

CPCCBC4010B APPLY STRUCTURAL PRINCIPLES TO RESIDENTIAL LOW RISE CONSTRUCTIONS & CPCCBC4011B APPLY STRUCTURAL PRINCIPLES TO COMMERCIAL LOW RISE CONSTRUCTIONS ASSESSMENT SUMMARY

The assessment activities for *CPCCBC4010B Apply structural principles to residential low rise constructions* & *CPCCBC4011B Apply structural principles to commercial low rise constructions* cover all aspects of the unit of competency required. To demonstrate competence in this unit, a participant must undertake all tasks and complete them satisfactorily and consistently. For Apprentices and Trainees, this includes employer completion of the Employer Record Book (ERB).

Participants must read all the information given before starting any assessment task. The assessment tasks are intended to be equitable, fair and flexible. If a participant has any questions or requires alternative arrangements to be made such requests should be directed to their Trainer/Assessor, who should note such arrangements in the 'Assessor Comments' on the affected assessment. If a participant feels they are not yet ready to be assessed, they should discuss their options with their Trainer/Assessor.

To satisfactorily complete the assessment, the participant is required to answer all questions correctly and demonstrate their skills to industry standards. If a participant does not answer some questions or perform some tasks, they will be deemed 'Not Satisfactory' for the task and 'Not Yet Competent' for the unit of competency. The Trainer/Assessor is able to provide the participant with additional information on interpreting the assessment outcomes and provide guidance on the participant's options. Should a participant still be deemed 'Not Satisfactory' they will have the opportunity to undertake a supplementary assessment or appeal the result.

By signing the cover page for each assessment item, the participant acknowledges they understand the assessment instructions and requirements and consent to being assessed. The participant also verifies and assures the RTO that the work submitted is their own work.

Participant Name	Tess Veldink
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Task	Assessment Results	
Theory Exam	☐ Satisfactory	☐ Not Yet Satisfactory
Practical Assessment	☐ Satisfactory	☐ Not Yet Satisfactory
Outcome for CPCCBC4010B	☐ Competent	☐ Not Yet Competent
Outcome for CPCCBC4011B	☐ Competent	☐ Not Yet Competent

Assessor Name	
Assessor Signature	
Unit Competence Determination Date	Click here to enter a date.

CPCCBC4010B APPLY STRUCTURAL PRINCIPLES TO RESIDENTIAL LOW RISE CONSTRUCTIONS & CPCCBC4011B APPLY STRUCTURAL PRINCIPLES TO COMMERCIAL LOW RISE CONSTRUCTIONS

THEORY EXAM INSTRUCTIONS

- This exam will occur under standard assessment conditions.
 - An oral examination may be allowed under certain circumstances, whereby the Participant's answers will be documented by a party other than the Participant. This must be acknowledged in writing (e.g. FT001 and Assessor Comments)
- Participants must provide enough detail in their responses to demonstrate their knowledge and skills.
- Please fill in the details below, providing your name, signature and date of assessment.
 - Your signature acknowledges that this is your own work.
- Assessors are to complete marking in pen of a different colour to the Participant.
- If a Participant initially answers a question incorrectly but modifies their response, they must follow the instructions below:
 - If a Participant changes their response in writing, they must put their initials next to the written change.
 - If a Participant changes their response verbally, this must be noted on the exam paper by the assessor.

Participant name Tess Veldink

Participant signature

Tess Veldink

Date 3/05/2021

Assessor name

Assessor signature

Date Click here to enter a date.

Number of questions	Number of questions answered correctly	Task outcome (Tick)	
93		Satisfactory	Not Yet Satisfactory
		☐	☐

ASSESSOR COMMENTS

What is the most important aspect in the design of buildings?

Tick your response.

Answer	Choice	Possible Answers	☐
	☐	Aesthetics	
	☐	Cost	
	☐	Location	
	☒	Stability	

Where can the definitive properties of materials used in the building industry be found? Tick your response.

Answer	Choice	Possible Answers	☐
	☒	Australian Standards	
	☐	Building journals	
	☐	Practical learning on the job	
	☐	Textbooks on building	

Which industry professional would you contact for structural advice? Tick your response.

Answer	Choice	Possible Answers	☐
	☐	Architect	
	☐	Draftsperson	
	☒	Engineer	
	☐	Quantity surveyor	

Which industry professional would you contact for the preparation of working drawings? Tick your response.

Answer	Choice	Possible Answers	☐
	☐	Building surveyor	
	☒	Draftsperson	
	☐	Quantity surveyor	

Briefly describe the role of an architect.

Answer	Architects are people who design buildings and in many cases also supervises their construction. They help you to set a viable and realistic budget, guide you through the planning process and obtain competitive quotes and manage consultants.	☐
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What is the difference between a building surveyor and a land surveyor?

Answer	Land surveyors - assess the surrounding terrain and landscape for the purpose of development. Building surveyors - cost planning and management throughout the entire life cycle of the project from inception to post-completion (including determining fair progress payments).	☐
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**Which industry professional would you contact for matters relating to cost?
Tick your response.**

Answer	<table border="1"> <thead> <tr style="background-color: #cccccc;"> <th style="text-align: center;">Choice</th> <th style="text-align: center;">Possible Answers</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">☐</td> <td style="text-align: center;">Architect</td> </tr> <tr> <td style="text-align: center;">☐</td> <td style="text-align: center;">Building surveyor</td> </tr> <tr> <td style="text-align: center;">☐</td> <td style="text-align: center;">Engineer</td> </tr> <tr> <td style="text-align: center;">☒</td> <td style="text-align: center;">Quantity surveyor</td> </tr> </tbody> </table>	Choice	Possible Answers	☐	Architect	☐	Building surveyor	☐	Engineer	☒	Quantity surveyor	☐
Choice	Possible Answers											
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☐	Building surveyor											
☐	Engineer											
☒	Quantity surveyor											

A land surveyor is to reinstate survey pegs. Which of the following documents would the surveyor need? Tick your response.

Choice	Possible Answers
☐	Title
☒	Contour plans
☐	Project specifications

When preparing a trench a builder digs through a gas pipe which was not shown on the plans. Which report should be used to prove the mistake was not the builder's? Tick your response.

Choice	Possible Answers
☒	Engineer's drawings
☐	Condition report
☐	Soil report

Which two (2) of the following can be determined from the contour report? Tick your responses.

Choice	Possible Answers
☒	Extent of cut and fill
☒	Height of retaining walls
☐	Location of trees
☐	Location of windows

The customer has requested a glass balcony. Which document would the builder refer to for information on structural members? Tick your response.

Choice	Possible Answers
☐	Building specifications
☐	Condition report
☒	Engineering report

The builder is planning a project and requires information on the location of fixtures and fittings, windows and doors. Which plans show this information? Tick your response.

Answer	Choice	Possible Answers	☐
	☐	Cross sections	
	☒	Floor plans	
	☐	Footing designs	

After an inspection, the client believes that what was installed is different to what they had chosen in the contract. What document details the materials the builder was meant to use? Tick your response.

Answer	Choice	Possible Answers	☐
	☒	Building specifications	
	☐	Plan of the subdivision	
	☐	Site plan	

What key pieces of information can be found on a site plan?
Tick all that apply.

Answer	Choice	Possible Answers	☐
	☒	Location of street frontage	
	☒	Location of proposed building	
	☒	North point	

What is the purpose of a footing design?

Answer	Footing plans provide details on: • Footing depths and widths • Slabs and stiffening beams • Type and positioning of steel reinforcement. These documents must also be included in a building permit application.	☐

Why would a pre-commencement site inspection be conducted?

Tick your response.

Answer	Choice	Possible Answers	☐
	☒	To ensure all contract documentation clearly reflects the actual site	
	☐	It allows the supervisor to get some fresh air	
	☐	To ensure that the client actually owns the property	
	☐	So that levels can be taken to check the slope of the site	

What are the dead loads in a building? Tick your response.

Answer	Choice	Possible Answers	☐
	☐	All stationary materials	
	☒	Permanent materials	
	☐	Roofing materials	
	☐	Use for which the building is intended	

What is the formula for calculating a dead load?

Answer	Dead load = Volume of member x Unit weight of materials (supplied)	☐

What are the live loads in a building? Tick your response.

Answer	Choice	Possible Answers	☐
	☒	Loads arising from the function of the structure	
	☐	Loads due to rain	
	☐	Loads due to wind	
	☐	Utility services	

Refer to the table shown below to respond to 0 to 0 These values are used to calculate live loads using the formula: Area of floor x Live load rating.

Live loads for floors as per building usage	Uniformly distributed load (kPa or kN/m ²)
Houses	1.5
Flats, motel bedrooms, apartments	2.0
Offices	3.0
Workshops	5.0
Parking, vehicle >2.5t	5.0
Hospitals, school assembly areas with fixed seating	3.0
Dance halls, bars, lounges	5.0

**Calculate the live load of a guest house measuring 23m x 8m.
Show your calculations.**

Answer ☐

Area of floor = $23 \times 8 = 184\text{m}^2$
 Live load rating = 1.5
 Live load = $184 \times 1.5 = 276\text{kn}$

Calculate the live load of a commercial office premises floor measuring 33m x 11m. Show your calculations.

Answer ☐

Area of floor = $33 \times 11 = 363\text{m}^2$
 Live load rating = 3
 Live load = $363 \times 3 = 1089\text{kn}$

Please refer to the information below in responding to 0 to 0

There is a building 21m long x 10m wide x 8m high with a 25° pitched gable roof. The rafter line on the metal clad roof measures 5.5m on the rafter line (from the fascia/gutter line up to the ridge line).

The wind load is calculated as *Area of surface x Wind load rate*. The wind load rates are as follows:

Windward wall is 21 metres long x 8 metres high with a wind load rate of +1.5kN/m²;

What is the wind load of the windward wall? Tick your response.

Answer	Choice	Possible Answers	
	☐	-252kN	
	☐	134.4kN	
	☒	252kN	
	☐	86.4kN	

What is the wind load for the leeward wall? Tick your response.

