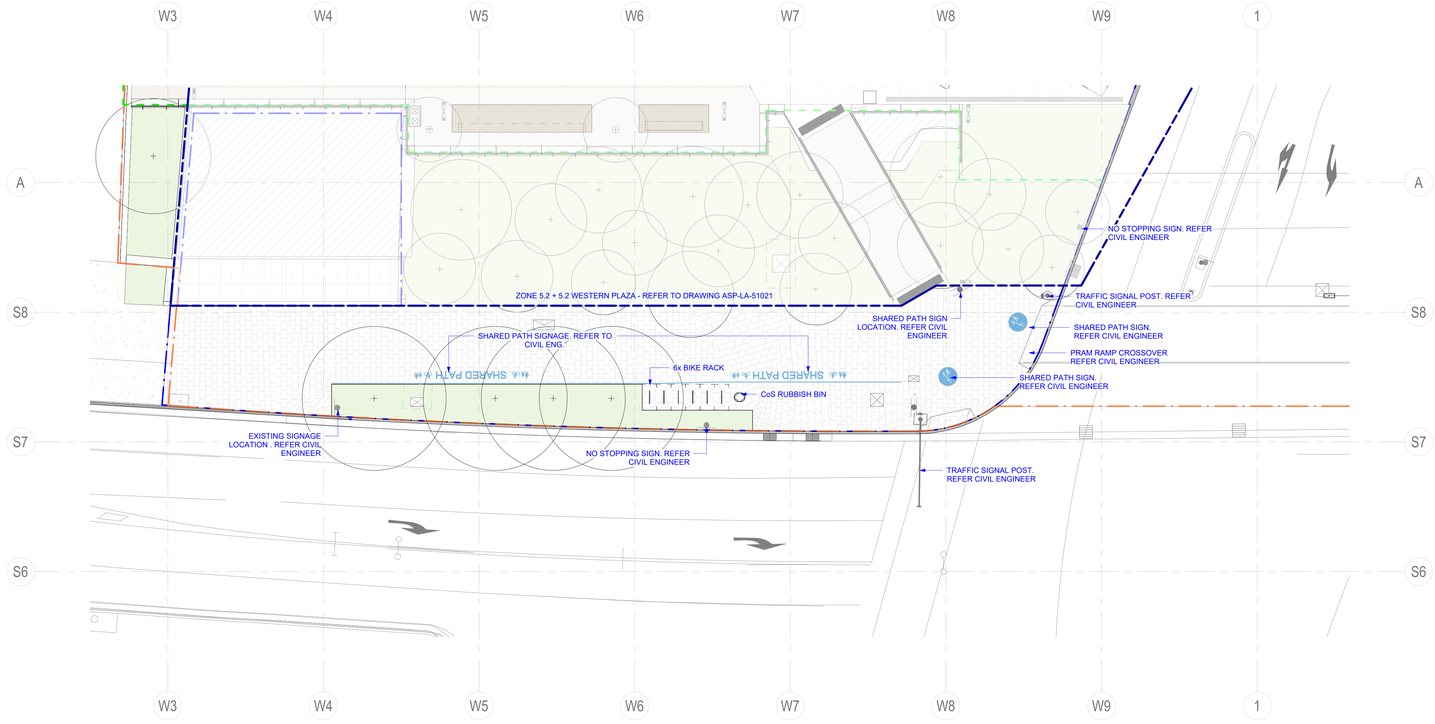
FOR CONSTRUCTION

DRAWING

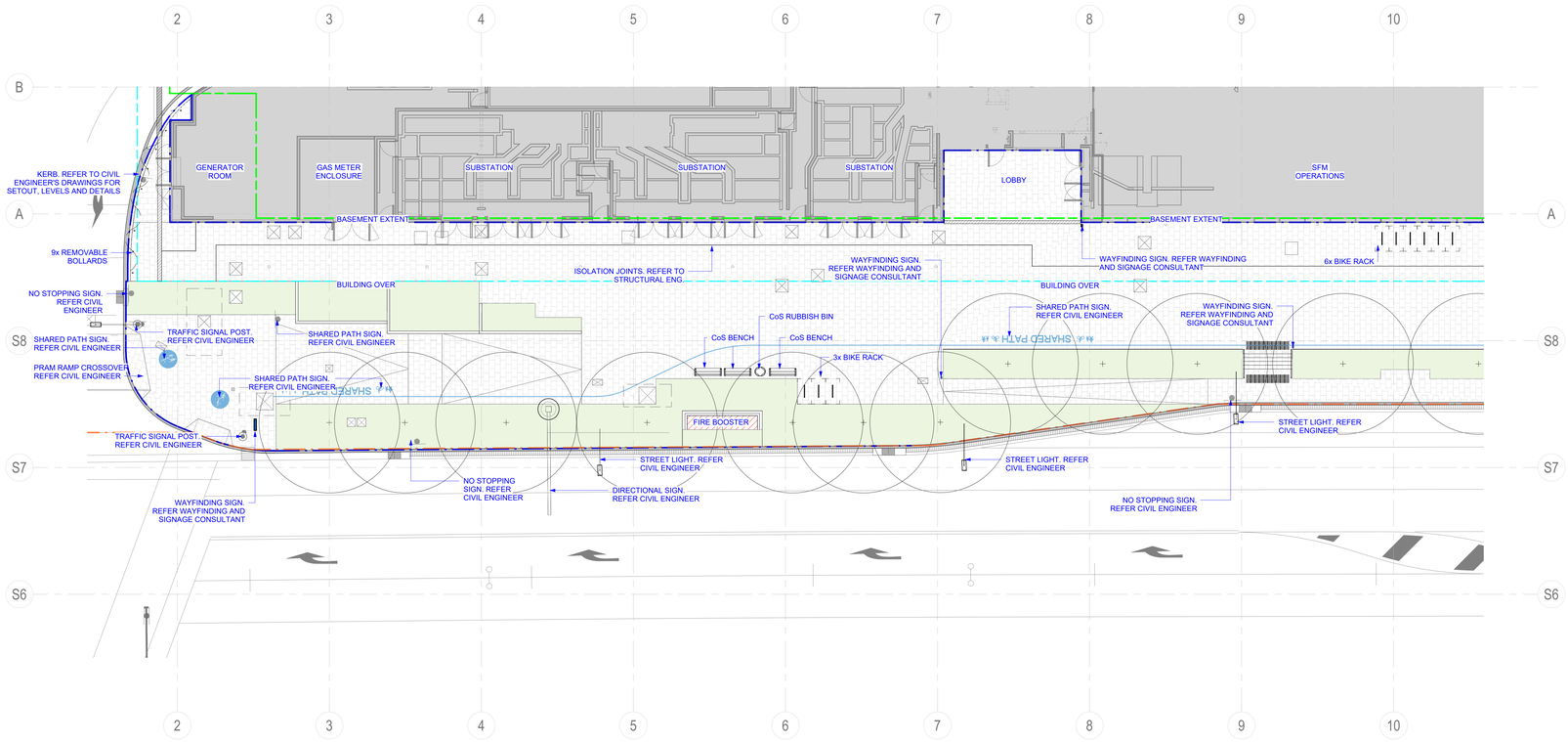
LEVELS + GRADING - CIVIC PLAZA
ZONE 3.1 & 3.2

DRAWING NO. ASP-LA-33011

REVISION H



1 GENERAL ARRANGEMENT PLAN - BRIDGE ROAD -ZONE 4.1



2 GENERAL ARRANGEMENT PLAN - BRIDGE ROAD -ZONE 4.2

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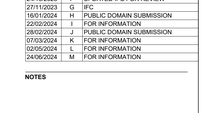
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DATE	REV	AMENDMENTS
05/07/2023	B	FOR INFORMATION
11/07/2023	C	FOR INFORMATION
10/08/2023	D	FOR INFORMATION
17/10/2023	E	100% SUBMISSION TO TINSW
24/10/2023	F	UPDATED IFC FOR REVIEW
27/11/2023	G	IFC
16/01/2024	H	PUBLIC DOMAIN SUBMISSION
22/02/2024	I	FOR INFORMATION
28/02/2024	J	PUBLIC DOMAIN SUBMISSION
07/03/2024	K	FOR INFORMATION
02/05/2024	L	FOR INFORMATION
24/06/2024	M	FOR INFORMATION

NOTES

LEGEND

KEYPLAN



CONSULTANTS

3XN — ARCHITECTURE - 3XN
500/19a Boundary St
Sydney NSW 2010
T (45) 7026 3646

BVN — ARCHITECTURE - BVN
355 Pitt St
Sydney NSW 2000
T (02) 8297 7200

enstruct — STRUCTURAL - Enstruct
4/2 Glen St
Milsons Point NSW 2061
T (02) 8904 1444

at&l — CIVIL - AT&L
10/10 Walker St
North Sydney NSW 2060
T (02) 9439 1777

EQUILIBRIUM — SERVICES - EC,JV
7/39 Brookhollow Ave
Norwest NSW 2153
T (02) 9439 4622

STOWE — ELECTRICAL - Stowe
10-12 Clyde St
Rydalmere NSW 2116
T (02) 9848 2111

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www.aspect-studios.com
sydney@aspect-studios.com
ABN 11 120 219 561

PROJECT

NEW SYDNEY FISH MARKET
1B BRIDGE ROAD, GLEBE NSW

CLIENT

MULTIPLEX

NORTH

SCALE A0 1 : 150 DRAWN CHECKED
SCALE A2 MP MS
DESIGNED APPROVED
MS LP

Do not scale-use dimensions &callouts on drawings and schedules. Refer discrepancies to Landscape Architect for clarification

STATUS

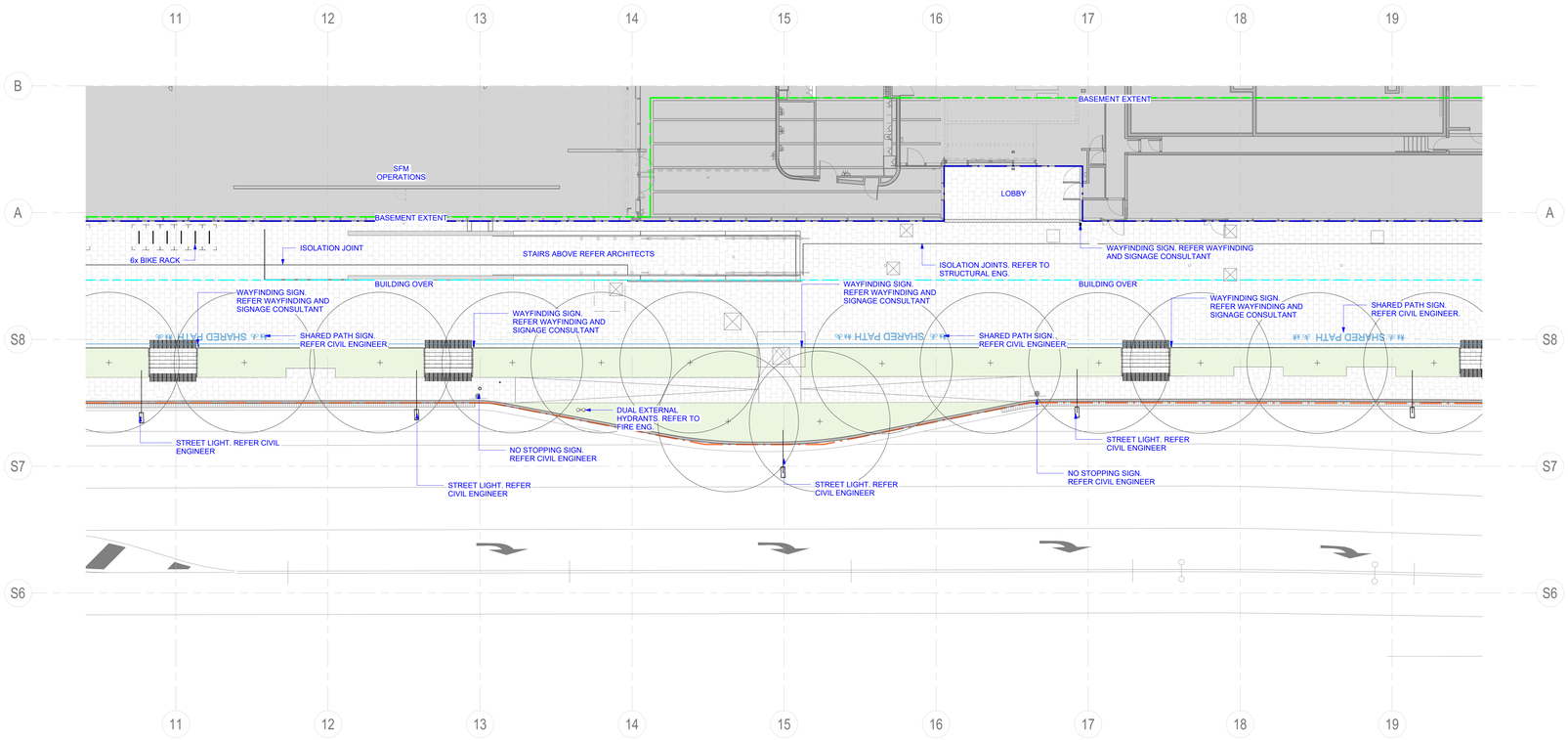
FOR CONSTRUCTION

DRAWING

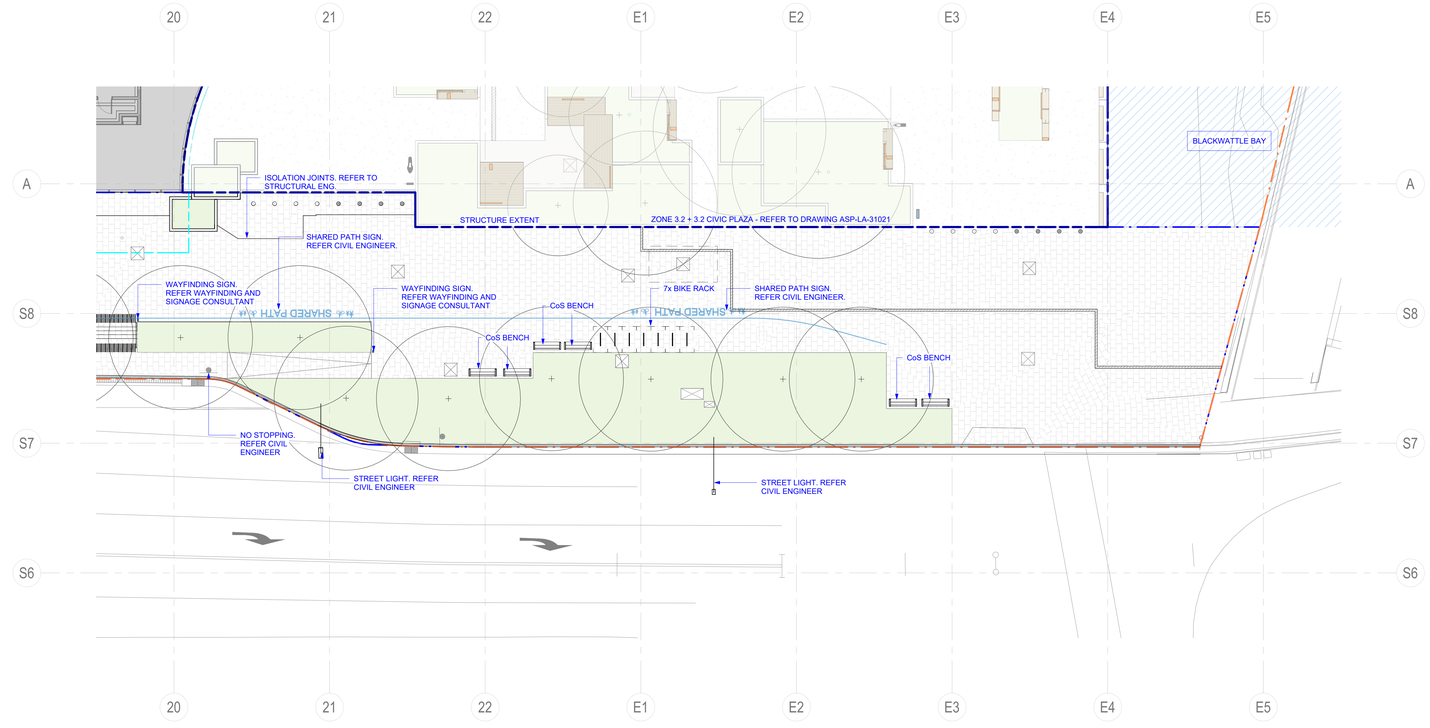
GENERAL ARRANGEMENT - BRIDGE ROAD

DRAWING NO. **REVISION**

ASP-LA-41021 M



1 GENERAL ARRANGEMENT PLAN - BRIDGE ROAD -ZONE 4.3



2 GENERAL ARRANGEMENT PLAN - BRIDGE ROAD -ZONE 4.4

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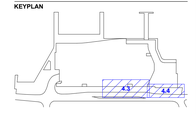
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DATE	REV	AMENDMENTS
28/04/2023	S	DRAFT IFC
18/05/2023	A	IFC
05/07/2023	B	FOR INFORMATION
11/07/2023	C	FOR INFORMATION
10/08/2023	D	FOR INFORMATION
17/10/2023	E	100% SUBMISSION TO TINSW
24/10/2023	F	UPDATED IFC FOR REVIEW
27/11/2023	G	IFC
16/01/2024	H	PUBLIC DOMAIN SUBMISSION
28/02/2024	I	PUBLIC DOMAIN SUBMISSION
02/05/2024	J	FOR INFORMATION
24/06/2024	K	FOR INFORMATION

NOTES

LEGEND

KEYPLAN



CONSULTANTS

ARCHITECTURE - 3XN
309/78a Boundary St
Sydney NSW 2010
T (45) 7026 2646

CIVIL - AT&L
15/10 Walker St
North Sydney NSW 2060
T (02) 9438 1777

ARCHITECTURE - BVN
355 Pitt St
Sydney NSW 2000
T (02) 8297 7200

SERVICES - EC,JV
7/38 Brookhollow Ave
Norwest NSW 2153
T (02) 9439 4622

STRUCTURAL - Enstruct
4/2 Glen St
Milsons Point NSW 2061
T (02) 8904 1444

ELECTRICAL - Stowe
10-12 Clyde St
Rydalmere NSW 2116
T (02) 9848 2111

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Australia
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www.aspect-studios.com
sydney@aspect-studios.com
ABN 11 120 219 561

PROJECT

NEW SYDNEY FISH MARKET
1B BRIDGE ROAD, GLEBE NSW

CLIENT

MULTIPLEX

NORTH

SCALE A0 1 : 150 DRAWN MP CHECKED MS
SCALE A2
DESIGNED MS APPROVED LP

Do not scale-use dimensions &calluts on drawings and schedules. Refer discrepancies to Landscape Architect for clarification

STATUS

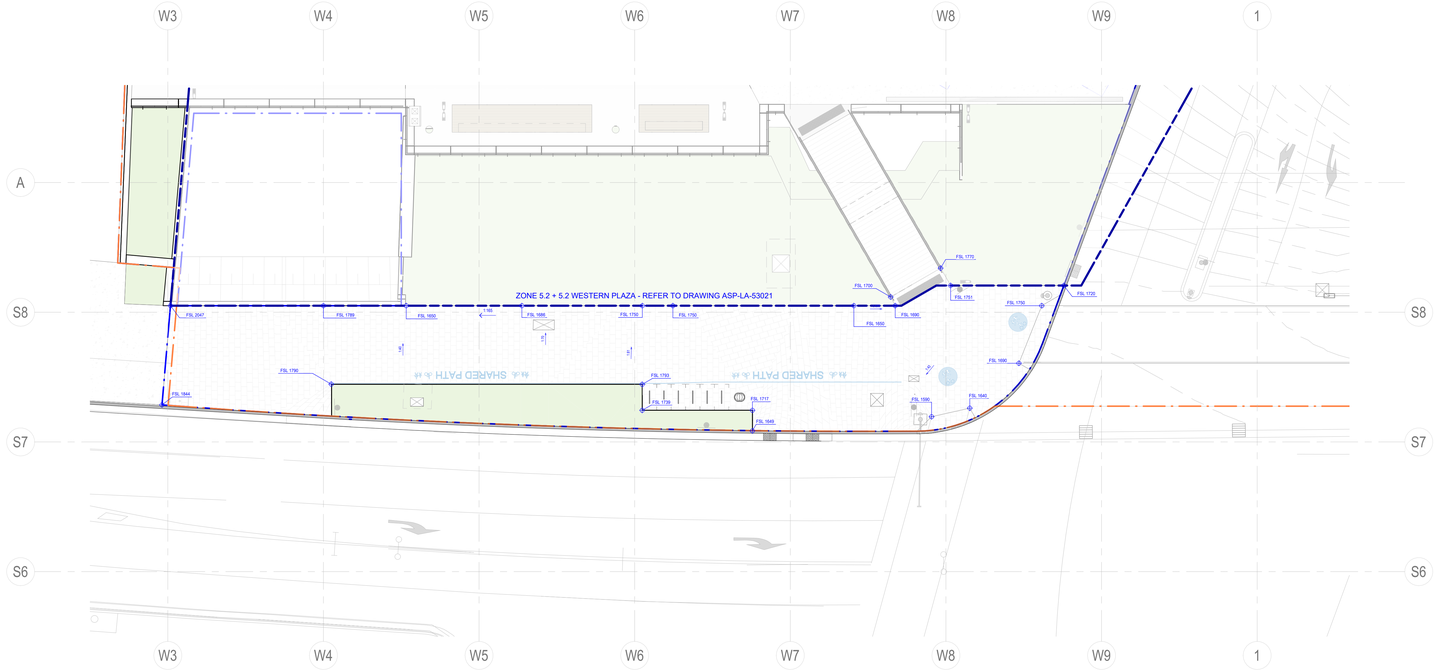
FOR CONSTRUCTION

DRAWING

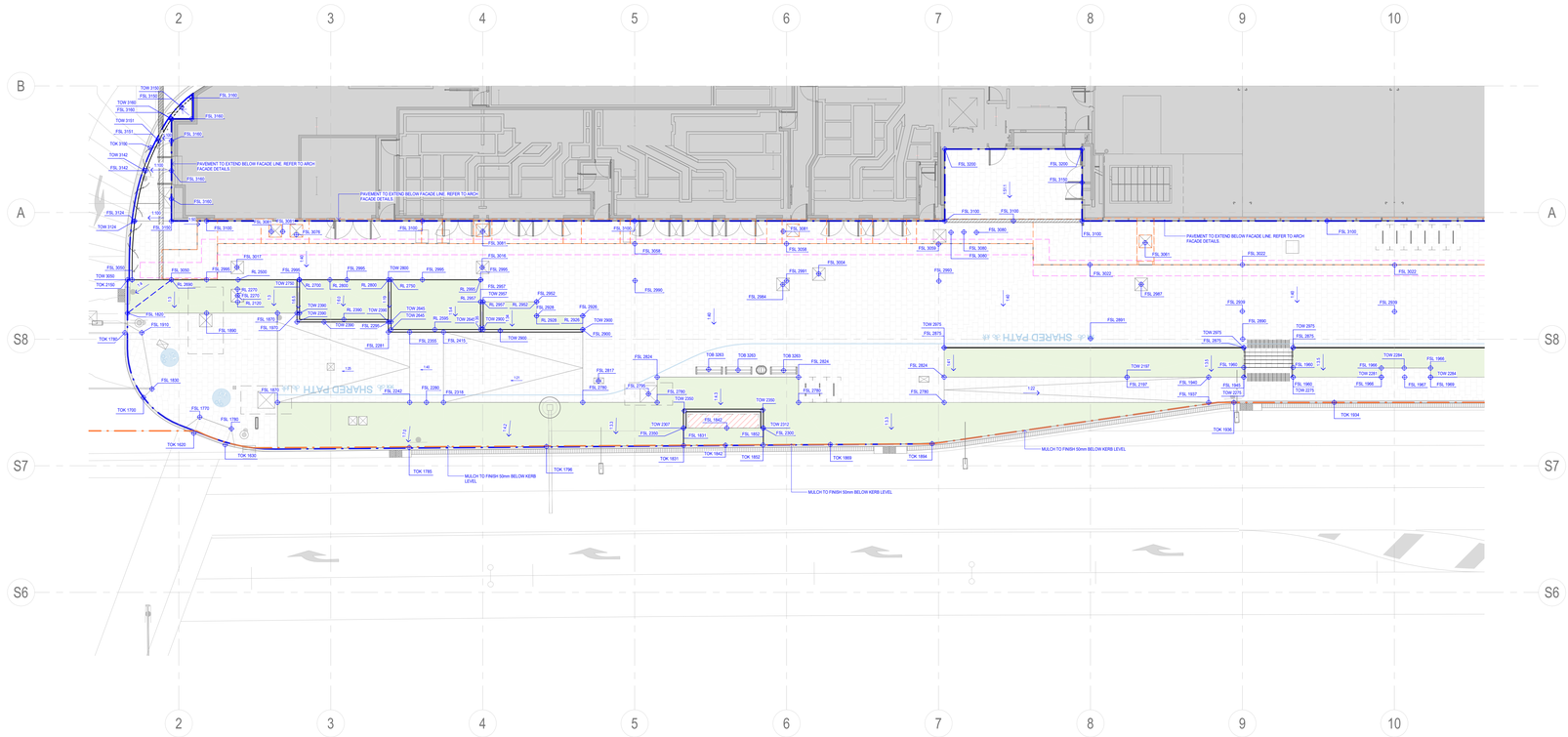
GENERAL ARRANGEMENT - BRIDGE ROAD

DRAWING NO. **REVISION**

ASP-LA-41022 K



1 LEVELS & GRADING - 04 BRIDGE ROAD - ZONE 4.1
1 : 150



2 LEVELS & GRADING - 04 BRIDGE ROAD - ZONE 4.2
1 : 150

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DATE	REV	AMENDMENTS
10/08/2023	F	FOR INFORMATION
08/09/2023	G	FOR INFORMATION
05/10/2023	H	FOR INFORMATION
17/10/2023	I	100% SUBMISSION TO TINSW
24/10/2023	J	UPDATED IFC FOR REVIEW
27/11/2023	K	IFC
16/01/2024	L	PUBLIC DOMAIN SUBMISSION
22/02/2024	M	FOR INFORMATION
28/02/2024	N	PUBLIC DOMAIN SUBMISSION
07/03/2024	O	FOR INFORMATION
02/05/2024	P	FOR INFORMATION
24/06/2024	Q	FOR INFORMATION

NOTES

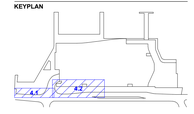
NO CROSS FALL TO BE HIGHER THAN 1:40 & LESS THAN 1:100.
CONTRACTOR MUST COMPLY TO AS.

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LEGEND

- TOB — TOP OF BENCH
- TOW — TOP OF WALL
- FSL — FINISHED SURFACE LEVEL
- SSL — STRUCTURAL SLAB LEVEL
- SUBL — SUBSTRUCTURAL SLAB LEVEL
- 1000 — SETOUTS
- 1000 — FURNITURES & FIXTURES SETOUTS
- 1000 — LIGHTPOLE & SIGNAGE FOOTING SETOUTS
- FALL LINE
- BRIDGE ROAD SLAB BOUNDARY
- APPROACH SLAB
- CAPPING BEAM
- LIGHTPOLE PEDESTAL SIGNAGE FOOTING
- SAWN CONSTRUCTION JOINT
- FORMED CONSTRUCTION JOINT
- PERMANENT MOVEMENTS JOINTS
- EXTENT OF TOPPING SLAB (ON VOID FORMER) PAVERS

KEYPLAN



CONSULTANTS

3XN — ARCHITECTURE - 3XN
Level 1, 77 Fort Street
300/19a Boundary St
Sydney NSW 2010
Sydney NSW 2000
T (61) 7026 2646
T (02) 8297 7200

at& — CIVIL - AT&L
Suite 1, 10-12 Clyde St
10/10 Walker St
North Sydney NSW 2060
Rhodes NSW 2138
T (02) 9439 1777
T (02) 9439 4622

BVN — ARCHITECTURE - BVN
Level 5, 255 Pitt St
255 Pitt St
Sydney NSW 2000
Sydney NSW 2000
T (02) 8297 7200

EQUATION LIGHTING SCAPES — SERVICES - ECJV
Level 1, 70-72 Wentworth Ave
70A Brookhollow Ave
Surry Hills NSW 2010
Norwest NSW 2153
T (02) 9211 3711
T (02) 9439 4622

enstruct — STRUCTURAL - Enstruct
Suite 1, 42 Glen St
42 Glen St
Milsons Point NSW 2061
Milsons Point NSW 2061
T (02) 8904 1444

STOWE — ELECTRICAL - Stowe
Suite 1, 10-12 Clyde St
10-12 Clyde St
Rydalmere NSW 2116
Rydalmere NSW 2116
T (02) 9848 2111

ASPECT Studios

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Level 1, 78-80 George Street
Redfern NSW 2016
Australia
T 02 9699 7182
www.aspect-studios.com
sydney@aspect-studios.com
ABN 11 120 219 561

PROJECT

NEW SYDNEY FISH MARKET
1B BRIDGE ROAD, GLEBE NSW

CLIENT

MULTIPLEX

NORTH

SCALE A0 As indicated
SCALE A3 1 : 300

DRAWN MP
CHECKED MS
DESIGNED MS
APPROVED LP

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STATUS

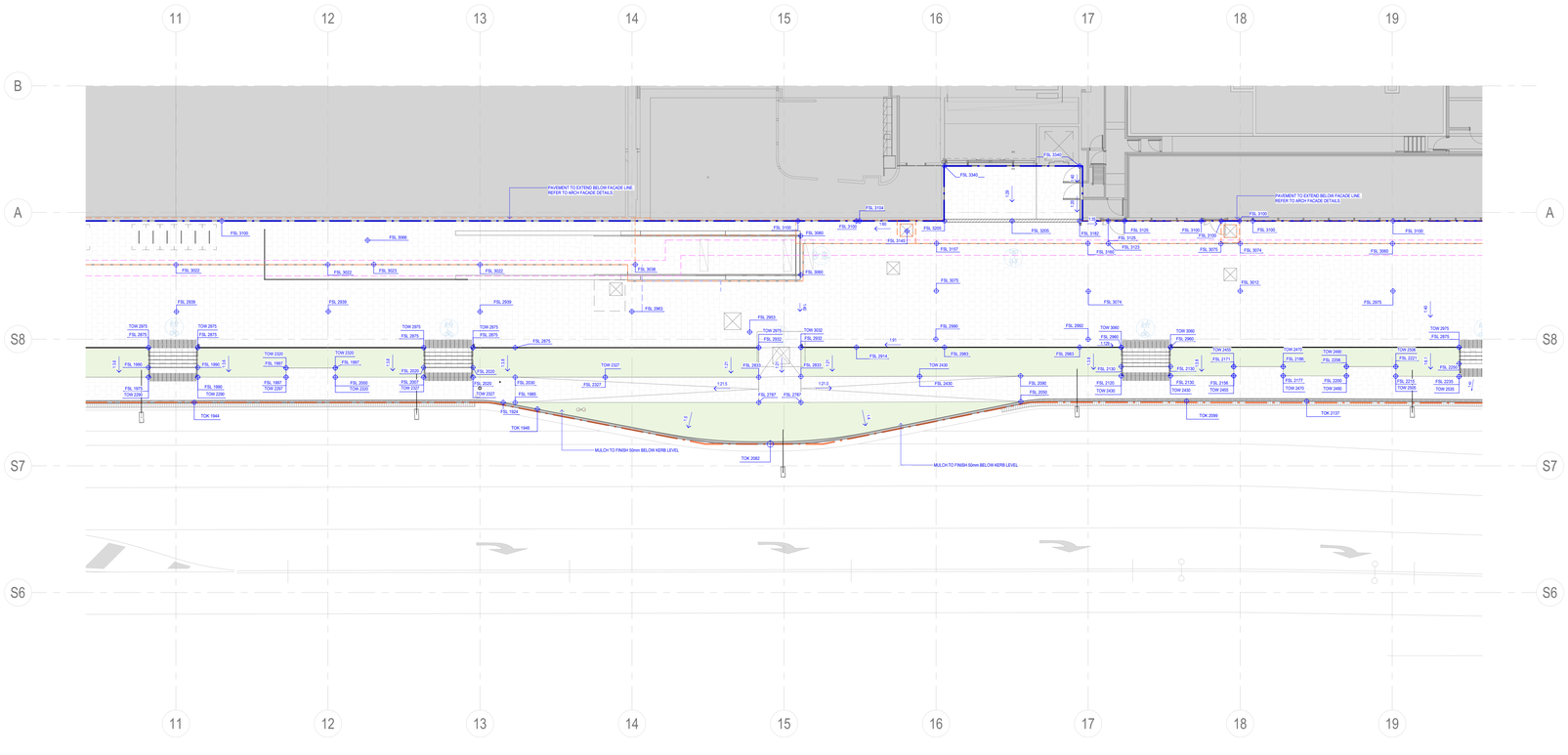
FOR CONSTRUCTION

DRAWING

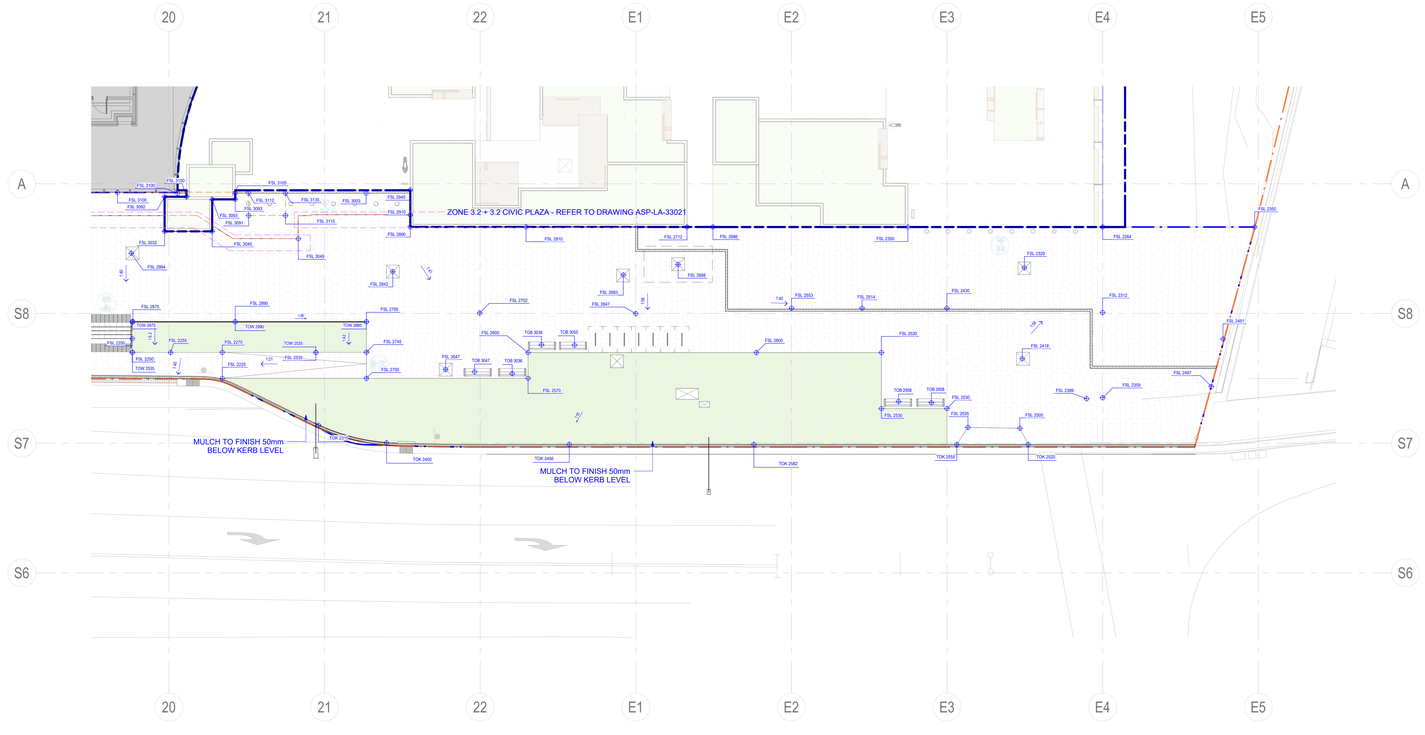
LEVELS & GRADING - BRIDGE ROAD
ZONE 4.1 & 4.2

DRAWING NO. ASP-LA-43021

REVISION Q



1 LEVELS & GRADING - 04 BRIDGE ROAD - ZONE 4.3
1 : 150



2 LEVELS & GRADING - 04 BRIDGE ROAD - ZONE 4.4
1 : 150

WARNING

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DATE	REV	AMENDMENTS
02/08/2023	E	ISSUE FOR CONSTRUCTION
10/08/2023	F	FOR INFORMATION
08/09/2023	G	FOR INFORMATION
05/10/2023	H	FOR INFORMATION
17/10/2023	I	100% SUBMISSION TO TINSW
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27/11/2023	K	IFC
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28/02/2024	M	PUBLIC DOMAIN SUBMISSION
02/05/2024	N	FOR INFORMATION
24/06/2024	O	FOR INFORMATION
08/08/2024	P	FOR INFORMATION

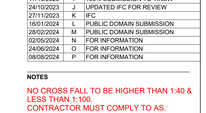
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- SSL — STRUCTURAL SLAB LEVEL
- SUBL — SUBSTRUCTURAL SLAB LEVEL
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- 1000 — FURNITURES & FIXTURES SETOUTS
- 1000 — LIGHTPOLE & SIGNAGE FOOTING SETOUTS
- FALL LINE
- BRIDGE ROAD SLAB BOUNDARY
- APPROACH SLAB
- CAPPING BEAM
- LIGHTPOLE PEDESTAL SIGNAGE FOOTING
- SAWN CONSTRUCTION JOINT
- FORMED CONSTRUCTION JOINT
- PERMANENT MOVEMENTS JOINTS
- EXTENT OF TOPPING SLAB (ON VOID FORMER) PAVERS

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PROJECT

NEW SYDNEY FISH MARKET
1B BRIDGE ROAD, GLEBE NSW

CLIENT

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LEVELS & GRADING - BRIDGE ROAD
ZONE 4.3 & 4.4

DRAWING NO. **REVISION**

ASP-LA-43023 P

TREE SCHEDULE

Code	Botanical Name	Common name	Exotic/Native	Mature Height	Mature Spread	Indicative Installation Caliper	Indicative Installation Height	Installation Clear Trunk Height	Minimum Pot Size	Count
ANG cos	ANGOPHORA costata	Sydney Red Gum	Native	15m	10m	65mm	3.8m	0.95m	400L	4
BAN int	BANKSIA integrifolia	Coastal Banksia	Native	8m	7m	65mm	3.8m	0.95m	400L	9
BRA ace	BRACHYCHITON acerifolius	Illawarra Flame Tree	Native	12m	10m	65mm	3.8m	0.95m	400L	1
CAS cun	CASUARINA cunninghamiana	River Oak	Native	15m	8m	55mm	4.4m	1.10m	400L	3
COR mac	CORYMBIA maculata	Spotted Gum	Native	20m	10m	65mm	3.8m	0.95m	400L	6
EUC rob	EUCALYPTUS robusta	Swamp Mahogany	Native	16m	7m	65mm	3.8m	0.95m	400L	3
EUC sal	EUCALYPTUS saligna	Sydney Blue Gum	Native	25m	12m	65mm	3.8m	0.95m	400L	3
GLO fer	GLOCHIDION ferdinandi	Cheese Tree	Native	7m	4m	65mm	3.8mm	0.95m	400L	4
LIV aus	LIVISTONA australis	Cabbage Palm	Native	18m	6m	65mm	NA	0.95m	400L	6
LOP con	LOPHOSTEMON confertus	Brush Box	Native	15m	10m	65mm	3.8m	0.95m	400L	37
MEL leu	MELALEUCA leucadendron	Weeping Paperbark	Native	10m	5m	65mm	3.8m	0.95m	400L	4
MEL qui	MELALEUCA quinquenervia	Broad-leaved Paperbark	Native	15m	8m	65mm	3.8m	0.95m	400L	3
TRI lau	TRISTANIOPSIS laurina	Kanooka	Native	8m	6m	65mm	3.8m	0.95m	400L	5

Grand total: 88

FEATURE PLANT SCHEDULE

Code	Botanical Name	Common Name	Exotic/Native	Mature Height	Mature Spread	Rate	Pot Size	Count
Aa	Asplenium australisicum	Bird's Nest Fern	Native	1m	1m	AS SHOWN	200mm	42
Br	Banksia robur	Swamp Banksia	Native	3m	2m	AS SHOWN	200mm	6
De	Doryanthes excelsa	Gymea Lily	Native	1m	1m	AS SHOWN	300mm	10
Gm	Grevillea 'Moonlight'	Grass Tree	Native	4m	3m	AS SHOWN	300mm	5
Mc	Macrozamia communis	Burrawang	Native	1.5m	1.5m	AS SHOWN	300mm	4
Xa	Xanthorrhoea australis	Grevilla	Native	3m	1m	AS SHOWN	300mm	4

Plant Schedule: Mass Planting [Mix 1A] Civic Plaza — **69.43 m²**

Category/ID	Botanical Name	Common Name	Spacing/m2	Pot Size	Qty
Ca	*Correa alba*	White Correa	6	200mm	108
Pp	*Poa poiformis*	Coastal Tussock Grass	8	140mm	114
Lt	*Lomandra Tanika*	Mat Rush	6	140mm	108
Bb	*Banksia 'Cherry Candles'*	Hairpin Banksia	6	30mm	88
Lb	*Leucophyta brownii*	Cushion Bush	6	200mm	46

Plant Schedule: Mass Planting [Mix 2] Civic Plaza — **158.52 m²**

Category/ID	Botanical Name	Common Name	Spacing/m2	Pot Size	Qty
Ca	*Correa alba*	White Correa	6	200mm	193
Bb	*Banksia 'Cherry Candles'*	Hairpin Banksia	6	300mm	193
Pp	*Poa poiformis*	Coastal Tussock Grass	8	140mm	256
Ll	*Lomandra longifolia 'Katie Bells'*	Spiny Headed Mat Rush	8	140mm	256
Wf	*Westringia fruticosa 'Grey Box'*	Native Rosemary	8	200mm	256

Plant Schedule: Mass Planting [Mix 3] Civic Plaza — **95.09 m²**

Category/ID	Botanical Name	Common Name	Spacing/m2	Pot Size	Qty
Mp	*Myoporum parvifolium*	Creeping boobialla	4	200mm	59
Lt	*Lomandra Tanika*	Mat Rush	6	140mm	144
Wf	*Westringia fruticosa 'Grey Box'*	Native Rosemary	8	200mm	230
GGC	*Grevillea 'juniperina 'Gold Cluster'*	Grevillea 'Gold Cluster'	8	200mm	116
Ds	*Darwinia 'Seaspray'*	Darwinia	6	200mm	87