Answer	Choice	Possible Answers	
	☒	-134.4kN	
	☐	-94.2kN	
	☐	252kN	
	☐	134.4kN	

What is the wind load for the leeward roof? Tick your response.

Answer	Choice	Possible Answers	
	☒	-173.25kN	
	☐	92.4kN	
	☐	173.25kN	
	☐	-134.4kN	

What is the wind load for the windward roof? Tick your response.

Answer	Choice	Possible Answers	
	☐	252kN	
	☐	-92.4kN	
	☐	-252kN	
	☒	92.4kN	

Explain the term 'load path' in reference to a building.

Answer ☐

The load path is the direction in which each consecutive load will pass through connected members. The sequence commences at the highest point of the structure, working all the way down to the footing system – ultimately transferring the total load of the structure to the foundation. So the lowest structural member must be strong enough to support all the members above it.

- Foundation supports the footings
- Footings support the flooring structure which consist of bearers, joists and flooring
- Stud walls and bracing transfer their load to the flooring
- Roof trusses support the battens which support the roof cladding and this load is transferred to the walls.

Forces are represented as vectors and have three (3) properties. Name these properties.

Answer ☐

Magnitude, direction and position

Name five (5) structural members that a building may consist of.

Answer ☐

Retaining walls, wind bracing, walls (load-bearing, Footings & Floors

What should be considered when determining the shape and type of material to use?

Answer	Mechanical properties – strength, toughness, elasticity, plasticity, ductility, malleability, brittleness, hardness Section properties - the mathematical properties of structural shape	☐
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Match the mechanical properties and definitions below by writing the appropriate letter next to each number in the centre column.

Answer	Mechanical properties	Answers	Definitions	☐
1	Brittleness	1 - G	A The resistance the structural member is able to offer the load that will just cause fracture.	
2	Elasticity	2 - D	B The resistance to a fracture point of a material by repeated bending or twisting after yield point has passed.	
3	Ductility	3 - E	C Present if a material deforms with loading and then returns to its original shape when the loads are removed.	
4	Hardness	4 - H	D If a material deforms when loaded and does not return to its original shape when the load is removed, causing permanent deformation.	
5	Malleability	5 - F	E Enables a material to be drawn out in the direction of its length.	
6	Plasticity	6 - C	F Can be hammered or otherwise worked into various shapes.	
7	Strength	7 - A	G Causes material to break or snap off without any noticeable lengthening.	
8	Toughness	8 - B	H The degree of resistance to indentation or abrasion.	

Match the beam types and descriptions by writing the appropriate letter next to each number in the centre column.

Answer	Beam type	Answers	Description	☐
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1	Cantilevered	1 - A	A	Overhang their supports.
2	Continuously supported	2 - C	B	Supported at each end only.
3	Simply supported	3 - B	C	Supported by 3+ support points.

Match the column considerations and explanations by writing the appropriate letter next to each number in the centre column.

Answer	Column consideration		Answers	Explanation		☐
	1	Axially loaded column		A	The load is central to the centre of gravity axis.	
	2	Buckling		B	The load is off-centre, resulting in bending and compressing stress being applied to the column.	
	3	End fixity and effective length		C	The rigid connection to other members at the top and bottom affects the way a column buckles.	
	4	Non-axially loaded column		D	Affects the maximum load a column can be allowed to support.	
	5	Slenderness ratio		E	Occurs at the weakness axis unless a lateral restraint is used to prevent it.	

Explain how a column is in compression.

Answer	When the load is central to the centre of gravity axis, it produces a direct compressive stress within the column	☐
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Explain the letters 'CHS' and 'SHS' with reference to columns.

Answer The most efficient shape for a column is the circular hollow section (CHS).
The second most efficient shape is the square hollow section (SHS). ☐

Match the retaining wall types and descriptions by writing the appropriate letter next to each number in the centre column.

Answer	Retaining wall	Answers	Description	☐
1	Cantilevered retaining wall	1 - B	A Leans into the excavated soil and constructed at an angle between 45 and 80 degrees. Typically constructed from brickwork or pre-cast interlocking concrete units.	
2	Gravity retaining wall	2 - C	B Relies upon the correct placement of steel reinforcement and varying thickness of concrete to resist the soil pressure.	
3	Inclined retaining wall	3 - A	C Relies on its own weight to resist soil forces. Typically constructed from stone, brickwork or concrete.	

What is a ground level concrete slab floor?

Answer Slabs are:

- Relatively thin structural members which are normally used as floors and occasionally roof systems in multi-storey buildings
- Constructed of reinforced concrete poured into formwork or trenches
- Either ground slabs or suspended slabs. Ground slabs will be the focal point for this unit.

☐

What should you consider when selecting the type of slab floor?

Answer

You should consider a slab floor if foundations with high moisture content will make soils reactive creating foundation expanding or contracting, which can damage the slab and other building materials, such as brickwork.

☐

True or False (Tick your response): Concrete slab floors are popular in the construction of structures because they take less time to construct.

Answer

☒	True
☐	False

☐

Match the following slab structural performance terms with the descriptions by writing the appropriate letter next to each number in the centre column.

Answer	Term	Answers	Description	
1	Foundation movement	1 - C	A Placed along the perimeter of the slab. Design is influenced by the reactivity of the soils.	☐
2	Slab bending	2 - B	B Movement is classified as dishing or doming.	
3	Stiffening beams	3 - A	C Addressed by regulating the moisture content of the soil.	

Which of these terms relate to a roof truss? Tick your response.

Answer	Choice	Possible Answers	
	☐	Chord, knee, web	
	☐	Spider, pitch, chord	
	☐	Ankle, heel, tar	
	☒	Web, heel, pitch	

What are important considerations when undertaking demolition work? Describe relevant legislation, regulations and/or Codes of Practice relating to planning requirements, environmental standards, and safe work practices.

Answer		
	Considerations include; • Method of demolition - either manual or mechanised • Extent of temporary fencing and hoardings • Protection of adjoining properties, existing buildings and infrastructure • Disconnection notices for the service authorities, electricity, water, gas and telecommunications • The order in which the structural systems will be removed (the sequence of operations) • Details of any hazardous materials and notification of these to relevant authorities • On-site amenities such as toilet, first aid, fire services • Control measures for dust, noise and vibration • Vermin control for rats and mice • Traffic control on and off the site • Truck wash bays • Environmental considerations, such as recycling Ensure that all demolition operations are to be in accordance with AS and codes which include;	☐

- Work Health and Safety Regulations 2011 (Qld)
- Demolition Code of Practice 2013 (Qld)
- AS 2601: The demolition of structures

When demolition is being undertaken, which of the following items must be checked daily? Tick all that apply.

Answer

Choice	Possible Answers
☒	All boundaries are secured against unlawful entry
☒	All hazardous materials are removed or covered as required by OHS legislation
☒	All openings and elevated free edges are properly guarded
☐	All potential fire and safety hazards are eliminated and disconnected services are secured
☐	Asbestos is left on the nature strip for the garbage pickup
☒	Demolished materials have not been left on any floor or structure if their weight exceeds the safe carrying capacity of the floor or structure
☒	Emergency access routes are clear of debris
☒	Footpaths and public access are clear of demolished materials
☐	Neighbours have been notified not to hang out their washing
☒	No structure or part of a structure is left in such a condition that it may become dangerous, such as collapse due to wind or vibration
☐	Partly demolished elements are stabilised and loose materials are secured against bad weather
☐	Signs and balloons are in place for the garage sale
☐	Tell the demolisher to take a long lunch break as you don't need supervision



☒	Temporary hoardings, bracing, shoring and propping is tight and secure and in place as required to protect both workers and public
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Identify two (2) requirements under the NCC with regards to construction in bushfire prone areas?

Answer	located in a designated bushfire prone area if it is constructed in accordance with— (c) AS 3959; or (d) NASH Standard – Steel Framed Construction in Bushfire Areas.	☐
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What does AS3959 refer to?

Answer	AS 3959 assesses the bushfire risk based on the severity of the building's potential exposure to ember attack, radiant heat and direct flame contact.	☐
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Which of the following can assist with providing sufficient restraint to transfer wind forces to the ground to prevent collapse, uplift or sliding off the footing systems? Tick all that apply.

Answer	Choice	Possible Answers	☐
	☒	Anchorage systems	
	☒	Bracing systems	
	☒	Connecting structural elements together	

Which Australian Standard outlines the requirements of high wind areas?

Answer	AS 1170.2 Structural Design wind actions.	☐
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The acceleration coefficient is a number which indicates the expected severity of the earthquake ground movement. Which Australian Standard should be referenced for this information?

Answer

AS1170.4

☐

True or False (Tick your response): Where the acceleration coefficient is greater than 0.15, there are additional NCC requirements than where the acceleration coefficient is 0.12.

Answer

☒	True
☐	False

☐

Which of the following areas require specific compliance in alpine areas?
Tick all that apply.

Answer	Choice	Possible Answers	☐
	☒	Access bridges	
	☒	Access for emergency vehicles	
	☒	External doorways	
	☒	External ramps	

Identify the Volume and Parts of the NCC that relate to each of the following areas for Classes 1 and 10, and Classes 2 to 9.

Answer	Topic	Classes 1 and 10	Classes 2 to 9	☐
	Bushfire	Vol 2 Part 3.10.5 Construction in bushfire prone areas	Vol 1 Part G5 Construction in bushfire prone areas	
	High wind	Vol 2, Part 3.0 Structural provisions 3.0.4 Determination of structural resistance of materials and forms of construction	n/a	
	Earthquake	Vol 2 Part 3.10.2 Earthquake areas	Vol 1 Part B1 Structural provisions, B1.2	
	Alpine area	Vol 2 Part 3.10.4 Construction in alpine areas	Vol 1 Part G4 Construction in alpine areas	
	New technologies	n/a	n/a	

How are emerging building technologies and methods assessed in the National Construction Code? Tick all that apply.

Answer	Choice	Possible Answers	☐
	☒	Using verification methods	
	☒	With 'deemed to satisfy' provisions	
	☒	With documentary evidence	

True or False (Tick your response): Footings should be set out in accordance with the building plan.

Answer

☒	True
☐	False

☐

Name three (3) different types of footing systems for Classes 1 and 10, and Classes 2 to 9.

Answer

Classes 1 and 10	Classes 2 to 9
Volume 2 1. Stumps 2. Slabs 3. Strip	Volume 1 1. Concrete and compressed fibre-cement sheet flooring 2. For timber floors including particleboard, plywood and other timber based flooring materials 3. hobs

☐

Identify the Volume and Parts of the NCC that relate to footings (including damp coursing and provision of termite barriers) for Classes 1 and 10, and Classes 2 to 9.

Answer

Classes 1 and 10	Classes 2 to 9
Volume 2 - Part F1 Damp and weatherproofing	Volume 1 – Part C1, Fire resistance and stability

☐

For each of the following identify two (2) Australian Standards that relate to footings.

Answer

Classes 1 and 10	Classes 2 to 9
AS 2870 AS 2159.	AS 2870 AS/NZS 2904;

☐

Name two (2) materials that may be used for damp proof coursing.

Answer Bricks and timber

☐

Name two (2) termite resistant materials.

Answer Concrete and Steel

☐

Name three (3) different types of floor systems for Classes 1 and 10, and Classes 2 to 9.

Answer

Classes 1 and 10	Classes 2 to 9
Volume 2 1 Particleboard 2. Concrete 3. Timber	Volume 1 1 Solid concrete 2. Timber 3. Concrete planks

☐

What should be considered when constructing a floor system?

Answer When constructing the floor system it is important to take into consideration the type of flooring, the laying of pipes and reinforcement. Is the flooring system a concrete slab, or require bearers and joists?

☐

Which Australian Standard is referenced in Volumes 1 and 2 of the NCC regarding the requirements for slabs and footings?

Answer AS 2870.

☐

Name three (3) different types of materials used for wall systems or structures falling under Classes 1 and 10, and Classes 2 to 9.

Answer	Classes 1 and 10	Classes 2 to 9	☐
	Volume 2 – timber, steel & concrete masonry	Volume 1 – clay brickwork, concrete brickwork, steel stud walling	

Identify the Volume and Parts of the NCC that relate to masonry wall systems for Classes 1 and 10, and Classes 2 to 9.

Answer	Classes 1 and 10	Classes 2 to 9	☐
	Volume 2, Part 3.3	Volume 1 Part B1 Structural provisions, B1.4	

Which Australian Standard is referenced in Volumes 1 and 2 of the NCC regarding masonry structures?

Answer	AS 3700	☐
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Explain the purpose of bracing.

Answer	Bracing is attached to studs to provide lateral support to wall framing. Metal straps, timber or sheet bracing can be used for bracing. • Bracing enables framework to resist horizontal forces (load resistance of live, dead, wind loads) particularly wind loads as buildings must transmit the load through the structure to the foundation. • The bracing action requires bracing units to be installed at 90 degrees to the surfaces facing the wind • Permanent bracing is constructed into wall, sub-floor supports in vertical planes and must be designed for each storey • Temporary bracing supports wind and construction loads on the building and must be equivalent to 60% of permanent bracing required • Normal wall bracing is wall framing using sheet materials (plywood, plasterboard, fibre cement. The maximum amount that can be resisted by nominal wall bracing is 50% of the total racking forces.	☐
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Explain the purpose of fixings and tie-downs.

Answer	Fixings are necessary to ensure the structural adequacy of the interconnection of the various framing members. Fixings include straps, bolts, screws, and framing anchors. Tie-down fixings provide for structural connections to resist uplift and shear forces in floor, wall and roof framing. Where specific tie-down fixings provide equal or better resistance to gravity or shear loads, nominal nailing is not required.	☐
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Which Australian Standard relates to timber frames, bracing and fixings?

Answer	AS 1684.2	☐
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For the Australian Standard in 0which part relates to cyclonic areas?

Answer	Part 2: Non-cyclonic areas	☐
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Which of the following should be observed when checking the quality of the frame (whether, factory pre-cut and pre-nailed, factory pre-cut and assembled on site, or cut and assembled on site)? Tick all that apply.

Answer	<table><tr><th>Choice</th><th>Possible Answers</th></tr><tr><td>☐</td><td>Fixings must be protected from corrosion</td></tr></table>	Choice	Possible Answers	☐	Fixings must be protected from corrosion	☐
Choice	Possible Answers					
☐	Fixings must be protected from corrosion					

☐	Fixings must be protected from termites
☒	Provision has been made for plumbing services and fixtures
☒	Tie downs and nominal nailing must both be present
☒	Top and bottom plates have a tight fit on studs
☐	Top plate is to be reinforced when rafters land on top of plates
☒	Walls are tied together
☒	Walls are plumb
☒	Walls are square

True or False (Tick your response): Sarking is a substitute for cladding and is regarded as the principal means of weatherproofing.

Answer

☐	True
☒	False

☐

What is flashing?

Answer

The DPC, commonly called the 'flashing', is run around the perimeter of the building attached to the wall frame just above the top plate. It is angled down to the brickwork where it is embedded just below the weep hole.

☐

Identify the Volume and Parts of the NCC that relate to wall cladding material requirements for Classes 1 and 10, and Classes 2 to 9.

Answer

Classes 1 and 10	Classes 2 to 9
Volume 2 - Part 3.5	Volume 1 - Part F1 Damp and weatherproofing, F1.5

☐

True or False (Tick your response): Timber can stand greater stresses than brickwork.

Answer

☒	True
☐	False

☐

True or False (Tick your response): Individual timber boards for cladding should be nailed together at the overlap.

Answer

☐	True
☒	False

☐

**When should flashing materials be fixed to plywood cladding?
Tick your response.**

Answer

Choice	Possible Answers
☐	After the cladding is fixed
☒	Before the cladding is fixed
☐	While the cladding is being fixed
☐	At any convenient time

☐

What is the purpose of articulation joints? Tick your response.

Answer

Choice	Possible Answers
☐	They allow for shrinkage in a building
☐	They tie the brickwork to the frame
☒	They allow for movement in a building
☐	They seal the cavities

☐

When is the most appropriate time for the rough-in to occur for a brick veneer building constructed on a concrete slab Tick your response.

Answer

Choice	Possible Answers
☐	Before brickwork
☒	After brickwork

☐

☐	After plasterboard
☐	Any time

Apart from plumbing and electrical, name four (4) other services that should be considered at rough-in.

Answer ☐ Communication systems, dusting for hearing and cooling, smoke control and powered systems for operating doors and windows

Identify the Volume and Parts of the NCC that relate to window installation for Classes 1 and 10, and Classes 2 to 9.

Answer ☐

Classes 1 and 10	Classes 2 to 9
Volume 2	Volume 1

Name two (2) Australian Standards that relate to the installation of windows.

Answer ☐ Australian Standard AS2047 & AS 1288

What is the purpose of a window schedule? Tick your response.

Answer ☐

Choice	Possible Answers
☐	To help work out the appropriate type of window
☒	To work out the appropriate opening size of windows
☐	To work out whether to use a timber or aluminium frame
☐	To work out the height of a window

Identify the Volume and Parts of the NCC that relate to door installation for Classes 1 and 10, and Classes 2 to 9.

Answer

Classes 1 and 10	Classes 2 to 9
Vol 2 Part 3.6.4.1	Vol 1

☐

What Australian Standard must the design of a timber roof truss adhere to?

Answer

AS 4440-2004

☐

What is a roof system? Name three (3) roof types.

Answer	A roof system is the structure that forms the roof of a building. In Australia the roof system may be made up of: • A timber frame roof built on-site • A prefabricated truss roof in which major components are constructed in a factory and then assembled on-site Types include Gable Hip skillion	☐
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True or False (Tick your response): Roof trusses can be modified on site to suite different needs.

Answer	<table border="1"> <tr> <td style="text-align: center; width: 50px;">☒</td> <td style="text-align: center; width: 100px;">True</td> </tr> <tr> <td style="text-align: center;">☐</td> <td style="text-align: center;">False</td> </tr> </table>	☒	True	☐	False	☐
☒	True					
☐	False					

Devise a checklist for ensuring the quality of an installed roof frame.

Answer	• Rise and pitch of roof against plan • Correct propping of ridge, hips, valleys, rafters and under purlins at correct centres • Adequate collar ties • Line of rafter, hips and valleys • Support to strutting beams • Fascia and barge boards • All tie-downs and fixings • Ceiling joist and alignment with rafters • Hanging beams • Trimmers for location • Trimming to manhole •	☐
---------------	--	--------------------------

Devise a checklist for ensuring the quality of an installed roof truss.

Answer

- Truss layout plan
- Manufacturer's specifications for tie-downs, bracings and lateral stability
- Roof truss certification
- Adequacy of supporting structure
- Dimension, overall width and length of wall for fit
- Support to girder trusses
- Plumb and spacings
- All tie-downs and fixings
- Location of specialised trusses
- Trusses have not been modified on-site
- Eave overhangs
- Trimming to manhole.
-



Name three (3) roof cladding materials.

Answer

Concrete tiles, slate tiles and terracotta tiles



What pitch of roof should roof tiles be applied? Are there exceptions?

Answer

There are exception to the pitch of roof tiles should be applied - Roof tiles can generally be used on roofs of 15° or greater pitch, however, some materials and methods of manufacture require 25° or greater pitch.



When installing corrugated metal roof sheeting, which is the preferred direction of laying sheets to improve side lap effectiveness for minimising leakage? Tick your response.

Choice	Possible Answers
☐	Away from the prevailing weather
☐	Towards the north
☒	Towards the prevailing weather

True or False (Tick your response): Sarking is advisable under any roof.

☒	True
☐	False

What Australian Standard relates to sarking?

Answer	AS/NZS 4256
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Name three (3) items that may require roof penetration.

Answer	Wind blown spray, broken tiles and condensation
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Identify the sections/parts of NCC Volume 1 that relate to the installation of skylights.