Plant Schedule: Mass Planting [Mix 4] Civic Plaza — **137.11 m²**

Category/ID	Botanical Name	Common Name	Spacing/m2	Pot Size	Qty
Dc	*Dianella caerulea*	Blue Flax Lily	8	200mm	169
Mp	*Myoporum parvifolium*	Creeping boobialla	4	200mm	87
Lt	*Lomandra Tanika*	Mat Rush	6	140mm	209
Fn	*Ficinia nodosa*	Knobby Club Rush	6	140mm	128
GGC	*Grevillea 'juniperina 'Gold Cluster'*	Grevillea 'Gold Cluster'	8	200mm	169
Od	*Ozothamnus diosmifolius*	Rice Flower	4	200mm	87

Plant Schedule: Mass Planting [Mix 4.1] Civic Plaza — **117.26 m²**

Category/ID	Botanical Name	Common Name	Spacing/m2	Pot Size	Qty
Bb	*Banksia 'Cherry Candles'*	Hairpin Banksia	6	300mm	22
Ca	*Correa alba*	White Correa	6	200mm	22
Cd	*Chrysocephalum 'Desert Flame'*	Yellow Buttons	8	140mm	28
Ci	*Casuraina glauca 'Cousin It'*	Cousin It	6	200mm	32
Lb	*Leucophyta brownii*	Cushion Bush	6	200mm	11

Plant Schedule: Mass Planting [Mix 5] Civic Plaza Cascading — **13.57 m²**

Category/ID	Botanical Name	Common Name	Spacing/m2	Pot Size	Qty
Ci	*Casuraina glauca 'Cousin It'*	Cousin It	6	200mm	25
Cw	*Carpobrotus rossii 'White Hot'*	White Pig Face	8	140mm	34
Lc	*Leptospermum 'Cardwell'*	Tea Tree	6	200mm	34

Plant Schedule: Mass Planting [Mix 6] Civic Plaza Cascading Plants — **13.30 m²**

Category/ID	Botanical Name	Common Name	Spacing/m2	Pot Size	Qty
Ci	*Casuraina glauca 'Cousin It'*	Cousin It	6	200mm	26
Hv	*Hardenbergia violacea 'Snow White'*	White Native Sarsparilla	6	200mm	34
Pp	*Pandorea pandorana 'Snowbells'*	Wonga Wonga Vine	6	200mm	26

Plant Schedule: Mass Planting [Mix 7] Civic Plaza Tactile Planting — **63.95 m²**

Category/ID	Botanical Name	Common Name	Spacing/m2	Pot Size	Qty
Bb	*Banksia 'Cherry Candles'*	Hairpin Banksia	6	300mm	79
Ag	*Anigozanthos 'Gold Velvet'*	Kangaroo Paw	6	200mm	79
Cd	*Chrysocephalum 'Desert Flame'*	Yellow Buttons	8	140mm	106
Fn	*Ficinia nodosa*	Knobby Club Rush	8	140mm	106
Pp	*Poa poiformis*	Coastal Tussock Grass	8	140mm	106

Plant Schedule: Mass Planting [Mix 8] Civic Plaza Tactile Planting — **54.45 m²**

Category/ID	Botanical Name	Common Name	Spacing/m2	Pot Size	Qty
Ca	*Correa alba*	White Correa	6	200mm	69
Lb	*Leucophyta brownii*	Cushion Bush	8	200mm	92
Ka	*Kunzea ambigua 'Prostrate'*	White Tick Bush	8	140mm	92
Ds	*Darwinia 'Seaspray'*	Darwinia	6	200mm	69
Ar	*Anigozanthos 'Regal Velvet'*	Kangaroo Paw	6	200mm	69

Plant Schedule: Mass Planting [Mix 9] Bridge Road — **240.58 m²**

Category/ID	Botanical Name	Common Name	Spacing/m2	Pot Size	Qty
Dc	*Dianella caerulea*	Blue Flax Lily	8	200mm	289
Mp	*Myoporum parvifolium*	Creeping boobialla	4	200mm	145
Lt	*Lomandra Tanika*	Mat Rush	6	140mm	217
Fn	*Ficinia nodosa*	Knobby Club Rush	8	140mm	289
Vh	*Viola hederacea*	Native Violet	8	140mm	385
Wf	*Westringia fruticosa 'grey box'*	Coast Rosemary	4	200mm	193

Plant Schedule: Mass Planting [Mix 10] CENTRAL BRIDGE ROAD — **588.33 m²**

Category/ID	Botanical Name	Common Name	Spacing/m2	Pot Size	Qty
Dc	*Dianella caerulea*	Blue Flax Lily	8	200mm	713
Dr	*Dianella revoluta*	Blueberry lily	6	200mm	537
Dl	*Dianella longifolia*	Spreading Flax Lily	6	200mm	537
Lt	*Lomandra Tanika*	Mat Rush	6	200mm	537
Leb	*Lomandra 'Evergreen Baby'*	Lomandra	6	200mm	537
Vh	*Viola hederacea*	Native Violet	6	200mm	358
Bn	*Blechnum nudum*	Fishbone Water-fern	6	200mm	537

Plant Schedule: Mass Planting [Mix 11] Western Plaza — **209.83 m²**

Category/ID	Botanical Name	Common Name	Spacing/m2	Pot Size	Qty
Fn	*Ficinia nodosa*	Knobby Club Rush	8	140mm	255
Dc	*Dianella caerulea*	Blue Flax Lily	8	200mm	255
Lt	*Lomandra Tanika*	Spiny Headed Mat Rush	6	140mm	192
GGC	*Grevillea 'juniperina 'Gold Cluster'*	Grevillea 'Gold Cluster'	8	200mm	255
Go	*Goodenia ovata*	Hop Goodenia	8	140mm	340
Pa	*Plectranthus argenatus*	Silver Spurflower	6	200mm	255

Plant Schedule: Mass Planting [Mix 12] Western Plaza Scramblers — **345.61 m²**

Category/ID	Botanical Name	Common Name	Spacing/m2	Pot Size	Qty
Bs	*Banksia Spinulosa*	Hairpin Banksia	2	200mm	38
Fn	*Ficinia nodosa*	Knobby Club Rush	8	140mm	281
Ju	*Juncus usitatus*	Common Rush	8	200mm	418
Dc	*Dianella caerulea*	Blue Flax Lily	8	200mm	418
Lt	*Lomandra Tanika*	Mat Rush	6	140mm	418
Bh	*Banksia Hybrid 'Bird Song'*	Banksia	4	200mm	72
Cli	*Callistemon Little John*	Bottlebrush	4	200mm	72

Plant Schedule: Mass Planting [Mix 13] Western Plaza — **117.26 m²**

Category/ID	Botanical Name	Common Name	Spacing/m2	Pot Size	Qty
Pp	*Pandorea jasminoides*	Bower of Beauty	6	200mm	144
Ca	*Cissus antarctica*	Kangaroo Vine	6	200mm	144
Hs	*Hibbertia scandens*	Snake Vine	8	140mm	190
Mp	*Myoporum parvifolium*	Creeping boobialla	4	200mm	98
Pa	*Pelargonium australe*	Native geranium	8	140mm	190

MIX 1



Correa alba · *Poa poiformis* · *Lomandra tanika* · *Banksia 'Cherry Candles'* · *Leucophyta brownii*

MIX 2



Correa alba · *Banksia 'Cherry Candles'* · *Poa poiformis* · *Lomandra tanika* · *Westringia fruticosa 'Grey Box'*

MIX 3



Myoporum parvifolium · *Lomandra tanika* · *Westringia fruticosa 'Grey Box'* · *Grevillea 'juniperina 'Gold Cluster'* · *Darwinia 'Seaspray'*

MIX 4



Dianella caerulea · *Myoporum parvifolium* · *Lomandra tanika* · *Ficinia nodosa* · *Grevillea 'juniperina 'Gold Cluster'* · *Ozothamnus diosmifolius*

MIX 4.1



Banksia 'Cherry Candles' · *Correa alba* · *Chrysocephalum 'Desert Flame'* · *Casuraina glauca 'Cousin It'* · *Leucophyta brownii*

MIX 5



Casuraina glauca 'Cousin It' · *Carpobrotus rossii 'White Hot'* · *Leptospermum 'Cardwell'*

MIX 6



Casuraina glauca 'Cousin It' · *Hardenbergia violacea 'Snow White'* · *Pandorea pandorana 'Snowbells'*

MIX 7



Banksia 'Cherry Candles' · *Anigozanthos 'Gold Velvet'* · *Chrysocephalum 'Desert Flame'* · *Ficinia nodosa* · *Poa poiformis*

MIX 8



Correa alba · *Leucophyta brownii* · *Kunzea ambigua 'Prostrate'* · *Darwinia 'Seaspray'* · *Anigozanthos 'Regal Velvet'*

MIX 9



Dianella caerulea · *Myoporum parvifolium* · *Lomandra tanika* · *Ficinia nodosa* · *Viola hederacea* · *Westringia fruticosa 'Grey Box'*

MIX 10



Dianella caerulea · *Dianella revoluta* · *Dianella longifolia* · *Lomandra tanika* · *Lomandra 'Evergreen baby'* · *Viola hederacea* · *Blechnum nudum*

MIX 11



Ficinia nodosa · *Dianella caerulea* · *Lomandra tanika* · *Grevillea 'juniperina 'Gold Cluster'* · *Goodenia ovata* · *Plectranthus argenatus*

MIX 12



Banksia spinulosa · *Ficinia nodosa* · *Juncus usitatus* · *Dianella caerulea* · *Lomandra tanika* · *Goodenia ovata* · *Grevillea juniperina 'Carpet Queen'* · *Banksia hybrid 'Bird Song'* · *Callistemon Little John*

MIX 13



Pandorea jasminoides · *Cissus antarctica* · *Hibbertia scandens* · *Myoporum parvifolium* · *Pelargonium australe*

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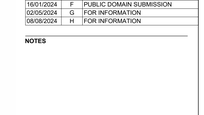
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DATE	REV	AMENDMENTS
17/01/2023	19	100% SUBMISSION
31/01/2023	20	FOR INFORMATION
07/03/2023	21	FOR INFORMATION
28/04/2023	22	DRAFT IFC
18/05/2023	A	IFC
28/06/2023	B	FOR INFORMATION
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NOTES

LEGEND

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PROJECT

NEW SYDNEY FISH MARKET
1B BRIDGE ROAD, GLEBE NSW

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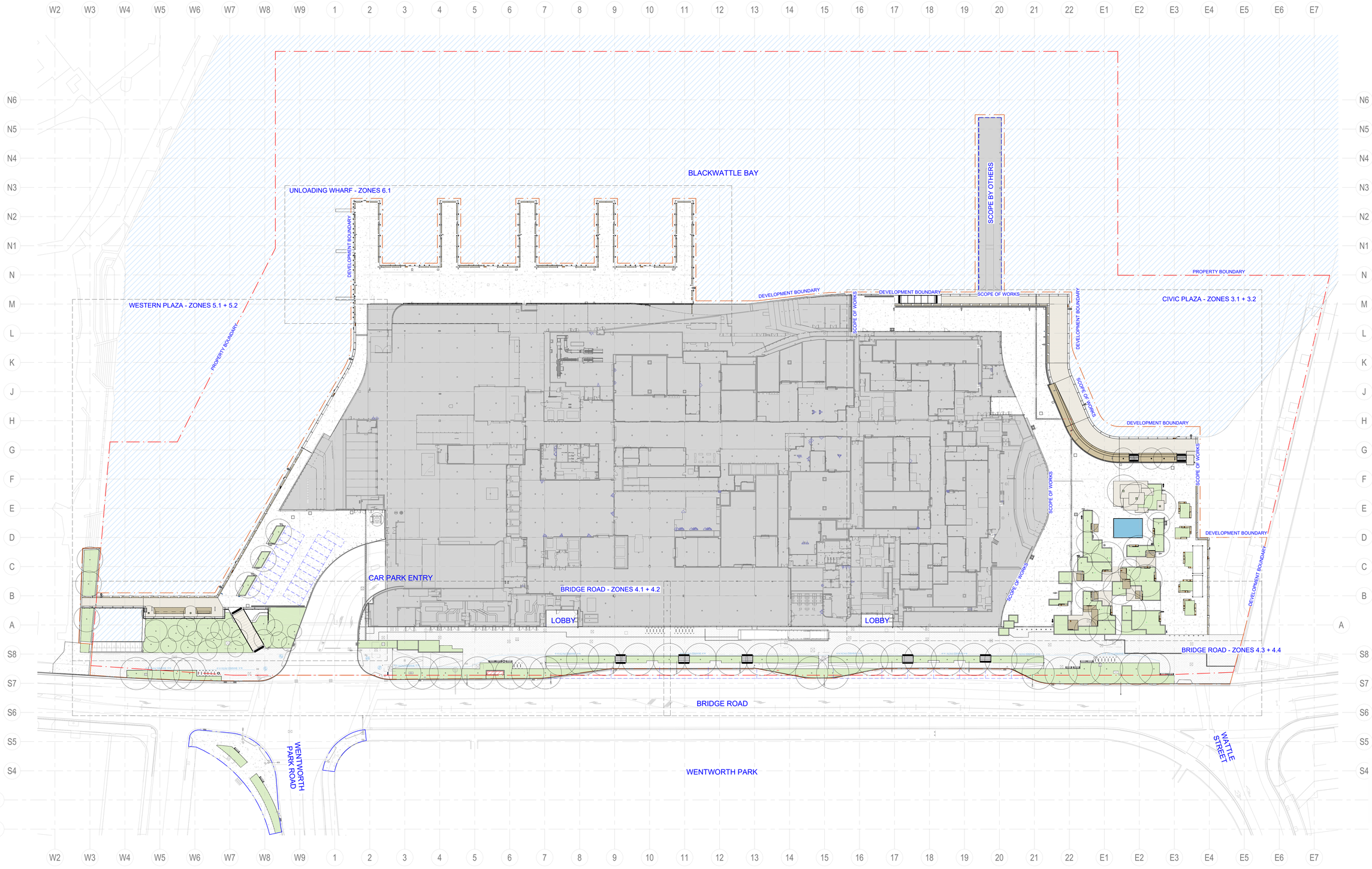
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DRAWING

PLANTING SCHEDULE

DRAWING NO. ASP-LA-00022

REVISION H



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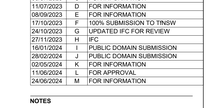
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DATE	REV	AMENDMENTS
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05/07/2023	C	FOR INFORMATION
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NOTES

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PROJECT

NEW SYDNEY FISH MARKET
1B BRIDGE ROAD, GLEBE NSW

CLIENT

MULTIPLEX

NORTH

SCALE A0 1 : 400 DRAWN MP CHECKED MS
SCALE A2 1 : 800
DESIGNED MS APPROVED LP

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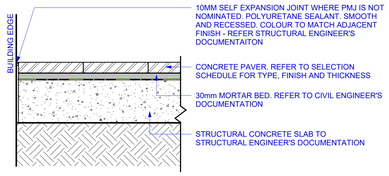
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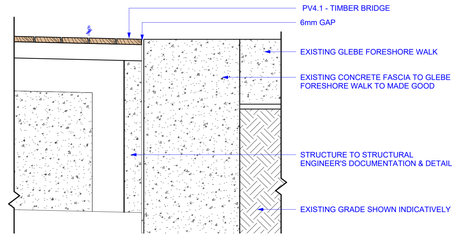
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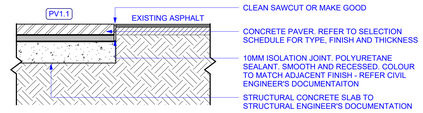
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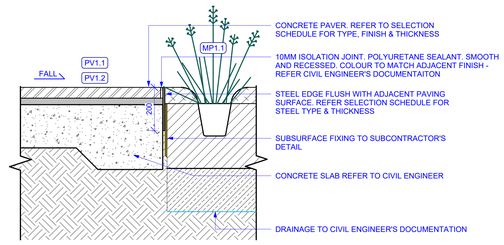
1 ED1 | PAVING INTERFACE - BUILDING EDGE
1 : 10



2 ED2 | TIMBER DECK INTERFACE - EXISTING GLEBE FORESHORE
1 : 10



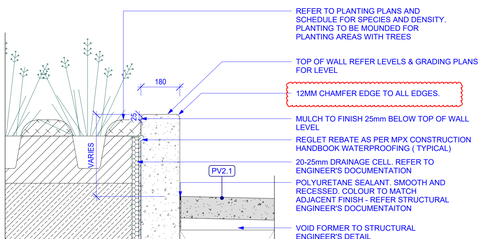
3 ED3 | PAVING INTERFACE - EXISTING ASPHALT
1 : 10



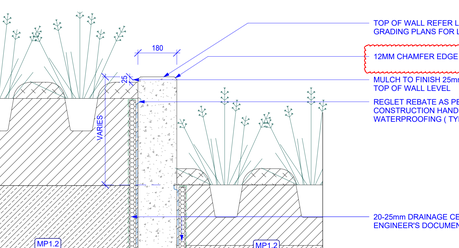
4 ED4 | PAVING INTERFACE - FLUSH MASS PLANTING
1 : 10

5 ED5 | PAVING INTERFACE - TO SUNKEN PLANTING
1 : 10

6 ED6 | PAVING INTERFACE - MASS PLANTING - BRIDGE ROAD
1 : 10



7 ED7 | PAVING INTERFACE - MASS PLANTING - SHARED PATH
1 : 10



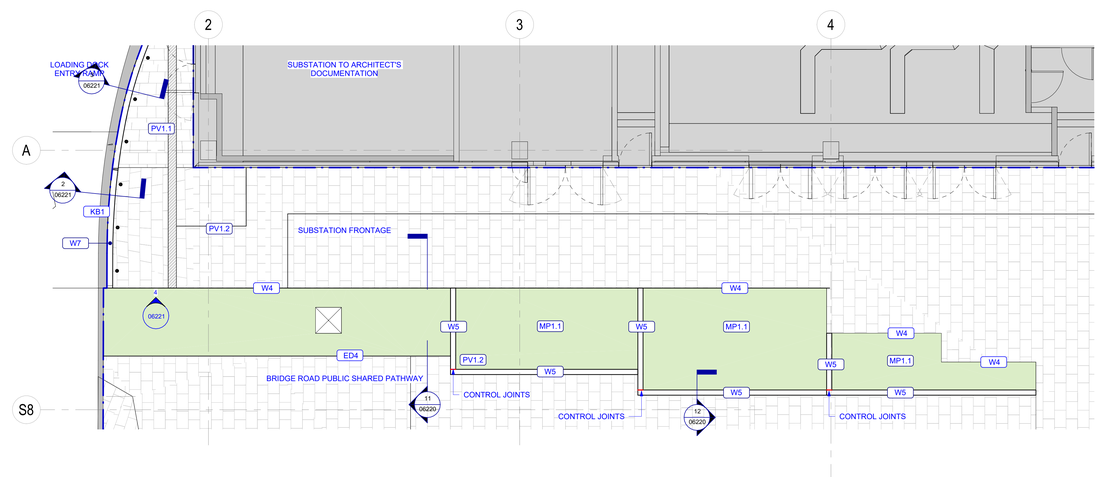
8 WWP INTERSECTION - INSITU CONCRETE PAVING TO FLUSH MASS PLANTING
1 : 10

9 W1 | INSITU CONCRETE WALL (FLUSH)
1 : 10

10 W2 | INSITU CONCRETE WALL (RAISED) - WIND MITIGATION PLANTER
1 : 10

11 W4 | CONCRETE CLAD WALL - PLANTER INTERFACE SECTION
1 : 10

12 W5 | INSITU CONCRETE WALL (RAISED) - IN FRONT OF SUBSTATION
1 : 10



13 W4 | CONCRETE CLAD WALL - PLAN
1 : 75

14 W5 | INSITU CONCRETE WALL (RAISED) - CIVIC PLAZA - TO PAVEMENT
1 : 10

15 W5 | INSITU CONCRETE WALL (RAISED) - CIVIC PLAZA - IN PLANTER
1 : 10

WARNING

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DATE	REV	AMENDMENTS
11/07/2023	B	FOR INFORMATION
14/09/2023	C	FOR INFORMATION
17/10/2023	D	100% SUBMISSION TO TfNSW
24/10/2023	E	UPDATED IFC FOR REVIEW
13/11/2023	F	FOR INFORMATION
21/11/2023	G	FOR INFORMATION
16/01/2024	H	PUBLIC DOMAIN SUBMISSION
28/02/2024	I	PUBLIC DOMAIN SUBMISSION
07/03/2024	J	FOR INFORMATION
02/05/2024	K	FOR INFORMATION
11/06/2024	L	FOR APPROVAL
24/06/2024	M	FOR INFORMATION

NOTES

KEYPLAN

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www.aspect-studios.com
ABN 11 120 219 561

PROJECT

NEW SYDNEY FISH MARKET
1B BRIDGE ROAD, GLEBE NSW

CLIENT

MULTIPLEX

NORTH

SCALE A0 As indicated
SCALE A2

DRAWN MS
CHECKED MP
DESIGNED MS
APPROVED LP

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STATUS

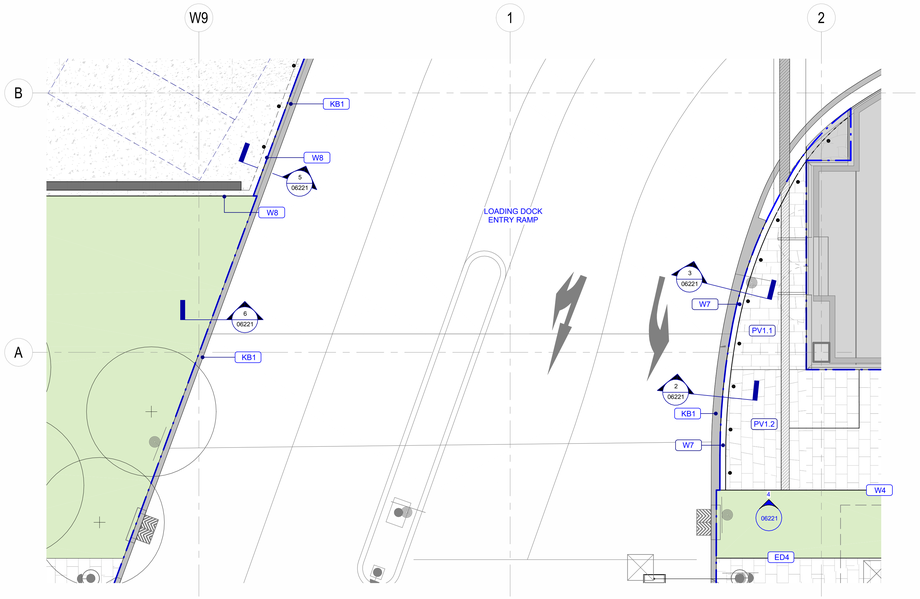
FOR CONSTRUCTION

DRAWING

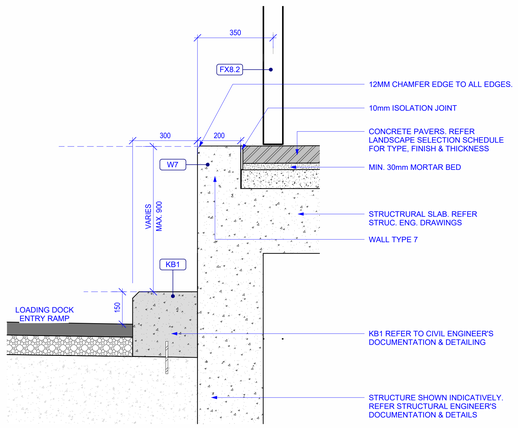
HARDWORKS - WALLS & EDGES

DRAWING NO. ASP-LA-06220

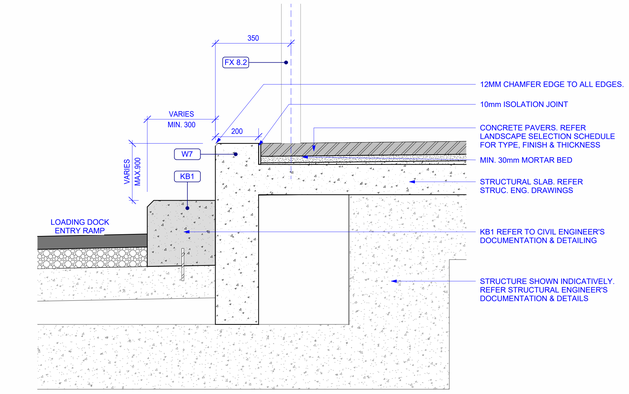
REVISION M



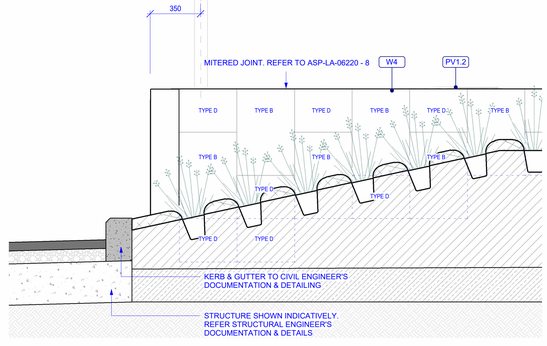
1 W7& W8 | PLAN
1 : 75



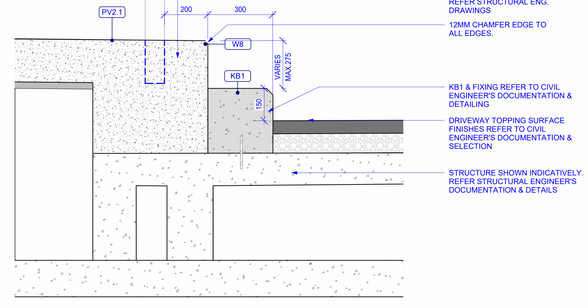
2 W7 | CONCRETE INSITU WALL - DRIVEWAY EASTERN INTERFACE SECTION 01
1 : 10



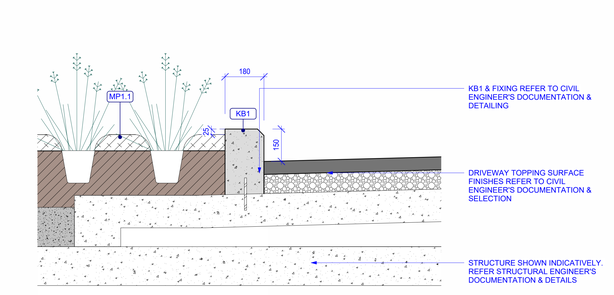
3 W7 | CONCRETE INSITU WALL - DRIVEWAY EASTERN INTERFACE SECTION 02
1 : 10



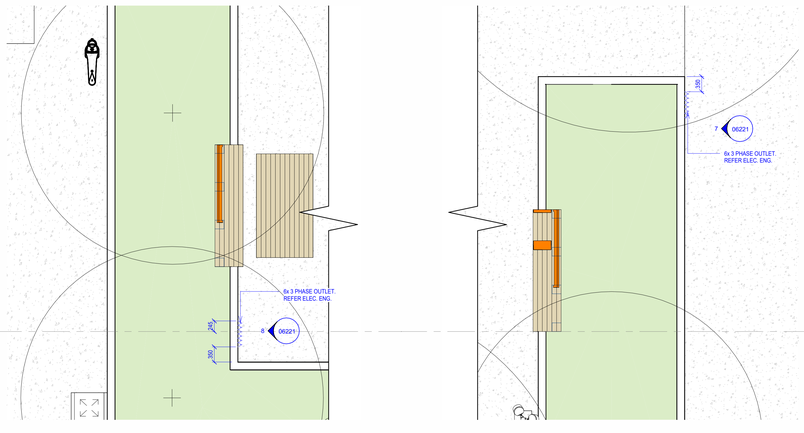
4 W7 | CONCRETE INSITU WALL - DRIVEWAY EASTERN INTERFACE ELEVATION
1 : 15



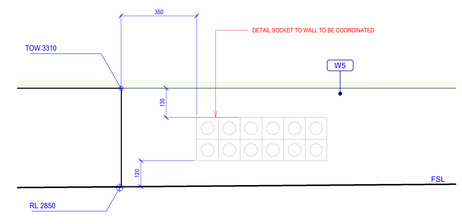
5 W8 | DRIVEWAY WESTERN INTERFACE SECTION 01
1 : 10



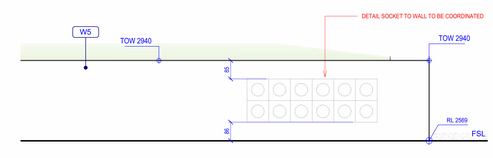
6 KB1 | DRIVEWAY WESTERN INTERFACE SECTION 02
1 : 10



9 CIVIC PLAZA POWER OUTLET SETOUT - PLAN
1 : 50



8 CIVIC PLAZA POWER OUTLET SETOUT - ELEVATION 01
1 : 10



7 CIVIC PLAZA POWER OUTLET SETOUT - ELEVATION 02
1 : 10

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DATE	REV	AMENDMENTS
07/03/2024	A	FOR INFORMATION
02/05/2024	B	FOR INFORMATION
24/06/2024	C	FOR INFORMATION
20/08/2024	D	IFC - POWER OUTLET UPDATE

NOTES

KEYPLAN

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ARCHITECTURE - BVN
205 Pitt St
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ELECTRICAL - Stowe
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PROJECT

NEW SYDNEY FISH MARKET
1B BRIDGE ROAD, GLEBE NSW

CLIENT

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NORTH

SCALE A0 As indicated
SCALE A2
DRAWN MP CHECKED MS
DESIGNED MS APPROVED LP

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STATUS

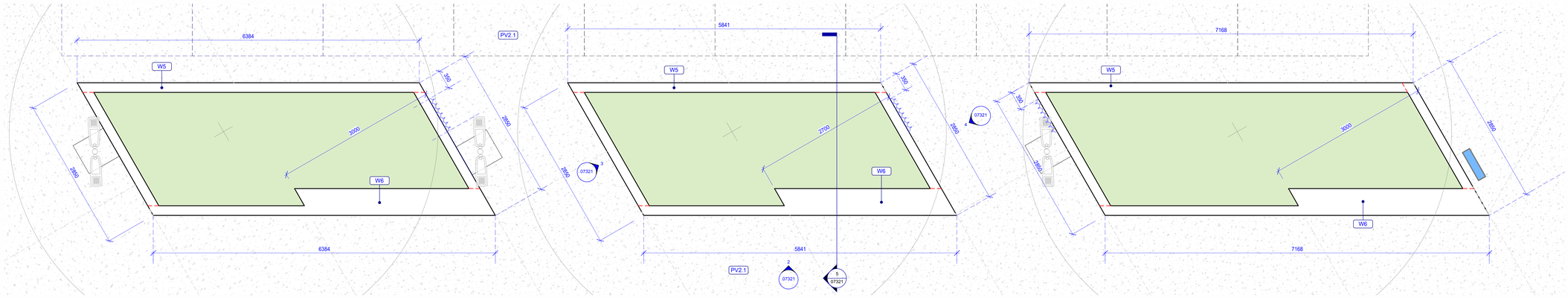
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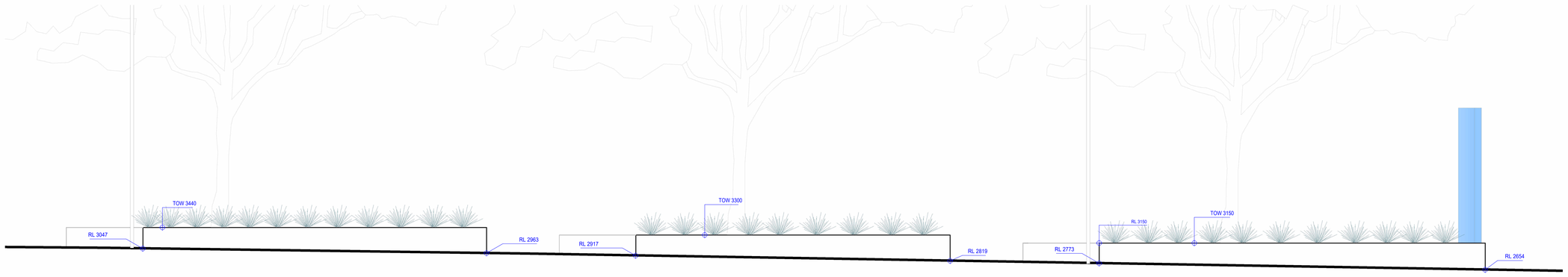
HARDWORKS - WALLS & EDGES

DRAWING NO. **REVISION**

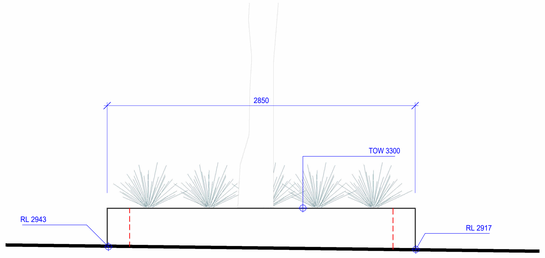
ASP-LA-06221 D



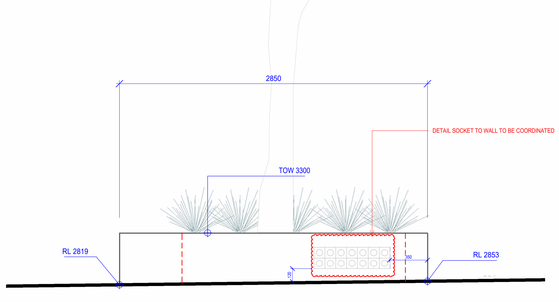
1 WESTERN PLAZA PLANTER WALL- PLAN
1 : 30



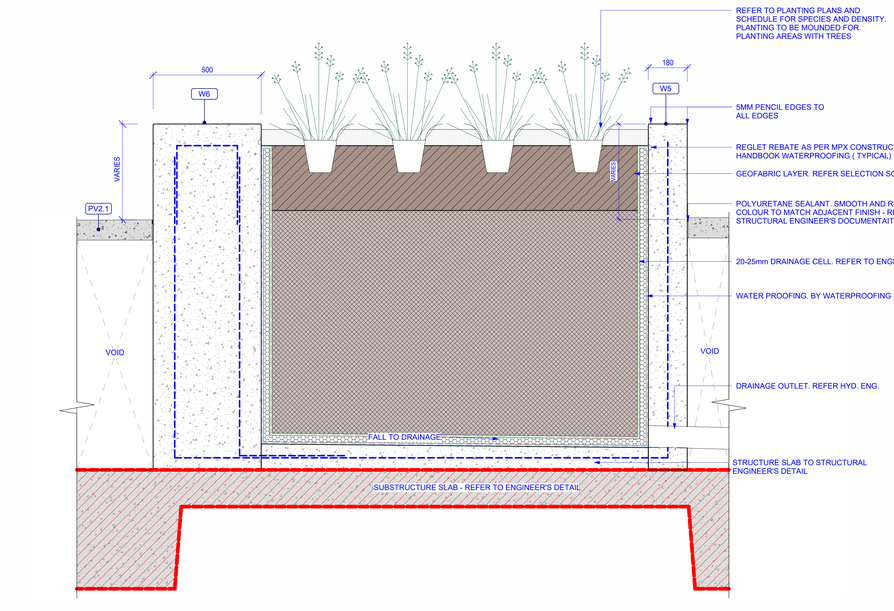
2 WESTERN PLAZA PLANTER WALL- ELEVATION
1 : 30



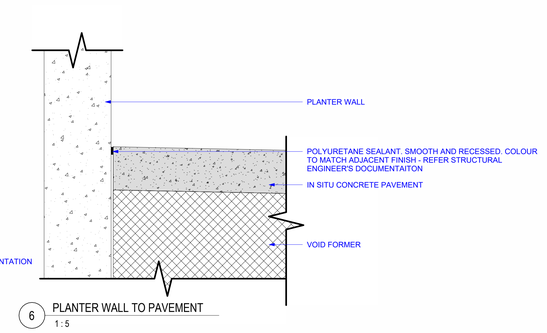
3 WESTERN PLAZA PLANTER WALL- SIDE ELEVATION 01
1 : 20



4 WESTERN PLAZA PLANTER WALL- SIDE ELEVATION 02
1 : 20



5 WESTERN PLAZA PLANTER WALL - SECTION
1 : 10



6 PLANTER WALL TO PAVEMENT
1 : 5



7 3 PHASE POWER OUTLET - 204x101x108mm PRODUCT IMAGE



8 DOUBLE EXTERNAL POWERPOINT PRODUCT IMAGE
1 : 10

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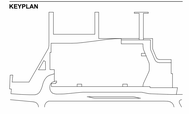
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DATE	REV	AMENDMENTS
05/8/2022	2	90% TENDER
22/08/2022	3	90% TENDER
24/08/2022	4	90% TENDER
07/10/2022	5	DRAFT 100% DETAILED DESIGN
25/11/2022	6	100% SUBMISSION
28/04/2023	7	DRAFT IFC
18/05/2023	A	IFC
11/07/2023	B	FOR INFORMATION
24/10/2023	C	UPDATED IFC FOR REVIEW
27/11/2023	D	IFC
12/02/2024	E	FOR INFORMATION
02/05/2024	F	FOR INFORMATION

NOTES

LEGEND

KEYPLAN



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3XN — ARCHITECTURE - 3XN
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T (45) 7026 2648

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www.aspect-studios.com
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PROJECT

NEW SYDNEY FISH MARKET
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CLIENT

MULTIPLEX

NORTH

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SCALE A2
DRAWN MP
CHECKED MS
DESIGNED MS
APPROVED LP

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STATUS

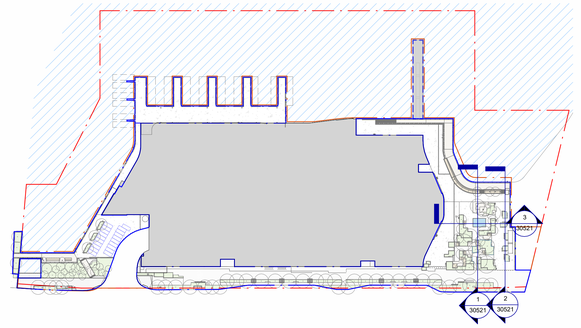
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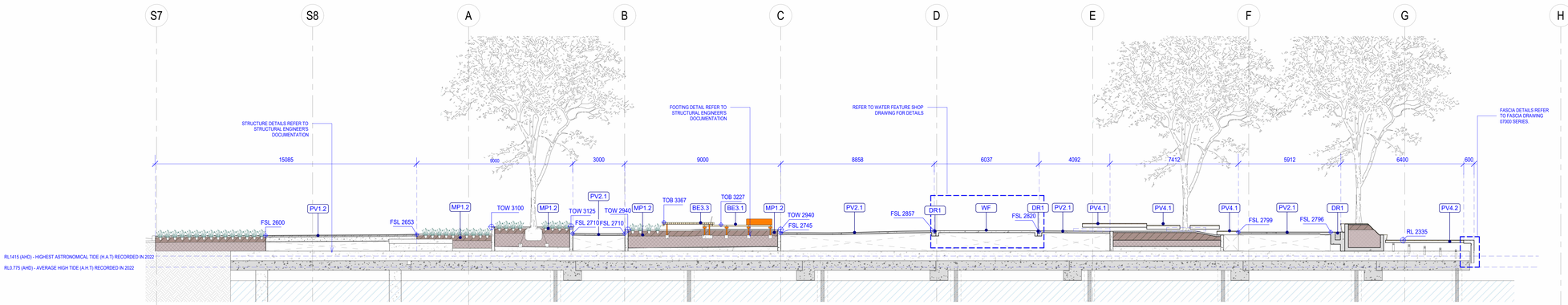
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PLANTER WALLS

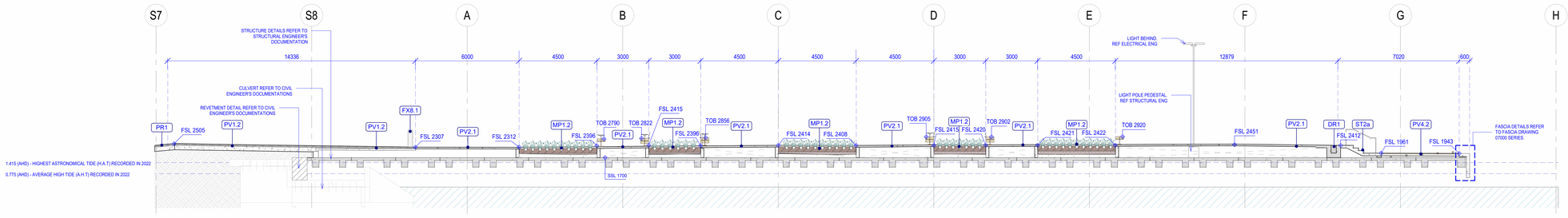
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REVISION F

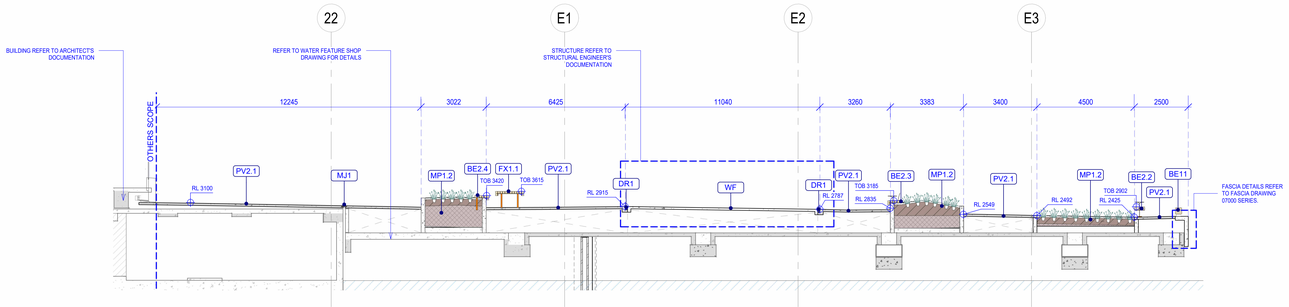




1 SITE SECTION | CIVIC PLAZA 01 - RAISED PLANTERS
1 : 100



2 SITE SECTION | CIVIC PLAZA 02 - FLUSH PLANTERS
1 : 100



3 SITE SECTION | CIVIC PLAZA 03 - WATER FEATURE
1 : 100

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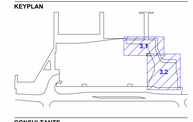
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22/08/2022	3	90% TENDER
24/08/2022	4	90% TENDER
07/10/2022	5	DRAFT 100% DETAILED DESIGN
28/10/2022	6	Package 4 - Landlord's Works to AFC
25/11/2022	7	100% SUBMISSION
28/04/2023	8	DRAFT IFC
18/05/2023	A	IFC
11/07/2023	B	FOR INFORMATION
24/10/2023	C	UPDATED IFC FOR REVIEW
27/11/2023	D	IFC
02/05/2024	E	FOR INFORMATION
24/05/2024	F	FOR INFORMATION