Answer	B1.4 Determination of structural resistance of materials and forms of construction
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CPCCBC4010B APPLY STRUCTURAL PRINCIPLES TO RESIDENTIAL LOW RISE CONSTRUCTIONS & CPCCBC4011B APPLY STRUCTURAL PRINCIPLES TO COMMERCIAL LOW RISE CONSTRUCTIONS

PRACTICAL ASSESSMENT INSTRUCTIONS

- The following practical assessment will require the Participant to complete work related activities.
- The Assessor will conduct observations of the Participant's work to determine whether they display sufficient practical skills and knowledge.
- Please fill in the details below – providing your name, signature and date of assessment.
 - The Participant's signature acknowledges that the Assessor provided clear instructions and the Participant understood what was required to complete this assessment.
- The Assessor may substitute a Practical Task with an alternate task of equal value.
 - Alternate tasks must be fully documented by the assessor in the Assessor Comments area.

Participant name Tess Veldink

Participant signature

Tess Veldink

Date 3/05/2021

Assessor name

Assessor signature

Date Click here to enter a date.

Task	Task outcome (Tick)	
	Satisfactory	Not Yet Satisfactory
Task 1	☐	☐
Task 2	☐	☐

ASSESSOR COMMENTS

CPCCBC4010B APPLY STRUCTURAL PRINCIPLES TO RESIDENTIAL LOW RISE CONSTRUCTIONS

Practical Task 1	
Description of task: A suitable observer is to verify the participant's ability to apply structural principles to the erection and demolition of a low rise residential structure (Classes 1 and 10). The participant is to gather evidence of how they have completed each component of the Practical Task, which is to be submitted with this Practical Assessment sheet. Evidence to be submitted may include: - Photographic evidence of projects, including detailed descriptions of all structural elements - Documentation from a project structurally designed; for example a garage, small extension, etc. including: - A copy of the plans and/or specifications - Identification of site classification, uplift forces, wind ratings, - Component selection methods – for example; BCA references, Australian Standard references The observer is to provide detailed comments on the tasks completed by the participant. The assessor is to verify the observer's comments in the Assessor Comments section, and provide the Practical Assessment outcome on the front cover of this document.	
Resources required: Plans, computer, suitable work area appropriate to the construction process.	
Assessment of task	
Name of participant:	Tess Veldink
Name of observer:	Dean Williams
Role of observer (Confirm suitability to sign)	General Manager
Email address of observer	Tess.veldink@powerintegration.com.au
Signature of observer:	
Date:	25/05/2021
When completing the task, did the participant:	Tick if satisfactorily completed. Provide comments if left unticked.
1 Apply structural principles to planning	
Identify main structural principles that apply to the erection or demolition of the structure.	☒
Describe structural performance in terms of the effect of section properties on various materials.	☒
Explain structural performance characteristics of the slabs, floors, beams, columns and retaining walls – and apply to the planning of the construction work.	☒
Coordinate demolition of existing structures in accordance with safe work practices, legislative, environmental and planning requirements.	☒
2 Structural integrity of buildings	

Q1. Consult relevant industry professionals to provide advice regarding the design process and structural integrity of the proposed building – using language and concepts appropriate to cultural differences (including non-verbal communication).	☒
Q2. Collect and analyse project documentation to assist with the analysis of plans and specifications.	☒
Q3. Analyse project documentation for compliance with National Construction Code requirements for bushfire, high wind, earthquake and alpine environments.	☒
Q4. Assess new and emerging building technologies, techniques and materials for application to the construction process and their compliance with National Construction Code requirements and Australian standards.	☒
Q5. Conduct pre-commencement site inspection to confirm analysis.	☒
3 Footing system	
2.7A. Set out footings in accordance with building plans.	☒
2.7B. Assess structural integrity of the footings specified in the plans for compliance with relevant codes and accepted industry construction principles.	☒
2.7C. Lay footings specified in building's plan, checking for compliance with project documentation.	☒
2.7D. Plan, implement and check damp coursing, provision of termite barriers and other relevant techniques in accordance with codes, standards and industry practice.	☒
4 Floor system	
1.3A. Assess concrete slab or bearers and joists specified in building plan for structural integrity and compliance with relevant codes and accepted industry construction principles.	☒
1.3B. Supervise laying of floor system specified in building's plan, checking for compliance with project documentation.	☒
5 Structural and non-structural wall systems	
2.1A. Identify and analyse technical construction principles and performance of materials to be used in the construction in the planning of the building and construction project.	☒
2.1B. Plan, implement and check application of bracing requirements, tie-downs, tolerance, allowances and fixing and installation of components for compliance with relevant Australian standards, codes and manufacturer specifications.	☒
2.1C. Select structural timber members for low rise buildings to conform to AS1684 requirements.	☒
2.1D. Put processes in place to ensure quality of the frame – whether factory pre-cut and pre-nailed, factory pre-cut and assembled on site, or cut and assembled on site.	☒
2.1E. Attach and check vapour permeable sarking or a waterproof membrane relevant to the construction method.	☒
6 Roof system	
2.2A. Assess structural integrity of roof system components specified in building plan for compliance with relevant codes and accepted industry construction principles.	☒
2.2B. Plan, implement and check erection of roof trusses in accordance with requirements of building plan, type of roof being construction, relevant codes and accepted industry construction principles.	☒
2.2C. Put processes in place to ensure quality of the manufactured roof trusses or hand-cut roof system.	☒
2.2D. Plan roof sarking and cladding and supervise installation for compliance with codes, standards and industry practice.	☒
7 External wall cladding	
2.3A. Assess structural performance of cladding to be used for bracing in the frame construction for compliance with relevant codes, manufacturer specifications and accepted industry construction principles.	☒

2.3B. Supervise installation of cladding as specified in building plan, and check for compliance with standards and accepted industry construction principles.	☒
2.3C. Supervise installation of windows and external doors to ensure compliance with relevant codes, manufacturer specifications and accepted industry construction principles.	☒
The Participant's performance was: ☒ Satisfactory ☐ Not Satisfactory	

OBSERVER COMMENTS

The first occasion was for a residential low rise construction – the project that was chosen was in Bulimba – McConnell Street. This occasion has many different and useful documentation submitted as evidence. It included

- Fire engineering report
- Site plan
- Finishes & Fixtures schedule
- Floor plans GA – basement to roof
- Floor plans – structural layout
- Window Schedule
- Slab, column & footing elevation plans
- Roof detail drawing

Apply structural principles to planning

The first section was about a general introduction to the structural principles and elements of a building. It started with the classification of the building that will be mentioned throughout (McConnell Street). The structural principles were then identified and the structural performance was discussed. Each characteristic was then discussed at length and finishing on what is demolition and the steps to follow when completing a task like that.

Structural integrity of buildings

The role of construction industry professionals were touched on and an example of a fire report was submitted as evidence and explained. The different kinds of documents submitted for a project was next discussed in detail. A site plan, schedule, floor plans and reference to the fire report was submitted as evidence to show what each document contained. NCC requirements in relation to natural disasters, high winds and alpenes were lightly touched on and explained which part of the NCC and Australian Standards to refer to if needed. New technologies in construction were lightly discussed and explained that McConnell street didn't have any new technologies at the building. This section was completed using appropriate language and concepts with non-verbal communication (email).

Footing system

In this section setting out footing systems was discussed, along with the structural integrity of the footing,, which reference the correct sections of the NCC and which Australian Standards. For the next criteria, slab and footing floor plans, slab/ column elevations were submitted to help with the discussion about footings specified in a building plans and checking for compliance. The last part was explaining provisions of termite barriers and damp coursing, no evidence was submitted.

Floor system

Different type of flooring systems was next A concrete slab, bearers and joists were explained and showed the relevant Australian Standards for the construction and compliance.

Structural and non-structural wall systems

Different wall systems and principles were discussed at the start – explaining them one by one in concise language and showing which section of the NCC to refer to. Floor plans of the structural layout was submitted. The different structural requirements were next discussed and related to the Australian Standard requirements. A table was inserted to the email trail to show quality of the frame and the importance. Waterproofing was the final criteria that was mentioned which was related back to construction.

Roof system

A general overview of structural integrity for a roof was explained at the start in quite a bit of detail giving a good insight. The advantages of roof trusses were next highlighted with a table included to show compliance requirements ect. Quality processes/checklist tables were then submitted to ensure the roof trusses and roof framing will pass NCC requirements when being completed. Roof sarking and cladding supervision was the last criteria discussed in this section relating it back to McConnell Street.

External wall cladding

Cladding was next highlighted and referenced the NCC sections that relate. The external wall cladding choice for McConnell Street was then discussed in detail. The different window and door types were then touched on at the end, giving McConnell Street references and relating it back to relevant NCC sections and Australian Standards for compliance.

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CPCBC4011B APPLY STRUCTURAL PRINCIPLES TO COMMERCIAL LOW RISE CONSTRUCTIONS

Practical Task 2	
Description of task: A suitable observer is to verify the participant's ability to apply structural principles to the erection and demolition of a low rise commercial structure (Classes 2 to 9 with a gross floor area not exceeding 2000m², but not including Type A or Type B construction). The participant is to gather evidence of how they have completed each component of the Practical Task, which is to be submitted with this Practical Assessment sheet. Evidence to be submitted may include: - Photographic evidence of projects, including detailed descriptions of all structural elements - Documentation from a commercial works structurally designed; including: - A copy of the plans and/or specifications - Identification of site classification, uplift forces, wind ratings - Component selection methods – for example; BCA references, Australian Standard references The observer is to provide detailed comments on the tasks completed by the participant. The assessor is to verify the observer's comments in the Assessor Comments section, and provide the Practical Assessment outcome on the front cover of this document.	
Resources required: Plans, computer, suitable work area appropriate to the construction process.	
Assessment of task	
Name of participant:	Tess Veldink
Name of observer:	Dean Williams
Role of observer (Confirm suitability to sign)	General Manager
Email address of observer	Tess.veldink@powerintegration.com.au
Signature of observer:	
Date:	25/05/2021
When completing the task, did the participant:	Tick if satisfactorily completed. Provide comments if left unticked.
1 Apply structural principles to planning	
Identify main structural principles that apply to the erection or demolition of the structure.	☒
Describe structural performance in terms of the effect of section properties on various materials.	☒
Explain structural performance characteristics of the slabs, beams, columns and retaining walls – and apply to the planning of the construction work.	☒
Coordinate demolition of existing structures in accordance with safe work practices, legislative, environmental and planning requirements.	☒

2 Structural integrity of buildings	
Consult relevant industry professionals to provide advice regarding the design process and structural integrity of the proposed building – using language and concepts appropriate to cultural differences (including non-verbal communication).	☒
Collect and analyse project documentation to assist with the analysis of plans and specifications.	☒
Analyse project documentation for compliance with National Construction Code requirements for bushfire, high wind, earthquake and alpine environments.	☒
Assess new and emerging building technologies, techniques and materials for application to the construction process and their compliance with National Construction Code requirements and Australian standards.	☒
Conduct pre-commencement site inspection to confirm analysis.	☒
3 Footing system	
Set out footing systems in accordance with building plans.	☒
Assess structural integrity of the footings specified in the plans for compliance with relevant codes and accepted industry construction principles.	☒
Lay footings specified in building's plan, checking for compliance with project documentation.	☒
Plan, implement and check damp coursing, provision of termite barriers and other relevant techniques in accordance with codes, standards and industry practice.	☒
4 Floor system	
Assess floor system components specified in building plan for structural integrity and compliance with relevant codes and accepted industry construction principles.	☒
Supervise laying of structural floor system specified in building's plan, checking for compliance with project documentation.	☒
5 Structural wall systems and wall cladding systems	
Identify and analyse technical construction principles and performance characteristics of structural wall systems and wall cladding systems in the planning of the building and construction project.	☒
Identify, implement and check processes for erecting wall systems and wall cladding systems for compliance with manufacturer specifications and relevant Australian standards and codes.	☒
Identify and implement building plans and relevant standards and codes to ensure appropriate allowances were made for relevant services to be installed.	☒
Install windows and external doors in compliance with relevant codes, manufacturer specifications and accepted industry construction principles.	☒
6 Structural roof systems and roof cladding systems	
Assess structural integrity of the structural roof system and roof cladding system components specified in the building's plan for compliance with relevant codes and accepted industry construction principles.	☒
Plan and implement and check construction of roof system and roof cladding system (including details of service penetrations, skylights and roof ventilators) according to building plan's requirements, type of roof being constructed, relevant codes and accepted industry construction principles.	☒
Put processes in place to ensure quality of finished roof system.	☒
The Participant's performance was: ☒ Satisfactory ☐ Not Satisfactory	

OBSERVER COMMENTS

The second occasion was for a commercial low rise construction – the project that was chosen was in Fortitude Valley– 95 Robertson Street. This occasion has many different and useful documentation submitted as evidence. It included

- Many different specifications from tender
- Site plan
- Demolition plan
- Approvals, Permits document
- Concept report
- Floor plans
- Door Schedule

Apply structural principles to planning

The first section was about a general introduction to the structural principles and elements of a building. It started with the classification of the building that will be mentioned throughout (Robertson Street). The structural principles were then identified and the structural performance was discussed. Each characteristic was then discussed at length and finishing on what is demolition, the steps to follow when completing a task like that and a specification of demolition for Robertson Street as evidence.

Structural integrity of buildings

The role of construction industry professionals were touched on different specification were submitted as evidence to show the work of a architect. The different kinds of documents submitted for a project was next discussed in detail. A site plan, permit/approval document, floor plans and a concept report was submitted as evidence to show what each document contained. NCC requirements in relation to natural disasters, high winds and alpiners were lightly touched on and explained which part of the NCC and Australian Standards to refer to if needed. New technologies in construction were lightly discussed and explained that Robertson street were using new technologies in the building which is getting more popular. This section was completed using appropriate language and concepts with non-verbal communication (email).

Footing system

In this section setting out footing systems was discussed, along with the structural integrity of the footing, which reference the correct sections of the NCC and which Australian Standards. Footing and slabs were next discussed in detail, there was no evidence to support this section. The last part was explaining provisions of termite barriers and damp coursing, no evidence was submitted.

Floor system

Different type of flooring systems was next - A concrete slab, bearers and joists were explained and showed the relevant Australian Standards for the construction and compliance. Reference to the selected flooring system in Robertson Street was mentioned at the end.

Structural wall systems and wall cladding systems

Different wall systems and principles were discussed at the start – explaining them one by one in concise language and showing which section of the NCC to refer to. The importance of having a process when erecting a wall system was next explained; and ensuring all building documentation has appropriate allowance and complies with other trades and Australian Standards. The installation of windows and doors was the next explained in accordance with the relevant codes and standards and a door schedule was submitted as evidence from Robertson Street.

Structural roof systems and roof cladding systems

A general overview of structural integrity for a roof was explained at the start in quite a bit of detail giving a good insight. The advantages of roof trusses were next highlighted with a table included to show compliance requirements ect. Roof cladding was then touched on lightly and Robertson Street roof choice was mentioned. The different service penetrations was next discussed and the last part discussed quality processes of roof trusses and roof framing which included a checklist table and if followed correctly these element will meet the NCC requirements.

Apply structural principles to residential low rise constructions

To: Dion@hutchies.com.au

From: tess@hutchies.com.au

Subject: McConnell Street – Bulimba - New project commercial low rise.

Hi Dion,

Welcome to Hutchinson Builder. In the internship and cadet program we teach overview all aspects of project management to building the structure. Today we will be running through structural principles that are applied on site. There are 7 topics to run through today so please refer to the documents attached at the bottom for visual references.

1. Apply structural principles to planning

The classification of a building or part of a building is determined by the purpose for which it is designed, constructed or adapted to be used. As per the NCC there are 10 building classifications - A low rise residential building belongs to either: Class 1 or Class 10. Today the project we will be referring to is a new project in Brisbane, Bulimba called McConnell Street. This project is classified under class 1a – one of more attached dwellings, each being a building – such as a town house

The main structural principles that apply to residential low rise structure erection and demolition include, loads and loading, forces and section properties. In any building design, the strength and stability of an overall building and its individual components are the most important aspects. The structure of a building is what maintains the shape of the building when subjected to forces. The forces on a building include dead, lives and wind loads.

- The dead load on a structure is the result of the weight of the permanent components, such as beams, floor slabs, columns and walls. These components will produce the same constant 'dead' load during the lifespan of the building. Dead loads are exerted in the vertical plane.
- The live loads are all unfixed items in a building (such as people and furniture) result in a live load on the structure. Live loads are exerted in the vertical plane. They are variable as they depend on usage and capacity.
- Wind load is considered to be dynamic as it varies greatly in intensity from time to time. Wind loads are very different to dead loads and live loads. Wind loads typically act laterally/horizontally on walls and may act up and down on roofs.
- From there all the materials to build the structure has a load path. It's the direction in which each consecutive load will pass through connected materials. The sequence commences at the highest point of the structure, working all the way down to the footing system – ultimately transferring the total load of the structure to the foundation. So, the lowest structural member must be strong enough to support all the members above it. See photo for reference.

Next is to determine the strength and stability of an overall building and its components. This is understood my structural calculations to work out the effects of all the forces acting on any components on the building. You can visualise which portion of the building's load is transmitted to which structural element by following the load paths.

The two main principles of structural effectiveness are:

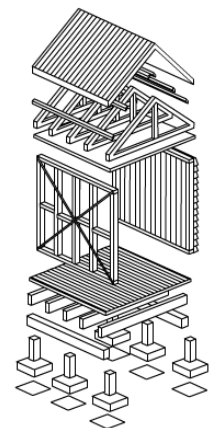
1. **Mechanical properties** – strength, toughness, elasticity, plasticity, ductility, malleability, brittleness, hardness
2. **Section properties** - the mathematical properties of structural shapes

The members used on a structure can shape the integrity and structural effectiveness on a building. Some include – Columns, bearers, floors and footings. Let's go through the structural performance characteristics.

Beams

Simply supported beams - are supported at each end only. If downwards pressure is applied bending would occur at the middle of the beam

Continuously supported beams - are supported by three or more support points. They deflect less than simple beams of the same span because the positive and negative bending cancel each other out. Generally, 20% more efficient than a simple span

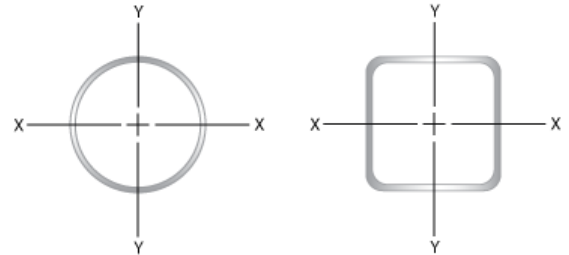


Cantilever beams - overhang their supports. The cantilever section of the beam cannot support the same loads as the **back span** which is the section of beam between the supports. A typical allowance for the amount of cantilever in a beam is 30% of the back span therefore a 45 m beam could have a cantilever section 15 m long.

Structural performance include – bending, neutral axis, internal moments of resistance, beam shape, bending moments & shear forces.

Columns

Columns are vertical support members subjected to compressive loads. They are also referred to as pillars, posts, stanchions and struts. The most efficient shape for a column is the circular hollow section (CHS). The second most efficient shape is the square hollow section (SHS).



Structural performance include – Axially loaded column, non-axially loaded column, buckling, slenderness ratio & end fixity and effective length

Retaining walls

A retaining wall is a wall built to hold back soil. It is required to support soil where a sloping site requires excavation and either there is insufficient room or it is impractical to batter the soil. Retaining walls must be able to resist soil pressures to be a stable structure. Walls of a certain height may need to be designed by a qualified structural engineer.

Structural performance include – Inclined retaining wall, gravity retaining wall and cantilver retaining wall.

Concrete slab

Concrete slabs are similar to beams as they span horizontally between supports and may be simply supported, continuously supported or cantilevered. Slabs are:

- Relatively thin structural members which are normally used as floors and occasionally roof systems in multi-storey buildings
- Constructed of reinforced concrete poured into formwork or trenches
- Either ground slabs or suspended slabs. Ground slabs will be the focal point for this unit.