NOTES

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at& — CIVIL - AT&L
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BVN — ARCHITECTURE - BVN
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Sydney NSW 2000
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PROJECT

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1B BRIDGE ROAD, GLEBE NSW

CLIENT

MULTIPLEX

NORTH

SCALE A0 As indicated
SCALE A3

DRAWN MP
CHECKED MS
DESIGNED MS
APPROVED LP

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STATUS

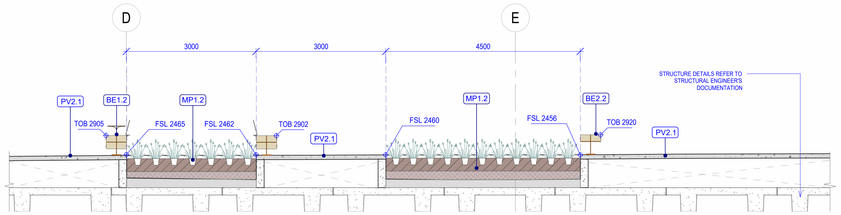
FOR CONSTRUCTION

DRAWING

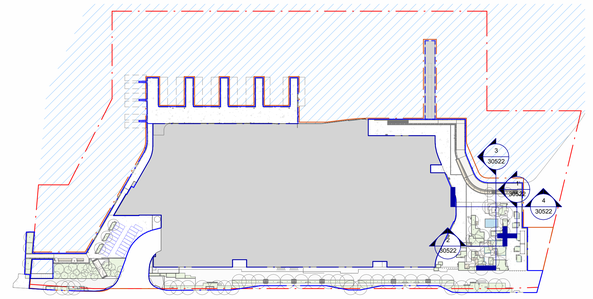
SITE SECTIONS - CIVIC PLAZA
ZONE 3.1 + 3.2

DRAWING NO. ASP-LA-30521

REVISION F



1 CIVIC PLAZA - FURNITURE SECTION 01
1 : 50



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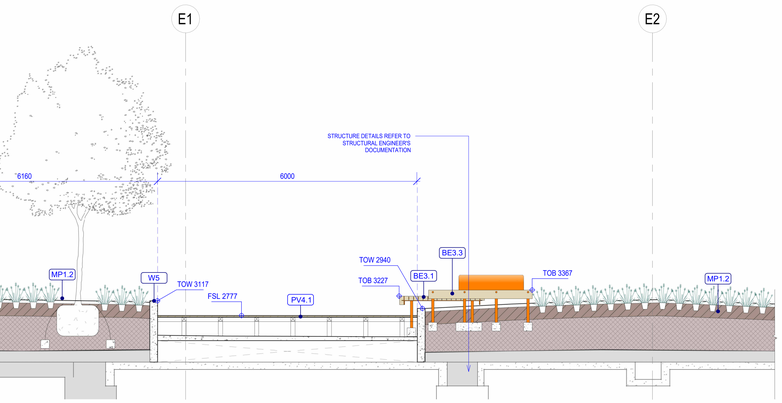
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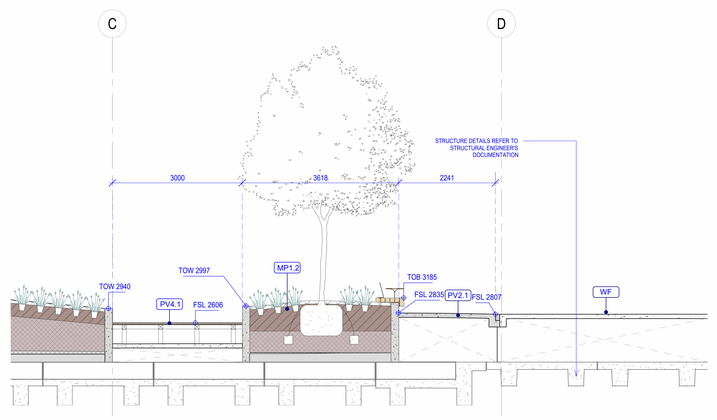
DATE	REV	AMENDMENTS
28/10/2022	1	Package 4 - Landlord's Works to AFC
25/11/2022	2	100% SUBMISSION
28/04/2023	3	DRAFT IFC
18/05/2023	A	IFC
11/07/2023	B	FOR INFORMATION
24/10/2023	C	UPDATED IFC FOR REVIEW
27/11/2023	D	IFC
02/05/2024	E	FOR INFORMATION
24/05/2024	F	FOR INFORMATION

NOTES

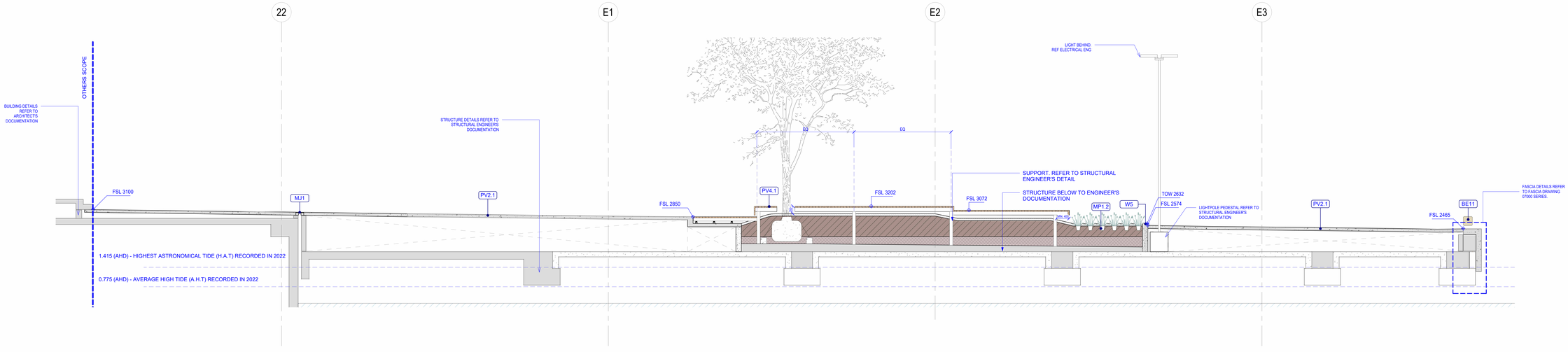
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2 CIVIC PLAZA - FURNITURE SECTION 02
1 : 50

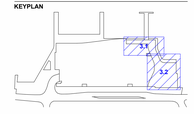


3 CIVIC PLAZA - FURNITURE SECTION 03
1 : 50



4 CIVIC PLAZA _WEST - EAST SECTION
1 : 50

KEYPLAN



CONSULTANTS

3XN — ARCHITECTURE - 3XN
309/78a Boundary St
Sydney NSW 2010
T (45) 7026 2646

at&l — CIVIL - AT&L
10/10 Walker St
North Sydney NSW 2060
T (02) 9438 1777

BVN — ARCHITECTURE - BVN
255 Pitt St
Sydney NSW 2000
T (02) 8297 7200

EQUILIBRIUM — SERVICES - EC,JV
7/39 Brookhollow Ave
Norwest NSW 2153
T (02) 9439 4622

enstruct — STRUCTURAL - Enstruct
4/2 Glen St
Milsons Point NSW 2061
T (02) 8904 1444

STOWE — ELECTRICAL - Stowe
10-12 Clyde St
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T (02) 9848 2111

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Level 1, 78-80 George Street
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Australia
T 02 9699 7182
www.aspect-studios.com
sydney@aspect-studios.com
ABN 11 120 219 561

PROJECT

NEW SYDNEY FISH MARKET
1B BRIDGE ROAD, GLEBE NSW

CLIENT

MULTIPLEX

NORTH

SCALE A0 As indicated
SCALE A3

DRAWN MP
CHECKED MS
DESIGNED MS
APPROVED LP

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STATUS

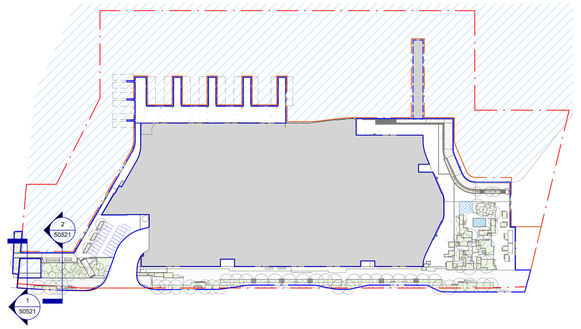
FOR CONSTRUCTION

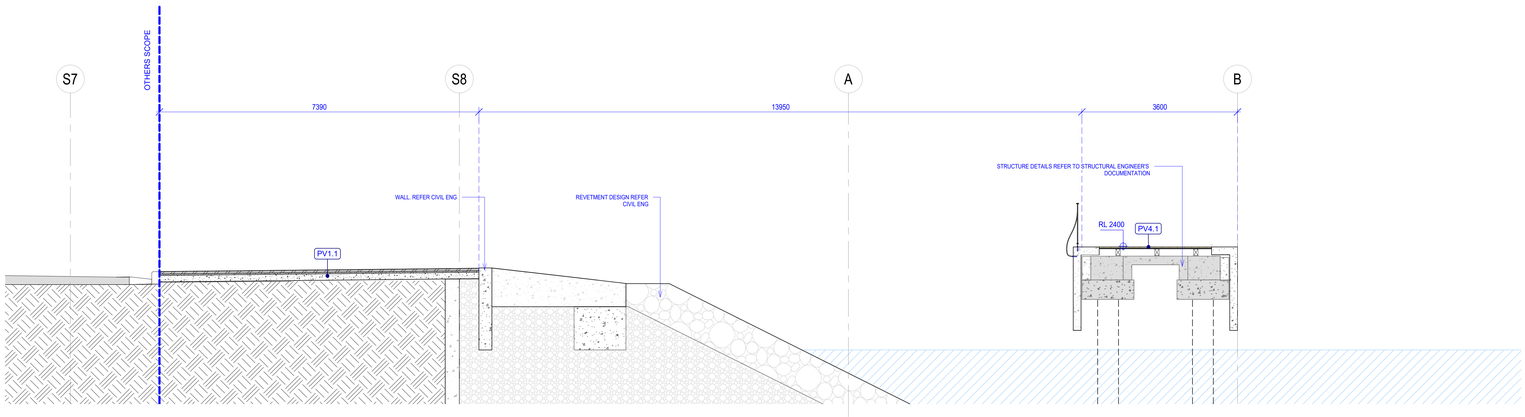
DRAWING

SITE SECTIONS - CIVIC PLAZA

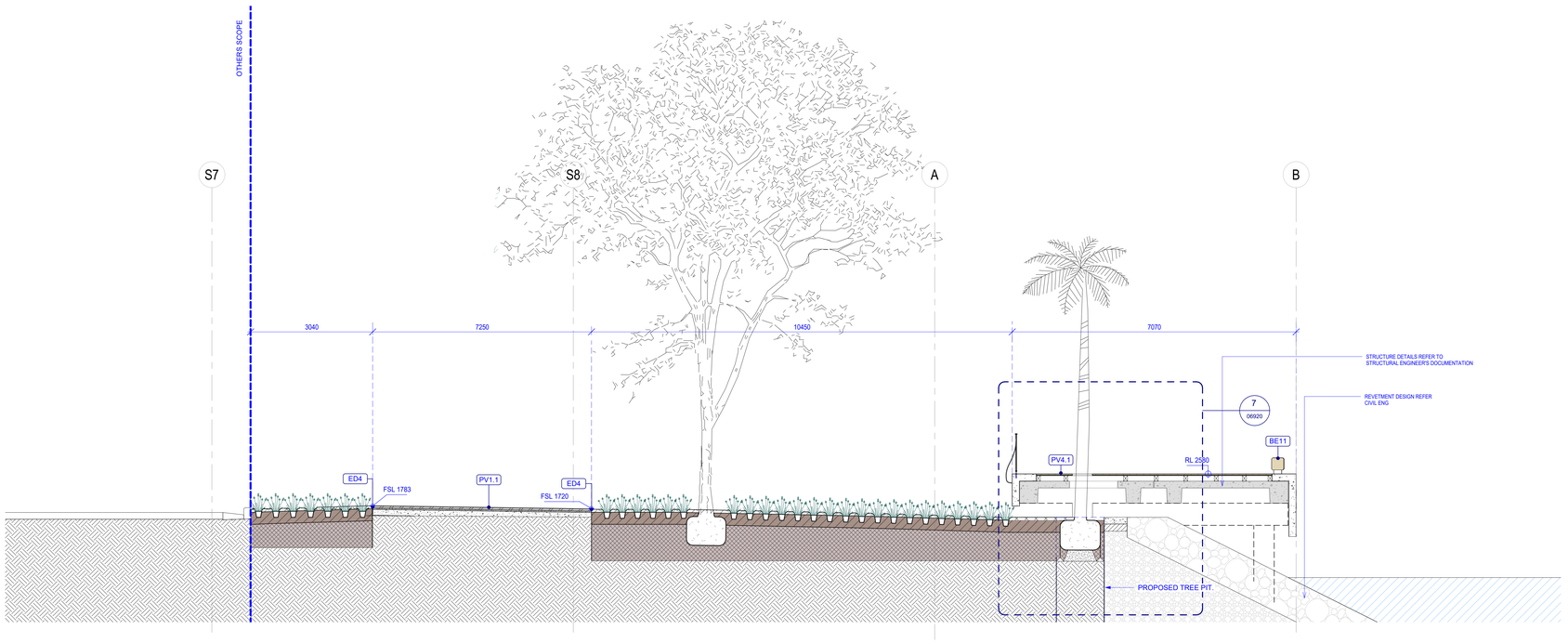
DRAWING NO. ASP-LA-30522

REVISION F





1 SITE SECTION | WESTERN PLAZA 01 - BRIDGE LINK
1 : 50



2 SITE SECTION | WESTERN PLAZA 02 - SUNKEN PLANTER
1 : 50

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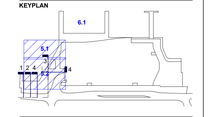
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DATE	REV	AMENDMENTS
22/08/2022	4	90% TENDER
24/08/2022	5	90% TENDER
07/10/2022	6	DRAFT 100% DETAILED DESIGN
28/10/2022	7	Package 4 - Landlord's Works to AFC
25/11/2022	8	100% SUBMISSION
28/04/2023	9	DRAFT IFC
18/05/2023	A	IFC
11/07/2023	B	FOR INFORMATION
24/10/2023	C	UPDATED IFC FOR REVIEW
16/01/2024	D	PUBLIC DOMAIN SUBMISSION
02/05/2024	E	FOR INFORMATION
24/05/2024	F	FOR INFORMATION

NOTES

KEYPLAN



CONSULTANTS

ARCHITECTURE - 3XN
509/19a Boundary St
Sydney NSW 2010
T (45) 7026 0646

CIVIL - AT&L
10/10 Walker St
North Sydney NSW 2060
T (02) 9438 1777

ARCHITECTURE - BVN
355 Pitt St
Sydney NSW 2000
T (02) 8297 7200

SERVICES - EC,JV
7/38 Brookhollow Ave
Norwest NSW 2153
T (02) 9439 4622

STRUCTURAL - Enstruct
4/2 Glen St
Milsons Point NSW 2061
T (02) 8904 1444

ELECTRICAL - Stowe
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sydney@aspect-studios.com
ABN 11 120 219 561

PROJECT

NEW SYDNEY FISH MARKET
1B BRIDGE ROAD, GLEBE NSW

CLIENT

MULTIPLEX

NORTH

SCALE A0 As indicated
SCALE A3

DRAWN MP
CHECKED MS
DESIGNED MS
APPROVED LP

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STATUS

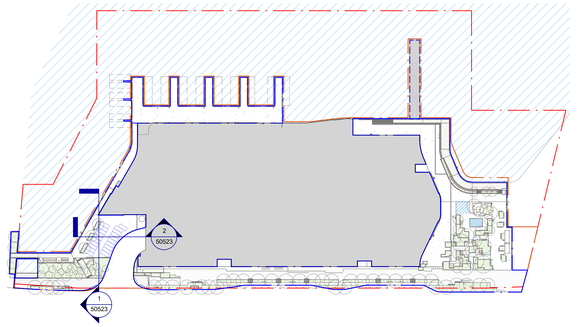
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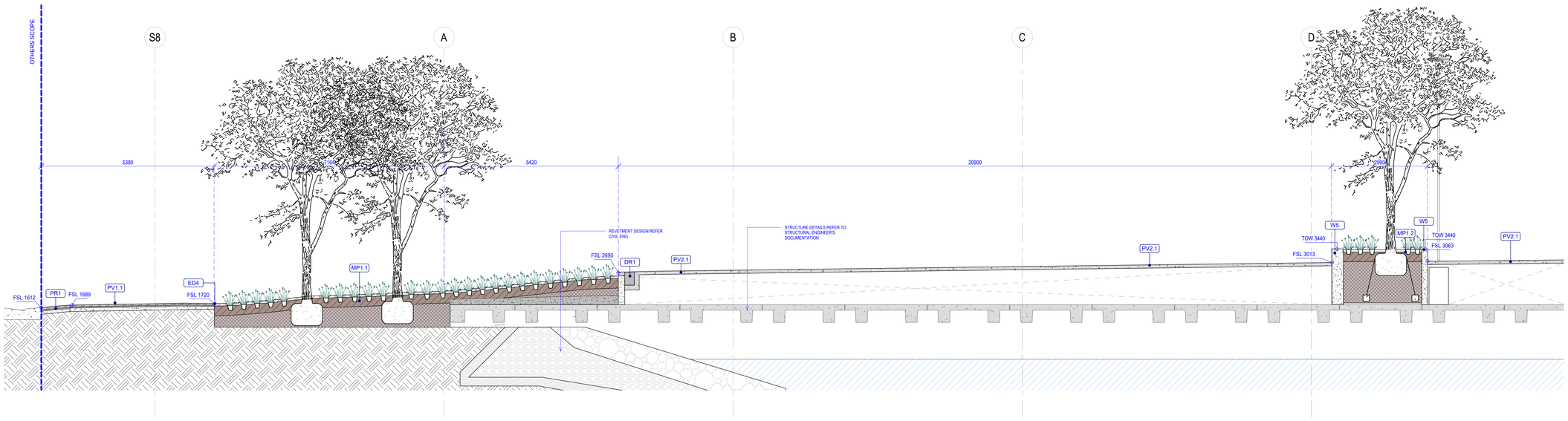
DRAWING

SITE SECTIONS - WESTERN PLAZA
ZONE 5.1 + 5.2

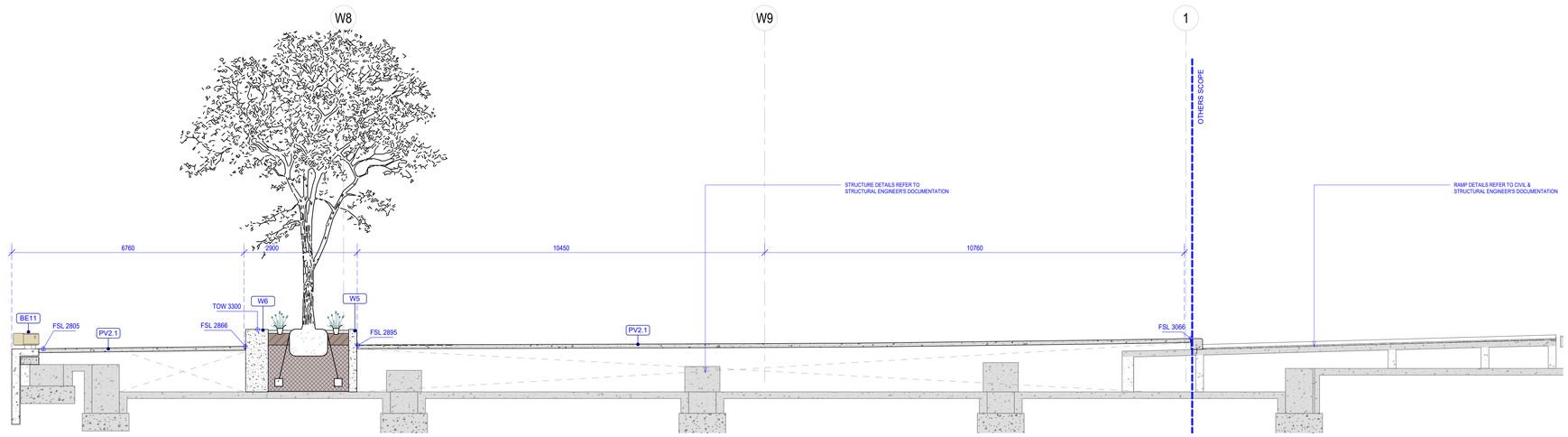
DRAWING NO. **REVISION**

ASP-LA-50521 F





1 SITE SECTION | WESTERN PLAZA 03 - PEDESTRIAN RAMP
1 : 50



2 SITE SECTION | WESTERN PLAZA 04 - PAVED AREA
1 : 50

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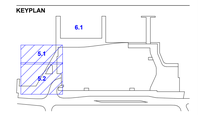
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DATE	REV	AMENDMENTS
28/10/2022	1	Package 4 - Landlord's Works to AFC
25/11/2022	2	100% SUBMISSION
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24/10/2023	C	UPDATED IFC FOR REVIEW
16/01/2024	D	PUBLIC DOMAIN SUBMISSION
02/05/2024	E	FOR INFORMATION
24/05/2024	F	FOR INFORMATION

NOTES

KEYPLAN



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ARCHITECTURE - 3XN
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T (45) 7026 2648

CIVIL - AT&L
7/153 Walker St
North Sydney NSW 2060
T (02) 9439 1777

ARCHITECTURE - BVN
355 Pitt St
Sydney NSW 2000
T (02) 8297 7200

SERVICES - EC|V
7/38 Brookhollow Ave
Norwest NSW 2153
T (02) 9439 4822

STRUCTURAL - Enstruct
2/2 Glen St
Milsons Point NSW 2061
T (02) 8904 1444

ELECTRICAL - Stowe
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PROJECT

NEW SYDNEY FISH MARKET
1B BRIDGE ROAD, GLEBE NSW

CLIENT

MULTIPLEX

NORTH

SCALE A0 As indicated
SCALE A2

DRAWN MP
CHECKED MS
DESIGNED MS
APPROVED LP

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STATUS

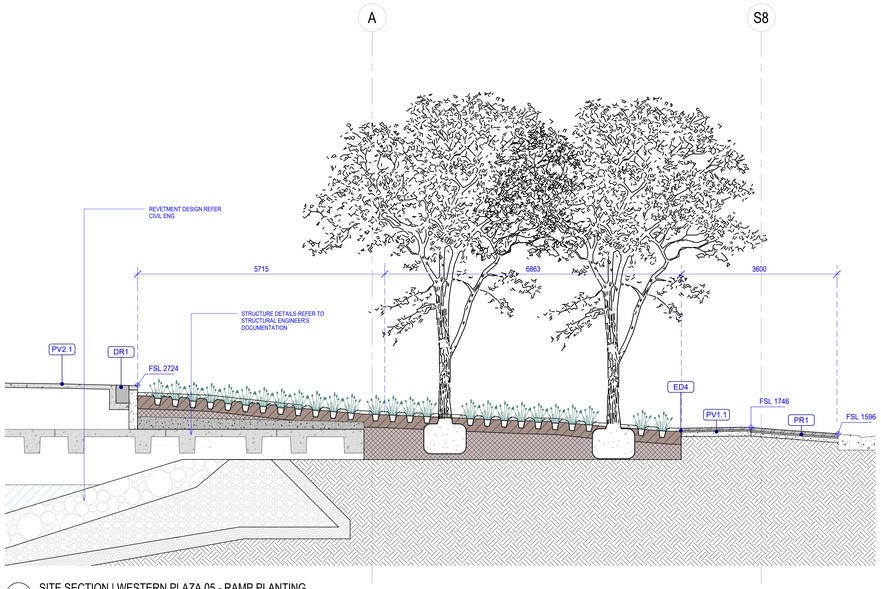
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DRAWING

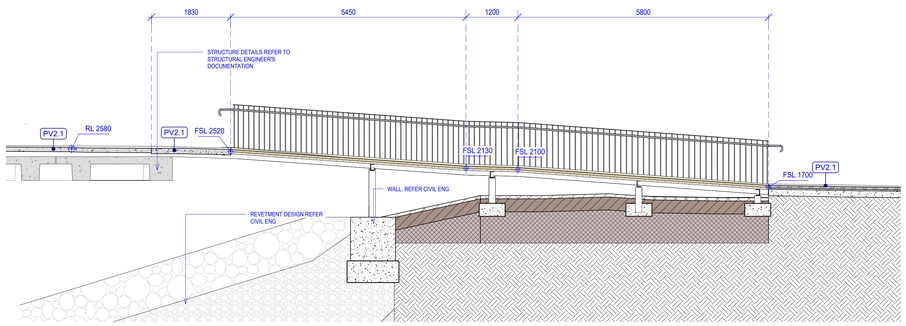
SITE SECTIONS - WESTERN PLAZA

DRAWING NO. ASP-LA-50523

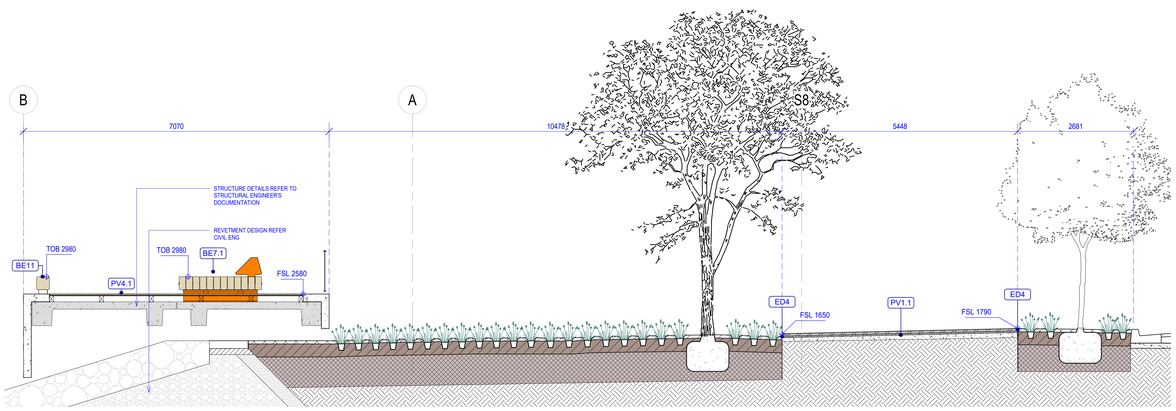
REVISION F



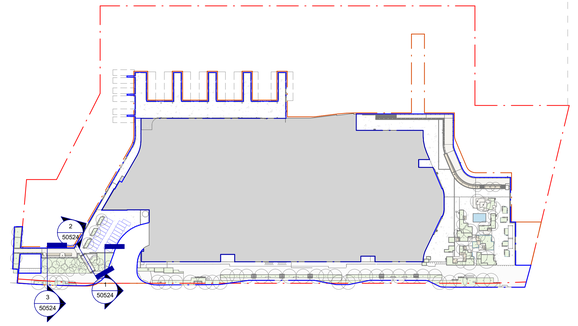
1 SITE SECTION | WESTERN PLAZA 05 - RAMP PLANTING
1 : 50



2 SITE SECTION | WESTERN PLAZA 01 - BRIDGE LINK
1 : 50



3 SITE SECTION | WESTERN PLAZA - PATHWAYS
1 : 50



WARNING

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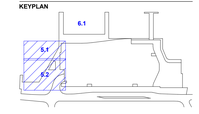
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DATE	REV	AMENDMENTS
28/10/2022	1	Package 4 - Landlord's Works to AFC
25/11/2022	2	100% SUBMISSION
28/04/2023	3	DRAFT IFC
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16/01/2024	D	PUBLIC DOMAIN SUBMISSION
02/05/2024	E	FOR INFORMATION
24/05/2024	F	FOR INFORMATION

NOTES

KEYPLAN



CONSULTANTS

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309/78a Boundary St
Sydney NSW 2010
T (45) 7026 3648

CIVIL - AT&L
10/10 Walker St
North Sydney NSW 2060
T (02) 9438 1777

ARCHITECTURE - BVN
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Sydney NSW 2000
T (02) 8297 7200

SERVICES - EC,JV
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Norwest NSW 2153
T (02) 9439 4622

STRUCTURAL - Enstruct
4/2 Glen St
Milsons Point NSW 2061
T (02) 8904 1444

ELECTRICAL - Stowe
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sydney@aspect-studios.com
ABN 11 120 219 561

PROJECT

NEW SYDNEY FISH MARKET
1B BRIDGE ROAD, GLEBE NSW

CLIENT

MULTIPLEX

NORTH

SCALE A0 As indicated
SCALE A3

DRAWN MP
CHECKED MS
DESIGNED MS
APPROVED LP

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STATUS

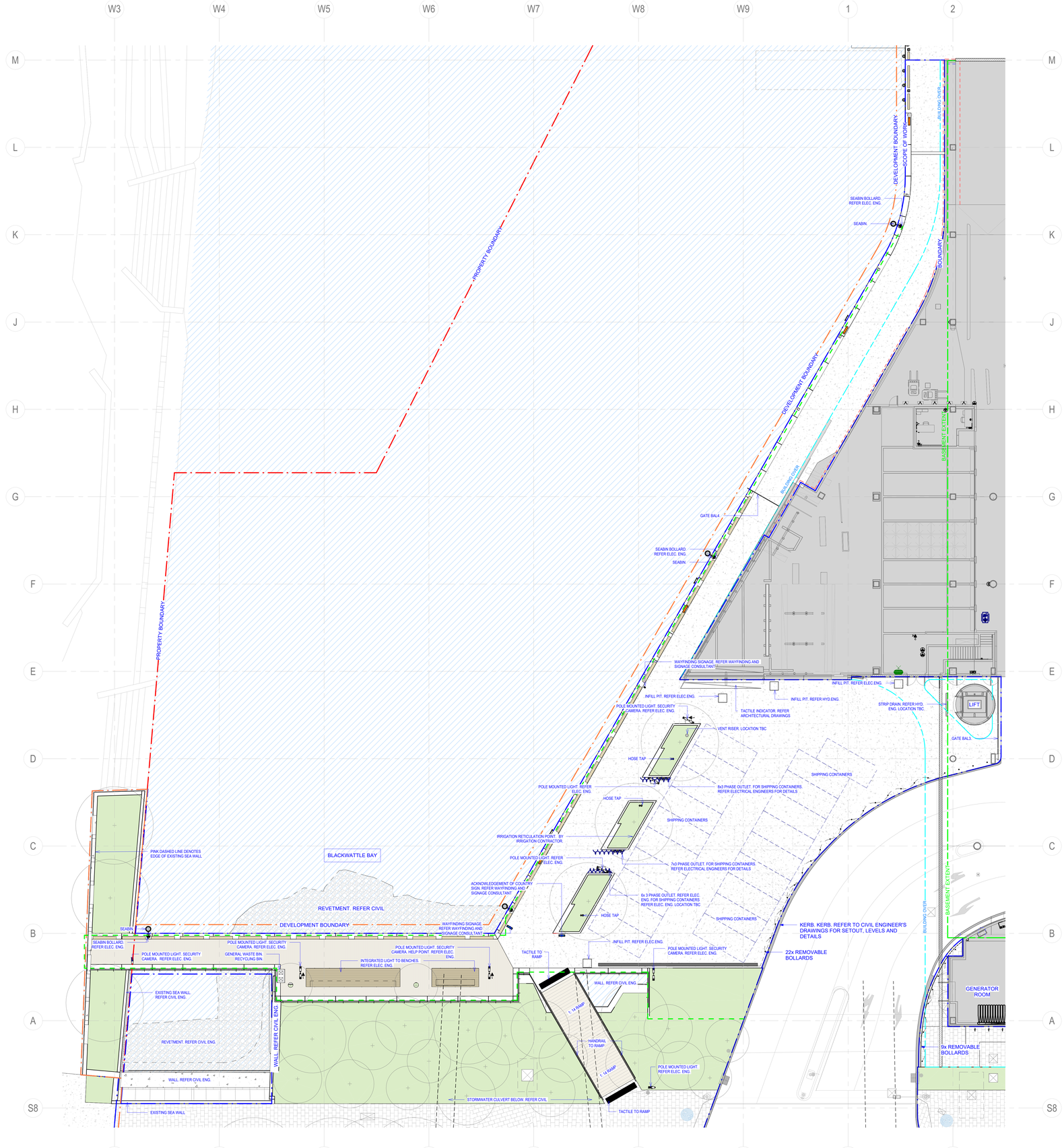
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DRAWING

SITE SECTIONS - WESTERN PLAZA

DRAWING NO. **REVISION**

ASP-LA-50524 F



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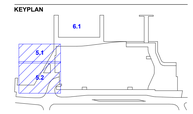
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DATE	REV	AMENDMENTS
28/04/2023	B	DRAFT IFC
18/05/2023	A	IFC
11/07/2023	B	FOR INFORMATION
08/09/2023	C	FOR INFORMATION
14/09/2023	D	FOR INFORMATION
12/10/2023	E	FOR INFORMATION
24/10/2023	F	UPDATED IFC FOR REVIEW
16/01/2024	G	PUBLIC DOMAIN SUBMISSION
22/02/2024	H	FOR INFORMATION
07/03/2024	I	FOR INFORMATION
02/05/2024	J	FOR INFORMATION
24/06/2024	K	FOR INFORMATION

NOTES

LEGEND

KEYPLAN



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100/19a Boundary St
Rushcutters Bay 2000
T (02) 9326 9444

CIVIL - AT&L
G153 Walker St
North Sydney NSW 2060
T (02) 9929 7777

ARCHITECTURE - BVN
355 Pitt St
Sydney NSW 2000
T (02) 8297 7200

SERVICES - ECJV
708 Brookhollow Ave
Norwest NSW 2153
T (02) 9439 4822

STRUCTURAL - Enstruct
#2 Glen St
Milsons Point NSW 2061
T (02) 8904 1444

ELECTRICAL - Stowe
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Rydalmere NSW 2116
T (02) 9848 2111

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sydney@aspect-studios.com
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PROJECT

NEW SYDNEY FISH MARKET
1B BRIDGE ROAD, GLEBE NSW

CLIENT

MULTIPLEX

NORTH

SCALE A0 1 : 150 DRAWN MP CHECKED MS
SCALE A2
DESIGNED MS APPROVED LP

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STATUS

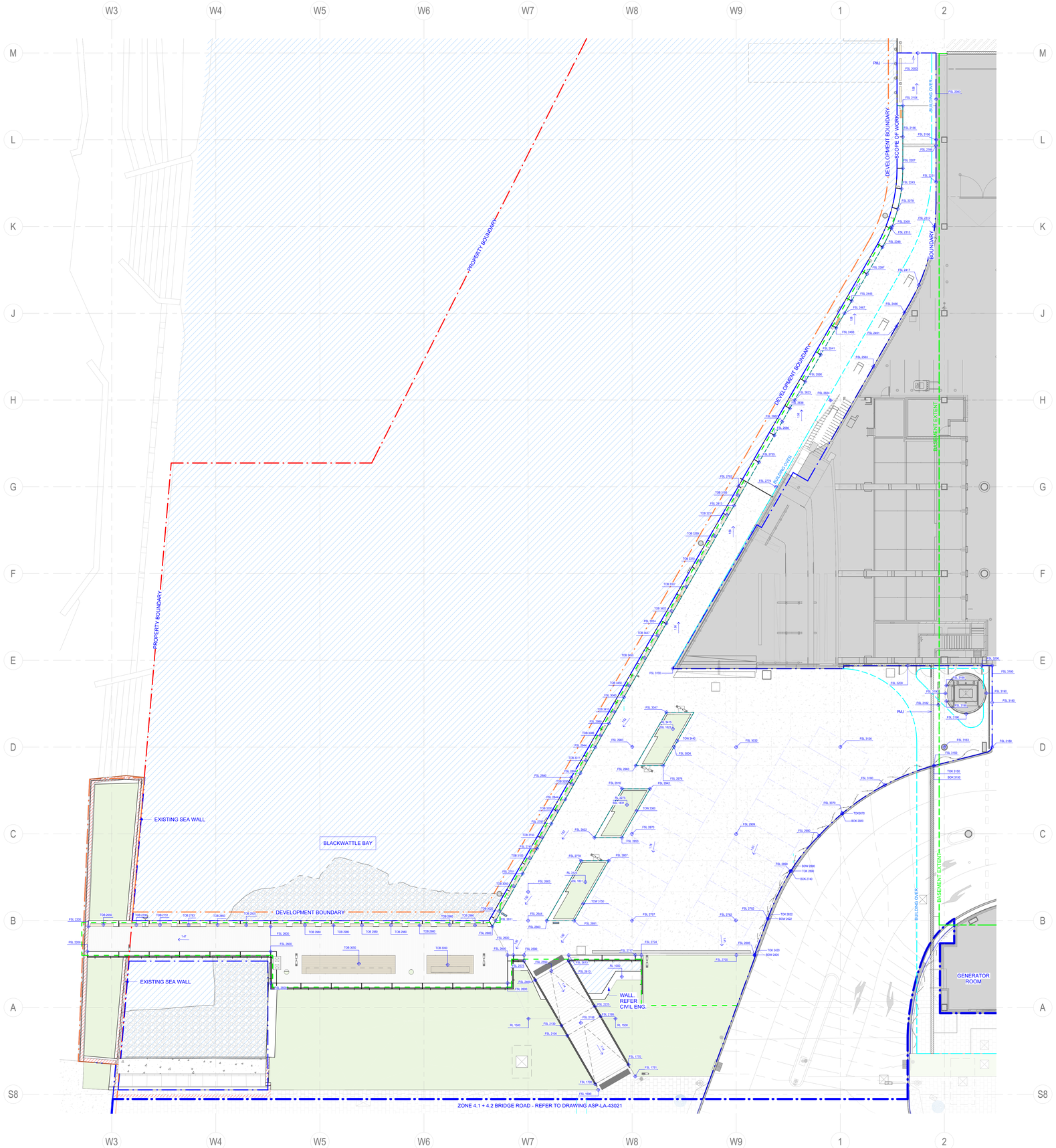
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DRAWING

GENERAL ARRANGEMENT - WESTERN PLAZA

DRAWING NO. ASP-LA-51021

REVISION K



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DATE	REV	AMENDMENTS
19/06/2023	19	80% SUBMISSION
23/06/2023	20	DRAWING NUMBER AMENDED TO SUIT DOCUMENT CONTROL
11/07/2023	B	FOR INFORMATION
08/09/2023	C	FOR INFORMATION
14/09/2023	D	FOR INFORMATION
24/10/2023	E	UPDATED IFC FOR REVIEW
16/01/2024	F	PUBLIC DOMAIN SUBMISSION
22/02/2024	G	FOR INFORMATION
07/03/2024	H	FOR INFORMATION
02/05/2024	I	FOR INFORMATION
24/06/2024	J	FOR INFORMATION

NOTES

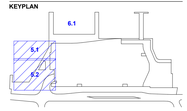
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CONTRACTOR MUST COMPLY TO AS.

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LEGEND

TOB	TOP OF BENCH
TOW	TOP OF WALL
DSL	DRAINAGE SURFACE LEVEL
DIL	DRAINAGE INVERT LEVEL
FSL	FINISHED SURFACE LEVEL
SSL	STRUCTURAL SLAB LEVEL
SUBL	SUBSTRUCTURAL SLAB LEVEL
	CONCRETE JOINTS SETOUTS PERMANENT MOVEMENTS JOINTS SETOUTS SETDOWN EDGES SETOUTS SLAB SETOUTS
	WALL SETOUTS
	LIGHTPOLE PEDESTAL SETOUTS SIGNAGE FOOTING SETOUTS INFILL ELECTRICAL PITS SETOUTS
	SAWN CONSTRUCTION JOINT
	FORMED CONSTRUCTION JOINT
	PERMANENT MOVEMENTS JOINTS
	STEP IN SLAB
	STRUCTURE BELOW
	FALL LINE
	LIGHTPOLE PEDESTAL SIGNAGE FOOTING REFER TO STRUCTURAL ENG.
	PITS REFER TO ELECTRICAL ENG. & HYDRAULIC ENG.
	WESTERN PROMENADE EXTERNAL STITCH REFER TO STRUCTURAL ENG.

KEYPLAN



CONSULTANTS

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Surry Hills NSW 2010
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CIVIL - AT&L
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North Sydney NSW 2060
T (02) 9439 7777

ARCHITECTURE - BVN
155 Pitt St
Sydney NSW 2000
T (02) 8297 7200

SERVICES - ECJV
7/38 Brookhollow Ave
Norwest NSW 2153
T (02) 9439 4622

STRUCTURAL - Enstruct
Suite 2.04
10 Century Point NSW 2061
T (02) 8904 1444

ELECTRICAL - Stowe
Suite 2.04
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Redfern NSW 2016
Australia
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www.aspect-studios.com
sydney@aspect-studios.com
ABN 11 120 219 561

PROJECT

NEW SYDNEY FISH MARKET
1B BRIDGE ROAD, GLEBE NSW

CLIENT

MULTIPLEX

NORTH

SCALE A0 As indicated @ 100
SCALE A2

DRAWN MP
CHECKED MS
DESIGNED MS
APPROVED LP

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STATUS

FOR CONSTRUCTION

DRAWING

LEVELS + GRADING - WESTERN PLAZA
ZONE 5.1 & 5.2

DRAWING NO. **ASP-LA-53011**

REVISION **J**

New Sydney Fish Markets

Landscape Technical Specification

For Tender

Client: **Infrastructure New South Wales**

Document Number: **ASP-LA-SPC-00001**

Document Control:

Revision	Date	Approved by
A	21.11.2019	Andrew Langford
B	8.07.2022	Alex Woodside
C	25.08.2022	Alex Woodside
D	07.07.2023	Miguel Serrao
E	12.04.2024	Miguel Serrao

LANDSCAPE TECHNICAL SPECIFICATIONS

1 GENERAL

This **Landscape Technical Specification** (AS_SPC_01) includes the following worksections:

Landscape Technical Specifications 2
0171 General requirements 3
0241 Landscape – walling and edging 19
0251 Landscape – soils 20
0253 Landscape – planting 29
0254 Irrigation 33
0255 Landscape – plant procurement 38
0256 Landscape – establishment 45
0259 Landscape maintenance 49
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2 WORKSECTION NOTES

- Substituted or additional texts to NATSPEC standards are shown in blue.
- Adjustments of format, spelling, or punctuation are not identified, unless likely to affect the sense.
- Deletions to NATSPEC standards and superseded text is deleted by removal entirely.
- Refer **Landscape Selections Schedule** (SMCSWVI-LLC-SVC-LA-SCH 000001) for materials and finishes selections and specifications.

0171 GENERAL REQUIREMENTS

1 GENERAL

1.1 DESIGN

Design development

General: The works include development of the design beyond that documented, as required.

Design by contractor: If the contractor provides design, use only appropriately qualified persons and conform to all statutory requirements.

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.

1.2 PRECEDENCE

General

Order of precedence:

- The requirements of the Landscape Selections Schedule override conflicting requirements of this worksection.
- The requirements of other worksections of the specification override conflicting requirements of this worksection.
- The requirements of the worksections override conflicting requirements of their referenced documents, excluding the Landscape Selections Schedule. The requirements of the referenced documents are minimum requirements.

1.3 REFERENCED DOCUMENTS

Contractual relationships

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

Current editions

General: Use referenced documents which are the editions, with amendments, current 3 months before the closing date for tenders, except where other editions or amendments are required by statutory authorities.

1.4 INTERPRETATION

Documentation conventions

Imperative mood and streamlined language: The words shall or shall be are implied where a colon is used following a keyword or within a sentence or sentence fragment.

Subject of sentences and phrases: Specification requirements are to be performed by the contractor, unless stated otherwise.

Abbreviations

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

- AS: Australian Standard.
- 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.
- NZS: New Zealand Standard.
- 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 climbing over or removing obstructions, mounting upon a chair, or using a movable ladder, and in any case not more than 2.0 m above the ground, floor or platform.
- Attendance: Attendance, provide attendance and similar expressions mean give assistance for examination and testing.
- Contract administrator: Has the same meaning as architect or superintendent 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 which 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.
- 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.
- Fire hazard properties: To BCA A2.4.
- 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 after fabrication with coating thickness and mass to AS/NZS 4680 Table 1.
- Ingress protection: IP, IP code, IP rating and similar expression have the same meaning as IP Code in AS 60529.
- 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 which 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 which 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 (government) authority: 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.
- 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. Metal thicknesses specified are based metal thicknesses.
  - . Ferrous open sections zinc coated an in-line process: To AS/NZS 4791.
  - . Ferrous hollow sections zinc coated by a continuous or specialised process: To AS/NZS 4792.
- Network utility operator: The entity undertaking the piped distribution of drinking water or natural gas for supply or is the operator of a sewerage system or external 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.
- 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: As defined by the BCA.
- 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.
- Referenced documents: Standards and other documents whose requirements are included in this specification by reference.
- Registered Testing Authority:
  - . An organisation registered by the National Association of Testing Authorities (NATA) to test in the relevant field; or
  - . An organisation outside of Australia registered by an authority recognised by NATA through a mutual recognition agreement; or
  - . An organisation recognised as being a Registered Testing Authority under legislation at the time the test was undertaken.
- Required: Required by the contract documents, the local council or statutory authorities.
- If required: A conditional specification term for work which 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, prototypes and sample panels.
- 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 – completion: Tests carried out on completed installations or systems and fully resolved before the date for practical completion, to demonstrate that the installation or system, including components, controls and equipment, operates correctly, safely and efficiently, and meets performance and other requirements. The superintendent may direct that completion tests be carried out after the date for practical completion.
- Tests – pre-completion: Tests carried out before completion tests, including:
  . Production: Tests carried out on a purchased item, before delivery to the site.
  . Progressive: Tests carried out during installation to demonstrate performance in conformance with this specification.
  . Site: Tests carried out on site.
  . Type: Tests carried out on an item identical with a production item, before delivery to the site.
- Tolerance: The permitted difference between the upper limit and the lower limit of dimension, value or quantity.
- Verification: Provision of evidence or proof that a performance requirement has been met or a default exists.

1.5 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.

1.6 SUBMISSIONS

Requirement

General: Submit the following, as documented:

- Authority approvals: Notes of meetings with authorities whose requirements apply to the work and evidence that notices, fees and permits have been sought and paid, that authority connections are complete and that statutory approvals by the authorities whose requirements apply to the work have been received.
- Building penetrations: Details of the methods to maintain the required structural, fire and other properties to **EXECUTION**, **BUILDING PENETRATIONS**.
- Certification: Certification of conformance to documented requirements, including certification that the plant and equipment submitted meets all requirements of the contract documents and that each installation is operating correctly.
- Design documentation: Design data and certification of proposed work, if required and as documented.
- Electronic facility and asset management information: For the whole of the work to **EXECUTION**, **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.
- Marking and labelling: Samples and schedules of proposed marking and labels to **EXECUTION**, **MARKING AND LABELLING.**
- Operation and maintenance manuals: For the whole of the work to **EXECUTION**, **OPERATION AND MAINTENANCE MANUALS**.

- Products: Products and materials data, including manufacturer's technical specifications and drawing, evidence of conformance to product certification schemes, performance and rating tables and installation and maintenance recommendations.
- Prototypes: Prototypes of components, systems or elements.
- Records: As-built documents, photographs, system diagrams, schedules and logbooks to **EXECUTION**, **RECORD DRAWINGS**.
- Samples: Representative of proposed products and materials and including proposals to incorporate samples into the works, if any to **EXECUTION**, **SAMPLES**.
- Shop drawings: To **EXECUTION**, **SHOP DRAWINGS**.
- Substitutions: To PRODUCTS**, GENERAL, Substitutions**.
- Tests:
  . Inspection and testing plan consistent with the construction program including details of test stages and procedures.
  . Certificates for type tests.
  . Fire hazard properties: Evidence of conformance of proposed proprietary products to documented requirements for fire hazard properties.
  . Test reports for testing performed under the contract to **EXECUTION**, **TESTS**.
- Warranties: To **EXECUTION**, **WARRANTIES**.

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

Submission times

Default timing: Make submissions 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: 4 days
- Samples and prototypes: 4 days
- Manufacturers' or suppliers' recommendations: 4 days
- Product data: 4 days
- Product/design substitution or modification: 4 days

Proposed products schedules: If major products are not specified as proprietary items, submit a schedule of those proposed for use within 3 weeks of site possession.

Identification

Requirement: Identify the project, contractor, subcontractor or supplier, manufacturer, applicable product, model number and options, as appropriate and include relevant contract document references. Include service connection requirements and product certification.

Non-conformance: Identify proposals that do not conform with project requirements, and characteristics which 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.

1.7 INSPECTION

Notice

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

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

Minimum notice: As documented in the **Notices schedule**.

Light levels

Requirements: To AS/NZS 1680.2.4.

Attendance

General: Provide attendance for documented inspections and tests.

Site Inspections

The Sub Contractor is to notify the head contractor where applicable in order to arrange inspection of the works at the stages described below. Sub-Contractor will ensure that site visits by Landscape Architect are coordinated such that multiple items can be inspected concurrently, where possible.

A minimum of 3 days' notice is to be provided. Items for Landscape Architect inspection are noted below.

The Sub Contractor is not to proceed to the next stage of construction until obtaining approval for the works. Program inspection's activities accordingly to ensure approval times do not affect the works programme. Where completion schedules vary or overlap, inspections may be negotiated. Approval of samples to be carried out on site, with all samples to be retained on site.

Inspection/Hold Point	Release Authority
Inspection of all materials and surfaces samples units, prior to procurement (as specified in the Landscape Selections Schedule)	Superintendent and Project Landscape Architect
Provision of all materials testing results, prior to procurement	Superintendent and Project Landscape Architect
Drainage layer spread and geotextile layer ready for installation in sandpit	Superintendent and Project Landscape Architect
Prototype of all precast concrete elements	Superintendent and Project Landscape Architect
Custom elements manufactured (to be viewed in factory prior to delivery to site)	Superintendent and Project Landscape Architect
Review of all shop drawings (as specified in the Landscape Selections Schedule)	Superintendent and Project Landscape Architect
Setout of water play equipment	Superintendent and Project Landscape Architect
Setout of paving surfaces	Superintendent and Project Landscape Architect
Setout of feature timber play prior to fixing	Superintendent and Project Landscape Architect
Prototype of all bespoke fixtures	Superintendent and Project Landscape Architect
Review of images of all plant stock (including trees) for approval, prior to delivery to site	Superintendent and Project Landscape Architect
Substrate installation complete (prior to planting media infill)	Superintendent and Project Landscape Architect
Completion of layout and set out of landscape edges and walls.	Superintendent and Project Landscape Architect
Inspection of all softscape samples	Superintendent and Project Landscape Architect
Inspection of all plant stock upon delivery to site	Superintendent and Project Landscape Architect
Inspection of plant setout prior to planting	Superintendent and Project Landscape Architect
Soil and Mulch installation complete	Superintendent and Project Landscape Architect
Practical Completion	Superintendent and Project Landscape Architect
Final Completion	Superintendent and Project Landscape Architect
Comprehensive Post Installation Inspection of playground prior to handover	Play Certifier and Project Landscape Architect

2 PRODUCTS

2.1 GENERAL

Manufacturers' or suppliers' recommendations

General: Provide and select, if no selection is given, transport, deliver, store, handle, protect, finish, adjust and prepare for use the manufactured items in conformance with the recommendations of the manufacturer or supplier.

Proprietary items/systems/assemblies: Assemble, install or fix to substrate in conformance with the recommendations of the manufacturer or supplier.

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

Sealed containers

General: If materials or products are supplied by the manufacturer in closed or sealed containers or packages, bring the materials or products to point of use in the original containers or packages.

Prohibited materials

General: Do not provide the following:

- Materials, exceeding the limits of those listed, in the Safe Work Australia Hazardous Substances Information System (HSIS).
- Materials that use chlorofluorocarbon (CFC) or hydro chlorofluorocarbon (HCFC) in the manufacturing process.

Substitutions

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:

- Evidence that the performance is equal to or greater than that specified.
- Evidence of conformity to a cited standard.
- Samples.
- Essential technical information, in English.
- Reasons for the proposed substitutions.

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.

2.2 MATERIALS AND COMPONENTS

Consistency

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

Corrosion resistance

General: Conform to the following atmospheric corrosivity category as defined in AS 4312 and the AS/NZS 2312 series.

Galvanizing

Severe conditions: Galvanize mild steel components (including fasteners) to AS/NZS 1214 or AS/NZS 4680 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 EXECUTION

3.1 SAMPLES

General

Incorporation of samples: Only incorporate samples in the works which have been endorsed for inclusion. Do not incorporate other samples. Refer Landscape selections Schedule.

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

Unincorporated samples: Remove on completion.

Samples

Submit representative samples of each material as set out in Landscape Selections Schedule for approval by the Superintendent, Landscape Architect and where necessary the Architect:

Proposed products schedules: If major products are not specified as proprietary items, submit a schedule of those proposed for use with the tender submission.

Authorities

Authorities' approvals: Submit documents showing approval by the authorities whose requirements apply to the work.

Correspondence: Submit copies of correspondence and notes of meetings with authorities whose requirements apply to the work.

Identification

General: Identify the project, contractor, subcontractor or supplier, manufacturer, applicable product, model number and options, as appropriate and include pertinent contract document references. Include service connection requirements and product certification. Identify proposals for non-compliance with project requirements, and characteristics which may be detrimental to successful performance of the completed work.

Materials and components

Product certification: If products must conform to product certification schemes, submit evidence of conformance.

Product data: For proprietary equipment, submit the manufacturer's product data as follows:

- Technical specifications and drawings.
- Type-test reports.
- Performance and rating tables.
- Recommendations for installation and maintenance.
- Additional product data for services equipment:
  - . Model name, designation and number.
  - . Country of origin and manufacture.
  - . Capacity of all system elements.
  - . Size, including required clearances for installation.
  - . Materials used in the construction.

3.2 DESIGN

General

Design by contractor: If the contractor provides design, use only appropriately qualified persons and comply with all statutory requirements.

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

3.3 SHOP DRAWINGS

General

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.

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.

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.

Submission medium: .pdf (.dwg upon request)

Building work drawings for building services: On dimensioned drawings show all:

- 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.

Submissions

Submit the Shop Drawings as per Landscape Selections Schedule.

Submit to: Superintendent.

Default timing: Make submissions at least 5 working days before ordering products for, or starting installation of, the respective portion of the works.

3.4 OFF-SITE DISPOSAL

Removal of material

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

3.5 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.

3.6 SERVICES CONNECTIONS

Connections

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

Network distributors' requirements

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

3.7 SERVICES INSTALLATION

General

Fixing: If non-structural building elements are not suitable for fixing services to, fix directly to structure and trim around holes or penetrations in non-structural elements.

Installation: Install equipment and services plumb, fix securely and organise reticulated services neatly. Allow for movement in both structure and services.

Concealment: Unless otherwise documented, conceal all cables, ducts, trays and pipes except where installed in plant spaces, ceiling spaces and riser cupboards. If possible, do not locate on external walls.

Lifting: Provide heavy items of equipment with permanent fixtures for lifting as recommended by the manufacturer.

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

Arrangement: Arrange services so that services running together are parallel with each other and with adjacent building elements.

Dissimilar metals

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

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

Vibration: Arrange and support piping so that it remains free from vibration whilst permitting necessary movements. 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.

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.

3.8 BUILDING PENETRATIONS

Penetrations

Requirement: Maintain the required structural, fire 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.

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 or conduit penetrates 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 an annular space around the pipe or pipe insulation of at least 12 mm.
- Prime paint ferrous surfaces.
- Terminations:
  . If cover plates are fitted: Flush with the finished building surface.
  . In fire-resisting and acoustic rated building elements: 50 mm beyond finished building surface.
  . In floors draining to floor wastes: 50 mm above finished floor.

. Elsewhere: 5 mm beyond finished building surface.
. Termite management: To AS 3660.1.

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

Sleeves for cables: For penetrations of cables not enclosed in conduit through ground floor slabs, beams and external walls provide sleeves formed from PVC-U pipe sections.

3.9 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.

Warranty period: Start warranty periods at acceptance of installation.

Approval of installer: If installation is not by manufacturer, and product warranty is conditional on the manufacturer's approval of the installer, submit the manufacturer's written approval of the installing firm.

3.10 RECORD DRAWINGS

General

Requirement: Show 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

Progress recording: Keep one set of drawings on site at all times, expressly for the purpose of marking changes made during the progress of the works.

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 **General** and **Recording, format and submission** and the following:

- Contents: As for the respective shop drawings.
- Extensions and/or changes to existing: If a drawing shows extensions and/or alterations to existing installations, include sufficient 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.
- Fixings.
- 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.

3.11 OPERATION AND MAINTENANCE MANUALS

General

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 technical worksections require that manuals be submitted, include corresponding material in the operation and maintenance manuals.

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

Contents

Requirement: Include the following:

- Table of contents: For each volume. Title to match cover.
- Directory: Names, addresses, email addresses and telephone and facsimile numbers of principal consultant, subconsultants, contractor, subcontractors and names of responsible parties.
- Record drawings: Complete set of record drawings, full size.
- Drawings and technical data: As necessary for the efficient operation and maintenance of the installation. Include:
  . Switchgear and controlgear 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.
- Installation description: General description of the installation.
- Systems descriptions and performance: Technical description of the systems installed and mode of operation, presented in a clear and concise format readily understandable by the principal's staff. Identify function, normal operating characteristics, and limiting conditions.
- Systems performance: Technical description of the mode of operation of the systems installed.
- Baseline data: To AS 1851 and AS/NZS 1668.1.
- Documentation to AS 1851 including the schedule of essential functionality and performance requirements.
- Digital photographic records to **Underground services**.
- Equipment descriptions:
  . Name, address, email address and telephone and facsimile numbers of the manufacturer and supplier of items of equipment installed, together with catalogue list numbers.
  . Schedules (system by system) of equipment, stating locations, duties, performance figures and dates of manufacture. Provide a unique code number cross-referenced to the record and diagrammatic drawings and schedules, including spare parts schedule, for each item of equipment installed. Equipment schedules in tabular form including the equipment designation used on the drawings, manufacturer's name and contact details, equipment name plate data, function of item, associated system and capacity data.
  . Manufacturers' technical literature for equipment installed, assembled specifically for the project, excluding irrelevant matter. Mark each product data sheet to clearly identify specific products and component parts used in the installation, and data applicable to the installation.
  . Supplements to product data to illustrate relations of component parts. Include typed text as necessary.
- Certificates:
  . Certificates from authorities.
  . Copies of manufacturers' warranties.
  . Product certification.
  . Test certificates for each service installation and all equipment.

  - . Test reports
  - . Test, balancing and commissioning reports.
  - . Control system testing and commissioning results.
- 7 day record of all trends at commissioning.
- Operation procedures:
  - . Manufacturers' technical literature as appropriate.
  - . Safe starting up, running-in, operating and shutting down procedures for systems installed. Include logical step-by-step sequence of instructions for each procedure.
  - . Control sequences and flow diagrams for systems installed.
  - . Legend for colour-codes services.
  - . Schedules of fixed and variable equipment settings established during commissioning and maintenance.
  - . Procedures for seasonal changeovers.
  - . If the installation includes cooling towers, a water efficiency management plan.
- Maintenance procedures:
  - . Detailed recommendations for periodic maintenance and procedures, including schedule of maintenance work including 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 sequence of instructions for each procedure.
  - . Schedule of spares recommended to be held on site, being those items subject to wear or deterioration and which 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.
  - . Schedules for recording recommissioning data so that changes in the system over time can be identified.
  - . Instructions for use of tools and testing equipment.
  - . Emergency procedures, including telephone numbers for emergency services, and procedures for fault finding.
  - . Safety data sheets (SDS).
  - . Instructions and schedules conforming to AS 1851, AS/NZS 3666.2, AS/NZS 3666.3 and AS/NZS 3666.4.
- Maintenance records:
  - . Prototype service records conforming to AS 1851 prepared to include project specific details.
  - . Prototype periodic maintenance records and report to AS/NZS 3666.2, AS/NZS 3666.3 and AS/NZS 3666.4 as appropriate, prepared to include project specific details.
  - . For hard copies: In binders which match the manuals, loose leaf log book 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 log book pages recording the operational and maintenance activities performed up to the time of practical completion.
  - . Number of pages: The greater of 100 pages or enough pages for the maintenance period and a further 12 months.
- Emergency information: For each type of emergency, including fire, flood, gas leak, water leak, power failure, water failure, system or sub system 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 the **RECORD DRAWINGS** clause provide material that can be legibly printed on A4 size paper.

Format – hard copy

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 on services equipment.

Final submission: Within 2 weeks after practical completion.

3.12 TOOLS AND SPARE PARTS

Spare parts

General: Provide spare parts listed in the appropriate worksections.

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.

Replacement: Replace spare parts used during the maintenance period.

3.13 TESTING

Attendance
General: Provide attendance on tests.

Testing authorities
General: Except for site tests, have tests carried out by a Registered testing authority.

Test instruments: Use instruments calibrated by a Registered testing authority.

Test reports
General: Indicate observations and results of tests and conformance or non-conformance with requirements.

Notice
Inspection: Give sufficient notice for inspection to be made of the commissioning and completion testing of the installation.

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.

Completion tests
General: Test the works under the contract to demonstrate conformance with the documented performance requirements of the installation.

Functional checks: Carry out functional and operational checks on energised equipment and circuits and make final adjustments for the correct operation of safety devices and control functions.

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

Sound pressure level measurements: Conform to the following:

- Correction for background noise: To AS/NZS 2107 Table B1.
- External: To AS 1055.1.
- Internal: To AS/NZS 2107.
- 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.
- 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.

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

3.14 TRAINING

General
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.

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

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

Seasonal operation
General: For equipment requiring seasonal operation, demonstrate during the appropriate season and within 6 months.

3.15 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 labels not required for maintenance.

3.16 PERIODIC MAINTENANCE OF SERVICES

General
Requirement: During the maintenance period, carry out periodic inspections and maintenance work as recommended by manufacturers of supplied equipment, and promptly rectify faults.

Emergencies: Attend emergency calls promptly.

Annual maintenance: Carry out recommended annual maintenance procedures before the end of the maintenance period.

Maintenance period: The greater of the defects liability period and the period documented in the **Maintenance requirements schedule**.

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 log books 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.

3.17 POST-CONSTRUCTION MANDATORY INSPECTIONS AND MAINTENANCE

General
Requirement: For the duration of the defects liability period, provide inspections and maintenance of safety measures required by the following:

- AS 1851.
- 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 defects liability period.

0241 LANDSCAPE – WALLING AND EDGING

1 GENERAL

1.1 RESPONSIBILITIES

General
Requirement: Provide walling and edging, as documented.

1.2 CROSS REFERENCES

General
Requirement: Conform to the following:
- *0171 General requirements*.

1.3 SUBMISSIONS

Samples
Refer Landscape Selections Schedule.

1.4 INSPECTION

Notice
Inspection: Give notice so inspection may be made of the following:
- Setting out before commencement of construction.
- Geotextiles and subsurface drainage in place before backfilling.

2 PRODUCTS

2.1 CONCRETE

General
Standard: To AS 1379.
Exposure classification: To AS 3600 Table 4.3.
Grade: Where there are cast in metal items:
- Exposure classification:
  . A1, A2: N25.
  . B1: N32.
  . B2, C: N40.
  . Otherwise: N20.

Materials: To be constructed of materials as defined in Appendix B2 and B1.5

3 EXECUTION

3.1 GENERAL

Set-out
General: Set out the positions of walls and edging and mark the positions of furniture.

4 SELECTIONS

Refer Landscape Selections Schedule.

0251 LANDSCAPE – SOILS

1 GENERAL

1.1 RESPONSIBILITIES

General

Soil Types: Provide landscape soils that are 'fit for purpose' and meet the performance requirements specified herein.

Performance

Identification of fit for purpose: Testing certificates.

1.2 CROSS REFERENCES

General

Requirement: Conform to the following:

- *0171 General requirements*.
- *0222 Earthwork*.
- *0224 Stormwater – site*.

1.3 STANDARDS

Soils

Site and imported topsoil: To AS 4419.

Potting mixes: To AS 3743.

Composts, soil conditioners and mulches: To AS 4454.

1.4 INTERPRETATION

Definitions

General: For the purposes of this worksection the following definitions apply:

- Bad ground: Ground unsuitable for the work, including fill liable to subsidence, ground containing cavities, faults or fissures, ground contaminated by harmful substances and ground which is, or becomes, soft, wet or unstable.
- Imported topsoil: Similar to naturally occurring local topsoil, suitable for the establishment and ongoing viability of the selected vegetation, free of weed propagules and of contaminants, and classified by texture to AS 4419 Appendix 1, as follows:
  - . Fine: Clay loam, fine sandy loam, sandy clay loam, silty loam, loam.
  - . Medium: Sandy loam, fine sandy loam.
  - . Coarse: Sand, loamy sand.
- Low density soil: Soil for use on an artificial base material, e.g. roof top garden or large landscape containers. Such soils will usually be blends of mineral and organic compounds, and will typically have:
  - . Bulk density: 0.3 to 0.6 Kg/L.
  - . Organic matter: 10% to 40% by mass.
- Natural soil: A soil that has been dug from the landscape and is presented for use with no more than minor amendment. This soil could be topsoil, subsoil or a mixture of them and have a bulk density greater than 0.6 Kg/L.
- Organic soil: A general purpose soil (normally an amended natural soil or soil blend) that has:
  - . Bulk density: > 0.6 Kg/L.
  - . Organic matter: 15% to 25% by mass. Naturally occurring organic soil can be 95% organic by mass.
- Site rock: Rocks selected for salvage.
- Site topsoil: Soil excavated from the site which contains organic matter, supports plant life, conforms to the technical specification and is free from:
  - . Stones more than 25 mm diameter.

. Clay lumps more than 75 mm diameter.
. Weeds and tree roots.
. Sticks and rubbish.
. Material toxic to plants.

- Soil blend: A general purpose soil derived from the blending of two or more of sand, natural soil material or organic materials, and with a bulk density and organic matter content to meet site specific requirements.
- Top dressing: A sandy soil which is suitable for surface application to lawn.

1.5 SUBMISSIONS

Execution

Program: Submit a work program in the form of a bar chart, for the landscape works.

Materials

Supplier's data: Submit supplier's data including the following:

- Material source of supply for topsoil, filling, stone and filter fabrics.

Suppliers

Statements: Submit statements from suppliers of soils and other materials, giving the following, where applicable:

- Particulars of the supplier's experience in the required type of work.
- Production capacity for material of the required type, sizes and quantity.
- Lead times for delivery of material to the site.

1.6 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following:

- Setting out completed.
- Subgrades cultivated or prepared for placing topsoil.
- Topsoil spread before planting.
- Grassing bed prepared before turfing, seeding, or temporary grassing.

1.7 QUALITY ASSURANCE AND CONTROL

General

The contractor must use analytical testing to verify compliance with the product specification. Testing shall be carried out by a NATA-accredited laboratory such as SESL Australia. Testing shall be done in two parts: Initial compliance certification and Quality control, as described below.

Initial compliance certification

Before any soil installation, the contractor or soil manufacturer will submit samples of trial blends likely to meet the performance specifications to SESL Australia or equivalent NATA-accredited laboratory. See Example components for the soil supplier below for suggested formulations to start this process. The trial blend must be based on available test information on components and, if necessary, employ a Soil Scientist for advice.

Submit trial samples to the testing laboratory, allowing sufficient time for testing and re-formulation in the case of failure to satisfy the performance criteria. Once compliant, a test certificate signed by a Certified Professional Soil Scientist (CPSS) clearly stating compliance with the applicable criteria must be presented to the site supervisor or quality officer.

Note that alternative test methodologies may be accepted and certified as compliant by an independent Soil Scientist.

HOLD POINT 1

Non-compliance will automatically generate HOLD POINT 1. No soil will be installed until initial compliance certification has been demonstrated.

Manufacturer's product representation: For imported soils from manufactures, a 'product representation' document produced by the supplier may be accepted as a compliance certificate if:

- It is an off-the-shelf product line, not a custom mix
- A representative test certificate is available and is acceptably recent (within 3 months)

- The testing covers all those criteria in the performance specification
- The manufacturer's quality assurance system is externally certified

Record keeping

Growing media initial compliance certification records must be kept in an easily retrievable manner that provides for traceability of purchase and location on site. Each compliance certification for all the product specifications used on site must be identified by date, quantity to be supplied and a copy of the formulation used to reach compliance.

Quality control: compliance during construction

The contractor must submit samples of blended spoils or imported soil mixes at regular intervals during construction for the purposes of demonstrating continued compliance as part of quality control.

Soil tests

General: To AS 4419, Table 1.

Sampling: As recommended in AS 4419 Appendix A.

Laboratory: SESL Australia or other NATA registered laboratory.

Imported topsoil tests: Type tests to AS 4419 Appendix B to I (topsoil), or AS 3743 Appendix D to G (potting mixes), as applicable.

Site topsoil tests: To AS 4419 Appendix C to I.

Test submissions

Submit representative samples of ~ 5 kg of each product specification, packed and labelled to indicate the source and the specification to be met. Ten litres of material is required for compost testing. The samples must be taken in a representative manner.

The contractor must undertake testing frequencies at 1 per 500m^3. Variations to this testing frequency are permitted on the submission to the superintendent of an alternative testing program that clearly achieves the desired outcome of quality control. Materials supplied from operations that have a third-party-endorsed quality assurance program may be acceptable pending submission of the relevant documentation.

Testing

All testing as required by the product specifications must be arranged by the contractor, and carried out by the Principal's nominated soil testing laboratory. All test results records will be made available to the superintendent, for review and approval by the project Landscape Architect.

Non-compliance

In the case of substantive non-compliance, Hold Points 2 and 3 will be invoked – HP2 to correct soil already installed and HP3 to ensure new deliveries are compliant. In the case of a minor non-compliance or substantial compliance, a clear statement must be obtained from a qualified independent Soil Scientist waiving the compliance and certifying the sample is fit for purpose.

Non-compliance with the target range criteria does not necessarily render a soil not fit for purpose but making this judgement requires an expert person to take responsibility for such deviation. Also, a conditional compliance certificate may be issued by a CPSS requiring that a certain fertiliser or further organic matter or some other amendment be added, with the aim of achieving compliance.

Where a drainage layer is coarser than around 5mm, a transition layer may be needed between it and the filtration soil media to prevent soil migrating into the drainage gravel layer. Generally this will be an intermediate very coarse sand or fine gravel. Do not use geotextile fabrics over the drainage layer to prevent soil migration.

HOLD POINT 2

The contractor will need to make corrective procedures to bring any soil that has been placed within substantial compliance in accordance with any Soil Scientist's advice.

HOLD POINT 3

In the event that quality control samples show substantial non-compliance from the approval performance requirements, the supplier must demonstrate compliance of any future loads. This may require re-formulation or alteration to existing formulations and may require the advice of a CPSS to meet correct analysis, and make adjustments to mixing ratios, additives and procedures to achieve compliance.

Record keeping

Growing media construction and QC compliance records must be kept in an easily retrievable manner that provides for traceability of purchase and location on site. Each batch of soil must be identified by date of manufacture, quantity and a corresponding test result, and must link into when the material was delivered and where the material was placed.

2 PRODUCTS

2.1 TOPSOIL

Source

General: All soils to be imported shall be manufactured specialist planting media.

General

Deliveries: Documentation to AS 4419, clause 8.

Additives: If using additives to raise topsoil to the required standard, ensure compliance with the relevant test criteria of AS 4419.

Nitrogen drawdown: If the NDI_{150} value is less than 0.5 to AS 4419 Appendix E, a source of soluble nitrogen should be added to or specified for those soils.

Nutrient levels: Provide soil nutrients as outlined in the **Physical and Chemical Properties** tables for each specified soil type.

Bushland restoration nutrient levels: Provide topsoil with nutrient levels related to the soils of the local natural bushland.

3 EXECUTION

3.1 SUBSTRATE

Podium levels

Screed

General: Provide a high strength mortar screed to podium levels where garden beds and tree planting is to be installed.

Screed depths:

- Maximum unreinforced : 50 mm
- Minimum thickness 25mm

Drainage layer

Excavated: Install drainage cell to top of screed such that drain points freely discharge to the storm water recovery system (into rainwater tank).

Install drainage cell to all sides of void formers as detailed.

Where void former is used, drainage cell must be applied above and below the void former, as well as vertically beside the void former to ensure unimpeded storm water movement. Void former and drainage cell, should be cut to fit the space, so the gap from the planter box wall is no greater than 15mm.

Geofabric

Lay geofabric loosely over drainage cell and ensure that a minimum 100mm of overlay exists

Planter media installation

Planter media should be delivered in bulka bags or small 20kg bags dependant on site access restrictions.

Consolidation

General: Compact lightly and uniformly in 50 mm layers. Avoid differential subsidence and excess compaction and produce a finished topsoil surface which has the following characteristics:

- Finished to design levels.
- Smooth and free from stones or lumps of soil.
- Graded to drain freely, without ponding, to catchment points.
- Graded evenly into adjoining ground surfaces.
- Ready for planting.

3.2 TOPSOIL

General

Following installation of all garden bed and turf areas, soil compaction to be tested and in the event it is excessively high, to be remediated to the satisfaction of the Landscape Architect prior to planting or grassing. Testing to be done with a penetrometer to test soil compaction to a depth of 500mm. If resistance as measured by the penetrometer is greater than 300psi or 2,000kPa, decompaction of material must be undertaken.

Placing topsoil

Site topsoil: Do not incorporate site topsoil into the works until soil testing certification has been approved. Remove unauthorised material from the site.

General: Spread the topsoil on the prepared subsoil and grade evenly, making the necessary allowances to permit the following:

- Required finished levels and contours may be achieved after light compaction.
- Grassed areas may be finished flush with adjacent hard surfaces such as kerbs, paths and mowing strips.

Spreading: On steep batters, if using a chain drag, ensure there is no danger of batter disturbance.

Finishing: Feather edges into adjoining undisturbed ground.

Consolidation

General: Compact lightly and uniformly in 150 mm layers. Avoid differential subsidence and excess compaction and produce a finished topsoil surface which has the following characteristics:

- Finished to design levels.
- Smooth and free from stones or lumps of soil.
- Graded to drain freely, without ponding, to catchment points.
- Graded evenly into adjoining ground surfaces.
- Ready for planting.

4 SELECTIONS

4.1 SOIL TYPE 1 | IMPORTED TOP SOIL – MASS PLANTING ON GRADE 'A' HORIZON

4.2 SOIL TYPE 2 | IMPORTED TOP SOIL – MASS PLANTING ON GRADE 'B' HORIZON

4.3 SOIL TYPE 3 | IMPORTED TOP SOIL – MASS PLANTING ON STRUCTURE 'A' HORIZON

Reference: 'Specification E1 On-Slab Soil Media 'A' Horizon' in Soils for Landscape Development (Leake S & Haege E, 2014)

Part A. 'Fit-for-purpose' performance description

This specification describes the formulation of an open granular well-drained growing media with a saturated density of less than 2400 kg/m3 (2.4 kg/L) for use in on-slab applications, including green roofs with an expectation of longevity. It is a topsoil formulation to be used in the surface 300 mm of all on-slab installations including planter boxes, containers and garden beds.

In order to maintain structure and porosity over extended periods, and to avoid slumping and volume loss over time, the formulation must employ low density mineral components such as ash, perlite, scoria, pumice and diatomaceous earth, or artificial components such as urea formaldehyde and styrofoam. Physically, the media has the properties of a potting media and is assessed using the methodology of AS 3743.

Phosphorous-sensitive plants: Phosphorus-sensitive plants have not been chosen for this soil type. Phosphorus levels must be within the standard range of the chemical properties.

Part B. Product specification (technical parameters)

Generally, the soil must be free of 'unwanted material' and must meet all the requirements of AS 3743 Potting mixes and the specified requirements of AS 4419. However, compliance with AS 3743 does

not demonstrate compliance with this specification. Where the requirements of this specification and AS 3743 conflict, properties specified here must take precedence.

Use AS 3743 unless otherwise stated.

Soil Type 4 – Physical Properties

Property	Unit	Sufficiency range
Texture, preferred range	n/a	Gravelly loamy sand to organic sandy loam
Air-filled porosity	%	≥ 10
Water-holding capacity	%	≥ 40
Permeability (@ 16 drops by McIntyre Jakobsen)	mm/h	> 100
Organic matter	% w/w	< 15
Wettability	min	≤ 5
Dispersibility in water	Category	1 or 2 (AS 4419) category
Large particles in the largest dimension		
< 2 mm	% w/w	30–70
2–10 mm	% w/w	10–20
10–20 mm	% w/w	5–10
20–50 mm	% w/w	< 5
> 50 mm	% w/w	0

Soil Type 4 – Chemical properties

Property	Unit	Sufficiency range
pH in water (1:5) standard range	pH units	5.4–6.8
Electrical conductivity (1:1.5)	dS/m	< 2.2
Chloride	mg/L	≤ 200
Ammonium-N (NH_4)	mg/L	≤ 100
Ammonium-N + nitrate-N (NH_4 + NO_3)	mg/L	≥ 50
Nitrogen draw-down index	-	≥ 0.7
Toxicity index	mm	≥ 70
Phosphorus – P-tolerant plants (P)	mg/L	8–40
~~Low phosphorus – P-sensitive plants (P)~~	~~mg/L~~	~~< 3~~
Potassium (K)	mg/L	50–250
Sulphate (SO_4)	mg/L	≥ 40
Calcium (Ca)	mg/L	≥ 80
Magnesium (Mg)	mg/L	≥ 15
Ca:Mg ratio	Ratio	1.5–10
K:Mg ratio	Ratio	1–7
Sodium (Na)	mg/L	≥ 130
Iron (Fe)	mg/L	≥ 35
Copper (Cu)	mg/L	0.4–15
Zinc (Zn)	mg/L	0.3–10
Manganese (Mn)	mg/L	1–15
Boron (B)	mg/L	0.02–0.65

Part C. Example components for the soil supplier

The following table outlines suggested components that may likely meet the physical requirements of this specification. This is not part of the product specification. It is an example for the edification of the soil supplier of what might meet the product specification.

Example components (likely to meet the physical requirements of this specification)

Sandy loam soil or site won topsoil	20–40% by volume
Horticultural ash, perlite, or similar lightweight low-density mineral matter or mixtures of these	30–60% by volume
Composted soil conditioner conforming with AS 4454	20–30% by volume

Base level requirements for fertilisers (to be verified by laboratory testing and per agronomist's report)

Lime and / or dolomite	2 kg/m3 at mixing
Balanced compound NPK turf starter fertiliser	3.0 kg/100 m^2 after placement
Minor and trace elements	300 g/m^3 at mixing

For the purposes of tendering, the contractor must allow for the inclusion of the above soil amendments, but the specific amendments required must be verified by laboratory testing and agronomist's recommendations.

The suggested fertilisers are expected to last 3–6 months of sustained growth. A suitable fertiliser (e.g. controlled slow release) and organic matter maintenance program may be required after this period, depending on the design intent.

4.4 SOIL TYPE 4 | IMPORTED TOP SOIL – MASS PLANTING ON STRUCTURE 'B' HORIZON

Reference: 'Specification E2 On-Slab Soil Media 'B' Horizon' in Soils for Landscape Development (Leake S & Haege E, 2014)

Part A. 'Fit-for-purpose' performance description

The specification describes the formulation of an open granular well-drained growing media with an all-up saturated density of less than 2400 kg/m3 (2.4 kg/L) for use in on-slab applications with an expectation of longevity to be used as a subsoil below 300 mm of all on-slab installations, including planter boxes, containers and garden beds.

In order to maintain structure and porosity over extended periods, and to avoid slumping and volume loss over time, the formulation must employ low-density mineral components such as ash, perlite, scoria, pumice and diatomaceous earth, or artificial components such as urea formaldehyde and Styrofoam.

Physically the media has the properties of a potting media and is assessed using the methodology of AS 3743.

Phosphorous-sensitive plants: Phosphorus-tolerant plants have not been chosen for this soil type. Phosphorus levels must be within the standard range of the chemical properties.

Part B. Product specification (technical parameters)

Generally, the soil must be free of 'unwanted material' and must meet all the requirements of AS 3743 and the specified requirements of AS 4419. However, compliance with AS 3743 does not demonstrate compliance with this specification. Where the requirements of this specification and AS 3743 conflict, properties specified here must take precedence.

Soil Type 5 – Physical Properties

Property	Unit	Sufficiency range
Texture, preferred range	n/a	Gravelly loamy sand to organic sandy loam
Air-filled porosity	%	≥ 10
Water-holding capacity	%	≥ 40

Property	Unit	Sufficiency range
Permeability (@ 16 drops by McIntyre Jakobsen)	mm/h	> 100
Organic matter	% w/w	< 5
Wettability	min	≤ 5
Dispersibility in water	Category	1 or 2 (AS 4419) category
Large particles in the largest dimension		
< 2 mm	% w/w	30–70
2–10 mm	% w/w	10–20
10–20 mm	% w/w	5–10
20–50 mm	% w/w	< 5
> 50 mm	% w/w	0

Soil Type 5 – Chemical properties

Property	Unit	Sufficiency range
pH in water (1:5) standard range	pH units	5.4–6.8
Electrical conductivity (1:1.5)	dS/m	< 2.2
Chloride	mg/L	≤ 200
Ammonium-N (NH_4)	mg/L	≤ 100
Ammonium-N + nitrate-N (NH_4 + NO_3)	mg/L	≥ 50
Nitrogen draw-down index	-	≥ 0.7
Toxicity index	mm	≥ 70
Phosphorus – P-tolerant plants (P)	mg/L	8–40
~~Low phosphorus – P-sensitive plants (P)~~	~~mg/L~~	~~< 3~~
Potassium (K)	mg/L	50–250
Sulphate (SO_4)	mg/L	≥ 40
Calcium (Ca)	mg/L	≥ 80
Magnesium (Mg)	mg/L	≥ 15
Ca:Mg ratio	Ratio	1.5–10
K:Mg ratio	Ratio	1–7
Sodium (Na)	mg/L	≥ 130
Iron (Fe)	mg/L	≥ 35
Copper (Cu)	mg/L	0.4–15
Zinc (Zn)	mg/L	0.3–10
Manganese (Mn)	mg/L	1–15
Boron (B)	mg/L	0.02–0.65

Part C. Example components for the soil supplier

The following table outlines suggested components that may likely meet the physical requirements of this specification. This is not part of the product specification. It is an example for the edification of the soil supplier of what might meet the product specification.

Example components (likely to meet the physical requirements of this specification)

Sandy loam soil or site won topsoil	10–30% by volume
Horticultural ash, perlite, or similar lightweight low-density mineral matter or mixtures of these	30–50% by volume
Composted 10mm pine bark	20–40% by volume
Composted soil conditioner conforming with AS 4454	<20% by volume

Base level requirements for fertilisers (to be verified by laboratory testing and per agronomist's report)

Lime and / or dolomite	2 kg/m3 at mixing
Balanced compound NPK turf starter fertiliser	3.0 kg/100m^2 after placement
Minor and trace elements	300 g/m^3 at mixing

For the purposes of tendering, the contractor must allow for the inclusion of the above soil amendments, but the specific amendments required must be verified by laboratory testing and agronomist's recommendations.

The suggested fertilisers are expected to last 3–6 months of sustained growth. A suitable fertiliser (e.g. controlled slow release) and organic matter maintenance program may be required after this period, depending on the design intent.

0253 LANDSCAPE – PLANTING

1 GENERAL

1.1 RESPONSIBILITIES

General
Requirement: Provide planting, as documented.

1.2 CROSS REFERENCES

General
Requirement: Conform to the following:
- *0171 General requirements*.

1.3 SUBMISSIONS

Certification
Species: Submit evidence of conformance to EXECUTION, **COMPLETION**, **Product Certification**.

Execution details
Program: Submit a work program in the form of a bar chart, for the landscape works.

Maintenance program: Submit a proposed planting maintenance program.

Planting machine: If a planting machine is to be used as an alternative to hand planting, submit proposal.

Spraying: Submit proposal.

Plants – open rooted stock: If open rooted stock is to be used, submit proposal.

Material site storage: Submit proposal.

Maintenance manuals
General: Submit recommendations for maintenance of plants.

Materials
Supplier's data: Submit supplier's data including the following:
- Material source of supply.

Compost: Submit a certificate of proof of compost pH value.

Samples
General: Submit representative samples of each material, packed to prevent contamination and labelled to indicate source and content.

Bulk materials: Submit a 5 kg sample of each type specified. Submit bulk material samples, with required test results, at least 5 working days before bulk deliveries.

1.4 INSPECTION

Notice
Inspection: Give notice so that inspection may be made of the following:
- Setting out completed.
- Plant holes excavated and prepared for planting.
- Plant material set out before planting.
- Planting, staking and tying completed.
- Completion of planting establishment work.

2 PRODUCTS

2.1 GENERAL

Marking
Identification: Marked to show the following:
- Manufacturer's identification.
- Product brand name.