Ground slabs are poured directly into excavated trenches in the ground and rely on the existing ground for support. The ground (or **foundation**) must be strong enough to support the concrete slab. Foundations with high moisture content will make soils reactive creating foundation expanding or contracting, which can damage the slab and other building materials, such as brickwork.

Structural performance include – Foundation movement, slab bending & stiffening beams

Other characteristic include roof trusses and wind bracing. Understanding how these structural elements are going to work in conjunction with each other to create a structure is the first steps to planning the works.

In order to build a new structure sometimes you have to demolish what is existing on the site. You must carry out all demolition work of existing structures in accordance with laws, Australian Standards and planning requirements - Ensure you have obtained required licences and check whether you need a demolition permit (e.g. refer to your City Council's requirements)

All demolition operations are to be in accordance with Australian Standards and Codes of Practices including: Work Health and Safety Regulations 2011 (Qld), Demolition Code of Practice 2013 (Qld) and AS 2601: The demolition of structures. There are many things to look out for before, during and after demolition to please ensure you are aware of all legislation before starting.

2. Structural integrity of buildings

The building and construction industry uses a wide range of skilled workers who are employed in an equally wide range of working environments. There are many professionals involved in building design and a variety of tradespeople responsible for the numerous stages in the construction process, such as:

1. Architects
2. Engineers
3. Drafts people
4. Building surveyors
5. Land surveyors
6. Quantity surveyors

Please see attached a fire engineers report for McConnell St. Fire protection engineers design systems, products, and procedures that prevent fire damage. Their job is to research causes of fires and decide on the best fire protection methods. They help organizations defend a property against fire hazards. In the report the fire

engineers discuss and analysis two design issues - Unprotected openings are located less than 3m from the property boundary & Fire Brigade Booster facility is located <10m from the building. Analysis of the above issues was undertaken with the BCA, the client, the architect and building certifier.

You must prepare a range of documentation to see a building project through to completion, including - title, permits, specifications, plans and reports.

Title

A land title is an official record of who owns a piece of land. It can also include information about mortgages, covenants, caveats and easements. It contains:

- A Plan with lot number
- Name of owner
- Reference numbers
- Certificate stamp

See attached a site plan of the proposed buildings, that is similar to a title – it has the positioning, client, and client land marks.

Permit

A construction permit or building permit is a permit required in most jurisdictions for:

- New construction
- Adding onto pre-existing structures
- Major renovations.

A building permit is the document which shows that your plans have been approved by a building surveyor. The building surveyor checks that the plans meet building regulations

Project specifications

Project specifications contain all the written information that accompanies the plans. Your building specifications provide supplementary information to the drawings, and they take precedence over any notations on the drawings. The sections included in a project specification include descriptions about:

- The job
- The site
- The proprietor
- Other parties in the contract arrangement (e.g. a trades section detailing standards and quality of work).

Additional information might include items listed by the architect and set by the Australian Standards in tabular form, such as:

- Windows, showing frame material and type of glass
- Doors, specifying size, material and the swing on the door
- Finishes to walls, floors and ceilings
- Door types and models of locks, latches, hinges, push plates and pull handles

This type of additional information is called a finishes and fixtures schedule. Please see attached schedule which relates to the McConnell Street project

Plans

Plans come in different formats to cover different purposes. The plan of the subdivision is prepared for planning approval prior to the development of the land. It is a good source of information relating to adjoining properties.

Please see attached floor plans of McConnell street from basements, the different levels and roof. Floor plans are like cross sections which are taken horizontally half way up the wall and are drawn to scale.

Floor plans show a vast amount of detail including:

- All horizontal dimensions such as room size and wall thickness
- Size and location of windows and doors
- Location of fixtures and fittings
- Any particular requirements in a room such as floor coverings
- An indication of the materials used for wall construction
- The overall floor areas

Reports

The reports you need to prepare prior to construction include the, condition report, soil report & engineer's drawings. They contain:

- Information on the existing site such as the location of services
- Instructions for building complex structures
- An assessment on the bearing capacity of the soil.

See attached the fire engineer report that was mentioned earlier.

NCC requirements for bushfire, high wind, earthquake and alpine environments

The NCC provides technical information for the design and construction of building structures and it defines the minimum standards of relevant health and safety including structural safety. You must incorporate the relevant NCC sections into the design and construction of structures being developed, making particular consideration of structures built in the following areas: Bushfire areas, high wind areas, earthquake areas, alpine environments.

Bush fires

All buildings located in a designated bushfire prone area are to be constructed in accordance with the requirements of AS 3959 Construction of buildings in bushfire prone areas. Please also reference the NCC volume 2 construction in bushfire prone areas.

High wind areas

The NCC gives guidelines to ensure buildings constructed in designated high wind areas are provided with sufficient restraint to transfer wind forces to the ground to prevent collapse, uplift or sliding of the footing systems. The following wind regions:

- Region A - Normal
- Region B - Intermediate
- Region C - Tropical cyclones
- Region D - Severe tropical cyclones.

High wind areas are regions that have design wind speeds which are calculated in accordance with AS 1170.2 and volume 2 of the NCC Structural Provisions.

Earthquake areas

Construction requirements for earthquake areas are necessary for buildings within areas of seismic activity. The two different areas are categorised by an acceleration coefficient (as determined under AS1170.4 and as outlined in the NCC) which is:

- Equal to 0.12 but less than 0.15
- 0.15 or greater

Alpine areas

Alpine areas are defined as 1,200 m or more above Australian height datum (AHD) for NSW, ACT and Victoria and 900 m or more above AHD for Tasmania.

In relation to McConnell Street, Bulimba isn't considered an alpine area, however could be subject to bush fires and high winds due to the Queensland climate and track record over the past decade. As for earthquake we have seismic activity occurring from time to time but generally at such a low level that has little to no community impact. Saying this it's important to understand the environmental impacts that could harm the integrity of the structure.

New and emerging building technologies

Any new technology must satisfy performance requirements, and this can be determined by using the following assessment methods:

- Documentary evidence
- Verification methods
- Expert judgement
- Comparison to deemed to satisfy provisions

The NCC examines the following

Area	Explanation
Suitability of materials	Materials must be chosen that are suitable for their purpose. Every part of the building must be constructed in an appropriate manner which satisfies all the requirements of the NCC.
Evidence of suitability	Substantial evidence must be provided to support the use of the new technology.
Fire requirements	New technologies must demonstrate suitability and conform to the deemed to satisfy provisions in relation to the fire resistance level (FRL), conform to the deemed to satisfy provision in relation to early fire hazard indices and have resistance to the incipient spread of fire.

At McConnell Street there have been no new technologies used that I am aware of – however Hutchinson Builders do use recycled materials, greener tools and equipment and have introduced energy star ratings to our projects.

Pre-commencement site inspection

Before commencing work, a site inspection should occur to ensure that all contract documentation clearly reflects the actual site. Such inspections can avoid unnecessary wastes of time and money.

3. Footing systems

Set out footing systems

Footings are the construction that transfers the load from the building to the foundation.

There are many things to consider such as:

- The type of the foundation soil – the NCC sets out the requirements for minimum bearing pressures
- The choice of an appropriate footing system, such as – columns, concrete or beams

Always set out your footings in accordance with the building plan. Other considerations will include damp coursing and the provision of termite barriers.

Structural integrity of the footings

In order to assess the structural integrity of footings specified within your building plan refer to –

- National Construction Code: Volume 2, Parts 3.1 and 3.2
- AS 1684 'Residential timber framed construction'
- AS 2870 'Residential slabs and footings'
- AS/NZS 2904 'Damp-proof courses and flashings'
- AS 3660 'Termite management'

Lay footings specified in building's plan, checking for compliance with project documentation

Stumps must have a concrete or timber footing placed underneath the base of the stump. This is to spread the

load transferred to the stump from the building. This support beneath the stump is called a 'pad' or 'soleplate'.

Usually, concrete stumps are provided with concrete pads poured in situ on the site. Timber stumps are provided with timber soleplates.

Slab footings consist of concrete beams and floors across the entire floor plan. Slabs are also referred to as slab floors, slab on ground or raft slabs. Slab is the general term used to refer to any of the available types of slabs.

When good bearing soil or strata cannot be located within the required distance, pier and beam construction is usually considered. Pier and beam footings are only considered for low bearing soil sites. They require engineering design. The primary difference between the bulk pier and beam and the bored pier and beam is the size of the piers.

See attached slab and footing floor plans, slab elevations and column elevation drawings from the architects. Which shows the different levels, measurements, different systems and which schedule to refer to for construction. These drawings have also been approved for construction which ensure that the methodology and construction has been compliant with regulations.

Check damp coursing, provision of termite barriers and other relevant techniques

Damp proof course (DPC) is a barrier of impervious material built into a wall or pier to prevent moisture from moving to any part of the building. The DPC is built into base wall brickwork. It bridges brick skins and/or the brick and pier. The DPC is laid into the brick wall approximately two courses (two bricks) below the lowest timber member, typically the bearer.

Damp proof courses are also installed to buildings constructed on concrete slabs. The DPC, commonly called the 'flashing', is run around the perimeter of the building attached to the wall frame just above the top plate. It is angled down to the brickwork where it is embedded just below the weep hole.

All new buildings must have their primary building elements (structural elements) built with termite resistant materials or be protected against termite attack. Concrete slabs form part of the termite barrier. However, termites may be able to access timber framing at the edges of the slab, around service pipes and box-outs for plumbing fixtures or through naturally occurring cracks in the concrete.