- Product type.
- Quantity.
- Product reference code and batch number.
- Date of manufacture.

2.2 SOIL CONDITIONING COMPOST

Compost

General: Provide mature soil conditioning compost free from harmful chemicals, grass and weed growth. Apply at an application rate that accounts for the immediate fertilizer equivalence of the compost as part of the overall fertilizer management schedule.

Particle size as a soil conditioner, pH, physical and chemical contaminants: To AS 4454 Table 3.1(A).

Mature compost: To AS 4454 Appendix N Table N3.2.

Soil conditioning properties

Wettability: ≤ 2 to AS 3743 Table 2.1 as tested to Appendix C.

Total water holding capacity: ≥ 40 to AS 3743 Table 2.1 tested to Appendix B.

Nitrogen draw down index: ≥ 0.7 to AS 3743 Table 2.1 tested to Appendix E.

Chlorine content: < 1000 mg/kg to Rayment and Lyons 2010 test method.

Compost Fertiliser equivalence properties values

Standard: To the test methods in Rayment and Lyons 2010, *Soil chemical methods – Australasia* for nitrate N, total N or total Kjeldahl N, total P and Cowell P, and extractable K.

Requirement: Establish the following values for each type of soil conditioning compost:

- Nitrogen content (kg/ton):
  - . Total N.
  - . Nitrate.
- Phosphorus content (kg/ton):
  - . Total P.
  - . Colwell P.
- Plant available Potassium (kg/ton).

2.3 FERTILISER

General

Delivery: Provide proprietary fertilisers, delivered to the site in sealed bags marked to show manufacturer or vendor, weight, fertiliser type, N:P:K ratio, recommended uses and application rates.

Application rate: Vary the application rate to allow for the plant available immediate fertilizer equivalence value of the soil conditioning compost.

2.4 MULCH

All organic and timber mulch shall only be sourced from Forestry Waste, recycled packaging pallets and tree loppings. It should be free of any demolition, construction, other building waste including any fencing materials or CCA treated timber.

Requirement: Provide mulch which is free of deleterious and extraneous matter such as soil, weeds and sticks. Do not include fine mulch.

Standard:

- Particle size, physical and chemical contaminants: To AS 4454 Table 3.1(A).
- pH, electrical conductivity, ammonium, chlorine and other nutrients: To AS 3743 Table 2.1 for regular mix.

Organic mulches: Free of stones.

Mulch material: Brush chippings and leaf litter recovered from site clearing, if available; otherwise, pine bark.

Organic mulch types

Brush chippings and leaf litter: Vegetative material processed through a chipper to pieces not larger than 75 x 50 x 15 mm as follows:

- Material permitted: Leaf matter and tree loppings from *Eucalyptus, Tristania and Pinus species*.

- Material not permitted: Leaf matter and tree loppings from privet, camphor laurel, coral tree, poplar, willow, and noxious weeds.

Pine bark: From mature trees, graded in size from 50 x 50 x 25 mm to 25 x 15 x 15 mm, free from wood slivers.

Pine flake: Pinus species sapwood slivers of size range 250 x 25 mm to 30 x 3 mm, including fragments of pine bark.

Straw: Cereal straw, wood fibre, or other suitable vegetative material (but not meadow hay) free from weeds and seeds, applied in conjunction with a bitumen emulsion or polymer binder.

Inorganic mulch types

Washed river pebble: Uniform size or graded material in the size range 6 – 10 mm.

Decomposed granite gravel: Uniform size or graded material in the size range 5 – 20 mm, of uniform colour and low plasticity. Keep clear of plant stems.

Crushed quartz: Uniform size or graded material in the size range 5 – 20 mm, of uniform colour.

Marble chip gravel: Uniform size or graded material in the size range 5 – 20 mm, of uniform colour.

Slate: Plum slate slivers in the size range 5 – 25 mm.

Shale: Uniform size or graded material, no particles smaller than 0.1 mm diameter.

Scoria: Uniform size or graded material.

3 EXECUTION

3.1 PLANTING

Locations

General: If it appears necessary to vary plant locations and spacings to avoid service lines, or to cover the area uniformly, or for other reasons, give notice.

Planting conditions

Weather: Do not plant in unsuitable weather conditions such as extreme heat, cold, wind or rain. In other than sandy soils, suspend excavation when the soil is wet, or during frost periods.

Watering

Timing: Thoroughly water the plants before planting, immediately after planting, and as required to maintain growth rates free of stress.

Placing

Method: Remove the plant from the container with minimum disturbance to the root ball. Root prune to ensure all circling roots have been either severed or aligned radially into the surrounding soil. Make sure that the root ball is moist, place it in its final position, in the centre of the hole and plumb, and with the top soil level of the plant, level with the finished surface of the surrounding soil. Compact lightly so as to minimise subsidence without compacting the backfill. Avoid mixing mulch with topsoil.

Fertilising

Pellets: In planting beds and individual plantings, place fertiliser pellets around the plants at the time of planting.

Backfilling

General: Backfill with topsoil mixture. Lightly tamp and water to eliminate air pockets. Make sure that topsoil is not placed over the top of the root ball, so the plant stem remains the same height above ground as it was in the container.

Watering basins for plants in grass

Method: Except in irrigated grassed areas and normally moist areas, construct a watering basin around the base of each individual plant, consisting of a raised ring of soil capable of holding at least 10 L.

3.2 MULCHING

Placing mulch

General: Place mulch to the required depth, clear of plant stems, and rake to an even surface flush with the surrounding finished levels. Spread and roll mulch so that after settling, or after rolling, it is smooth and evenly graded between design surface levels sloped towards the base of plant stems in plantation beds, and not closer to the stem than 50 mm in the case of gravel mulches.

In mass planted areas: Place after the preparation of the planting bed but before planting and other work.

In smaller areas (e.g. planter boxes): Place after the preparation of the planting bed, planting and other work.

Extent: Provide mulch to 750 mm diameter, to surrounds of plants planted in riplines and grass areas.

Depths: Spread organic mulch to a depth of 75 mm, and gravel mulch to a depth of 50 mm.

3.3 SPRAYING

Notice

General: Immediately give notice of evidence of insect attack or disease amongst plant material.

Spraying

Product: Spray with insecticide, fungicide or both, as required.

3.4 STAKES AND TIES

Stakes

Material: Hardwood, straight, free from knots or twists, pointed at one end.

Installation: Drive stakes into the ground at least one third of their length, avoiding damage to the root system.

Stake sizes:

- For plants ≥ 2.5 m high: Three 50 x 50 x 2400 mm stakes per plant.
- For plants 1 to 2.5 m high: Two 50 x 50 x 1800 mm stakes per plant.
- For plants < 1 m high: One 38 x 38 x 1200 mm stake per plant.

Ties

General: Provide ties fixed securely to the stakes, one tie at half the height of the main stem, others as necessary to stabilise the plant. Attach ties loosely so as not to restrict plant growth.

Tie types:

- For plants ≥ 2.5 m high: Two strands of 2.5 mm galvanized wire neatly twisted together, passed through reinforced rubber or plastic hose, and installed around stake and stem in a figure eight pattern.
- For plants < 2.5 m high: 50 mm hessian webbing stapled to the stake.

Marker stakes

Material: Timber offcuts 25 x 25 x 1200 mm. Dip the top 200 mm in white paint.

Installation: Drive firmly into the ground at least 300 mm from the plant. Do not tie to the plant.

Location of marker stakes:

- Trees in grass: Mark each tree.
- Ripline planting areas: Mark each ripline at every fifth plant along the line.

Trunk protection

Collar guards: 200 mm length of 100 mm diameter agricultural pipe split lengthways.

3.5 COMPLETION

Product certification

Certification: Submit the supplier’s written statement certifying that plants are true to the required species and type and free from diseases, pests and weeds.

Cleaning

Stakes and ties: Remove those no longer required at the end of the planting establishment period.

Temporary fences: Remove temporary protective fences at the end of the planting establishment period.

0254 IRRIGATION

1 GENERAL

1.1 RESPONSIBILITIES

General
Requirement: Provide automatically controlled, fixed irrigation systems, as documented.

Performance
Requirements:

- Achieve the documented flow rates over the irrigated area.
- Meet statutory requirements for backflow prevention.

1.2 CROSS REFERENCES

General
Requirement: Conform to the following:

- *0171 General requirements*.

1.3 STANDARDS

Water supply
General: To AS/NZS 3500.1.

1.4 INTERPRETATION

Abbreviations
General: For the purposes of this worksection the following abbreviations apply:

- LDPE: Low-density polyethylene.

Definitions
General: For the purposes of this worksection the following definitions apply:

- Backflow prevention device: A device, required by law, on an irrigation system that prevents water from re-entering the potable water lines once it flows into the irrigation pipes.
- Emitter: A device used to control the rate at which water is applied to a specific area.

1.5 SUBMISSIONS

Shop drawings
General: Submit drawings and schedules showing the layout and details of the system, including the following:

- Micro-irrigation stake layout.
- Irrigation controller cabinets.

1.6 INSPECTION

Notice
Inspection: Give notice so that inspection may be made in accordance with 0171 GENERAL REQUIREMENTS, INSPECTIONS, Site Inspections.

2 PERFORMANCE SPECIFICATION

2.1 AIMS

Pump, filtration and all infrastructure requiring servicing and maintenance is easily accessible.

Tank lids and pit lids ideally located in hard stand (paths/pavement).

Rain switch device or mains top up/balance tank are ok – as long as water tracking can be achieved and operational pressure is maintained.

Need to be able to track both potable and non potable water usage – best method is to install pulse type flow meter on the irrigation output line (which is a general requirement for cloudmaster) and in alternate supply sites also use a pulse type flow meter on the town water top up. These meters are to

be wired into the cloudmaster. Meters should be easily accessible to allow for manual meter reading in the event of controller failure.

Systems should include rain sensor and/or soil moisture sensors to optimise system efficiency.

2.2 TREATMENT

UV filter should be installed per manufactures spec – braced and secured in a water proof enclosure (most water harvesting sites require a pump station so put all infrastructure together).

All primary and secondary filtration to be serviceable and sufficient to ensure water quality is suitable for use and ensure public health is maintained. Note that UV filtration may not be effective if water is cloudy or turbid when entering UV chamber.

2.3 CABLING, WIRING, AND PIPE WORK

The system design will be dependent upon the requirements of the site, manufacturer and designer recommendations, and available technology and resources. The following is the hierarchy of system types.

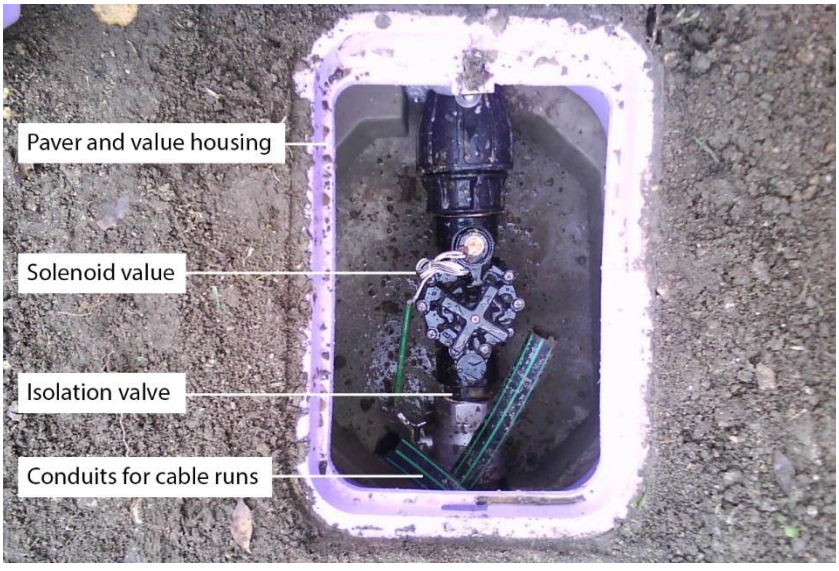
- Decoder system (Large sites only)
- multi strand cabling
- Hydraulic system

All can be operated by Cloudmaster controllers. Decoder systems allow for ease of future system expansion and repairs so are preferred in large systems. Multi strand systems are sufficient in small scale systems. Hydraulic systems have been problematic in the past and are not desirable.

Other key items for consideration are:

- All cabling should be installed in conduits with connections at valve boxes only.
- All connections must be water tight.
- If Decoder system is used please ensure the designer calculates the cable runs and voltage draw down. This is particularly important when using cloudmaster decoders.
- If cable runs are long or the system is constructed in large parklands, cable isolation points are desirable.
- Mainlines should have warning tape installed with it. Tape should be at 200mm above the pipe and contain a tracer line for locating purposes.

Image 1 – Preferred valve box layout



2.4 DEPTH OF PIPE WORK

Some issues have been encountered previously with pipe work not being installed at sufficient depth. The pipes are hard to detect and if not at a sufficient depth can be damaged during maintenance works (image below). Mainlines should be installed at a minimum depth of 450mm. Lateral lines

should be at a minimum of 300mm – with articulated riser assemblies used to attach and raise sprinklers.

Image 2 – Mainline installed too shallow and damaged by mower



Image 3 – Mainlines to be installed at minimum 450mm below surface



2.5 MAINS CONNECTIONS

All water meters and back flow prevention devised must the registered with Sydney water on installation. The installer will require the lot number of the parkland to complete this. Key requirements for mains connections are:

- Ensure appropriate backflow/duel use controls are installed. Mains top up should be placed to achieve relevant air gap as specified by Sydney water.
- Backflow prevention or RPZ units must be installed to Sydney water requirements. These units are tested annually as part of ongoing maintenance so it is critical that units comply with regulations at construction or development.

- QCV (Quick Coupler Valves) should be incorporated in the initial design and installation works. This allows for water supply in event of failure.
- If alternate water supply is utilised, signage should be installed to notify the public.

Image 4 – Sample signage – Hornsby Council



Cloudmaster controller and system initiation

- GSM modem and SIM card (Paul Rowley) and set up operations for back to base
- Initialise controller and PC communication
- Upload aerial image of site (bitmap)
- Cloudmaster detail

2.6 TESTING AND COMMISSIONING

To include but not limited to:

- System flushing to remove all residue
- Test pump units and operate at duty flow rates. Shut off heads to confirm their integrity. Reset after testing
- Test mainlines at 1.5 times pressure rating of the pipe for 30 min. Take readings at 0min, 10min, 20min, 30min. Test will be successful if the 3rd and 4th reading are less than 2% difference, and the 4th is not lower than 7% lower than the original test pressure.
- After testing adjust solenoid control valves, heads, and controllers for operation.
- Test all electrics and rectify any issues.
- All water harvesting components are to be fully operational at hand over to parks services. Trunk valves, feeder lines, storage tanks etc will have been tested and be fully operational.
- Commissioning must incorporate initiation of any storm water harvesting agreements, water disposal/trade waste agreements or initial system testing requirements to ensure that the system is successfully validated as legally required and to minimise public risk.
- As the end user of the system and being responsible for future testing we need to ensure that the system at hand over has been fully operated and thoroughly tested (trunk lines open, storm water supply and treatment units etc fully tested and operated on recycled supply). The Contractor shall be responsible for full commissioning of the system to prove the scheme is operating as designed. Commissioning will involve the testing of all pumps, pressure pipe, storages, alarms, treatment systems and any other aspect of the scheme as designed including the testing of RPZ valves and solenoid valves on the potable water back up. The objective is to define the routine conditions of the scheme for the long term and to confirm that the equipment and systems operate as intended.
- The Contractor shall leave each system in full operation condition. Its proper function shall then be demonstrated to Council maintenance staff to the satisfaction of the Superintendent who will then accept handover.
- Water quality testing of the recycled stormwater shall be undertaken over a minimum period of 4 weeks where the recycled water quality shall meet the compliance values set. All testing shall be at the cost of the Contractor until 4 successive weeks of compliance has been met. The testing parameters and frequency is will be at weekly intervals (minimum) and by a NATA accredited

laboratory. A validation report outlining the results from the water quality testing and the compliance shall be submitted to the Superintendent for approval.

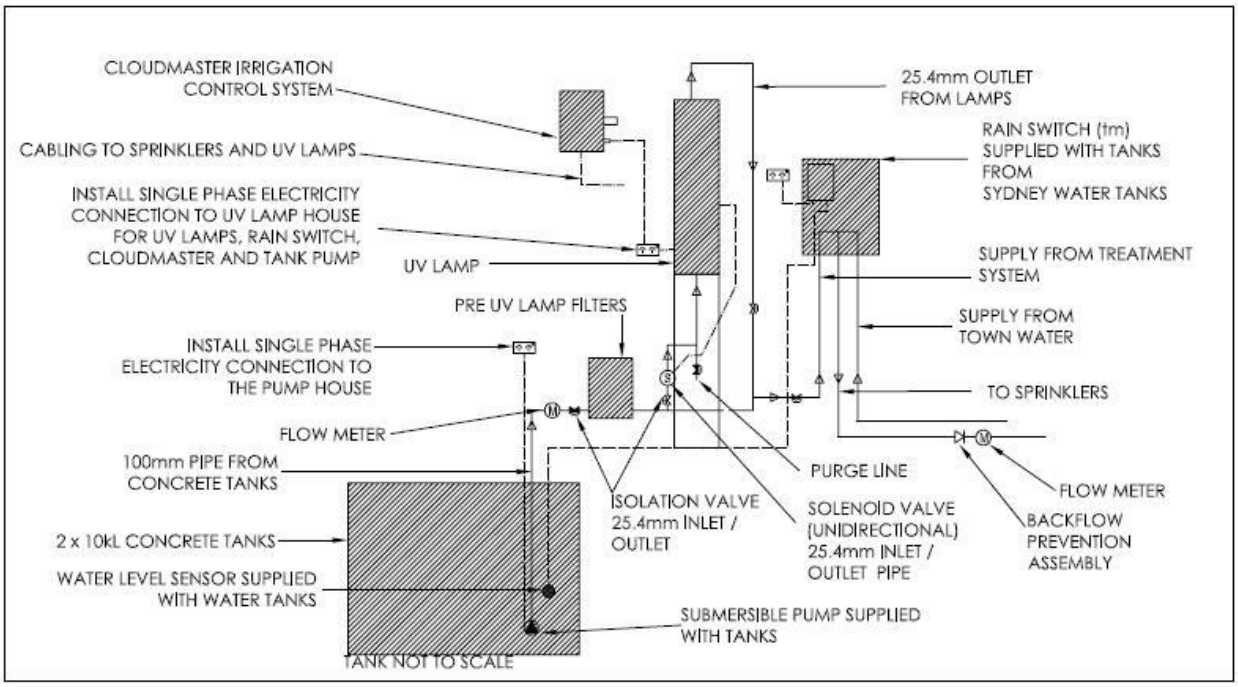
- Defect period should include follow up servicing of irrigation components as required.

2.7 HAND OVER

Site hand over will occur at successful completion of testing and commissioning period. This will include the following:

- Site meeting and induction/training of parks maintenance staff
- Spare parts – 2 x full circle sprinklers, 1 x solenoid valve
- Provision of servicing manuals and maintenance manuals for the system and all components.
- As constructed drawings
- electronic copies – 1 x DWG (CAD) file and 1 x PDF
- 2 x hard copies in A3 or bigger
- Diagram of pump station and system component (example below)

Image 5 – Diagram of pump station and system component



0255 LANDSCAPE – PLANT PROCUREMENT

1 GENERAL

1.1 RESPONSIBILITIES

General
Requirement: Provide plants as documented.

Performance
Maintenance: Encourage and maintain healthy growth for the duration of the contract.

Program: Provide a suitable irrigation, pruning, fertiliser and monitoring program for all plant materials held by the supplier. Take any other precautions required to safeguard the health and well-being of all plant materials before and including their delivery to site.

1.2 CROSS REFERENCES

General
Requirement: Conform to the following:

- *0171 General requirements*.

1.3 STANDARD

General
Tree stock supply: Conform to the recommendations of AS 2303.

1.4 INTERPRETATION

Definitions
General: For the purposes of this worksection the definitions given in AS 2303 and the following below apply:

- Destructive inspection (of trees): The washing away of all soil from a rootball to allow inspection of rootball development.
- Investigative inspection: Any method of root inspection that involves the washing away of all or portions of the soil from the rootball to expose a section or all the roots.
- Known history: Supplier documentation, demonstrating and enabling verification that the product was grown by essentially the same processes and under essentially the same system of control.
- Large tree: A tree grown in a container not less than 20 L or ex-ground with a minimum rootball diameter of 400 mm.
- Partial inspection (of trees): A method of exposing a section of a root system to enable inspection of root development by washing the soil away in a wedge-shaped section from the stem to the extremity of the rootball. This soil can be gently replaced so the tree is not damaged.
- Shrub: A woody perennial plant smaller than a tree, usually having permanent stems branching from or near the ground.
- Small trees: Tree or shrub grown in a container less than 20 L (other than tubes or plant cells) or ex-ground trees of size index less than 35.

1.5 SUBMISSIONS

Forward order contracts
Reports: Complete regular reports using the pro forma **TREE INSPECTION FORM** provided in **SELECTIONS**. Include checks against specification requirements.

- Photographs: Provide current colour copies with date verification.
- Inspection: Complete and return the attached pro-forma **TREE INSPECTION FORM** before despatch of every batch, and at the following frequencies:
  . Inspections: At 3 monthly intervals.
- Reports: At time of inspections.

Photographic examples
Requirement: Submit photographic examples as follows:

- All palm species.
- 100, 200, 400 L plant species.
- Specimen plant species.

Program: Within fourteen (14) days of the date of contract.

Clarity: Sufficient to be able to ascertain the species, size and quality of a single specimen of the subject plant.

Identification: Provide photographs as follows:

- In colour.
- With a clearly identifiable scale reference located in the same plane as the plant stem or trunk.
- Labelled with plant species name.

Plant provenance

Locality: Provide written certification that all plant material has been grown from locally sourced stock. If this is not achievable give notice.

Species: Provide written certification that all plant material is true to the required species and type.

Progress reports

Content: A detailed resume of the quantities, growth, general health and geographic location of the complete inventory of plant material for the works.

Purpose: To evaluate progress payments under the general conditions of contract.

Program: At 3 monthly intervals.

Test results

General: Complete and return the **TREE INSPECTION FORM** for each batch inspected.

Rejection: Non-conformity may lead to rejection of the entire batch.

Corrective action: Conform to corrective action procedures for each order as instructed.

Substitution: If non-conforming trees are proposed, submit a proposal in writing.

Authentication: Submit a copy of the written approval of substitution with any non-conforming trees.

1.6 INSPECTION

Notice – off-site

Inspection: Give notice so that inspection may be made of the following:

- Immediately prior to the acceptance of tender to establish conformance of the representative samples of all stock scheduled. Conform to **PRODUCTS**, **BALANCE**.
- After eight weeks of the growing on period.
- At 80% completion of stocking of plant material.
- At completion of stocking of plant material, deemed to be as close as practical to 100% in terms of species and numbers.
- At the date of commencement of delivery.
- At a time to be determined to assess potting on procedures, if necessary.

2 PRODUCTS

2.1 PLANTS – GENERAL ASSESSMENT CRITERIA

General

Requirement: Supply trees to AS 2303 and with the following properties:

- Stress: Free from stress resulting from inadequate watering, excessive shade or excessive sunlight experienced at any time during their development.
- Site environment: Grown and hardened off to suit anticipated site conditions at the time of delivery.
- Native species with a history of attack by native pests: Restrict plant supply to those with evidence of previous attack to less than 15% of the foliage and make sure of the absence of actively feeding insects.

Labelling

General: To AS 2303 clause 2.2.1.

Label type: To withstand transit without erasure or misplacement.

2.2 ABOVE-GROUND ASSESSMENT CRITERIA - TREES

General

Requirement: Supply trees to AS 2303 clause 2.2 and with the following properties:

- Clean stem height: < 40% of total tree height.
- Trunk position: Variation in distance from the centre of the trunk to the extremity of the rootball:
  . < 10%.
- Tree stock in containers less than 45 L: Self-supporting at dispatch.
- Pest and diseases: No evidence of active pests and diseases.
- Indication of north: Trees in containers greater than 100 L or of Size Index greater than 140:
  . Label the northerly aspect during growth in the nursery and maintain during transit.

2.3 BELOW-GROUND ASSESSMENT CRITERIA - TREES

General

Requirement: Supply trees to AS 2303 clause 2.3 and with the following properties:

- Rootball occupancy: Soil retention:
  . On shaking or handling the unsupported rootball, at least 90% of the soil volume is to remain intact.
- Rootball diameter:
  . Containers less than or equal to 45 L and ex-ground stock: ≥ to rootball depth.
  . Bare-rooted tree stock with size index less than or equal to 57: ≥ 10 x calliper
- Pest, diseases and weeds: No evidence of active pests, diseases and weeds.

2.4 BELOW-GROUND QUALITIES – SHRUBS

Root system

Requirement: Supply plant material with a root system as follows:

- Well-proportioned in relation to the size of the plant material.
- Conducive to successful transplantation.
- Free of any indication of having been restricted or damaged.

Root inspection: If inspection is by the removal of soil test such as destructive inspection, sample as follows:

- For > 100 samples: Inspect 1%.
- For < 100 samples: Inspect 1 sample.

Sample plants: Replace plants used in inspection.

Rejection: Do not provide root bound stock.

2.5 BALANCE - ASSESSMENT CRITERIA

Small trees and shrubs

Containers (except tubes or plant cells) or rootballs: To remain flat on the ground when the stern, held at 80% of height above ground, is deflected 30°C from the vertical, side to side.

Exempt: Species that naturally produce hard inflexible wood in the early stages of their development.

Small container-grown trees and shrubs table

Container size or minimum rootball diameter	**Height range above soil (m)**	
	Thin-stemmed species	**Thick-stemmed species**
Tubes or plant cells	1.5 to 2.5 x the height of the container	
150 mm (1.8 L)	0.4 – 0.6	0.3 – 0.5
170 mm (2.6 L)	0.5 – 0.7	0.4 – 0.6
200 mm pot (4 L)	0.7 – 0.9	0.6 – 0.8
200 mm bag (5 L)	0.8 – 1.0	0.7 – 0.9
250 mm (8 L)	1.0 – 1.2	0.8 – 1.0
300 mm (15 L)	1.2 – 1.5	1.0 – 1.2

Large trees
Size Index range for trees grown in containers ≥ 20 L: To AS 2303 Appendix E Table E1.

Minimum rootball diameter for ex-ground trees: To AS 2303 Appendix E Table E2.

2.6 SPECIMEN PLANTS

Properties
Source: From locations where these plant materials are growing in natural ground conditions.

Non-containerised nursery stock: Required.

Presentation: Provide maximum initial impact at the time of project opening.

Properties: As documented in the **Specimen plants schedule**.

Preparation: Undertake the preliminary preparation of all specimen plants and the programming of all necessary preparation works to assure readiness of specimen plants for transplanting to site when required.

Indication of north
Trees in containers greater than 100 L or of Size Index greater than 140: Label the northerly aspect during growth in the nursery and maintain during transit.

2.7 INTERNAL PLANTS

Properties
Presentation: Provide maximum initial impact at the time of project opening. Consideration providing alternative species that may mimic or offer similar foliage display to those nominated.

Properties: As documented in the **Internal plants schedule**.

Growing medium: Anticipate and match the soil type and drainage conditions of the works.

3 EXECUTION

3.1 ACCLIMATISATION

Internal plants
Requirement: To cause physiological changes within the plant that will enable it to withstand the transition to the project site without loss of foliage or variance from a healthy and attractive state for five years or more.

Method: Provide internal plants nursery grown in their final nursery containers for six months or longer, under a lighting regime of shading from natural light appropriate to the plant variety. During the final four months simulate conditions in the shadehouse to match the climate anticipated on the project site.

3.2 PRE-COMPLETION TESTS

Production tests
Sampling: Select sample trees, of known history, at evenly distributed intervals within each batch.

Above ground tree inspection:

- Frequency: Inspect trees at dispatch.
- Sampling strategy: To AS 2303 Appendix A Table A1.
- Inspector: Supplier.

Investigative tree inspection:

- Frequency: Inspect trees before dispatch.
- Inspector: Qualified person authorised by the contract administrator.
- Destructive inspection: Use for trees with rootballs/containers not more than 200 mm.
- Allowance: Allow for sample trees in addition to quantity ordered.
- Partial inspection: Use for trees with rootballs/containers more than 200 mm.

Investigative tree inspection sampling table

Number of trees per batch	Number of trees to sample
0 – 20	1
21 – 50	2
51 – 100	4

Number of trees per batch	Number of trees to sample
101 – 500	4 for the first 100 + 2% of balance of order
501 – 2000	12 for first 500 + 1% of balance of order
2001+	27 for the first 2000 + 0.5% of balance of order

3.3 CONTINGENCY PLANT MATERIAL

Replacement

Provision: Anticipate replacement of failures on site.

Amount: 15% above any normal allowances made in the nursery trade for anticipated losses in the course of propagation and the growing on of plant materials.

Delivery: Supply to the site upon 7 days' notice to the supplier.

Holding: Until the contingency plant material is delivered to site or until the expiry of twelve months from the date of completion of the works, whichever is the earlier. The supplier is not entitled to holding costs for contingency plant material.

Surplus plant material: To remain the property of the supplier.

3.4 WARRANTIES

True-to-species

Parties: Supplier(s) to the principal.

Form: All the plants supplied under these works are true-to-species and type, and free of disease, fungal infection and/or any other impediment to their future growth and that they have been fully acclimatised for the conditions of the site.

Submission of warranty: At the time of each delivery.

Maintenance

Parties: Supplier(s) to the principal.

Form: Maintain all plant materials sourced and secured by the supplier throughout the procurement and pre-transplanting maintenance period. Cover the cost of purchase, labour, equipment, transport and materials to replace any losses, with plant materials of equivalent sizes and quality during the warranty period. Ensure that it is physically possible for any or all of the on-site plant material to be successfully prepared and transplanted.

Warranty period:

- Commencement: The date of contract.
- Completion: To cease in respect of any particular plant material upon issue of a delivery notice issued by the contractor upon delivery to site.
- Earliest delivery date: One week after the date of contract.

4 SELECTIONS

4.1 TREE INSPECTION FORM

General details schedule

Date		**Reference**	
Customer contact details:			
Supplier contact details:		Inspected by (supplier/purchaser/agent)	
Species		Batch identification	
Botanical name		Number of tree stock sampled	
Included bark (circle): Yes/no		Self-supporting (circle): Yes/no	
Number of trees in batch		Container/rootball size	
Height range/Average		Calliper range/Average	
Tree stock balance/Calculated using average figures		Tree stock balance conforms to AS 2303 clause 3.2: Yes/no	
Special requirements			

Above-ground attributes schedule

Attributes	**Conforming (yes/no/not applicable)**	**Comments**
Label present		
Sufficient crown density		
Typical crown cover		
Typical crown form		
Typical leaf colour and size		
Absence of epicormic shoots		
Absence of dieback		
Symmetrical crown		
Freedom from injury		
Adequate stem taper		
Adequate branch diameter		
Apical bed and adequate stem deviation		
Sound divisions		
Divisions above clean stem requirement		
Pruning cuts and branch collar or node points		
Minimal pruning cut diameter		
Clean stem height		
Convex unions at stem and branch bark ridges		
Central trunk position		

Attributes	**Conforming (yes/no/not applicable)**	**Comments**
Compatibility of graft unions		
Diameter of scion		
Freedom from pests and diseases		
Indication of north		

Below-ground attributes schedule

Attributes to AS 2303 Appendix B	**Conforming (yes/no/not applicable)**	**Comments**
Inspection method used		
Number of trees in sample		
Adequate rootball diameter		
Adequate rootball depth		
Height of root crown		
Non-suckering rootstock		
Absence of active pests, diseases and weeds		
Adequate rootball occupancy		
Absence of circling roots		
Absence of woody circling roots		
Adequate root direction		
Absence of girdled, kinked or j-roots		
Root division		
Date of rootball assessment		
Rootball assessment valid until		

Conformance with the specification schedule

Conforming Yes/no	
Comments	
Name of inspector	
Signatures of inspector	
Date of inspection	
Inspection valid until	

0256 LANDSCAPE – ESTABLISHMENT

1 GENERAL

1.1 RESPONSIBILITIES

General
Requirement: Provide plant establishment, as documented.

1.2 CROSS REFERENCES

General
Requirement: Conform to the following:
- *0171 General requirements*.
- *0254 Irrigation*

1.3 INTERPRETATION

Definitions
General: For the purpose of this worksection the following definitions apply:
- Plant establishment period: The period between the date of practical completion and the end of the defects liability period.

1.4 SUBMISSIONS

Execution details
Notice: Provide two days notice of the following operations:
- Application of herbicide.
- Application of fertiliser.
- Watering.
- Each site maintenance visit.

Log book
Records: Log the following on a weekly basis:
- Description, time and method of application of toxic material.
- Maintenance work details.
- Inclement weather to verify inability to carry out work within the specified time frame.

Availability: Upon request.

Monitoring program
General: Provide a monitoring program developed by a specialist monitoring consultant and incorporating the following:
- Photographic record including:
  . Colour photographs.
  . Documented monitoring locations and photograph angles.
- Reporting periods including photographic records at the following:
  . Before commencement of the works.
  . Date of practical completion.
  . Three monthly intervals during the plant establishment period.
  . Date of final completion.
  . Benchmark definition based on remnant communities.
  . Replicated measurements over time and comparative analysis with regard to the benchmark.

Specialist consultant: Submit the name, qualifications including research papers and scientific publication details, and contact details of the specialist monitoring consultant.

Replacement plants
Species: Provide written certification that all plant material is true to the required species and type.

1.5 INSPECTION

Notice

Inspection: Give notice so that inspection of the contract area may be made at the following:

- Date of practical completion.
- Three monthly intervals during the plant establishment period.
- Date of final completion.

2 EXECUTION

2.1 GENERAL

Special instructions

Priority: If instructed by the contract administrator, attend to certain areas and procedures as a priority. Obtain approval for additional costs before commencement of works.

Reporting

Monthly report: Submit regular reports by the last Friday of each month:

- Of the general status of works.
- Include soil test results as required for the fertilising programs.
- Plant replacement requirements.

Incident reports: Report immediately verbally and confirm in writing any disturbance or incidence affecting or likely to affect the day to day scheduling of works.

Disruption of works by others

Other contractors: Make arrangements to work around the disturbance.

2.2 PLANTING WORKS

Planting

Planting: Ensure the general appearance and presentation of the landscape and the quality of plant material at date of practical completion is maintained for the full planting establishment period.

Existing plant material: Maintain existing planting and grass within the landscape contract area as specified for the corresponding classifications of new grassland or planting.

Replacements: Replace failed, dead and/or damaged plants at maximum 3 week intervals as necessary throughout the full plant establishment period.

Fertilising

Soil tests: Take samples from both planting beds and lawn areas and conduct tests.

Fertilising: Base the fertilisation program on the soil testing results. Fertilise trees once every two years. Generally apply an all purpose fertiliser of N:P:K (Nitrogen:Phosphorus:Potassium) 10:4:6 at recommended rates. Alternatively apply 12 month slow release fertiliser at the manufacturer's recommended rate. Apply all purpose fertiliser to shrubs annually in two bands and cultivated into the soil 100 mm deep.

Season: Fertilise shrubs and trees in September and March according to their seasonal growth requirement.

Insect and disease control

Period for treatment: Until the problem has been eliminated.

Chemical spray: Apply outside of normal working hours.

Stakes and ties

Generally: If plants are unable to be self-supported or if stakes are damaged, stake or restake the plants as follows:

- Drive three hardwood stakes placed obliquely with the first stake on the opposite side to the prevailing winds.
- Do not single stake large plants.

Removal: If plants are robust with well developed systems and are strong enough to no longer require support, remove stakes and ties.

2.3 GARDEN BEDS

Weeding

Weeds: Unwanted plants and grasses considered invasive to the locality.

Program:

- Lawns: Quarterly, and as determined by the relationship of the general lawn condition and weed growth.
- Trees and shrubs: As required for planted, paved and mulched areas to be weed free when observed at bi-weekly intervals.

Method: Clear and keep clear vigorous ground covers 200 mm from the base of any shrub or tree:

- Small areas: By hand.
- Large areas: Proprietary herbicides.

Herbicide application: Avoid windy days or if rain is likely to follow within 12 hours. Apply:

- To the manufacturer's instructions and Safety Data Sheets.
- When the weather is humid with moderate temperatures and maximum sunlight.
- When the ground has recommended soil moisture.

Rubbish removal

Rubbish: Remove loose rubbish such as bottles, papers, and cigarette butts from the site. Execute this work regularly so that all areas are free from rubbish when observed at bi-weekly intervals.

Leaf litter: Remove from all path and lawn areas.

Mulched surfaces

Inspection: Bi-weekly to determine mulch requirements.

Depth: Maintain a minimum depth as specified in Landscape Selections Schedule.

Remulching: Maintain the original ground levels around the base of plants.

2.4 WATERING

Establishment

Extent: All landscape areas

Water quality:

- pH between 5.5 and 7.5.
- Total soluble salts less than 1000 mg/litre.
- No substances that would be toxic to plant growth.

Watering program: Minimum three complete waterings, soaking to a depth of 150 mm at fortnightly intervals for the first 6 weeks of plant establishment irrespective of natural rainfall. Confirm soaked depth and record in the log book.

Water restrictions: Coordinate the water supply and confirm the watering regime against state and territory government legislation and restrictions at the time.

Irrigation

Refer ***0254 Irrigation***

2.5 PAVING AND STRUCTURES

Furniture, signage and barriers

Maintenance guidelines:

- Furniture and pots: Keep in a good condition and move as required to carry out maintenance works.

Directional and building signs: Keep in a good condition and maintain visibility.

Boundary and car park barriers: Keep in a good condition as originally specified.

Drains

General: Inspect and clean all drainage structures and pit covers and ensure that they are in proper working order.

Frequency: As required, so that all overflow drains are cleared when observed at fortnightly intervals.

2.6 COMPLIANCE

Criteria

Generally: Plant establishment shall be deemed complete, subject to the following:

- Repairs to planting media completed.
- Ground surfaces are covered with the specified treatment to the specified depths.
- Pests, disease, or nutrient deficiencies or toxicities are not evident.
- Organic and rock mulched surfaces have been maintained in a weed free and tidy condition and to the specified depth.
- Vegetation is established and well formed.
- Vegetation cover to cell, seeded and/or hydromulched areas.
- Plants have healthy root systems that have penetrated into the surrounding, undisturbed ground and not able to be lifted out of its planting hole.
- Vegetation is not restricting essential sight lines and signage.
- Only frangible species are growing within road side clear zones.
- Specified vegetation setbacks from services and road furniture are evident.
- All hard landscape works have been installed and are operating as specified.
- Collection and removal of litter.
- Removal of mulch from drainage and access areas.
- All non-conformance reports and defects notifications have been closed out.

Plant establishment compliance table

Plant material	**Acceptable failure per area**	**Acceptable concentration of failure**
Tube stock	< 10%	< 15% in any given location
140 mm	< 5%	< 15% in any given location
300 mm or larger	< Nil%	Nil %
Turf	< 5%	Nil %
Cells	< 5%	< 15% in any given location
Direct seeded native species and cover crop – including hydromulch, drilled and broadcasted areas	Not less than 3 [Nominate as appropriate] specified species per 1 m^2 grid (determined on a testing frequency of 20 grid areas per 500 m^2)	Nil grids with < three (3) [Nominate as appropriate] specified plant species
Direct seeded grass species and cover crop	< 15% (determined by a 1 m^2 grid on a testing frequency of 1 grid area per 500 m^2)	< 10%
Cover crop	< 5%	Nil %

3 SELECTIONS

Refer Landscape Selections Schedule.

0259 LANDSCAPE MAINTENANCE

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide landscape maintenance of the contract area during the maintenance period.

Performance

Extent of maintenance:

- Weeding of lawn, garden bed areas, and pavement.
- Supply and spreading of fertiliser to lawn, garden bed areas and pots.
- Supply and installation of mulch to existing garden bed areas and pots.
- Pruning, trimming and tree surgery.
- Pest and disease control of lawn, shrubs and trees.
- Mowing and edge trimming to all lawn areas including collection and removal of clippings.
- Replacement of dead or failed plants.
- Maintenance of irrigation systems.
- Removal of rubbish and debris in garden areas.
- Keeping of a log book.
- Monthly reports.

Maintenance period: 52 weeks

Maintenance procedures: To the SELECTIONS **Maintenance schedule**.

1.2 THE SITE

Site restrictions

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

List: At least 10 working days before entry is required, submit the full name, address, and date and place of birth of persons required to enter designated secure areas.

- Purpose of submission: Review.

Protection of persons and property

Temporary works: Provide and maintain required guards, fencing, footpaths, signs and lighting.

Accessways, services: Do not obstruct or damage footpaths, drains and watercourses or other existing services in use on or adjacent to the site.

Property: Do not interfere with or damage property which is to remain on or adjacent to the site, including adjoining property encroaching onto the site, and trees.

Rectification

Accessways, services: Rectify immediately any obstruction or damage to footpaths, drains and watercourses or other existing services in use on or adjacent to the site. Provide temporary services whilst repairs are carried out.

Property: Rectify immediately any interference or damage to property which is to remain on or adjacent to the site, including adjoining property encroaching onto the site, and trees.

1.3 GENERAL CONDITIONS

Reporting

Monthly report: Submit regular reports by the last Friday of each month, to the SELECTIONS **Monthly reports schedule** and as follows:

- General status of the works.
- Soil test results included as required for the fertilising programs.
- Any plant replacement requirements.

Incident reports: Report immediately verbally and confirmed in writing any disturbance or incidence affecting or likely to affect the scheduling of the works.

Notice

Inspection: Provide two days' notice of the following operations:

- Application of herbicide.
- Application of fertiliser.
- Each site maintenance visit.
- Work affecting public access or amenity on the Thursday of the week before the work is planned.

Log book

Records: Log the following on a weekly basis:

- Description, time and method of application of toxic material.
- Maintenance work details.
- Inclement weather to verify inability to carry out work within the specified time frame.

Availability: Upon request.

Replacement plants

Species: Provide written certification that all plant material is true-to-species and type, and free of disease and fungal infection.

Disruption of works by others

Other contractors: Make arrangements to work around the disturbance.

2 EXECUTION

2.1 GENERAL

Weeding

Requirement: Remove unwanted broadleaf plants and grasses considered invasive to the locality.

Program:

- Trees and shrubs: As required for planted, paved and mulched areas to be weed free when observed at fortnightly intervals.

Method: Clear and keep clear vigorous ground covers 200 mm from the base of any shrub or tree:

- Small areas: By hand.
- Large areas: Proprietary herbicides.