4. Floor systems

When constructing the floor system it is important to take into consideration the type of flooring, the laying of pipes and reinforcement. Is the flooring system a concrete slab, or require bearers and joists? You must always check that what is specified within your building plan and comply with relevant codes and construction principles

Concrete slabs

Concrete slabs are floor systems of concrete and steel reinforcing. They are constructed on the ground, various types of slabs include:

- Slab on the ground – Supported on the ground
- Stiffened raft slab – Supported on the ground with a separate edge strip footing

Remember to always refer to AS 2870 for the minimum dimensions and specification for the depth, width and spacing of beams and slab thickness

Bearers and joists

Floor system components of the bearers and joists include:

1. Compressed sheet wet area flooring
2. Fitted (cut-in) floors
3. Platform floor construction
4. Tongue and groove flooring

Make sure that you always supervise the laying of the floor so that it specifies with the building plan and is checked for compliance against your project documentation

5. Structural and non-structural wall system

Technical construction principles and performance of material

Wall systems provide structural support to roof systems, allow for installation of services & provide a means to apply external and internal linings

Materials used for wall systems include:

1. Cavity brick - A cavity wall is two wythes of masonry, separated by a cavity of varying dimension
2. Concrete block - A cavity wall is two wythes of masonry, separated by a cavity of varying dimension
3. Structural steel - Stud, plate and nogging is used to manufacture wall and structural framing to support a variety of cladding styles.
4. Timber - The most common is a timber stud wall frame and includes the following members - Top plate, lintel, common stud and jamb stud

Please see attached floor plan of the structural layout of McConnell Street – this shows all of the walls of the level 3 dwelling units. All aspects of this drawing would have been in created in conjunction with all codes and principles relating to the materials used for the wall systems.

Bracing requirements, tie-downs, tolerance, allowances and fixing and installation & AS1684 requirements

The first thing you need to before anything else is plan for the implementation of your wall systems. You need to consider the application of:

1. Bracing requirements
2. Tie-downs
3. Tolerances
4. Allowances
5. Fixing and installing components

A critical part of this planning requires you to check your wall system complies with relevant Australian standards, codes and manufacturer specifications

You must ensure that all building plans and relevant standards and codes are identified and implemented to ensure appropriate allowances have been made for relevant services to be installed. Common systems include – plumbing and electrical.

All pipes should be properly clipped to the frame to avoid water hammer and pipe vibration. All plumbing fixtures should be adequately attached to the frame. Check for leaks before installing internal linings and the electrician should be provided with suitably marked working drawings indicating the precise location of all installations using manufacturer's specifications. Remember the plumbers and electricians also have a responsibility to check their work and double check with will be on complications in the future. The NCC volume 3 is the plumbing code and is something that the plumbers would use to keep their work compile.

AS 1684.2 gives details about design solutions for bracing and fixings. AS/NZS 4791, AS/NZS 4534, AS 1397 and AS 1214 outline the corrosion protection requirements of fixings.

Ensure quality of the frame

Fixings and installing checklist - the following is a checklist for ensuring the quality of the frame members and the frame as a whole.

Quality Procedure - Checklist

- | | |
|--|---|
| <ul style="list-style-type: none">• Walls for plumb, square, straight and level• Top and bottom plates have a tight fit on studs• Bracing and tie-downs in accordance with plan• Noggings at correct centres and support for fixtures• Corner blocking• Walls tied together | <ul style="list-style-type: none">• Room sizes and ceiling heights with plan• Window and door clearances and openings• Jamb studs to all openings• Concentrated load bearing studs• Lintels for adequate bearing• Block under studs if timber floor• Any excessive notching• Provisions for plumbing services and fixtures• Safety of frame• Adequacy of temporary bracing |
|--|---|

Vapour permeable sarking or a waterproof membrane

Sarking is a waterproof, vapour-permeable, flexible sheet material fixed directly behind timber cladding or under flooring material. It directs any water that may have penetrated the cladding back to the outside of the structure and provides a draught proof barrier to keep wind-driven rain or dust out of the wall cavity. Sarking is not a substitute for well-chosen and properly installed cladding and should never be regarded as the principal means of weatherproofing.

Only vapour permeable building paper should be used as it must be impermeable to moisture yet still allow the free flow of water vapour from the back surface of the cladding. Never use non-permeable materials, such as polyethylene film or foil as sarking immediately behind timber cladding.

Flashings are used at corners and vertical joints and around openings to ensure that water is prevented from penetrating the wall frame cavity. As flashing does not extend fully behind the cladding, non-permeable materials may be used.

6. Roof system

Structural integrity of roof systems

A roof system is the structure that forms the roof of a building. In Australia the roof system may be made up of: A timber frame roof built on-site, A prefabricated truss roof in which major components are constructed in a factory and then assembled on-site.

A 'coupled' roof is a conventional roof that is constructed on-site. It uses ceiling joists, hanging beams, strutting beams, struts, under purlins, collar ties, rafters and ridge boards. See attached elevation plans of the McConnell Street roof and gutter box. Roof system components include ceiling joists, hanging beams, strutting beams, roof struts, under purlins, collar ties, rafters, ridge boards. It's important that the structural integrity to comply with all components as it provides uniform technical standards for the design, construction and performance and overall safety of the building

Check erection of roof trusses

Manufactured timber roof trusses provide a structurally efficient alternative to timber beams. They place greater emphasis on axial loading of members and less on bending. The advantages of trusses include the following:

- They are strong, but light to erect
- They can be made to suit most roof shapes
- There is less on-site fabrication, therefore less site labour is required
- They are less affected by bad weather
- Factory production allows automated production
- Better quality control is possible
- Trusses make maximum structural use of the timber
- Trusses are capable of long spans
- Internal walls are usually non-load bearing, therefore lighter weight internal walls are possible

Compliance requirements	Truss types for hip roofs	Truss camber
The design of a timber roof truss must accord with engineering principles and with AS 1720.1. This includes the wind design. AS 4440 'Installation of nail plated timber roof trusses' provides details for correct practices when installing roof trusses. Trusses are usually spaced at regular intervals, typically 600 mm, 900 mm or 1,200 mm apart depending on the mass of the roofing material and local practice.	Hip end trusses include various types required to shape a hip end. The following diagram shows the basic concept: • Truncated standard truss • Truncated girder truss • Hip truss • Jack truss • Creeper truss • Scissor truss • Bell truss • Bowstring truss • Cantiliever truss • Cut off truss • Half truss	During production, trusses improve on traditional rafter design by forcing an upward bend into the chords of trusses called 'camber'. A camber helps to resist loads (the amount of bend is calculated to help resist the load of tiles and ceiling lining). The calculations are designed to ensure the truss eventually flattens out to provide straight chords once it is fully loaded.

Quality of the manufactured roof trusses or hand-cut roof system

Roof framing checklist – this checklist is to ensure the roof frame is quality. If these steps are followed it will be compliance with the NCC requirements

Quality Procedure - Checklist	
• Rise and pitch of roof against plan • Correct propping of ridge, hips, valleys, rafters and under purlins at correct centres • Adequate collar ties • Line of rafter, hips and valleys • Support to strutting beams	• Fascia and barge boards • All tie-downs and fixings • Ceiling joist and alignment with rafters • Hanging beams • Trimmers for location • Trimming to manhole

Roof truss checklist – this checklist is to ensure the roof truss is quality. If these steps are followed it will be compliance with the NCC requirements

Quality Procedure - Checklist	
• Truss layout plan • Manufacturer's specifications for tie-downs, bracings and lateral stability • Roof truss certification • Adequacy of supporting structure • Dimension, overall width and length of wall for fit	• Support to girder trusses • Plumb and spacings • All tie-downs and fixings • Location of specialised trusses • Trusses have not been modified on-site • Eave overhangs • Trimming to manhole.

Roof sarking and cladding and supervise installation

Roof cladding is the material used to protect the building from the extremes of the weather. The two most common options are roof tiles and metal roof sheeting. Roof tiles are particularly suited to the Australian climate, which generally does not have high winds or snow loads. These elements are most likely to reduce the life of roof tiles.

For McConnell Street the roof will not be used as a communal area like some projects, therefore the client will probably choose something like a roof sheeting. Roof sheeting is available in various profiles and materials. Generally, roof sheets can be used on any roof type, but each particular profile has a particular range of roof pitches in which it is most efficient. The standard corrugated profile has the widest range of applications and it is the only profile that lends itself to curving.

When installing corrugated metal roof sheeting, the preferred direction of laying sheets to improve side lap effectiveness for minimising leakage is towards the prevailing weather. Most manufacturers of roof tile products indicate a minimum pitch for their product without sarking and a different minimum pitch for roofs with sarking. However, sarking is advisable under any roof, particularly if the sarking can perform two roles, that is:

- Acts as a secondary protection against moisture penetration due to wind-blown spray, broken tiles, condensation, etc
- Acts as a reflective foil surface to reflect the radiant heat of the sun. Refer to the following codes and Standards - AS/NZS 4256 & NCC Volume 2: Part 3.5.2.4

7. External wall cladding

Cladding systems are the building envelope. They enclose the building and provide protection from the weather. External cladding contributes to the comfort, structural adequacy and aesthetics of a building.

Common cladding used on timber frames include:

- Brick veneer
- Coatings over base materials
- Sheeting
- Weatherboard

To ensure that cladding is following structural performance refer to NCC Volume 2 part 3.5.3. For McConnell Street project Hutchinson builders were asked to use Brick veneer with a single layer. This is called masonry cladding - A single skin of brickwork is laid on the outside of a building to form a barrier against the weather. This single skin of brickwork is not load bearing, that is, it does not support any roof loads. However, it must be strong enough to resist lateral loads from wind. The brick veneer is attached to the timber frame using a series of brick ties. These provide sufficient support against wind loads.

There are many different window types to choose from – remember to refer to the NCC volume 2, part 3.6 or AS 1288 to understand the requirements. For this project we will be going with a double hung window as per the specification from the client. Window frame manufacturers produce a range of readily available frames. Their sizes are detailed on a schedule. A typical schedule details the appearance of the window frame when viewed from the outside. It also shows the finished height and width of the frame.

External timber door frames are generally made by specialist joinery companies. The jambs and head of the door frames have two rebates. One accommodates the door, and the other accommodates a flywire door. Some manufacturers also provide grooves in the back of the jambs for side flashing. The sill is usually made from a dense weather-resistant timber, with a sloping rebate to shed water. A drip groove on the underside stops water from running back in under the sill. For more information and requirements on the correct doors for the building, please refer to NCC volume 2, part 3.6.4.1.