Herbicide application: Apply as follows:

- To the manufacturer’s recommendations and the material data and safety data sheets.
- When the weather is humid with moderate temperatures and maximum sunlight.
- When the ground has adequate soil moisture.
- Avoid windy days or if rain is likely to follow within 12 hours.

Pest and disease control

Requirement: Control any pests or diseases affecting the lawn and garden bed areas as follows:

- Identify the problem.
- Execute the correct treatment until the problem has been eliminated.
- Apply hazardous material out of normal working hours.
- Protect staff and public.

2.2 TREES AND SHRUBS

Pruning and trimming

General: Prune to reflect the natural growth, flowering and regrowth habit of the individual species.

Program generally: Spring and Summer and on a spot basis as required.

Shrubs: Prune after flowering.

Hedge trimming: Schedule trimming at times which will maintain the character and design of hedges. Allow up to three times per season.

Tip pruning:

- Purpose: To encourage development of new shoots during the active growing season.
- Method: Removal of the top 25 mm or growing tip of each branch.
- Restriction: Do not remove buds before the flowering season in those plants that have terminal flowers.

Radical pruning:

- Purpose: To maintain a hedge or formal shape or when a particular problem, growth habit, damage, or disease requires branch removal.

Tree pruning:

- Eliminate diseased or damaged growth, avoid inter-branch contact and thin out crowns in a natural manner.
- Maintain sight lines to signs and lights.
- Maintain visibility for personal security.

Tree branch removal:

- To AS 4373.
- Give notice and engage a suitably qualified arborist.

Fertilising

Fertilising program: Base the program on soil testing results.

Soil testing: Undertake soil tests as follows:

- At the commencement of the contract.
- Take samples from a cross section of planting beds.

Soil pH adjustment: Apply additional fertilisers and soil conditioners as indicated from soil testing or from the physical soil structure. Maintain a pH range of 5.5 to 6.5.

Shrubs:

- N:P:K ratio: Balanced 10:4:6.
- Rate: To the manufacturer's recommendation and cultivate two rows into the soil 100 mm deep.
- Regular application: Each September and March.
- Sensitive native species: Apply appropriate dosage.

Trees:

- Application: Apply pill to the root zone at a distance from the trunk equal to the spread of the foliage. Make holes 400 mm deep to take the pill, equally spaced around the plant and backfill with sand.

Micro nutrients: Apply 1 kg of urea in 20 litres of water per 100 m^2, through a hose proportioner every four weeks during Summer.

Stakes and ties

Generally: If plants are unable to be self-supported or if stakes are damaged, stake or re-stake the plants as follows:

- Drive three hardwood stakes placed obliquely with the first stake on the opposite side to the prevailing winds.
- Do not single stake large plants.

Removal: If plants are robust with well developed systems and are strong enough to no longer require support, remove stakes and ties.

Plant replacements

General: Replace all evergreen plants that have died or lost 50% of their normal foliage cover. Provide replacement plants as follows:

- Of the same species and variety and of the closest commercially available size.
- With a balanced root system in relation to the size of the plant and conducive to successful transpiration. Inspect the root conditions of plants by knocking plants from their containers.
- Without signs of having been stressed at any stage during their development due to inadequate watering, excessive shade/sunlight, suffered physical damage or have restricted habit due to growth in nursery rows.
- Grown in final containers for not less than twelve (12) weeks.

2.3 WATERING

Lawn and planted areas

Generally: Maintain a vigorous healthy appearance.

Application rates: Soak to a depth of 150 mm for lawn and 300 mm for planting. Avoid frequent dampening of the surface. Allow the surface of the soil to partially dry out between waterings. Confirm soaked depth and record in the log book.

Timing: Water at times of day to minimise water evaporation loss. Do not water during the hottest period of Summer days.

Water restrictions: Coordinate the water supply and confirm the watering regime against legislation and restrictions applying at the time.

Hand watering

General: Manually water all lawn and planting areas in the absence of an irrigation system or until the proposed irrigation system is fully operational.

Irrigation

Irrigation system program: To suit the following:

- The precipitation requirements of the individual zones/stations with regard to types of plants.
- The infiltration rate of the soil/medium and associated physical factors, of seasons, evaporation, exposure, topography, local authority restrictions.
- Adjustment or shut down during and after periods prolonged heavy rains.
- Water supply and watering regime of legislation and restrictions applying at the time.

Equipment maintenance: Confirm the following:

- Check all components for proper operation.
- Obtain approval to repair or replace damaged component with equivalent parts.
- Flush any dirt or foreign matter from the system and clear all blockages.

Operation: Make sure by adjustment or replacement of components, that the overall operation of the system is efficient and operational during the maintenance contract.

System maintenance: Conform to the **Irrigation system maintenance schedule**.

Programming

Automated systems: Program to coincide with optimum periods of water pressure and water absorption.

Public access: Do not inconvenience persons occupying the site by water spray or block normal pedestrian or traffic flow.

2.4 MULCHING

General

All organic and timber mulch shall only be sourced from Forestry Waste, recycled packaging pallets and tree loppings. It should be free of any demolition, construction, other building waste including any fencing materials or CCA treated timber.

Clean up: Remove all mulching materials off lawn or paved areas and maintain a clean and tidy appearance when viewed on a weekly basis.

Depth: Maintain a minimum depth as specified in Landscape Selections Schedule.

Top up: Areas of excessive wear.

Appearance: Maintain to keep clean and tidy with no soil disturbance evident on the surface of the mulch.

2.5 INCIDENTAL WORKS

Supplementary works

General: Execute the following:

- Removal of waste from maintenance work.
- Removal of leaf litter fortnightly during leaf fall.
- Wash paving on completion of herbicide application.

Furniture, signage and barriers

Scope: All fixed and movable features noted in the record drawings.

Furniture and pots:

- Move and relocate as required for maintenance of the area.
- Repair or replace items damaged by the maintenance contract staff.

Signage: Maintain sight line visibility.

Drains

General: Inspect and clean all drainage structures and pit covers and make sure they are in proper working order.

Frequency: As required so that all overflow drains are cleared when observed at fortnightly intervals.

3 SELECTIONS

3.1 MAINTENANCE REPORT

Monthly reports schedule

Item	**Action**
Plant material	Replace failed plants
	Additional planting
	Treat for disease or insect attack
	Tree surgery
	Fertilising generally
	Fertilising for specific nutrient deficiencies
	Thin out planting
	Pruning/trimming
Turf	Returfing
	Seeding
	Treat for disease
	Topdressing
	Weeding
	Mowing/trimming
Soil	Erosion/bank stabilisation
	Additional soil
	Soil conditioner
	Weeding
Mulch	Top up mulch
Rubbish removal	Generally remove bottles, paper, cigarette butts etc.
	Remove leaf, litter from path and paved areas
Irrigation	Replace parts
	Repair
	Clean out
	Adjust
	Clean out subsurface drains
Paving and pathways	Repair dips, hollows, irregularities
	Remove stains and graffiti
	Replace sections of uplift

Item	Action
	Clear main pathway drains of debris
	Weeding
Infant playground	Make sure that all play structures are secure and in working order and protective coatings are re-applied to manufacturer's recommendation
Fencing	Repair fencing
Furniture and hard fixtures	Bench/seat
	Bollard
	Lighting
	Barriers

3.2 MAINTENANCE PROCEDURE

Maintenance schedule

WEEK	SPRING (Sept, Oct, Nov)	SUMMER (Dec, Jan, Feb)	AUTUMN (Mar, Apr, May)	WINTER (Jun, Jul, Aug)
1	Mow and trim lawns	Mow lawns; weed	Mow lawns	Weed
2	Weed; trim and adjust trees and shrubs	Weed; mow lawns, trim and adjust trees and shrubs	Weed; mow lawns, trim and adjust trees and shrubs	Mow and trim lawns Trim and adjust trees and shrubs
3	Mow and fertilise lawns; treat plant material for insects and disease	Mow lawns; weed; treat plant material for insects and disease	Mow and trim lawn	Weed
4	Weed; topdress, condition lawns and oversow bare patches; issue maintenance report	Weed; mow and trim lawns; issue maintenance report	Weed; mow lawns; issue maintenance report	Mow lawns; issue maintenance report
5	Fertilise all trees and shrubs in garden beds; mow and trim lawns	Mow lawns; weed	Mow lawns	Mow lawns
6	Weed; inspect mulch for deficiencies in cover; check and adjust irrigation	Mow lawns; check and adjust irrigation	Weed; inspect mulch for deficiencies in cover; check and adjust irrigation	Mow and trim lawns; treat for insects and disease; check and adjust irrigation
7	Reinstate mulch as required; treat plant material for insects and disease; mow lawns	Mow lawns; weed	Reinstate mulch as required; mow, trim and fertilise lawns	Weed
8	Weed; inspect condition of paving and furniture; issue maintenance report	Mow and trim lawns; inspect condition of paving & furniture; issue maintenance report	Weed; inspect condition of paving and furniture; issue maintenance report	Mow lawns; Inspect condition of paving and furniture; issue maintenance report
9	Mow and trim lawns	Mow lawns; treat plant material for	Mow lawns	Weed

WEEK	SPRING (Sept, Oct, Nov)	SUMMER (Dec, Jan, Feb)	AUTUMN (Mar, Apr, May)	WINTER (Jun, Jul, Aug)
		insects and disease		
10	Weed; mow lawns	Mow and topdress lawns	Weed; treat plant material for insects and disease	Mow and trim lawns
11	Mow and fertilise lawns; trim and adjust trees and shrubs	Mow lawns; trim and adjust lawns; weed	Mow and trim lawns; trim and adjust trees and shrubs	Prune back trees and shrubs after flowering
12	Weed; mow lawns; treat plant material for insects and disease	Mow, trim & fertilise lawns	Weed	Mow lawns; treat plant material for insects and disease
13	Check and adjust irrigation; mow lawns; issue maintenance report	Check and adjust irrigation; mow lawns; weed; issue maintenance report	Check and adjust irrigation; mow lawns; weed; issue maintenance report	Check and adjust irrigation; weed; issue maintenance report

3.3 IRRIGATION

Irrigation system maintenance schedule

Item	Frequency
Filters – mainline	Monthly
Electrical source output (auto system)	Monthly
Controller (automatic systems)	Monthly
Operation – progression - Station to Station.	Weekly
Proper activation of valves	Monthly
Proper timing of stations	6 monthly
Proper time and day readings	Weekly
Exterior appearance	6 monthly
Valve operation	6 monthly
Open, close completely (weeping)	Weekly
Sprinkler operation	Weekly
Rotaries – clogged nozzles	2 monthly
Plant obstructed pattern	2 monthly
Arc coverage	2 monthly
Radius adjustment	2 monthly
Pop-up action	2 monthly
Riser seal leaks	2 monthly
Set to grade	2 monthly
Coverage pressure	2 monthly
Rotational speed	2 monthly
Clogged screens	2 monthly
Head damage	2 monthly
Piping	2 monthly
Leaks – broken or cracked pipe	As Needed
Bad solvent welds, bad threaded	As Needed
Connection	As Needed
Clogged pipe	As Needed

0261 LANDSCAPE – FURNITURE AND FIXTURES

1 GENERAL

1.1 RESPONSIBILITIES

General
Requirement: Provide landscape furniture and fixtures, as documented.

1.2 CROSS REFERENCES

General
Requirement: Conform to the following:
- *0171 General requirements*.
- *0262 External sports and playground surfacing*.

1.3 SUBMISSIONS

Operation and maintenance manual
Requirement: Submit the manufacturer's published use, care and maintenance requirements for each item.

Products and materials
Requirement: Submit the manufacturer’s standard drawings and details showing methods of construction, assembly and installation; with dimensions and tolerances.

Shop drawings
Custom-built furniture and fixtures: Submit shop drawings to a scale that best describes the details, showing methods of construction, assembly and installation, with dimensions and tolerances.

Subcontractors
General: Submit names and contact details of proposed suppliers and installers.

Warranties
Requirement: Submit the manufacturer's published product warranties.

1.4 INSPECTION

Notice
Inspection: Give notice so that inspection may be made of the following:
- Custom-built furniture and fixtures fabricated and ready to be delivered to the site.
- Furniture items delivered to site before installation.
- Site locations or substrates prepared to receive furniture or fixtures before installation.
- Set-out of furniture and fixtures.
- Completed installation.

2 PRODUCTS

2.1 GENERAL

Storage and handling
General: Deliver, unload and store products and accessories in sealed manufacturer's packaging.

Preservative treatment
CCA treated timber: If proposed, provide details.

Weathering steel
Standard: To AS/NZS 3678.
Grade: WR350.

3 EXECUTION

3.1 INSTALLATION

Erection

Line and level: Erect posts or poles vertically. Erect furniture items level. Where installed on slopes, provide a level area around benches and seats.

Sand pits

Requirement: Compact aggregate to 100 mm depth after installation of play structure components. Lay agricultural pipe in aggregate and cover with filter fabric allowing for a fall of 1:75 towards the agricultural pipe. Top up with 300 mm (minimum) sand.

3.2 COMPLETION

Cleaning

General: On completion, remove protective coatings, clean all surfaces and remove all labels not required for maintenance, or by AS 4685 series.

4 SELECTIONS

Refer Landscape Selections Schedule.

0271 PAVEMENT BASE AND SUBBASE

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide base and subbase courses as documented.

1.2 CROSS REFERENCES

General

Requirement: Conform to the following worksection(s):

- *0171 General requirements*.
- *0222 Earthwork*.

1.3 INTERPRETATION

Abbreviations

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

- CBR: California bearing ratio.
- CRB: Crushed rock base.
- CRS: Crushed rock subbase.
- NGB: Natural gravel base.
- NGS: Natural gravel subbase.
- RCCB: Recycled crushed concrete base.
- RCCS: Recycled crushed concrete subbase.

Definitions

General: For the purposes of this worksection the definitions given in AS 1348 and the following apply:

- Absolute level tolerance: Maximum deviation from design levels.
- Base: Layer(s) of material forming the uppermost structural element of a pavement and on which the surfacing may be placed.
- Flexible pavement: A pavement which obtains its load-spreading properties from intergranular pressure, mechanical interlock and cohesion between the particles of the pavement material.
- Relative level tolerance: Maximum deviation from a 3 m straightedge laid on the surface.
- Subbase: Material laid on the subgrade (or selected material), below the base, either for the purpose of making up additional pavement thickness, to prevent intrusion of the subgrade into the base, or to provide a working platform.

1.4 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.
- Sources of materials.

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.

Materials

Source of material: Submit the supplier name, material type (crushed rock, natural gravel, recycled concrete aggregate) and source quarry or recycling site.

Compliance of material: Provide certification and test results from a NATA registered laboratory confirming that the material conforms to the documented requirements.

Tests

Type tests: Submit results for each material listed in the **Base material properties table** and **Subbase material properties table**.

1.5 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.

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 and recycled material class

Requirement: Provide crushed rock and recycled material as documented, from the following classes:

- Class 1: Pavement base material (with a minimum plasticity index) for unbound pavements requiring a very high standard of surface preparation for a sprayed sealed or thin asphalt surfacing.
- Class 2: Pavement base material (with no minimum plasticity index) for unbound pavements which may not require a very high standard of surface preparation.
- Class 3: Not applicable.
- Class 4: Subbase material for unbound flexible pavements.

Crushed rock

Designation: Unbound crushed rock materials are designated as follows:

- CRB20-1: 20 mm nominal sized class 1 crushed rock base.
- CRB20-2: 20 mm nominal sized class 2 crushed rock base.
- CRS20: 20 mm nominal sized crushed rock subbase.
- CRS40: 40 mm nominal sized crushed rock subbase.

Recycled crushed concrete

Designation: Recycled crushed concrete materials are designated as follows:

- RCCB20-1: 20 mm nominal sized class 1 recycled crushed concrete base.
- RCCB20-2: 20 mm nominal sized class 2 recycled crushed concrete base.
- RCCS20: 20 mm nominal sized recycled crushed concrete subbase.

Natural gravel

Designation: Unbound natural gravel materials are designated as follows:

- NGB20: 20 mm nominal sized natural gravel base.
- NGS20: 20 mm nominal sized natural gravel subbase.
- NGS40: 40 mm nominal sized natural gravel subbase.

Base material properties table

Test method	Description	CRB20-1	CRB20-2	RCCB20-1	RCCB20-2	NGB20
AS 1289.3.6.1	Particle size distribution					
AS 1289.3.6.1	% passing 26.5 mm sieve	100	100	100	100	100

Test method	Description	CRB20-1	CRB20-2	RCCB20-1	RCCB20-2	NGB20
AS 1289.3.6.1	% passing 19.0 mm sieve	95-100	95-100	95-100	95-100	93-100
AS 1289.3.6.1	% passing 13.2 mm sieve	77-93	77-93	78-92	78-92	-
AS 1289.3.6.1	% passing 9.5 mm sieve	63-83	63-83	63-83	63-83	71-87
AS 1289.3.6.1	% passing 4.75 mm sieve	44-64	44-64	44-64	44-64	47-70
AS 1289.3.6.1	% passing 2.36 mm sieve	29-49	29-49	30-48	30-48	35-56
AS 1289.3.6.1	% passing 0.425 mm sieve	13-23	13-23	13-21	13-21	14-32
AS 1289.3.6.1	% passing 0.075 mm sieve	5-11	5-11	5-9	5-9	6-20
AS 1289.3.1.1	Liquid limit	max 30	max 30	max 35	max 35	max 25
AS 1289.3.3.1	Plasticity index:					
	All areas	min 2	-	min 2	-	-
	Areas with annual rainfall > 500 mm	max 6	max 6	max 6	max 6	max 6
	Areas with annual rainfall < 500 mm	max 10	max 10	max 10	max 10	max 10
AS 1289.3.4.1	Linear shrinkage:					
	All areas:	min 0.7	-	min 0.7	-	-
	Areas with annual rainfall > 500 mm	max 2.0	max 2.0	max 2.0	max 2.0	max 2.0
	Areas with annual rainfall < 500 mm	max 4.0	max 4.0	max 4.0	max 4.0	max 4.0
Direct measurement	Foreign materials in that fraction of RCCB retained on 4.75 mm sieve - % by mass:					
	High density (brick, etc)	-	-	max 2.0	max 2.0	-

Test method	Description	CRB20-1	CRB20-2	RCCB20-1	RCCB20-2	NGB20
	Low density (plaster, etc)	-	-	max 0.5	max 0.5	-
	Organic matter (wood, etc)	-	-	max 0.1	max 0.1	-
	Asbestos and hazardous	-	-	0	0	-
AS 1141.52	Maximum dry compressive strength on fraction passing 19 mm sieve (only applies if plasticity index is less than 1)	min 1.7 MPa	min 1.7 MPa	min 1.7 MPa	min 1.7 MPa	min 1.7 MPa
AS 1141.14	Particle shape by proportional calliper - % misshapen (2:1)	max 35%	max 35%	max 35%	max 35%	-
AS 1141.22	Aggregate wet strength*	min 100 kN	min 80 kN	min 100 kN	min 80 kN	-
AS 1141.22	Wet/dry strength variation* (dry - wet)/dry	max 35%	max 35%	max 35%	max 35%	-
AS 1141.23	Los Angeles value	max 35%	max 35%	max 40%	max 40%	-
AS 1289.6.1.1	4 day soaked CBR (98% modified compaction)	min 80%	min 80%	min 80%	min 80%	min 80%
NOTES: * All fractions of the proposed mix must satisfy this requirement. Use the fraction with the highest wet/dry strength variation as the value for determining conformance. Test the fraction 19.0 mm to 9.5 mm. In the case of blended materials, also test the fraction 9.5 mm to 4.75 mm. Test any other fraction which is at risk of failing in the opinion of the Engineer.						

Subbase material properties table

Test method	Description	CRS20	CRS40	RCCS20	NGS20	NGS40
AS 1289.3.6.1	Particle size distribution					
AS 1289.3.6.1	% passing 53.0 mm sieve	-	100	-	-	100
AS 1289.3.6.1	% passing 37.5 mm sieve	-	90-100	-	-	95-100
AS 1289.3.6.1	% passing 26.5 mm sieve	100	74-97	100	100	80-97

Test method	Description	CRS20	CRS40	RCCS20	NGS20	NGS40
AS 1289.3.6.1	% passing 19.0 mm sieve	90-100	62-86	95-100	96-100	-
AS 1289.3.6.1	% passing 13.2 mm sieve	74-96	-	74-95	-	-
AS 1289.3.6.1	% passing 9.5 mm sieve	61-85	42-66	60-90	65-90	48-85
AS 1289.3.6.1	% passing 4.75 mm sieve	42-66	28-50	42-76	47-80	35-73
AS 1289.3.6.1	% passing 2.36 mm sieve	28-50	20-39	28-60	32-67	25-58
AS 1289.3.6.1	% passing 0.425 mm sieve	11-27	8-21	10-28	14-42	10-33
AS 1289.3.6.1	% passing 0.075 mm sieve	4-14	3-11	2-10	6-26	3-21
AS 1289.3.1.1	Liquid limit	max 35	max 35	max 40	max 35	max 35
AS 1289.3.3.1	Plasticity index:					
	Areas with annual rainfall > 500 mm	max 12	max 12	max 12	max 12	max 12
	Areas with annual rainfall < 500 mm	max 15	max 15	max 15	max 15	max 15
AS 1289.3.4.1	Linear shrinkage:					
	Areas with annual rainfall > 500 mm	max 4.5	max 4.5	max 4.5	max 4.5	max 4.5
	Areas with annual rainfall < 500 mm	max 6.0	max 6.0	max 6.0	max 6.0	max 6.0
Direct measurement	Foreign materials in that fraction of RCCB retained on 4.75 mm sieve - % by mass:					
	High density (brick, etc)	-	-	max 3.0	-	-
	Low density (plaster, etc)	-	-	max 1.0	-	-

Test method	Description	CRS20	CRS40	RCCS20	NGS20	NGS40
	Organic matter (wood, etc)	-	-	max 0.2	-	-
	Asbestos and hazardous	-	-	0	0	-
AS 1141.52	Maximum dry compressive strength on fraction passing 19 mm sieve (only applies if plasticity index is less than 1)	min 1.0 MPa	min 1.0 MPa	min 1.0 MPa	min 1.0 MPa	min 1.0 MPa
AS 1141.14	Particle shape by proportional calliper - % misshapen (2:1)	max 35%	max 35%	max 35%	-	-
AS 1141.22	Aggregate wet strength*	min 50 kN	min 50 kN	min 50 kN	-	-
AS 1141.22	Wet/dry strength variation* (dry - wet)/dry	max 40%	max 40%	max 40%	-	-
AS 1141.23	Los Angeles value	max 40%	max 40%	max 40%	-	-
AS 1289.6.1.1	4 day soaked CBR (94% modified compaction)	min 30%	min 30%	min 30%	min 30%	min 30%
NOTES: * All fractions of the proposed mix must satisfy this requirement. Use the fraction with the highest wet/dry strength variation as the value for determining conformance. Test the fraction 19.0 mm to 9.5 mm. In the case of blended materials, also test the fraction 9.5 mm to 4.75 mm. Test any other fraction which is at risk of failing in the opinion of the Engineer.						

Tests

Material property testing: Conform to the **Base material properties table** and the **Subbase material properties table** test methods.

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).
- 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 in conformance with the *0222 Earthwork* worksection.

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.

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 TOLERANCES

Surface level

General: Provide a finished surface which is free draining and evenly graded between level points.

Base abutting gutters: ± 5 mm from the level of the lip of the gutter, minus the design thickness of the wearing course.

Surface level tolerances table

Item	**Level tolerance**	
	Absolute	**Relative**
Subbase surface	+ 10 mm, - 25 mm	10 mm
Base surface	+ 10 mm, - 5 mm	5 mm
NOTES: The tolerances apply to the finished level of each layer, unless overridden by the requirements (including tolerances) for the finished level and thickness of the wearing course.		

3.4 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**
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 material to dry back to 60% to 80% of the optimum moisture content before applying the seal or wearing course.

Rectification

General: If a section of 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, and recompact.

Level corrections

General: Rectify incorrect levels as follows:

- High areas: Grade off.
- Low areas: Remove layers to a minimum depth of 75 mm, lightly tyne and replace with new material and recompact.

3.5 TESTING

Compaction control tests

Standard: To AS 1289.5.4.1 and AS 1289.5.4.2.

Frequency of compaction control tests

General: 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 carparks.
- 3 tests per layer.
- 3 tests per visit.

0274 CONCRETE PAVEMENT

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide concrete pavement as documented.

Performance

Requirement: Provide concrete surfaces conforming to the following:

- Free draining and evenly graded between level points.
- Even and smooth riding.

Conformance: Conform to the local government authority's requirements for levels, grades and minimum thickness, reinforcement and concrete strength for pavements within the kerb-and-gutter property boundaries.

1.2 DESIGN

General

Coordination: Determine the local authority requirements that may affect grades, transitions and work zones, including the following:

- Drainage.
- Trees (due to settlement).
- Adjacent structures.

1.3 CROSS REFERENCES

General

Requirement: Conform to the following:

- *0171 General requirements*.
- *0222 Earthwork*.
- *0271 Pavement base and subbase*.

1.4 STANDARDS

Concrete

Specification and supply: To AS 1379.

Materials and construction: To AS 3600.

Slip resistance

Classification: To AS 4586.

1.5 INTERPRETATION

Definitions

General: For the purposes of this worksection the following definitions apply:

- Ambient temperature: The air temperature at the time of mixing and placing of concrete.
- Concrete class – normal: Concrete which is specified primarily by a standard compressive strength grade and otherwise in conformance with AS 1379 clause 1.5.3.
- Concrete class – special: Concrete which is specified to have certain properties or characteristics different from, or additional to, those of normal-class concrete and otherwise in conformance with AS 1379 clause 1.5.4.
- Weather – cold: Ambient shade temperature less than 10°C.
- Weather – hot: Ambient shade temperature greater than 30°C.

1.6 TOLERANCES

General

Surface abutting gutters: ± 5 mm from the level of the gutter edge.

Rigid pavement surface:

- From design level: + 10 mm, - 0 mm.
- From a 3 m straightedge placed anywhere on surface: 5 mm.

Horizontal position of outer concrete edge: 30 mm from documented position.

Joint locations in plan : 10 mm from documented position.

1.7 SUBMISSIONS

Certification

Test certificates and records: Submit test certificates and also retain results on site.

Compliance certificate: If product testing is not proposed, submit a manufacturer's certificate together with results of recent tests undertaken by the manufacturer, showing compliance with test criteria.

Execution details

Concrete: Submit proposals for mixing, placing, finishing and curing concrete including the following:

- Addition of water on site.
- Changes to the concrete mix.
- Temperature control, curing and protection methods.
- Cutting or displacing reinforcement.
- Handling, placing, compaction and finishing methods and equipment, including pumping.
- Sequence, size and times of concrete pours, and construction joint locations and relocations.

Cores, fixings and embedded items: If required, submit shop drawings showing the proposed locations, clearances and cover, and indicate any proposed repositioning of reinforcement.

Cutting or coring: If cutting or coring of hardened concrete is proposed, provide details.

Sawn joints: Submit proposed methods, timing and sequence of sawing joints.

Damaged galvanizing: If repair is required, submit proposals to AS/NZS 4680 Section 8.

Splicing: If undocumented splicing is proposed, submit details.

Welding: If welding of reinforcement is proposed, provide details and give notice before welding reinforcement.

Joint sealants: Submit proposals for installation methods and sealant performance.

Crack assessment: If unplanned cracks occur in the finished pavement, submit proposals for investigation.

Surface repair method: If required, submit details of the proposed method before commencing repairs.

Trial section: Submit proposal for trial pavement.

Products and materials

Aggregates: Nominate the source for all aggregates.

Reinforcement: Submit the manufacturer's certificate of compliance with AS/NZS 4671, or submit test certificates from a registered testing authority.

Liquid curing compounds: Submit certified test results, including the application rate and the efficiency index to AS 3799 Appendix B.

Curing by covering: Submit details of the proposed covering material.

Repair materials: Submit proposals for epoxy resin/grout and elastomeric sealant.

Concrete: Submit the concrete supply delivery dockets.

Trial mix design report: Six weeks before commencing production, submit a report for each mix design containing the information required in AS 1012.2, the individual and combined aggregate particle size distribution, and the records and reports for the tests.

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

Site tests: Submit results, as follows:

- Slip resistance test of completed installations.

1.8 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following:

- Base or subgrade before covering.
- Membrane or film underlay installed on the base or subgrade.
- Concrete formwork, reinforcement and dowels in position.
- Commencement of concrete placing.
- Completion of concrete placing.
- Evaluation of surface finish.

2 PRODUCTS

2.1 AGGREGATE

Characteristics

Standards: AS 2758.1.

Durability: Tested to AS 1141.22:

- Wet strength not less than 80 kN.
- 10% Fines Wet/Dry Variation not to exceed 35%.

Recycled concrete aggregate (RCA): If blending coarse RCA with natural aggregates, make sure substitution rates are below 30%.

2.2 CEMENT

General

Standard: To AS 3972.

Moisture: Protect from moisture until used. Do not use caked or lumpy cement.

Age: Less than 6 months old.

Storage: Store cement bags under cover and above ground.

Supplementary cementitious materials

Fly ash: To AS/NZS 3582.1.

Slag: To AS 3582.2.

Amorphous silica: To AS/NZS 3582.3.

2.3 WATER

General

Quality: Potable water free from materials harmful to concrete or reinforcement, and not salty or brackish.

Limits: Not containing more than:

- 600 parts per million of chloride ion, tested to AS 3583.13.
- 400 parts per million of sulphate ion, tested to AS 1289.4.2.1.

2.4 ADMIXTURES

General

Standard: Chemical admixtures to AS 1478.1, used to the manufacturer's recommendations.

Quality: Free from calcium chloride, calcium formate, or triethanolamine or any other accelerator. Do not use admixtures or combinations of admixtures without prior written approval.

Dosage: Vary the dosage of chemical admixture to account for factors such as air temperature, setting time and cement content to the manufacturer's recommendations.

Types of admixtures

Air entraining agent: Adjust mix for workability allowing up to 5% air entrainment.

Warm season retarder: During the warm season, (October to March inclusive), use a lignin or lignin-based (ligpol) set-retarding admixture (Type Re or Type WRRe) if required to control slump within the limits stated in Concrete mix, properties.

Cool season accelerator: During the cool season, (April to September inclusive), use only a lignin or lignin based set-retarding admixture, if required, containing not more than 6% reducing sugars (Type Ac or Type WRAc to AS 1478.1).

2.5 CURING COMPOUNDS

General

Curing compounds: To AS 3799 and AS 1160, Type 2.

Sheet material covering: To ASTM C171, white opaque or clear polyethylene film, or white burlap-polyethylene sheet, or equivalent material.

2.6 OTHER MATERIALS

Tactile ground surface indicators

Standard: To AS/NZS 1428.4.1.

3 EXECUTION

3.1 TRIAL PAVEMENT

General

Requirement: Provide a trial section of pavement to demonstrate that the proposed method of placement produces a conforming pavement. Remove test sections that do not comply with requirements.

Minimum area of test section: Refer Landscape Selections Schedule.

Location: As agreed with Superintendent.

3.2 CONCRETE MIX

Standard

Concrete mix and supply: To AS 3600 Section 17 and AS 1379.

Properties

Refer Engineers documentation.

Slump: Maximum 100 mm.

Drying shrinkage: Maximum 450 με after 21 days of air drying.

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

Site mixed supply

Emergencies: If mixing by hand, provide details.

Plant: Mix concrete in a plant located on the construction site.

Pre-mixed supply

Addition of water: Do not add water.

Transport: Make sure the mode of transport prevents segregation, loss of material and contamination of the environment, and does not adversely affect placing or compaction.

Concrete delivery docket: For each batch, provide a docket listing the information required by AS 1379 clause 1.7.3, and the following information:

- Any binders or additives.
- Method of placement and climate conditions.

- Name of concrete delivery supervisor.
- The concrete element or part of the works for which the concrete was ordered, and where it was placed.

3.3 TESTING

Standards

Sampling, identification, testing and recording: To the AS 1012 series.

Specimens: Sample the concrete on-site, at the point of discharge from the agitator.

Type and frequency: To AS 1379.

Testing authority: Concrete supplier or registered testing authority.

Concrete testing methods

Slump: To AS 1379 clause 5.2.

Compressive strength: Test to AS 1012.8.1 and AS 1012.9.

Drying shrinkage: Test to AS 1012.8.4 and AS 1012.13.

Flexural strength: Test to AS 1012.8.2 and AS 1012.11.

Acceptance criterion for strength: The average strength of any set of 3 consecutive project samples must be equal to or greater than the specified minimum value.

Sampling frequency: Provide a minimum of one sample from each 50 m^3 of concrete.

3.4 INSTALLATION

Junctions with existing pavements

Trimming: If new pavement is to be joined to an existing pavement, trim the edge of the existing pavement to create a neat vertical edge for its full depth before placing new pavement material.

Fixed formwork

Description:

- Steel forms.
- Seasoned, dressed timber planks, free of warps, bends or kinks.

Depth: Equal to the edge thickness of the slab and in one piece.

Tolerances on position:

- Level of top of form: - 0 mm, + 10 mm from pavement surface design level.
- Horizontal tolerance: 10 mm (maximum departure from a plane surface).
- Verticality: 3 mm departure from vertical.

Staking: Stake forms in position using at least 3 steel stakes per form, not more than 1.5 m apart. Lock joints between form sections to prevent movement.

Release agent: 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.

Re-use: Clean and recoat the forms each time before placing concrete.

Keyways: Form the keyways of keyed construction joints using steel or timber form strips accurately located at the mid-depth of the slab and securely fastened flush against the formwork face.

Reinforcement

Tolerances in fabrication and fixing: To AS 3600.

Locate reinforcement: Place reinforcement in the top half of the pavement.

Minimum cover to reinforcement: 30 mm.

Splicing mesh: Overlap a minimum of 2 crosswires.

Supports: Provide reinforcement supports as follows:

- Able to withstand construction and traffic loads and maintain the concrete cover, as documented.
- With a protective coating if they are ferrous metal extending to the surface of the concrete.
- Use plastic or concrete supports with galvanized or zinc-coated reinforcement.
- Spacing:
  - Bars: ≤ 60 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: 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.

Tying: Secure the reinforcement against displacement at intersections with either wire ties, or clips. Bend the ends of wire ties away from nearby faces of formwork or unformed faces to prevent the ties projecting into the concrete cover.

Mats: For bar reinforcement in the form of a mat, secure each bar at alternate intersections.

Cores, fixings and embedded items

Position: Fix cores and embedded items to prevent movement during concrete placing. In locating cores, fixings and embedded items, displace but do not cut reinforcement, and maintain cover to reinforcement.

Isolation: Isolate embedded items to prevent water tacking to concrete providing minimum cover to reinforcement.

3.5 CONCRETE PLACING AND COMPACTION

Concrete placing

General: Place concrete uniformly over the width of the slab or lane and so that the face is generally vertical and normal to the direction of placement. Hand spread concrete using shovels, not rakes.

Ponding: Remove any water ponding on the base or subbase before starting placement.

Placing sequence: Commence from one corner (usually the lowest point) and proceed continuously out from that point.

Weather: Do not place concrete in ambient temperatures above 30°C or below 10°C, without adequate precautions.

Compaction

Thickness 100 mm or less: Compact by placing, screeding and finishing processes. If required use a hand-held vibrating screed at the surface. Do not use immersion vibrators.

Thickness more than 100 mm and downturns: Use an immersion vibrator.

Placing records

Log book: 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.

Rain

Protection: During placement and before setting, protect surface from damage.

Concrete placing in cold weather

Cement: Do not use high alumina cement.

Temperature limits: Maintain the following:

- Freshly mixed concrete: ≥ 5°C.
- Formwork 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 free of frost and ice any formwork, materials, and equipment coming in contact with the concrete.

Placed concrete: Prevent from freezing, without using salts or chemicals.

Concrete placing in hot weather

Handling: Prevent premature stiffening of the fresh mix and reduce water absorption and evaporation losses.

Hot weather placing: Maintain concrete at a temperature ≤ 35°C.

Formwork and reinforcement: Before and during placing maintain temperature ≤ 35°C.

Severe weather: If ambient shade temperature more than 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 before mixing.
- Use chilled mixing water or ice.

Evaporation control barriers: Erect barriers to protect freshly placed concrete from drying winds.

3.6 CONCRETE PRIMARY FINISH

General

Commencement: Immediately after placement, spreading and compaction of the concrete, start initial finishing procedures to achieve the documented finish.

Final finishing: Do not commence final finishing until all bleed water has evaporated from the surface after initial finishing procedures.

Finish: Refer Landscape selections Schedule

Unformed surfaces

General: Strike off, screed and level slab surfaces to finished levels, to the tolerance class and finish documented in the **Unformed surface finishes schedule**.

Formed surfaces

Damage: Do not damage concrete works through premature removal of formwork.

Curing: 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.

Surface repairs

Method: If surface repairs are required, detail proposals.

3.7 CONCRETE CURING

General

Curing: Commence curing as soon as possible after finishing, when the concrete has set sufficiently not to be damaged by the curing process, and extend for a minimum period of 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.

Cold weather curing

General: 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 is commenced.

Curing methods

Covering sheet method: Cover concrete using damp hessian or cotton mats overlapped at least 150 mm and anchored against displacement by wind or other interference. Keep the mats continuously damp until covered by the covering sheet material. Repair tears immediately.

Moist curing method: Keep the concrete surface continuously damp by ponding or spraying constantly with water, fog, or mist, using suitable spraying equipment. Continue wetting for the curing period.

Curing compound: Provide a uniform continuous flexible coating to AS 3799, without visible breaks or pinholes. Make sure coating remains unbroken at least for the required curing period after application. Respray defective areas within 30 minutes. Respray within 3 hours after heavy rain.

Self-levelling toppings: If used also as curing compounds, conform to AS 3799.

Coloured concrete: Do not cure with plastic sheeting, damp sand or wet hessian. Use only chemical curing compounds compatible with the sealer or a sealer to the manufacturer's recommendations.

3.8 JOINTS

General

Requirement: Construct expansion, contraction and construction joints straight and plumb. Make transverse joints normal to longitudinal joints. Extend transverse expansion and contraction joints continuously from edge to edge of the pavement through interconnected slabs.

Joint layout: Install joints as documented.

Joint spacings: Refer Landscape documentation.

Joint widths: Refer Landscape documentation.

Contraction joints

Installation: Construct transverse and longitudinal contraction joints by early power sawing at an appropriate time, tooling or by placing an insert in the fresh concrete.

Dowelled joints

Requirement: Place dowels as documented, orthogonal to the joint direction and parallel to the pavement surface, accurate alignment is critical.

Dowel assembly: Use a dowel-assembly support frame firmly secured to the subbase during concrete placement. Prevent the dowel assembly support frame from passing through the joint. Do not insert dowels during the placement of concrete.

Debond dowel: Provide a proprietary sleeve or coat with a debonding coating to 0.5 length + 25 mm. Embed the unsleeved or unpainted half of the dowels in the slab placed first.

Dowelled expansion joints: Cap dowels at one end with a compressible material.

Movement: Do not distort or displace beyond the alignment tolerances under testing or during construction. Do not remove and replace dowels in pre-formed holes.

Dowel tolerances:

- Alignment: 1:150.
- Location: ± half the diameter of the dowel.

Tie bar joints

Longitudinal contraction joints: Place tie bars at 800 mm centres. Alignment accuracy of tie bars is not critical.

Construction joints

Installation: Place header board on the subbase or subgrade at right angles to the pavement centre line.

Planned location: Terminate each day’s placing operation at a transverse construction joint located to coincide with a planned contraction or expansion joint.

Unplanned joints: If placement is interrupted for 30 minutes or longer, form a tied transverse construction joint within the middle third of the distance between planned joints but no closer than 1.5 m to the nearest planned joint. If necessary remove placed concrete back to the required location.

Expansion joints

Joint filling: Fill with jointing materials as documented. Finish visible jointing material neatly flush with adjoining surfaces.

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.

Isolation joints

Requirement: Provide formed full depth joints around structures and features which project through, into or against the pavement, and elsewhere as required.

Formed joints

Full depth joints: Form the edge of the concrete placed first to provide a smooth, vertical face. After stripping and cleaning fix the joint filler with a suitable waterproof adhesive to the face of the slab, and place the adjoining concrete after the adhesive has set.

Weakened plane joint: Cut a crack-inducing groove by using a suitable tool into the plastic concrete during finishing of the concrete surface. Compact and refinish the plastic concrete around the groove after forming the joint.

Rebated groove joints: Form the rebate by securely fixing removable steel or timber form strips to the form or forms on the slab which is placed first, so that the top of the strip is flush with the top of the form. After stripping and cleaning, fix the joint filler in the rebate after placing the adjoining concrete.

Sawn joints

Weakened plane joint: Saw the hardened concrete to depth at least ¼ to ⅓ of the pavement thickness and to a uniform width in the range of 3 to 5 mm as follows:

- Timing: Commence sawing, regardless of time or weather conditions, as soon as the concrete has hardened sufficiently to permit cutting with only minor ravelling of the edges of the saw cut. Complete sawing no later than 24 hours after concrete placement.
- Sequence: If possible, saw every third transverse joint initially, then saw the intermediate joints. Start where concrete placement commenced.
- Cracking: If the concrete has already cracked near the location chosen for a joint, do not saw a joint in that location. If a crack develops ahead of the saw cut, discontinue sawing and submit proposals for extra sawn joints.
- Stand-by machines: Provide one stand-by sawing machine for each machine planned to be used.
- Cleaning and protection: Immediately after each joint is sawn, flush the saw cut and adjacent concrete surface using water, until the waste from sawing is removed from the joint.

Rebated groove joints: Saw straight, parallel sided grooves for joint seals on top of and centred on the sawn weakened plane joints.

- Timing: Commence sawing after the curing period has ended, immediately before joint sealing. Saw during daylight hours.

Preparing joints

Stripping time: At least 12 hours.

Clean: Immediately before installation of the sealer, make sure the joint space is dry, clean and free from loose material. Remove laitance, curing compound and protrusions of hardened concrete from the sides and upper edges of the joint.

Joint sealing

Sealant type: Provide silicone sealant in conformance with the manufacturer's recommendations.

Backing rod: Compressible closed cell polyethylene foam with a bond breaking surface.

3.9 SURFACE SEALERS

General

Application: Apply surface sealer after the curing period and when concrete has dried to allow the sealer to penetrate into the concrete surface.

Curing sealer compound: If using the sealer as a curing compound, apply directly after finishing.

3.10 COMPLETION

Completion tests

Slip resistance of completed installation: To AS 4663.

Rectification

Reinstating adjacent surfaces: Reinstate surfaces next to new pavements and associated elements. If an existing road pavement has been disturbed, trim back to a straight, neat and undisturbed edge, parallel to the new concrete for the full depth of the slab.

Concrete pavement: If pavement does not conform to the tolerances, submit rectification proposal.

Unplanned cracking:

- Maximum 0.4 mm wide crack is acceptable.
- > 1 mm must be assessed, detail a proposal for possible cause and rectification processes.

Cleaning

Excavated material: Remove from site.

4 SELECTIONS

Refer Landscape Selections Schedule.

0275 SEGMENTAL PAVERS – MORTAR AND ADHESIVE BED

1 GENERAL

1.1 RESPONSIBILITIES

General
Requirement: Provide segmental paving, as documented.

Performance
Requirements:
- Consistent in colour and finish.
- Firmly bonded to substrates for the expected life of the installation.
- Resistant to expected impacts in use.
- Set out with joints accurately aligned in both directions.
- To 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 worksection(s):
- *0171 General requirements*.

1.3 STANDARDS

Slip resistance
Classification: To AS 4586.

Slip resistance measurement of completed installations: To AS 4663.

1.4 INTERPRETATION

Definitions
General: For the purposes of this worksection the definitions given below apply.
- Absolute level tolerance: Maximum deviation from design levels.
- Adhesives - cementitious (C): Adhesives in which the binders are hydraulic, e.g. Portland cement, with aggregates and organic additives.
- Bedding: Mixtures of materials which are applied to substrates in a plastic state and dry and cure to adhere pavers to substrates.
  . Adhesive bedding: Paving adhered by a cementitious adhesives bed.
  . Mortar bedding: Paving adhered in a cementitious mortar bed.
- Lippage: Height deviation between adjacent pavers or other surface features.
- Pavers: Units made from clays, stone, precast concrete and/or other inorganic raw materials generally over 20 mm thick used as coverings for floors and supported over continuous substrates.
- Relative level tolerance: Maximum deviation from a 3 m straightedge laid on the surface.
- Substrate: The surface to which a material or product is applied.
- Soldier course: A course of whole or trimmed rectangular pavers at the pavement restraint edge.
- Terrazzo tiles – cementitious: Manufactured cementitious terrazzo tiles formed in a suitable machine to give sufficient compaction and density to the finished surface, and moisture cured before grinding and honed at the place of manufacture. Thickness usually 35 mm.

1.5 TOLERANCES

Completed paving
Lippage:
- Unpolished pavers: Less than 2 mm.
- Polished pavers 300 x 300 mm or less: 1 mm, with 5% not exceeding 1.5 mm.
- Polished pavers over 300 x 300 mm: 1.5 mm, with 5% not exceeding 2 mm.

Paving surface level tolerances table

Item	Level tolerance	
	Absolute	**Relative**
Vehicular pavements	± 5 mm	5 mm
Pedestrian pavements	± 10 mm	10 mm

1.6 SUBMISSIONS

Execution details

Grouting: Submit proposals for grouting methods and materials.

Margins: If it appears that minor variations in joint widths or overall dimensions will avoid cut pavers, submit a proposal.

Materials

Product conformity: Submit current assessments of conformity as follows:

- Marking and classification of adhesive to AS ISO 13007.1.

Samples

General: Submit labelled samples of pavers, grout and sealants, illustrating the range of variation in colour and finish.

Sample panels

General: Prepare a sample panel of each type of finish as follows:

- Size: ≥ 2 m^2.
- Include samples of junction details and trim.
- Preserve each panel until related work is complete.

Tests

Type tests: Submit results, as follows:

- Type test slip resistance of pavers to AS 4586.

Other tests: Submit results, as follows:

- Site slip resistance test of completed installation to AS 4663.
- Salt efflorescence of paver prototype testing.

1.7 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following:

- Substrate immediately before paving.
- Trial set-outs before execution.
- Control joints before sealing and grouting.

2 PRODUCTS

2.1 MARKING

Identification

General: Deliver materials to the site in the manufacturer's original sealed containers or packaging, legibly marked to show the following:

- Manufacturer's identification.
- Product brand name.
- Product type.
- Quantity.
- Product reference code and batch number.
- Date of manufacture.
- Material composition and characteristics such as volatility, flash point, light fastness, colour and pattern. Provide technical data sheets if not shown on labels.
- Handling and installation instructions.

- Safety data sheets.

2.2 ADHESIVES

General
Standard: To AS ISO 13007.1.

Type
General: Provide adhesives compatible with the materials and surfaces to be adhered.

Prohibited uses: Do not provide the following combinations:

- 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.

2.3 MORTAR

Materials
Cement: To AS 3972.

- Type: GP.
- Iron salt content:
  . White cement: ≤ 1%.
  . Off-white cement: ≤ 2.5%.

Lime: To AS 1672.1.

Sand: Fine aggregate with a low clay content selected for grading, sharp and free from efflorescing salts.

Water: Clean and free from any deleterious matter.

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): Select from the range 1:3 to 1:4 to obtain satisfactory adhesion. Provide minimum water.

Mixing: To AS 3958.1 clause 2.15.

Gauging: Site gauged by volume.

2.4 GROUT

Type
Portland cement based grout: Mix with fine sand. Provide minimum water to achieve workability.

- Mix proportion (cement:sand): 1:3.

Pigments
Pigments for coloured grout: Provide colourfast pigments compatible with the grout material. For cement-based grouts, provide inorganic mineral pigments or lime-proof synthetic metallic oxides compatible with cement.

Water
General: Clean and free from any deleterious matter.

2.5 PAVERS

Concrete pavers
Standard: To AS/NZS 4455.2.

Description: Provide sound concrete pavers of uniform quality. Reject concrete pavers with any of the following defects liable to affect strength and durability:

- 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.

2.6 OTHER MATERIALS

Tactile ground surface indicators

Standard: To AS/NZS 1428.4.1.

Control joint types

General: As documented in the **Control joints schedule**.

Divider 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: Two-pack self-levelling flexible mould resistant, one-part silicone or polyurethane sealant applied over a backing rod. Finish flush with the paver surface.

- Floors: Trafficable, shore hardness more than 35.

Backing rod: Compressible closed cell polyethylene foam with a bond-breaking surface.

3 EXECUTION

3.1 SUBSTRATES

Drying and shrinkage

General: Before paving, 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.

3.2 PREPARATION

Trial set-out

General: Prepare a trial paving set-out to each area as follows to:

- Maximise the size of equal margins of cut pavers.
- Locate control joints.
- Note minor variations in joint widths to eliminate cut pavers at margins.

Ambient temperature

General: If the ambient temperature is less than 5°C or more than 35°C, do not lay pavers.

Substrates

General: Make sure substrates are as follows:

- Clean and free of any deposit or finish which may impair adhesion or location of pavers.
- Projections are hacked off and voids and hollows are filled with a cement:sand mix not stronger than the substrate nor weaker than the bedding.

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 or the like to remove 3 mm of the surface and expose the aggregate then apply a bonding treatment.

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.

3.3 TESTING

Salt efflorescence
Prototype testing of cementitious tiles for salt efflorescence in conformance with AS/NZS 4455.1 Table 2.3 Salt attack resistance grade is considered satisfactory for the selected pavers.

Completion tests
Slip resistance of completed installation: To AS 4663.

3.4 PAVING GENERALLY

Variations
General: If necessary, distribute variations in hue, colour, or pattern uniformly, by mixing pavers or paving batches before laying.

Paving joints
Joint widths: Set out pavers to give uniform joint widths of 6 to 12 mm.

Margins
General: 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.

Protection
Traffic: Keep pedestrian and vehicular traffic off paving until the bedding has set and attained its working strength.

Cleaning: Keep the work clean as it proceeds and protect finished work from damage.

3.5 MORTAR BEDDING

Preparation of pavers
Suction: Soak porous pavers in water for half an hour and then drain until the surface water has disappeared.

Bedding
General: Use bedding methods and materials which are appropriate to the paver, the substrate, the conditions of service, and which leave the paver firmly and solidly bedded in the bedding material and adhered to the substrate. Form falls integral with the substrate.

Mortar beds
Substrate preparation: 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, on to the paver back. Do not provide mortar after initial set has occurred.

3.6 ADHESIVE BEDDING

Preparation of pavers
Adhesive bedding: Fix pavers dry.

Bedding
General: Use bedding methods and materials which are appropriate to the paver, the substrate, the conditions of service, and which leave the paver firmly and solidly bedded in the bedding material and adhered to the substrate. Form falls integral with the substrate.

Thick adhesive beds
General: Provide on substrates with deviations up to 6 mm when tested with a 2 m straight edge, and with pavers having deep keys or frogs.

Nominal thickness: 6 mm.

Adhesive bedding application
General: Apply adhesive by notched trowel to substrates and direct to pavers if required, to provide evenly distributed coverage of more than 90% after laying.

Pattern of distribution of adhesive: Conform to AS 3958.1. Verify by examining one paver in ten as work proceeds.

Grouting: Allow the adhesive to cure for the period recommended by the manufacturer before grouting.

3.7 MOVEMENT JOINTS

General

General: Provide control joints as follows:

- Location:
  - . Over structural control joints.
  - . At internal corners.
  - . Close to external corners in large paved areas.
  - . Around the perimeter at abutments.
  - . At junctions between different substrates.
  - . To divide large paved areas into bays, maximum 5 m wide, maximum area 16 m^2.
  - . At abutments with the building structural frame and over supporting walls or beams where flexing of the substrate is anticipated.
- 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.

3.8 GROUTED JOINTS

Grouting

General: Commence grouting as soon as practicable after bedding has set and hardened sufficiently. Clean out joints as necessary before grouting.

Face grouting: Fill the joints solid and tool flush. Clean off surplus grout and wash down as the grouting proceeds.

3.9 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.

Specify a quantity here only if the requirement of the worksection is not adequate.

Cleaning

Completion: Clean progressively and leave pavements clean on completion.

Operation and maintenance manuals

General: Submit a manual describing care and maintenance of the paving, including procedures for maintaining the slip-resistance grading stating the expected life of the slip-resistance grade.

Completion tests

Slip resistance of completed installation: To AS 4663.

4 SELECTIONS

Refer Landscape Selections Schedule.

0277 PAVEMENT ANCILLARIES

1 GENERAL

1.1 RESPONSIBILITIES

General
Requirement: Provide channels, kerbs, linemarking, and vehicle barriers, as documented.

1.2 CROSS REFERENCES

General
Requirement: Conform to the following worksection(s):
- *0171 General requirements*.
- *0271 Pavement base and subbase*.

1.3 INTERPRETATION

Definitions
General: For the purposes of this worksection the definitions given in AS 1348 and the following apply:
- Absolute level tolerance: Maximum deviation from design levels.
- Relative level tolerance: Maximum deviation from a 3 m straightedge laid on the surface

1.4 TOLERANCES

Channels and kerbs
Absolute level tolerance: ± 10 mm at any point on the finished concrete surface.

Relative level tolerance: 5 mm to the top or face of kerbs, and to the surface of channels.

Plan position deviation: 25 mm.

Exception: Kerb laybacks, grade changes or curves, or at gully pits requiring channel depression.

Linemarking
Longitudinal line lengths: ± 20 mm from the lengths documented in AS 1742.2.

Longitudinal line widths: ± 10 mm from the widths documented in AS 1742.2

Transverse line lengths and widths: ± 10 mm from the lengths and widths documented in AS 1742.2.

Other markings: ± 50 mm from the documented dimensions shown on the drawings or in AS 1742.2 for arrows, chevrons, painted medians, painted left turn islands and speed markings. Place arrows and speed markings square with the centreline of the traffic lane.

Raised pavement markers
Plan position deviation: 20 mm.

Directional displacement: ± 4˚.

Vehicle barriers
Plan position deviation: 50 mm.

Length: ± 20 mm.

Bollard plumb: H/100.

1.5 SUBMISSIONS

Linemarking materials
General: Submit NATA Registered Laboratory Test Reports, at least seven days before work is scheduled to commence, on the properties of the materials, including paint and glass beads.

2 PRODUCTS

2.1 CHANNELS AND KERBS

Concrete
Standard: To AS 1379.

Grade: N20.

2.2 LINEMARKING

Pavement marking paint

Standard: Conform to the following:

- Solvent-borne paint: To AS 4049.1.
- Waterborne paint: To AS 4049.3.
- High performance: To AS 4049.4.

Glass beads

Standard: To AS/NZS 2009.

Bead type: B.

2.3 VEHICLE BARRIERS

Steel tube bollards

Type: : Refer Landscape Selections Schedule.

Finish: Refer Landscape Selections Schedule.

3 EXECUTION

3.1 CHANNELS AND KERBS

General

Standard: Construct kerb and/or gutters in fixed forms, by extrusion or by slip forming to AS 2876.

Foundation preparation

Foundation material: Shape and compact to form a firm base before placing any kerb and/or channel.

Construction not on a pavement course: Relative compaction to AS 2876.

Construction on a pavement course: To the requirements of the *0271 Pavement base and subbase* worksection.

Joints

Concrete pavement: Where kerbs and/or channels are cast adjacent to a concrete pavement, continue the same joint type, as documented for the concrete pavement, across the kerb and/or channel.

Backfill

Timing: Not earlier than three days after placing kerb and/or channel concrete, backfill and reinstate the spaces on both sides of the kerb and/or channel.

Material: Granular, free of organic material, clay and rock in excess of 50 mm diameter.

Compaction: Compact backfill in maximum 150 mm thick layers, to a relative compaction of 95%, when tested in conformance with AS 1289.5.4.1, for standard compactive effort.

Pavement: Backfill pavement material adjacent to new kerbs and/or channels in conformance with the drawings and the *0271 Pavement base and subbase* worksection.

3.2 LINEMARKING

Setting out

General: Set out the work so that all markings are placed, as documented.

Surface preparation

Surface: Clean, dry and free of any deposit which may impair adhesion of the paint finish.

Wet weather: Do not apply pavement marking during wet weather or if rain is likely to fall during the process or paint drying time.

Provision for traffic: Allow for traffic during application and protect pavement markings until the material has dried sufficiently to carry traffic without being damaged.

Mixing of paint: Before use, mix all paint in its original container to produce a smooth uniform product consistent with the freshly manufactured product.

Application of paint

Longitudinal lines: Spray all longitudinal lines with a self-propelled machine. For a one-way or two-way barrier line pattern, concurrently spray the two sets of lines.

Hand spraying: Hand spray transverse lines, symbols, letters, arrows and chevrons using templates.

Paint thickness: Uniform wet film thickness: 0.35 mm to 0.40 mm.

Markings alignment: Straight or with smooth, even curves where intended.

Edges: Form clean, sharp edges. Remove any paint applied beyond the defined edge of the marking and leave a neat and smooth marking on the wearing surface of the pavement.

Removal of pavement markings

General: Remove pavement markings, as documented or no longer required, from the wearing surface of pavements without causing significant damage to the surface.

3.3 VEHICLE BARRIERS

Steel tube bollards

Footing: Installed to manufacturer's recommendations.

Refer Landscape Selections Schedule.

0314 CONCRETE IN SITU

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide concrete in situ, as documented.

Performance

Requirements:

- Conforming to the design details and performance criteria.
- Satisfying the quality and inspection requirements.

1.2 CROSS REFERENCES

General

Requirement: Conform to the following:

- *0171 General requirements*.
- *0311 Concrete formwork*.
- *0312 Concrete reinforcement*.
- *0315 Concrete finishes*.

1.3 STANDARDS

General

Reinforced concrete construction: To AS 3600.

Specification and supply of concrete: AS 1379.

Concrete structures for retaining liquids: To AS 3735.

Design, installation and testing of post-installed and cast-in fastenings: To SA TS 101.

1.4 INTERPRETATION

Definitions

General: For the purposes of this worksection the following definitions apply:

- 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.
- Batch: A quantity of concrete containing a fixed quantity of ingredients and produced in a discrete operation.
- Concrete class:
  - . Normal: Concrete which is specified primarily by a standard compressive strength grade and otherwise conforming to 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 conforming to with AS 1379 clause 1.5.4.
- Early age strength: A mean compressive strength at 7 days exceeding the values shown in AS 1379 Table 1.2.
- Green concrete: Concrete which has set but not appreciably hardened.
- Production assessment: 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 assessment: 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.

- Sample: A physical example that illustrates workmanship, materials or equipment, and establishes standards by which the work will be judged. It includes samples, prototypes and sample panels.
- Specimen: A portion of a sample which is submitted for testing.
- Weather:
  . Cold: Ambient shade temperature less than 10°C.
  . Hot: Ambient shade temperature greater than 30°C.

1.5 SUBMISSIONS

Design

Loading: Submit details of proposed construction systems, loads and procedures, including propping and re-shoring.

Execution details

Concrete: Submit proposals for mixing, placing, finishing and curing concrete including the following:

- Changes to the concrete mix.
- Curing and protection methods.
- Curing period for low-pressure steam curing.
- Cutting or displacing reinforcement, or cutting or coring hardened concrete.
- Handling, placing, compaction and finishing methods and equipment, including pumping.
- Placing under water.
- Sequence and times for concrete placement, and construction joint locations and relocations.
- Site storage, mixing and transport methods and equipment, if applicable.
- Temperature control methods.
- Sequence of concrete placement: Submit details of any proposed sequential placement of slab segments.
- Sawn joints: Submit details of proposed methods, timing and sequence of sawing joints.

Pre-mixed supply delivery dockets: For each batch, submit a docket listing the information required by AS 1379, and the following:

- For special class performance concrete: Documented 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.
- 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.

Products and materials

Product conformity: Submit evidence of conformity, as appropriate, as follows:

- Certification by a JAS-ANZ accredited third party.
- Report by a registered testing authority describing tests and giving results which 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.

Curing compounds: Submit details of any proposed liquid membrane-forming curing compound, including the following:

- Certified test results for water retention to AS 3799 Appendix B.
- 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.

Samples

Refer Landscape selections Schedule.

Shop drawings

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, as follows:

- Concrete compressive strength test results to AS 1012.9.
- Other concrete properties. Test results as documented in the **Tests schedule**.

1.6 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following:

- Base or subgrade before covering.
- Membrane or film underlay installed on the base or subgrade.
- Completed formwork and reinforcement, tendons, cores, fixings and embedded items fixed in place.
- Concealed surfaces or elements before covering.
- Commencement of concrete placing.

2 PRODUCTS

2.1 CONCRETE

Properties

Concrete mix and supply: Conform to the following:

- Normal-class: To AS 1379 clause 1.5.3.
  - Properties: As documented in the **Concrete properties schedule - performance**.
- Special-class: To AS 1379 clause 1.5.4.
  - Properties: As documented in the **Concrete properties schedule - performance**.

General

Stockpile: If uniform, consistent colour is documented, stockpile sand, cement and aggregates.

Aggregates

Standard: To AS 2758.1.

Cement

Standard: To AS 3972.

Age: Less than 6 months old.

Storage: Store cement bags under cover and above ground.

Water

Standard: To AS 1379 clause 2.4.

Requirement: Clean, free from oil, acid, alkali, organic or vegetable matter and including not more than 500 mg/l of chloride ions.

Coloured concrete

Standard: To AS 3610.1.

Chemical admixtures

Standard: To AS 1478.1, used to manufacturer's recommendations.

2.2 MISCELLANEOUS

Polymeric film underlay

Vapour barriers and damp-proofing membranes: To AS 2870 clause 5.3.3.

Curing compounds
Standard: To AS 3799.

3 EXECUTION

3.1 CONCRETE

General
Performance properties: As documented in the **Concrete properties schedule – performance**.

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 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 plant located on the construction site.

3.2 TESTING

General
Test authority: Concrete supplier or a registered testing authority.

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.

Method of assessment: Project assessment.

Sampling
Method of sampling: AS 1012.1.

Sampling locations: To AS 1012.1 and the following:

- Slump tests: On site, at the point of discharge from the agitator.
- Compressive strength tests: Spread the site sampling evenly throughout the pour.

Frequency of sampling: To AS 1379 Sections 5 and 6 and the following:

- Slump 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: Columns and load bearing wall elements/batch	Minimum number of samples: Other elements/day
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 and AS 1012.8.2.

Specimen size:

- Aggregate size ≤ 20 mm: Nominally 200 x 100 mm diameter.
- Aggregate size > 20 mm: Nominally 300 x 150 mm diameter.

Test methods
General: To the relevant parts of the AS 1012 series.

Acceptance criteria:

- General: As documented in the **Concrete properties schedule – performance**.
- Early age compressive strength: As documented in the **Control tests schedule**.

Slump tests: Assess slump for every batch. Perform slump test on each strength sample.

Drying shrinkage at 56 days: To AS 1012.8.4 and AS 1012.13.

Other concrete properties tests: As documented in the **Tests schedule**.

Embedded pressure pipes
General: Complete leak tests before embedding pipes.

Liquid retaining structures
Testing for liquid tightness: To AS 3735.

3.3 CORES, FIXINGS AND EMBEDDED ITEMS

Adjoining elements
Fixings: Provide fixings for adjoining elements. If required, provide temporary support to the adjoining elements during concreting, to prevent movement.

Protection
General: Grease threads. Protect embedded 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 the documented surface finish.

Corrosion: In external or exposed locations, galvanize anchor bolts and embedded fixings or submit proposed alternate materials.

Structural integrity
Position: Fix cores and embedded items to prevent movement during concrete placing. In locating cores, fixings and embedded items, displace but do not cut reinforcement, and maintain cover to reinforcement.

Isolation: Isolate embedded items to prevent water tracking to concrete providing minimum cover to reinforcement.

Tolerances
General: Maximum deviation from correct positions:

- Anchor bolt groups for structural steel: To AS/NZS 5131.
- Cores and embedded items generally: 10 mm.
- Other fixing bolts: 3 mm.

3.4 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 tolerance
Deviation: Flatness tolerance Class B.

3.5 PLACING AND COMPACTION

Placing
Horizontal transport: Use suitable conveyors, clean chutes, troughs, hoppers or pipes.

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.

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 including pipes and conduits embedded in concrete. Do not use vibrators to move concrete along the formwork. Avoid causing segregation by over-vibration.

Placing records

Log book: 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.

Rain

Protection: During placement and before setting, protect the surface from damage.

Time between adjacent placements

Minimum time delay: As documented in the **Minimum time delay schedule.**

Vertical elements

Placement: Limit the free fall of concrete to maximum of 2000 mm.

Placing in cold weather

Cement: Do not use high alumina cement.

Temperature limits: Maintain the following:

- Freshly mixed concrete: ≥ 5°C.
- Formwork 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 free of frost and ice any formwork, materials, and equipment coming in contact with the concrete.

Freezing: Prevent concrete from freezing.

Placing in hot weather

Handling: Prevent premature stiffening of the fresh mix and reduce water absorption and evaporation losses.

Temperature limits: Maintain the following:

- Normal concrete in footings, beams, columns, walls and slabs: ≤ 35°C.
- For concrete strength grade less than 40 MPa with section thickness ≥ 1 m in all dimensions: ≤ 27°C.
- For concrete strength grade 40 MPa or greater with section thickness ≥ 600 mm in all dimensions: ≤ 27°C.
- Formwork and reinforcement before and during placing: ≤ 35°C.

Evaporation control barriers: Erect barriers to protect freshly placed concrete from drying winds.

Temperature control: Select one or more of the following methods of maintaining the temperature of the placed concrete at 35°C or less:

- Cool the concrete using liquid nitrogen injection before placing.
- Cover horizontal transport containers.
- Spray the coarse aggregate using cold water before mixing.
- Use chilled mixing water or ice.

Placing under water

General: Do not place under water unless conditions prevent dewatering.

Minimum cement content for the mix: Increase by 25%.

3.6 CURING

General

Requirements: Taking into account the average ambient temperature at site over the relevant period affecting the curing, 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, until the 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 the following, unless accelerated curing is adopted:
  - . Fully enclosed internal surfaces/Early age 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 compounds

Application: Provide a uniform continuous flexible coating without visible breaks or pinholes, which remains unbroken at least for 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 used also as curing compounds, conform to AS 3799.

Visually important surfaces: Apply curing compounds to produce uniform colour on adjacent surfaces.

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℃, or the ambient shade temperature exceeds 30℃, protect from drying winds and sun by using an evaporative retarder until curing is commenced.

Water curing

Method: Select a method of ponding or continuously sprinkling to prevent damage to the concrete surface during the required curing period.

3.7 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, submit 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.

Preparation: Roughen and clean the hardened concrete joint surface. Remove loose or soft material, free water, foreign matter and laitance. Dampen the surface just before placing the fresh concrete and coat with a neat cement slurry.

Expansion joints

Joint filling: Fill with jointing materials as documented. 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.

Jointing materials: Provide jointing materials compatible with each other, and non-staining to concrete in visible locations.

Bond breaking: Provide back-up materials for sealants, including backing rods, which do not adhere to the sealant.

Foamed materials (in compressible fillers): Closed-cell or impregnated, not water absorbing.

Slip joints

Requirement: If concrete slabs are supported on masonry, provide proprietary slip joints.

3.8 COMPLETION

Protection

General: Protect the concrete from damage due to construction load, physical and thermal shocks, and excessive vibrations, particularly during the curing period.

Surface protection: Protect finished concrete surfaces and applied finishes from damage.

4 SELECTIONS

Refer Landscape Selections Schedule.

0316 PRECAST CONCRETE

1 GENERAL

1.1 RESPONSIBILITIES

General

Responsibility: Provide precast concrete elements, as documented.

Design

Structural performance requirements: Conform to the following:

Structural design: To AS 3600 and BCA B1.1.

Performance

Requirement: Conform to the following:

- Fabricated in conformance with the shop drawings.
- Designed and certified by a professional engineer.
- Designed for handling, transport and erection by a professional engineer.
- Undamaged by handling and installation.
- Certified by a professional engineer after erection.

1.2 CROSS REFERENCES

General

Requirement: Conform to the following worksection(s):

- *0171 General requirements*.
- *0313 Concrete post-tensioned*.

1.3 STANDARDS

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.

1.4 INTERPRETATION

Abbreviations

General: For the purposes of this worksection the following abbreviation applies:

- WLL: Working Load Limit.

Definitions

General: For the purposes of this worksection the definitions given in AS 3850 clause 1.3 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.

1.5 TOLERANCES

General

Position of reinforcement and tendons: To AS 3600 clause 17.5.3.

Manufacturing and installation tolerance for precast elements: To AS 3610.1 Table 3.3.3 and AS 3850 clause 3.11.

Fixings and embedded items in precast elements: To AS 3850 Table 3.11(B) and AS 3610.1 Table 3.3.3.

1.6 SUBMISSIONS

Calculations

Design: Submit structural performance calculations.

Design

Contractor design: Provide independent verification by a professional engineer of conformance of the design to project criteria.

Execution details

Panel casting: Submit panel casting checklist.

Manufacturer's details: Submit name, contact details and credentials of proposed manufacturer of precast elements.

Safe work method statement: Prepare a safe work method statement specific to the project for the precast erection and submit on request.

Erection documentation: Submit lifting device locations and specification 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 of proposed equipment along with qualifications and training of the operating personnel in the form of a qualification register.

Products

Protective coating details: Submit proposals for protective coatings to exposed metallic components to AS/NZS 2312.1 or AS/NZS 2312.2 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 colouring oxide pigments or stain.

Proprietary documentation: Submit proprietary documentation for any lifting, bracing or fixing inserts. Include make, type and WLL.

Non-proprietary inserts: Submit certificate from a professional engineer.

Concrete mix: Submit concrete mix details including the proportions and source of the constituents, admixtures, release agents and curing compounds.

Prototypes

Requirement: Provide prototypes as documented in the **Prototypes schedule**.

Manufacture: Cast the precast elements using the formwork, concrete, compaction equipment, form release agents, curing and formwork removal methods which are to be used in the final work.

Prototype storage: Maintain prototypes on site, undamaged and protected from discolouration for comparison with manufactured precast elements.

Prototype use: Use prototypes in the works if they conform with the structural drawings.

Samples

Surface finish: Submit samples for texture and colour.

Shop drawings

Precast concrete drawings: Submit shop drawings of architectural and structural precast concrete elements showing the proposed details for their design, manufacture, assembly, transport and installation, 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.
- 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.

- Weight of precast elements.
- 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 for cast-in fixings.

Tests

Lifting inserts and attachments for precast elements: Submit test results.

Structural performance: Submit test results of prior testing for static load tests.

1.7 INSPECTION

Notice

Inspection: Give 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.
- 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 in situ topping.
- Installed temporary bracing.
- Final structure before removal of temporary bracing.

2 PRODUCTS

2.1 MATERIALS

General

Stockpile: If uniform, consistent colour is documented, stockpile sand, cement and aggregates.

Aggregates

Standard: To AS 2758.1.

Cement

Standard: To AS 3972.

Age: Less than 6 months old.

Storage: Store cement bags under cover and above ground.

Type: Do not use high alumina cement.

Water

Standard: To AS 1379 clause 2.4.

Requirement: Clean, free from oil, acid, alkali, organic or vegetable matter and including not more than 500 mg/l of chloride ions.

Other

Chemical admixtures: To AS 1478.1.

Pigments: Make sure that the pigments are:

- Chemically inert.
- Alkaline resistant.
- Insoluble.
- Light-fast.

Reinforcement

Standard: To AS/NZS 4671.

Surface condition: Free of loose mill scale, rust, oil, grease, mud or other material which would reduce the bond between the reinforcement and concrete.

Structural welding: To AS/NZS 1554.3.

Corrosion: Protect from corrosion in conformance with AS 3600 clause 17.2.1.2.

Prestressing tendons

Standard: To AS/NZS 4672.1.

Type: 7 wire, stress relieved, high tensile steel and strand.

Prestressing hardware (including ducts, anchorages): To AS 3600.

Welding tendons: Do not weld prestressing tendons.

Post-tensioning bars/tendons

Requirements: To the *0313 Concrete post-tensioned* worksection.

2.2 PRECAST CONCRETE

General

Concrete: To AS 3600 and AS 1379.

Testing: To the AS 1012 series.

Refer Landscape Selections Schedule for selection, finish, joints & sealants.

2.3 GROUTS AND MORTARS

General

Grout duct size: Large enough to provide erection tolerance and clearance for grout flow.

Post tensioning grout: Conform to *0313 Concrete post-tensioned* worksection.

2.4 CAST-IN ITEMS

Fixings and embedded items

Compatibility: Provide inserts, fixings and embedded items that are compatible with each other, with the reinforcement and with the documented concrete finish.

Corrosion: In external or exposed locations, galvanize anchor bolts and embedded fixings.

2.5 MISCELLANEOUS

Bearing pads

Selections and testing: To AS 5100.4.

Flashings

Standard: To AS/NZS 2904.

Sealants

Compression-seals: Polyethylene or polyurethane foam strip.

3 EXECUTION

3.1 PRECAST ELEMENTS

Marking

Precast element identification: Include the following:

- Plank thickness (mm).
- Number of strands.
- Strand diameter (mm).
- Concrete cover (mm).
- Remain legible until after the element has been fixed in place.
- Not visible in the completed structure.
- 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.
- Weight of the element.

Attachments for structural or architectural fixings

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, made from thin wall galvanized duct or similar 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.

Restraint brackets: Provide all restraint brackets for the precast elements as documented or as required.

Starter bars: Provide all starter bars as documented or as required.

Welding of connections: To AS/NZS 1554.1.

Requirement: Cast in all lifting, bracing and fixing inserts.

External walls: Wall panels and connections to BCA C1.11.

Curing

Curing compounds: To AS 3799.

Release agent: Provide a release agent that is compatible with the curing compound.

Rejection

Assessment: Set aside for inspection any element having damage such as cracking, deformation or spalling, or exhibiting lack of adequate concrete cover. Repair or recast, as instructed.

Lifting points

Standard: To AS 3850.

General: Provide proprietary lifting devices with published load data designed specifically for lifting concrete elements. Use face and edge lifters as required.

Cast in inserts: Provide hot-dipped galvanized finish with a minimum coating mass of 600 g/m^2 to all cast-in lifting and bracing devices.

Bracing inserts or strongbacks: Provide bracing inserts or strongbacks designed by a professional engineer.

Proprietary systems: Use in conformance with manufacturer’s specifications and recommendations.

Lifting loops: Do not use deformed bars or stressing tendons as lifting loops.

Sealing: Recess lifting attachments such as bracing ferrules, or other types of cast-in fixings, and provide plugs for sealing.

Location: Do not place lifting attachments, holes and other temporary fixings for handling purposes on faces visible upon completion.

Marking: Clearly mark all lifting points and the positions for temporary bearing for storage and transport.

Welding: Do not site weld lifting, bracing or fixing inserts.

Requirement: Only lift or support members at specified points.

Lifting devices: Do not use the fixing devices for lifting or hoisting unless they have been designed to do so and confirmed by a professional engineer.

Precautions: Use handling methods which do not overstress, warp or damage the elements.

Completion: Remove, seal and rectify temporary attachments after erection.

Storage

Support points: Support elements at designated support points during storage.

Prevent damage: Store precast elements and protect to prevent warping, twisting, crushing, cracking, staining, discolouration and other damage until they are installed in their final location.

3.2 INSTALLATION

Lifting and handling

Lifting and handling: Conform to the ASCC National code and AS 3850.

Site conditions: Make sure the wind and temperature conditions allow handling and fixing, and are consistent with the structural capability and geometry of the element.

Site Cranes: To AS 2550.1.

Temporary bracing and propping: To AS 3850.

Fixing

Fixing: Fix the precast elements securely and accurately in their final position.

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

Topping:

- Topping grade: N32 minimum to AS 1379.
- Immediately before in situ topping: Wet plank surface without pooling.

Shear keys: Grout with mix proportion (cement:sand) 3:1.

Surfaces bonded to in situ concrete

Requirement: Fully scabble and roughen all surfaces required to bond with in situ concrete to achieve a shear plane surface coefficient in conformance with AS 3600 Table 8.4.3.

3.3 TESTING

Compliance

Tolerances: Check element compliance with **TOLERANCES** in conformance with AS 3610.1 Section 5.

Rejection: Reject any precast elements not conforming to the documented tolerances.

4 SELECTIONS

4.1 SCHEDULES

Prototypes schedule

Refer Landscape Selections Schedule.

0315 CONCRETE FINISHES

1 GENERAL

1.1 RESPONSIBILITIES

General
Requirement: Provide finishes to formed and unformed concrete surfaces, as documented.

Performance
Requirement: Compatible with documented finishes.

1.2 CROSS REFERENCES

General
Requirement: Conform to the following:

- *0171 General requirements*.

1.3 STANDARDS

General
Formed surfaces: To AS 3610.1.

Slip resistance
Classification: To AS 4586.

1.4 INTERPRETATION

Definitions
General: For the purposes of this worksection the following definition applies:

- Green concrete: Concrete which has set but not appreciably hardened.

1.5 TOLERANCES

Formed surfaces
Quality of the surface finish: To AS 3610.1 Table 3.3.2.

Unformed surfaces
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

1.6 SUBMISSIONS

Prototypes
Test panels: Provide test panels to AS 3610.1 and as documented in the **Test panels schedule**.

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: Once accepted, maintain the panels on site undamaged and protected from the weather, as reference prototypes for evaluation of completed work.

Surface treatment: Do not proceed with the related work until the acceptable range of surface treatments has been determined.

Tests
Site tests: Submit test results, as follows:

- Slip resistance test of completed installations.

1.7 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following:

- Evaluation of the off-form finishes.
- Evaluation of surface finish.

2 PRODUCTS

2.1 MATERIALS

Surface modifiers

Hardeners, sealants and protectors: If documented, proprietary products conforming to the manufacturer's recommendations.

Slip resistance treatment: If documented, proprietary products conforming to the manufacturer's recommendations.

3 EXECUTION

3.1 SURFACE MODIFIERS

General

Application: Apply to clean surfaces to the manufacturer's recommendations.

3.2 FORMED SURFACES

General

Surface finish: Provide formed concrete finishes as documented in the **Formed surface finishes schedule.**

Damage: Do not damage concrete works through premature removal of formwork.

Curing

General: 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.

Evaluation of formed surfaces

General: If evaluation of formed surface tolerance or colour is required, complete the evaluation before surface treatment.

Surface repairs

Method: If surface repairs are required, submit proposals.

Finishing methods

Details: If soffits of concrete elements or faces of concrete columns are to have a finish other than an off-form finish, provide finishes as documented.

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: Remove the vertical face formwork 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: Remove the vertical face formwork 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 vertical face formwork 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 formwork 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.

3.3 UNFORMED SURFACES

General

Surface finish: As documented in the **Unformed surface finishes schedule**.

Finished levels: Strike off, screed and level slab surfaces to finished levels and to the flatness tolerance class documented.

Surface repairs

Method: If surface repairs are required, submit proposals.

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.

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 scratch 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 faux paved or cobblestone finish: Provide a proprietary finishing system.

Polished finish: After steel trowelling, grind the cured surface of the concrete.

3.4 TESTING

Completion tests

Slip resistance of completed installation: To AS 4663.

4 SELECTIONS

Refer Landscape Selections Schedule.

0345 STEEL – PROTECTIVE PAINT COATINGS

1 GENERAL

1.1 RESPONSIBILITIES

General
Requirement: Provide protective paint coatings for the protection of mild steel products and structural steel against interior and exterior atmospheric corrosion, as documented.

Performance
Requirement: Control corrosion to structural steelwork and mild steel products until the first scheduled maintenance.

1.2 CROSS REFERENCES

General
Requirement: Conform to the following worksection(s):

- *0171 General requirements*.

1.3 STANDARDS

General
Surface preparation and coating: To the recommendations of AS/NZS 2312.1.

1.4 INTERPRETATION

Abbreviations
General: For the purposes of this worksection the following abbreviations apply:

- DFT: Dry Film Thickness.
- ITP: Inspection and Test Plan.
- MIO: Micaceous Iron Oxide.
- SDS: Safety data sheet.
- µm: micron (10^{-6}m).

Definitions
General: For the purposes of this worksection the definitions given in AS/NZS 2310 and the following apply:

- Coating contractor: The protective coatings application contractor conducting the on or off-site coating application works.
- Coating manufacturer: The supplier and/or manufacturer of the protective coating materials used.
- ITP: A series of formal Inspection and Test Plans, prepared by the coating contractor to reflect the specific inspection and testing that will be carried out on the surface preparation, coating application and the record keeping tasks to be undertaken.

1.5 SUBMISSIONS

Execution details
Detail of structural steelwork: Where design and fabrication features of items to be coated may lead to difficulties, submit details before starting surface preparation.

Removal of deleterious materials: Submit advice on suitability of marking paints, and removal of materials which may be deleterious to coating processes such as grease, oil and paint.

Repair of damaged coating: If the protective coating is damaged, submit a coating repair proposal, based on the coating manufacturer's recommendations for reinstating the corrosion protection function of the system.

Reinstatement: If final coat varies from the submitted sample, submit proposals for reinstatement of the visible final coating system.

Maintenance painting
Existing systems: Identify, itemise and submit details of areas of corrosion, damage and other degradation.

Recoating systems: Submit details of coating systems for maintenance painting of previously coated items and structural elements, including surface preparation.

Materials

Multi-component coatings: If partial mixing of packs is proposed, submit details.

Quality

ITPs: Submit for each proposed coating system.

Quality supervisor: Submit the name and record of experience of the person responsible for the implementation of the ITPs.

Records

General: Prepare and maintain records of all surface preparation and coating application works as follows:

- Standard: To AS 3894.10, AS 3894.11, AS 3894.12, AS 3894.13 and AS 3894.14.
- Reference the relevant parts of the ITP and record conformance.

Samples

Painting and coating colour: Submit a 400 x 400 mm sample of the finished product for each coating system.

Retention: Retain samples for comparison during application.

Subcontractors

General: Submit names and contact details of proposed suppliers and applicators.

Evidence of experience:

Requirement: Submit proof of currency of the applicator's environmental operating licence.

Substrate acceptance

Applicator: Submit the applicator's certification of the acceptability of the coating substrate before commencing installation.

Warranties

General: Submit details of the proposed warranty terms, form and period.

1.6 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following:

- Items after fabrication, before commencing surface cleaning and preparation.
- Surfaces after preparation, before application of first coating.
- Coating stages:
  - After application of primer or seal coats.
  - After application of each subsequent coat.
- Repair of coating damage: Exposure of corrosion pitting or significant metal loss by blasting process.

2 PRODUCTS

2.1 GENERAL

Storage and handling

Requirement: Handle, store, mix and apply all protective coatings in conformance with the manufacturer's recommendations.

Ambient temperature range for storage: 15°C to 25°C.

Sunlight: Protect coating materials from direct sunlight before mixing or adding the converter (catalyst).

Use-by-date: Use products with limited shelf life before their use-by-date, unless written authorisation from the coating manufacturer's technical services section is provided.

Proprietary products

Requirement: Provide all products from the one manufacturer's supply.

Safety data sheets (SDS)

Requirement: Keep on site copies of all relevant SDS.

2.2 MARKING

Identification
General: Deliver materials to the site in the manufacturer's original sealed containers, legibly marked to show the following:

- Manufacturer's identification.
- Product brand name.
- Product type.
- Quantity.
- Product reference code and batch number.
- Date of manufacture.
- Material composition and characteristics such as volatility, flash point, light fastness, colour and pattern. Provide technical data sheets if not shown on labels.
- Handling and installation instructions.
- Safety data sheets.

3 EXECUTION

3.1 GENERAL

Product warnings
Requirement: Conform to the SDS.

Surroundings
Protection: Prevent the release of abrasives, overspray or paint waste debris into the air, ground or to any watercourse. Prevent damage to other assets, services or equipment.

Reinstatement: Repair and/or clean affected surrounding areas.

Working area
General: Perform all painting under cover and/or protected from rain, condensation, dew, excessive wind, overspray or wind-blown dust.

Period: Continue protection where any of these conditions exist until the coating is no longer affected.

3.2 SURFACE PREPARATION

General
Standards: Conform to the following:

- Removal of oil, grease and related contaminants: To AS 1627.1.
- Power tool cleaning: To AS 1627.2.
- Abrasive blast cleaning: To AS 1627.4.

Defects: Remove all surface defects, including cracks, laminations, deep pitting, weld spatter slag, burrs, fins, sharp edges and other defects before preparing the surface for coating.

Untreated steel
General: Conform to the following requirements:

- Wash and degrease all surfaces to be coated with a free-rinsing, alkaline detergent, in conformance with the manufacturer's recommendations and all safety warnings.
- Wash with clean water to remove all soluble salts.
- De-burr and round all edges with a power tool to a minimum radius of 2 mm.
- Abrasive blast clean all steel surfaces to be coated using a non-metallic medium to generate a surface profile of 35 to 65 µm.
- Abrasive blast cleaning class: Sa 2.5 – Very thorough blast cleaning.
- Remove spent abrasive from the surface by blowing with clean, dry air and/or by vacuum cleaning.
- Start application within 4 hours of abrasive blast cleaning or before surface becomes contaminated, otherwise repeat abrasive blasting step.
- Stripe coat welds, bolts, boltholes and all edges with primer before applying the full primer coat documented in **SELECTIONS, PROTECTIVE PAINT COATING SYSTEMS**.

- Before application, make sure that the surface is free of contaminants including oil, grease, dirt, dust, salt and any other deleterious materials that will interfere with coating performance.

Galvanized, aluminium and zinc primed surfaces

Requirement: Remove grease, oil and other solvent-soluble contaminants by wiping with mineral turpentine or white spirit. Finally, wipe with a clean solvent. Allow to dry and immediately proceed with the next operation.

Galvanized and aluminium surfaces: Abrade surfaces to a medium coarse type finish to provide an adhesion key.

Zinc primed surfaces: If present, remove zinc salts from zinc primers.

Treatment of welds

Requirement: Clean welds to remove roughness, using power tools to AS 1627.2. Remove filings by vacuuming or compressed air.

Temporary welds: Grind flush any temporary welds.

Porous, skip or stitch welds: Not permitted.

Site welding: If possible, avoid site welding. If on site welding is required, prepare the weld as per shop welds and as follows:

- Prime welds with the documented primer before contamination can occur. Make sure the primer overlaps the sound adjacent coating by 25 to 50 mm.
- Apply intermediate and topcoats over the primed welds to match the surrounding coating system, overlapping the sound adjacent coating by 25 to 50 mm.

Shop priming

Requirement: Dust off and apply a coat of primer in conformance with the manufacturer's recommendations.

Site coating

General: High pressure wash down all surfaces with clean water. Lightly sand down primer/intermediate coats, which have been shop applied, before site application of next coat.

3.3 PREPARATION ASSESSMENT

General

Conformance: Assess all surfaces of each steel member for conformance with the documented preparation requirements.

Abrasive blast cleaning

Assessment: To AS 1627.4 and AS 1627.9.

Minimum acceptance class: Sa 2.5.

Power tool cleaning

Assessment: To AS 1627.9.

Hand tool cleaning

Assessment: To AS 1627.9.

Surface profile

General: To AS 3894.5 Method A.

Surface dust from abrasion

General: To AS 3894.6 Method C.

Chloride level testing

Test: To AS 3894.6 Method A.

Maximum allowable chloride levels: 50 mg/m^2.

Conformance: If the maximum allowable chloride is exceeded, rewash the affected surface area until the chloride level is within the acceptable limits using clean water or chloride neutralising solutions. Jet-washing or steam cleaning is also acceptable before re-testing and re-abrasive blasting.

Timing of testing: Early in the blasting work so that removal procedures can be started before the blasting is completed.

3.4 MIXING

General

Mixing: Mix coatings thoroughly. Mix package sizes larger than 4 litres using powered agitators driven by air motors.

Multi-component coatings: Combine as whole pack units before application.

Thinners: If addition of thinners is proposed, conform to the coating manufacturer's recommendations for the documented product.

Colour consistency: If colour consistency is required, pre-mix tinted products, before the addition of the curing agent or converter and before coating application.

3.5 COATING APPLICATION

General

Requirement: Conform to the product data sheets.

Painting and coating colour: Verify all project finish colours with the retained samples.

Final surface preparation or coating application

Limits: If the following climatic/substrate conditions are present do not apply coating:

- Relative humidity above 85%.
- Substrate temperature less than 3°C above the dewpoint.
- Ambient air temperature below 5°C or above 40°C.
- Substrate temperature below 10°C or above 45°C.
- Surface to be coated is wet or damp.
- Full prime coat application cannot be carried out before the specified cleanliness of the surface deteriorates.
- For external or site applied coatings:
  - . The weather is deteriorating or unfavourable for application or curing.
  - . High wind conditions.
- Surface preparation standard has not been achieved.
- Time between surface blast cleaning and the commencement of coating has exceeded 4 hours.
- Visual tarnishing or black spots develop on the surface of the metal.

Exception: Preliminary blast or other surface preparations may be performed in conditions that are outside the limits, providing the final surface preparation and all coating applications are undertaken under the limit conditions.

Pre-coating: Before the spray application of each coating, stripe coat by brush method all edges, welds, seams, rivets, bolts, boltholes (including slots) and difficult to spray areas. Prime the underlying surfaces of replacement bolting, washers and nuts before installation.

Procedure: Conform to the coating order shown in **SELECTIONS, PROTECTIVE PAINT COATING SYSTEMS**.

Timing: Conform to the coating manufacturer's minimum and maximum recoat intervals and curing times.

Subsequent coats: Before applying any subsequent coating layer, make sure the surface condition of the preceding coat conforms to **SELECTIONS, PROTECTIVE PAINT COATING SYSTEMS** and is clean and free from defects.

Wet film thickness (WFT)

Method of measurement: To AS 3894.3 Appendix C using an approved wet film gauge continuously during application.

Dry film thickness (DFT)

Method of measurement: To AS 3894.3 clause 10.

Extent: Measure all surfaces at the completion of each prime, intermediate and finish coats, including areas of the element difficult to paint, masked by structure, or where double or light coating is likely.

Number of measurements: To AS 3894.3 clause 7.

Coatings with DFT 150 µm or less: If testing, deduct the effect of the measured surface profile from all DFT readings.

Single readings: Conform to the following:

- The average of 5 point readings for each 10 m^2 area of coating surface to be within the documented coating thickness range.
- No single point reading in any 10 m^2 to be less than 80% of the specified minimum coating thickness. If the average of three readings is used to produce a point reading, an individual reading may be less than 80% of the minimum coating thickness.
- Check any single reading that is greater than 150% of the documented DFT with three additional readings within 50 mm of the original reading. If the average of these three readings is not greater than 150% of the specified DFT, take the average reading as the point reading. If greater than 150%, reject the DFT for that area.

Rectification: Re-work areas rejected, using the same surface preparation, coatings and sequence as for the original work.

Defects (including under-thickness and over-thickness): Mark with dustless chalk, adhesive inspection labels or masking tape. Do not use crayon, paint or spirit based ink pens.

3.6 PROTECTION

Contamination

Surfaces: Prevent contamination of coated surface, which are not yet dry, from blasting dust, abrasive or surface preparation debris and any other foreign matter.

Post application care

General: Protect the coating against physical, chemical, or atmospheric damage until all components are fully cured.

Care: Stack and handle all coated items using fabric slings or padded chains. Use soft packaging, carpet strips or other deformable materials between all coated items.

Water ponding: Stack coated items to prevent water ponding.

3.7 COATING REPAIR

Repair of coating damage

Preparation: Feather back by hand or machine sanding all leading edges of intact coating adjacent to the repair, to remove any sharp edge.

Surface contamination: Remove by dusting or blowing down before applying the first coat of paint.

Sequence: Apply the repair coating in the same sequence and manner as the original coating.

Areas damaged without exposing the primer: Wash with a proprietary detergent solution, rinse with clean water and abrade so that edges of sound paint are feathered. Coat the area with the appropriate intermediate and finishing coat materials.

Areas damaged exposing the primer or steel surface: Blast clean to the original standard. Prepare at least 50 mm into the sound coating and to a further feathering zone of approximately 50 mm. Recoat with the documented system to restore the film thickness and integrity over the whole prepared surface including the feathered zone.

Aesthetic reinstatement: If required, repaint to a physical or discernible boundary line.

Defects: If corrosion pitting or areas of significant metal loss and defects are exposed by the blasting process, advise for inspection and have areas passed as being fit for service before proceeding with the coating system.

Timing: Apply the protective coating system within 4 hours of blast cleaning or in any case before visual tarnishing of the steel occurs.

3.8 COMPLETION

General

Joints: On completion, seal all joints and mating surfaces with a compatible polyurethane sealant.

Warranties

Requirement: 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.

0671 PAINTING

1 GENERAL

1.1 RESPONSIBILITIES

General
Requirement: Provide coating systems to substrates, as documented.

Performance
Requirement: Provide coating systems as follows:
- Consistent in colour, gloss level, texture and dry film thickness.
- Free of runs, sags, blisters, or other discontinuities.
- Paint systems which are fully opaque or at the documented level of opacity.
- Clear finishes at the level of transparency consistent with the product.
- Fully adhered.
- Resistant to environmental degradation within the manufacturer's stated life span.

1.2 CROSS REFERENCES

General
Requirement: Conform to the following:
- *0171 General requirements*.

1.3 STANDARDS

Painting
General: To the recommendations of those parts of AS/NZS 2311 referenced in this worksection.

1.4 INTERPRETATION

Definitions
General: For the purposes of this worksection the definitions in AS/NZS 2310 and the following apply:
- Gloss: The optical property of a surface, characterised by its ability to reflect light specularly.
- Gloss unit: Numerical value for the amount of specular reflection relative to that of a standard surface under the same geometric conditions.
- Levels of gloss finish: When the specular direction is 60 degrees, surfaces with the following specular gloss reading is defined as follows:
  . Full gloss: Over 85 gloss units.
  . Gloss: Between 50 and 85 gloss units.
  . Semi-gloss: Between 20 and 50 gloss units.
  . Low gloss (low sheen): Between 5 and 20 gloss units.
  . Flat finish (matt): Up to 5 gloss units.
- Opacity: The ability of a paint or textured and membrane coating to obliterate the colour difference of a substrate.
- Paint or coating system: A product in liquid form, which when applied to a surface, forms a dry film having protective, decorative or other specific technical properties.
- Primer, prime coat: The first coat of a painting system that helps bind subsequent coats to the substrate and which may inhibit its deterioration.
- Sealer: A product used to seal substrates to prevent the following:
  . Materials from bleeding through to the surface.
  . Reaction of the substrate with incompatible top coats.
  . Undue absorption of the following coat into the substrate.
- Substrate: The surface to which a material or product is applied.
- Undercoat: An intermediate coat formulated to prepare a primed surface or other prepared surface for the finishing coat.

1.5 SUBMISSIONS

Samples

Clear finish coatings: Submit samples of timber or timber veneer matching those to be used in the works as follows:

- Requirement: Label for identification and prepare, putty, stain, seal and coat in conformance with the documented system.
- Size: Large enough to be cut into 4 segments.

Opaque coatings: Submit labelled samples of each coating system, on representative substrates, showing surface preparation, colour, gloss level, texture, and physical properties.

Paint

General: Submit the following at least 3 weeks before the paint is required:

- Paint brand name and product range quality statement.
- Safety data sheets (SDS) showing the health and safety precautions to be taken during application.
- The published recommendations for maintenance.

Subcontractors

Specialist applicators: Submit name and contact details of proposed specialist applicators.

Wet samples

General: Submit two clearly labelled, 500 mL samples of each type of paint to be tested.

1.6 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following:

- Painting stages:
  - . Completion of surface preparation.
  - . After application of final coat.
- Clear finishing stages:
  - . Before surface preparation of timber.
  - . Completion of surface preparation.
  - . After application of final coat.

2 PRODUCTS

2.1 GENERAL

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.

Marking

Identification: Marked to show the following:

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

2.2 PAINTING MATERIALS

Standards

Paint types: To AS/NZS 2311 Table 4.2 and the following:

- Metal primer for steel, lead and chromate free: To AS 3730.21 and AS/NZS 3750.19.
- Metal primer, latex: To AS 3730.15.
- Metal primer for metallic-coated surfaces, solvent-borne: To AS 3730.21.
- Zinc-rich organic binder/primer for steel: To AS/NZS 3750.9.

Combinations
General: Do not combine paints 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 topcoats.

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 which are colour tinted by the manufacturer or supplier.

Toxic ingredients
General: To the *Poisons Standard June 2017 (including SUSMP 17)* Part 2 Section 7.

3 EXECUTION

3.1 PREPARATION

Order of work
Other trades: Before painting, 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 commencing opaque paint finishes in the same area.

Protection
General: Before painting, clean the area and protect it from dust contamination. Use drop sheets and masking agents to protect surfaces, including finished surfaces and adjacent finishes, during painting.

Fixtures and furniture: Remove door furniture, switch plates, light fittings and other fixtures before painting, and conform to the following:

- Labelling and storage: Attach labels or mark fixtures using a non-permanent method, identifying location and refixing instructions, if required. Store and protect against damage.

Difficult to remove fixtures: Where removal is impractical or difficult, apply surface protection before substrate preparation and painting.

Wet paint warning
Notices: Place in a conspicuous location and do not remove until the paint is dry.

Substrate preparation – generally
General: Prepare substrates to receive the painting systems to the paint manufacturer's recommendations.

Cleaning: Clean down the substrate surface. Do not cause damage to the substrate or the surroundings.

Filling: Fill cracks and holes with fillers, sealants, putties or grouting cements as appropriate for the finishing system and substrate, and sand smooth.

- Clear finish: Provide filler tinted to match the substrate.

Clear timber finish systems: Prepare the surface so that its attributes will show through the clear finish without blemishes, using methods including the following:

- Removal of bruises.
- Removal of discolourations, including staining by oil, grease and nailheads.
- Bleaching where necessary to match the timber colour sample.
- Puttying.
- Fine sanding, with the last abrasive no coarser than 220 grit, so that there are no scratches across the grain.

Treated surfaces: If surfaces have been treated with preservatives or fire retardants, make sure coating is compatible with the treatment and does not adversely affect its performance.

Unpainted surfaces
Standard: To AS/NZS 2311 Section 3.

Cleaning external surfaces

Sound external surfaces other than timber: 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 appropriate hand tools. Use sanding blocks to preserve the arrises of masonry and stone details.

Efflorescence: Eliminate the source of salt and water before cleaning. Allow surface to dry for 15 to 30 days before repainting.

New masonry: Allow 30 days for the masonry to cure and pH level to stabilise before painting.

3.2 PAINTING

Light levels

General: ≥ 400 lux.

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.

Paint application

Standard: To AS/NZS 2311 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.

Painting conditions

General: Unless the paint is recommended for such conditions, do not paint under the following conditions:

- Dusty conditions.
- Relative humidity: > 85%.
- Surface temperature: < 10°C or > 35°C.

Priming before fixing

General: Apply one coat of wood primer, and 2 coats to end grain, to the back of the following before fixing in position:

- External fascia boards.
- Timber door and window frames.
- Bottoms of external doors.
- Associated trims and glazing beads.
- Timber board cladding.

Spraying

General: If the paint application is by spraying, use conventional or airless equipment which conforms to the following:

- Satisfactorily atomises paint being applied.
- Does not require paint to be thinned beyond the maximum amount recommended by the manufacturer.
- Does not introduce oil, water or other contaminants into the applied paint.

Paint with known health hazards: Provide personal protection, masking, ventilating and screening facilities to AS/NZS 4114.1 and AS/NZS 4114.2.

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.

Maintenance painting: To AS/NZS 2311 Section 8.

Repair of galvanizing

Cleaning: For galvanized surfaces which 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.

Tinting

General: Tint each coat of an opaque coating system so that each has a noticeably different tint from the preceding coat, except for top coats in systems with more than one top coat.

Services

General: Paint all new services and equipment, including those in plant rooms, if not embedded, except chromium, anodised aluminium, GRP, PVC-U, stainless steel, non-metallic flexible materials and normally lubricated machined surfaces.

Proprietary items: Repaint only if damaged.

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.

3.3 COMPLETION

General

Protection and masking: Remove masking and protection coverings before paint has dried.

Cleaning: On completion of painting, remove splatters by washing, scraping or other methods which do not scratch or damage adjacent finished surfaces.

Reinstatement: Repair, replace or refinish any damage, including works of other trades. Touch up new damaged decorative paintwork or misses only with the paint batch used in the original application.

Removed fixtures: Refix undamaged fixture in the original location, make sure they are properly fitted and in proper working order.

Disposal of paint and waste materials.

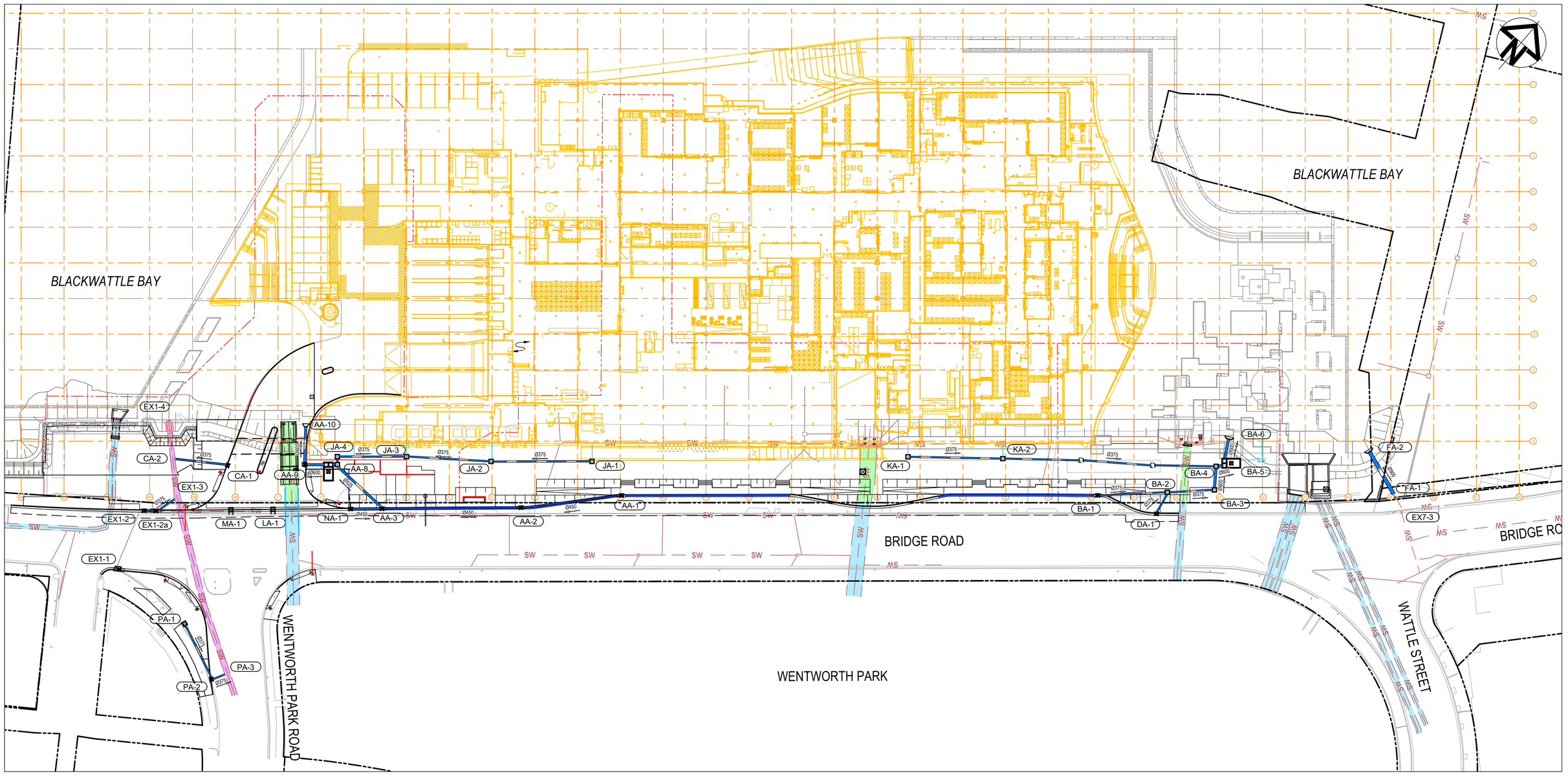
Requirement: Conform to requirements of the local government authority.

4 SELECTIONS

Refer Landscape Selections Schedule.

APPENDICES

1 PRODUCTS INFORMATION



LEGEND

- EXISTING BOUNDARY
- EXISTING SYDNEY WATER STORMWATER
- EXISTING CITY OF SYDNEY STORMWATER
- EXISTING TINSW STORMWATER
- EXISTING STORMWATER
- AA-1 — STORMWATER PIT LABEL
- Ø375 — PROPOSED STORMWATER PIPE WITH SIZE AND DIRECTION
- JUNCTION PIT
- STORMWATER PITS

Issue	Description	Date
C	ISSUED FOR CONSTRUCTION	12-07-24
B	ISSUED FOR CONSTRUCTION	17-06-24
A	ISSUED FOR CONSTRUCTION	17-04-24

100mm on Original

Bar Scales

0 10 20 30 40 50m

1 : 500 @ A1 1 : 1000 @ A3

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Client

MULTIPLEX

Scales 1:500

Grid MGA (GDA94)

Height Datum AHD

RMS Registration Number

DS2021/000232

Drawn GB

Designed GB

Checked PW

Approved

Project

SYDNEY FISH MARKETS
BRIDGE ROAD, GLEBE

Title

OVERALL
STORMWATER MANAGEMENT
PLAN

Civil Engineers and Project Managers

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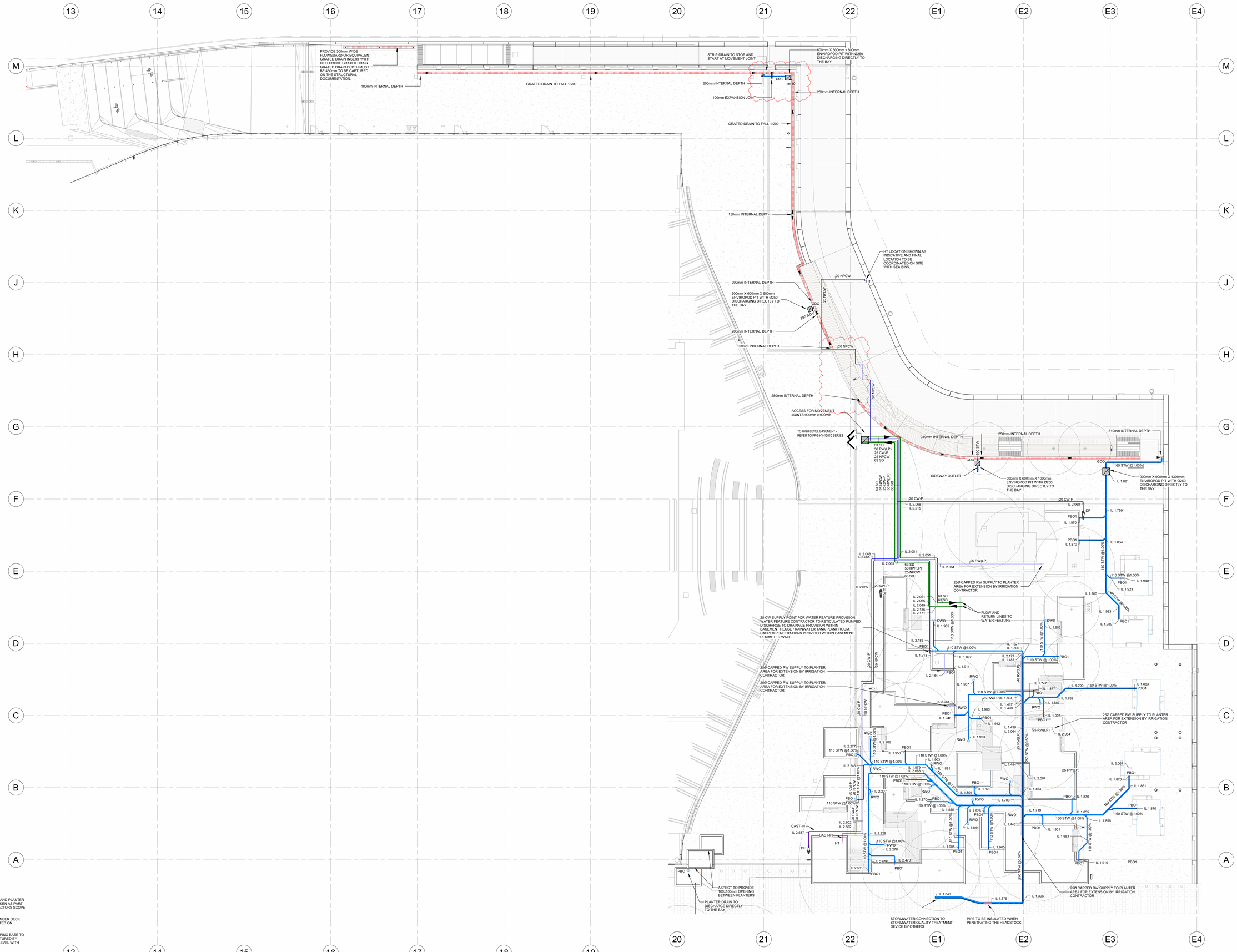
Status FOR CONSTRUCTION

A1

Project - Drawing No. ATL-CV-44000

Issue C

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TYPICAL NOTE:

1. RETICULATION TO ISLAND PLANTER AREAS TO BE UNDERTAKEN AS PART OF IRRIGATION CONTRACTORS SCOPE OF WORKS.

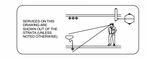
2. RWO'S WITHIN THE TIMBER DECK AREA TO BE COORDINATED ON FINISHED HEIGHT.

3. PLANTER BOXES TOPPING BASE TO BE REVIEWED AND CAPTURED BY MPX/ENSTRUCT TO BE LEVEL WITH PBO'S ILS.

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ISSUE	DATE	FOR
0	27/05/2022	FOR REVIEW
A	17/08/2022	FOR CONSTRUCTION
B	14/10/2022	PACKAGE 4 - LANDLORD'S WORKS TO APC
C	17/02/2023	FOR CONSTRUCTION
D	08/05/2023	FOR CONSTRUCTION
E	11/10/2023	FOR CONSTRUCTION
F	15/12/2023	FOR CONSTRUCTION
G	06/05/2024	FOR CONSTRUCTION
H	09/08/2024	FOR CONSTRUCTION



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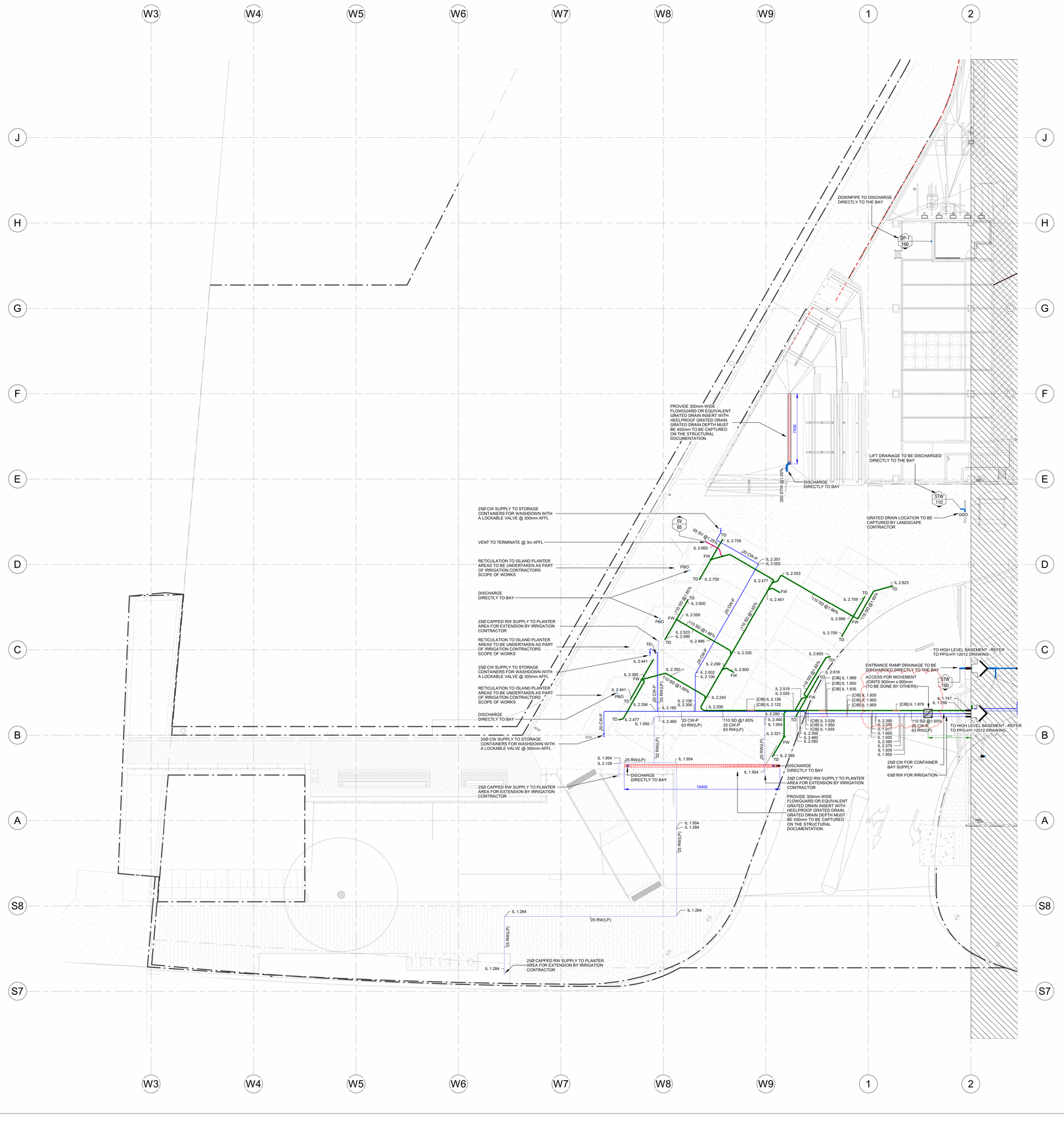
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SYDNEY FISH MARKET
1B BRIDGE RD, GLEBE NSW
PROJECT NUMBER
6618
DRAWING KEY

TRUE NORTH | PROJECT NORTH
GRAPHIC SCALE
0 2000 5000
SCALE @ A0
1 : 150
STATUS
FOR CONSTRUCTION
DRAWING
CIVIC PLAZA GARDEN - HYDRAULIC SERVICES

PPG-HY-30020 | ISSUE H



TYPICAL NOTE:

1. FLOOR WASTES AND TUNDISHES PROVISIONS WILL BE PROVIDED WITH A GAS TIGHT REMOVABLE COVER THAT WILL BE CAPPED AND REMOVED WHEN REQUIRED.

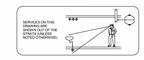
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ISSUE	DATE	FOR
0	27/05/2022	FOR REVIEW
A	18/08/2022	FOR CONSTRUCTION
B	14/10/2022	PACKAGE 4 - LANDLORD'S WORKS TO AFC
C	03/05/2023	FOR CONSTRUCTION
D	11/10/2023	FOR CONSTRUCTION
E	23/01/2024	FOR CONSTRUCTION
F	19/02/2024	FOR CONSTRUCTION

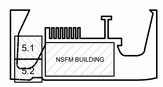


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1B BRIDGE RD, GLEBE NSW
PROJECT NUMBER
6618
DRAWING KEY



TRUE NORTH
PROJECT NORTH
GRAPHIC SCALE
0
2000
5000
SCALE @ A0
1 : 150
STATUS
FOR CONSTRUCTION
DRAWING
WESTERN PLAZA - HYDRAULIC SERVICES

PPG-HY-50020
ISSUE F

new Sydney Fish Market
Stage 2
SSD-8925 Modification 11
Bridge Road, Glebe
Stormwater Quality Assessment

Multiplex (c/- Infrastructure NSW)

15/07/2024

20-819

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Document Registration

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Document File Name	REP009-02-20-819 Stormwater Quality Assessment.docx
Section	Civil / Urban Water Management
Document Author	Tim Michel

Issue	Description	Date	Author	Checked	Approved
01	Issue for MOD Application	20/06/2023	Tim Michel	☐	☐
02	Issue for Construction	15/07/2024	Tim Michel	☒	☐
				☐	☐
				☐	☐
				☐	☐

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1. Introduction

This report has been prepared by AT&L on behalf of Multiplex to document the final stormwater quality management strategy adopted through the process of detailed design for the new Sydney Fish Market Site at 1A, 1B and 1C Bridge Road, Glebe. The stormwater quality management strategy is generally consistent with the strategy approved under Modification No. 11 (MOD 11) of State Significant Development Application (SSD-8925), with minor amendments that meet the stormwater quality management requirements for the development.

This report was originally prepared to support the MOD 11 application to SSD-8925 for the nSFM Site and should be read in conjunction with the EIS, development plans and supporting documentation submitted with the approved SSDA (accessible on the NSW Major Projects website: https://www.planningportal.nsw.gov.au/major-projects/projects/new-sydney-fish-market-stage-2).

This revision of the Assessment incorporates specifics for all management measures implemented in the For Construction design documentation, which is a fully coordinated design between civil, landscape, hydraulic and structural elements.

2. Water Quality Assessment

This Water Quality Assessment outlines the methodology and results of water quality modelling of the proposed development. The methodology is consistent with the strategy approved under SSD-8925 MOD 11, with amendments as described in the following sections.

2.1. Water Quality Objectives

The *Sydney Development Control Plan* (DCP) 2012 outlines stormwater quality targets for urban development. All developments greater than 1,000 m^2 are required to achieve the following post-development pollutant load standards:

(a) reduce the baseline annual pollutant load for litter and vegetation larger than 5mm by 90%;

(b) reduce the baseline annual pollutant load for total suspended solids by 85%;

(c) reduce the baseline annual pollutant load for total phosphorous by 65%; and

(d) reduce the baseline annual pollutant load for total nitrogen by 45%

These objectives are consistent with the strategy approved under SSD-8925.

2.2. Stormwater Management Measures

The approved stormwater management strategy has been developed as a result of:

a) The scope of the design that was the subject of the MOD 11 application to SSD-8925; and

b) Refinement, coordination and detailing of various design elements throughout detailed design of the nSFM building and adjacent public domain, including Bridge Road.

The measures that make up the proposed stormwater treatment train for the nSFM site are described below in **Table 1**.

Table 1: Proposed stormwater management measures

Proposed Stormwater Management Measure	Description
Rainwater tank	▪ 100 kL tank that will capture runoff from the north-eastern portion of the nSFM building roof. ▪ Overflow from the rainwater tank will be directed to Blackwattle Bay.
Ocean Protect Psorb StormFilter	▪ 15 cartridge unit proposed near south-western corner of nSFM building, to capture runoff from the south-western portion of the nSFM roof, promenade adjacent to Bridge Road and part of the northern side of Bridge Road. ▪ 15 cartridge unit proposed near south-eastern corner of nSFM building, to capture runoff from the north-eastern portion of the nSFM roof, part of the promenade and plaza adjacent to Bridge Road, and part of the northern side of Bridge Road.
Atlan FlowGuard (formerly known as SPEL Hydrochannel)	▪ Proposed to capture the following areas: ▸ Part of the Western Plaza (approx. 630 sqm) – 16 l.m of FlowGuard ▸ Western Stairs and Walkway (approx. 730 sqm) – 7 l.m of FlowGuard ▸ Part of Waterfront Promenade (approx. 590 sqm) – 9 l.m of FlowGuard

Proposed Stormwater Management Measure	Description
Pit filter baskets (EnviroPod™)	▪ Proposed to treat the following areas: ▸ Part of access ramp off Bridge Road ▸ Wharf / Dock area ▸ Waterfront Promenade
Bio-filtration landscape areas	▪ Proposed within the landscaped areas at the Western Promenade and adjacent to Bridge Road (south of the Eastern Plaza) to capture and treat runoff from the promenade paved areas.

The Stormwater Management Plan showing indicative locations of these proposed measures is included in **Appendix A**.

2.3. Model Setup

MUSIC modelling to demonstrate compliance with the City of Sydney stormwater quality targets has been undertaken using parameters that are consistent with the *City of Sydney WSUD Technical Guidelines* (Alluvium, 2014) and the approved SSDA MOD 11 Water Quality Assessment. The MUSIC model parameters including climate data, land use and catchment characteristics, rainfall and runoff parameters and pollutant generation rates are consistent with the approved Water Quality Assessment documented by Cardno.

The MUSIC model setup for the proposed development is presented as **Figure 1**.

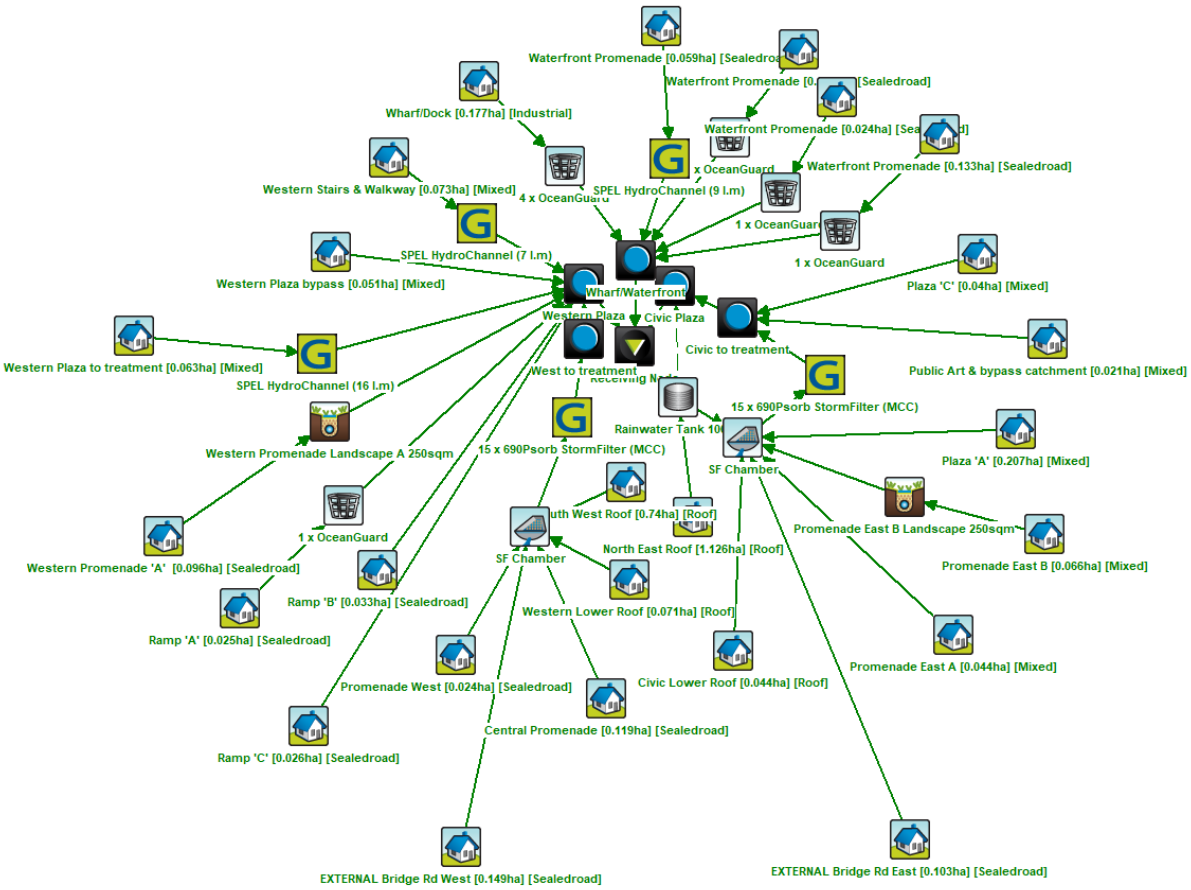


Figure 1: MUSIC model setup for the proposed development scenario

2.4. Model Results

The MUSIC model results presented as a percentage reduction in average annual pollutant load are presented in **Table 2**.

Table 2: MUSIC model results

	Source Loads	**Pollutant Load Removed**	**% Removal**	***% Reduction target***
Total Suspended Solids (kg/yr)	4220	3620	85.8%	*85%*
Total Phosphorus (kg/yr)	9.75	6.54	67.1%	*65%*
Total Nitrogen (kg/yr)	86	48.7	56.6%	*45%*
Gross Pollutants (kg/yr)	946	965	102%	*90%*

The MUSIC model results presented above demonstrate that the proposed stormwater management measures satisfy the pollutant reduction targets for the development of the nSFM site, which is consistent with the Stormwater Management Strategy approved under SSD 8925 Mod-11.

3. Conclusion

This report has been prepared to demonstrate that the stormwater quality objectives for the project will be met with a series of proposed stormwater treatment measures that have been implemented in the detailed civil, hydraulic and landscape design.

Appendix A –
Stormwater Management Plan

LEGEND

- ROOF CATCHMENT
- CATCHMENT TO PRIMARY TREATMENT
- CATCHMENT TO SECONDARY TREATMENT
- CATCHMENT BYPASSING STORMWATER TREATMENT MEASURES

BLACKWATTLE BAY

WHARF (0.236Ha)

WATERFRONT PROMENADE (0.134Ha)

NEW SYDNEY FISH MARKETS BUILDING

WESTERN ROOF AREA TO BE TREATED VIA WATER QUALITY CHAMBER 'A'.

EASTERN ROOF AREA TO BE TREATED VIA 100kL RAINWATER TANK AND WATER QUALITY CHAMBER 'B'.

TO GLEBE

TO PYRMONT

EASTERN PLAZA 'A' BYPASS (0.025Ha)

WESTERN STAIRS AND WALKWAY (0.073Ha)

EASTERN PLAZA BYPASS (0.079Ha)

EASTERN PLAZA 'B' (0.148Ha)

EASTERN PLAZA 'B' BYPASS (0.026Ha)

WESTERN PLAZA (0.063Ha)

RAMP 'A' (0.025Ha)

EASTERN PLAZA 'A' (0.191Ha)

EASTERN PLAZA 'C' (0.100Ha)

ACCESS ROAD

WATER QUALITY CHAMBER 'A' (15xOCEANPROTECT 690 PSORB STORMFILTERS)

WATER QUALITY CHAMBER 'B' (15xOCEANPROTECT 690 PSORB STORMFILTERS)

WESTERN PROMENADE 'A' (0.096Ha)

RAMP BYPASS 'B' (0.033Ha)

RAMP BYPASS 'C' (0.026Ha)

PROMENADE WEST (0.024Ha)

CENTRAL PROMENADE (0.119Ha)

PROMENADE EAST 'A' (0.045Ha)

PROMENADE EAST 'B' (0.066Ha)

BRIDGE ROAD 'A' (0.149Ha)

BRIDGE ROAD (MR523)

BRIDGE ROAD 'B' (0.103Ha)

WENTWORTH PARK

WENTWORTH PARK ROAD

WATTLE STREET (MR599)

Issue	Description	Date
1	ISSUED FOR INFORMATION	18-10-23

Bar Scales

0 10 20 30 40 50m

1 : 500 @ A1 1 : 1000 @ A3

100mm on Original

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Client: MULTIPLEX

Scales: 1:500 @ A1

Grid: MGA (GDA94)

Height Datum: AHD

RMS Registration Number: DS2021/000232

Drawn	JH
Designed	PDK
Checked	GB
Approved	

Project: SYDNEY FISH MARKETS BRIDGE ROAD, GLEBE

Title: WATER QUALITY CATCHMENT PLAN

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Status: FOR INFORMATION NOT FOR CONSTRUCTION

A1

Project - Drawing No.: ATL-CV-SKT-00148

Issue: 1

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