BULIMBA APARTMENTS

1-5 McCONNELL STREET

BULIMBA

FIRE ENGINEERING REPORT

BDA-FER-1946

December 13th, 2019

Client
DVB Projects

Architect
Brick Architects

Building Certifier
Pure Building Approvals

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REVISION HISTORY

Project 1946 – Bulimba Apartments, 1-5 McConnell Street, Bulimba					
Revision	Date	Description		Prepared by	Reviewed and Approved for Issue by
0	13/12/19	FER issued for Building Approval	Name	Lubo Gregor QBCC 1307354	Mark Sharples RPEQ 16019
			Signature		

Note: Parts of this document should be printed in colour.

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EXECUTIVE SUMMARY

BDA Fire has been engaged to address the variations to the Building Code of Australia Deemed-to-Satisfy Provisions identified in the proposed development of a Class 2 apartment building with a Class 7a carpark. The building is named Bulimba Apartments and is to be located at 1-5 McConnell Street, Bulimba.

A “Performance Solution” method of meeting building compliance is sought for the following design issues that do not meet the Building Code of Australia (BCA)¹ Deemed-to-Satisfy (D-t-S) Provisions:

Design Issue 1 – Unprotected openings are located less than 3m from the property boundary.

Design Issue 2 – Fire Brigade Booster facility is located <10m from the building.

Analysis of the above issues was undertaken in accordance with Part A0 of the BCA. The fire safety objectives and the proposed Performance Solutions were developed in consultation with the Client (DVB Developments), the Architect (Brick Architects) and the Building Certifier (Pure Building Approvals).

It is not proposed to consult QFES and issue a Fire Engineering Brief (as the design issues are relatively minor and similar issues have been successfully addressed previously with similar Performance Solutions on other projects); however it is understood that the finished FER will be submitted to QFES by the Building Certifier for their assessment. Should there be any changes required to the FER, this can be deemed to represent a ‘draft’ version and updated as necessary upon QFES review.

¹ National Construction Code, Building Code of Australia 2019 Volume 1, ABCB 2019

1. INTRODUCTION

1.1. The Fire Engineering Process

The Fire Engineering process encompasses two distinct phases. The process adopted by BDA Fire is to use the methodology described in the International Fire Engineering Guidelines² and the QFES “Policy on Fire Engineered Alternative Solutions” as appropriate and as described below:

1.1.1 The Fire Engineering Brief (FEB)

The basis of this phase is a detailed list of design issues that represent variations from the Deemed-to-Satisfy (D-t-S) Provisions of the Building Code of Australia (BCA) as identified by the design team and confirmed by the Building Certifier. The FEB is then developed, evaluating these variations and the proposed methodology by which the alternative design will meet the performance requirements of the BCA. This may include alternative, additional or enhanced fire safety or construction measures.

In the case of this project, a formal FEB document was not prepared due to the advice received from the Building Certifier in that the completed Fire Engineering Report will be submitted to QFES for review and comments, and an FEB meeting is not necessary due to relatively simple Design Issues and proposed Performance Solution. Should there be a need to provide changes to the FER, this can be deemed to represent a ‘draft’ FER and be updated accordingly upon the QFES review.

Phone and email conversations with DVB Projects and Brick Architects occurred to discuss the issue and clarified the approach to the fire engineering process for this particular project and necessary preliminary amendments were incorporated into the building design (i.e. nib walls).

1.1.2 The Fire Engineering Report (FER)

As the stakeholders accepted the FEB and an understanding and agreement by relevant parties had been reached on the objectives and performance issues, the issues are further developed and the Performance Solutions formalised as documented within this FER.

The FER accompanies and supports the Building Approval submission, part of which is a requirement that the Building Certifier and QFES provide formal acceptance of the design, allowing construction and ultimately building occupancy to commence.

² International Fire Engineering Guidelines. Edition 2005. ABCB 2005

1.2. Overview & scope

The subject is a development of a residential apartment building located at 1-5 McConnell Street, Bulimba. The building is classified as a Class 2 residential building with a rise in storeys of 4, containing three residential levels above one level of a Class 7a carpark and of Type A construction.

Two design issues have been identified to represent variations from the BCA D-t-S Provisions and relate to protection of openings (windows and driveway) located within external walls that are required to have an FRL and also location/protection of the Fire Brigade Booster enclosure serving the subject building.

The scope of this project is to provide Performance Solutions addressing the identified variations for the purpose of Building Approval. An analysis of the identified design issues is provided to assess the likely impact in a fire emergency. Compliance is to be demonstrated in terms of the BCA Clause A0.3, together with itemising the Fire Safety Requirements supporting the Performance Solutions and also specifying maintenance and management requirements.

The analysis is limited to the provisions contained within the BCA (2019) and does not consider any other legislative matters nor consider BCA issues of Access for People with Disabilities (Section D3) or Health and Amenity (Section F).

1.3. Summary of BCA deviations

A “Performance Solution” method of meeting building compliance is sought for design issues that are not proposed to be provided in accordance with the BCA Deemed-to-Satisfy (D-t-S) Provisions. The issues are defined below and summarised in the following table. The fire safety systems, fire safety features and fire safety provisions that are required to be provided to support these design issues are also listed in the following table.

Design Issue 1 – Unprotected openings are located less than 3m from the property boundary.

Design Issue 2 – Fire Brigade Booster facility is located <10m from the building.

Except where varied by the Performance Solutions, all other BCA Deemed-to-Satisfy Provisions are required to be met.

Design Issue	BCA Clauses and Performance Requirements	Methodology	Sub-systems (IFEG)	Acceptance Criteria
“Unprotected window openings are located less than 3m from the property boundary.”	C3.2 CP2 Indirect: CP1	Absolute Quantitative Deterministic	Fire Spread & Impact & Control (C)	Using the BCA Verification Method CV1, demonstrate that the potential for fire spread due to the unprotected openings within the external walls located <3m from the property boundary is limited to the degree necessary. BCA Performance Solution A2.2(1)(b) BCA Assessment Method A2.2(2)(b)(i).
“Fire Brigade Booster facility is located <10m from the building.”	E1.3 EP1.3	Comparative Qualitative	Fire Services Intervention (F)	Demonstrate that the fire brigade intervention is facilitated to a degree necessary. BCA Performance Solution A2.2(1)(b) BCA Assessment Method A2.2(2)(d).
Performance Solution	- Radiant Heat Attenuation screens are to be installed to provide protection of window openings located in the external walls less than 3m from the property boundary. - The Fire Brigade Booster assembly is to be provided in a concrete ‘bunker’ achieving a fire rating required to protect the FBB when positioned in the external wall of the building (FRL 90/90/90) and with a minimum clear height of 2.1m and a clear depth between the control valves and the door of the enclosure of a minimum 600mm to enable the fire fighters to step inside the enclosure and thus afford protection from the potential exposure from above when operating the FBB.			

Fire Safety Requirements	
	• All residential unit window openings located between 1.5m and 3m from the property boundary and oriented parallel to the property boundary are to be provided with radiant heat attenuation screens or otherwise protected (18 in total). • Additional protection of openings in the external walls associated with the carpark driveway on the Ground Floor is not required. • Other unprotected openings located less than 3m from the property boundary (if such exist) are not permitted. • Window openings within 1.5m of the property boundary (if such exist) are required to comply with the Deemed-to-Satisfy provisions of the BCA. • Kitchen window openings of Units 101 and 201 measured at ~2.925m from the property boundary are included in the schedule of openings that are required to be protected unless the window openings are set back further to achieve a 3m separation. • Where the attenuation screens are used, these are to cover the entire window opening (whole of window) and are to have a tested performance level demonstrating a capability to attenuate the received radiant heat flux at least by 40%. • A specific brand of a radiant heat attenuation screen is not proposed at the time of preparation of this report. For reference, the Invisi-Guard brand unit and the Crimsafe brand unit that have been tested by an

	Australian registered testing laboratory such as CSIRO and Exova Warringtonfire, manufactured, installed, framed and mounted in accordance with the subject test and specification under AS1530.4: 2014 Appendix B7, have previously been considered by BDA Fire to be acceptable. • The installation of the proposed radiant heat attenuation screens is to be conducted by a qualified (licensed) installer and is to be in strict accordance with the sample reference by the evidence supporting the selected product (any variations regarding, fixings, substrate materials or methods of constructions) must be discussed and approved in writing by BDA Fire prior to installations. • Face fix of the screen on the wall is permitted (alternative fixing with steel angle), the anchors must penetrate the screen frame, mesh and into the steel frame of the wall. • External wall cladding (where permitted by the NCC BCA) is required to be detailed around the radiant heat attenuation screens to ensure a secure and flush fit that also ensures the integrity of the screen is not compromised. • The external face of the external fire wall must be set such that when the radiant heat attenuation screen is fitted to the outside it fits flush all around the window opening. The external face of the of nib wall must be flush with the external face of the main external fire wall and wall construction must facilitate fixing into substructure to gain anchorage. It is recommend to keep the nib wall masonry (so that there is no differential). • Operable windows to be protected by radiant heat attenuation screens must be slide to open, awning (push open) type windows are not suitable. Architect to amend the window schedule. • The radiant heat attenuation screens allow light and ventilation however, if additional screens for privacy
--	---

	or aesthetics are still required, consideration should be given to a combined effect of the two 'privacy' features and the impact they may have on light or ventilation requirements. • The radiant heat attenuation screens are required to remain in place and be maintained/inspected in accordance with AS1851 and QDC MP6.1 (annually). A tag should be provided on each screen stating: "Radiant Heat Attenuation Screen – DO NOT REMOVE". It is the responsibility of the building body corporate to maintain all prescribed fire safety installations and also to employ appropriate record keeping practice. The subject radiant heat attenuation screens are considered to represent a "prescribed fire safety installation required as part of a Performance Solution that specify maintenance criteria" and the maintenance is required to be undertaken in accordance with AS1851 (as applicable to 'fire and smoke barriers'). • The Fire Brigade Booster assembly is to be protected by a fire rated enclosure (rear wall and sides and a lid on top) achieving FRL90/90/90 with a minimum clear height inside of 2.1m and clearance between the control valves and the front face of minimum 600mm to enable fire fighters to step inside when operating the FBB. • Provide an information plaque (permanently etched and securely attached) in the Fire Brigade Booster cabinet identifying the Performance Solutions provided in the subject building. The proposed wording is as follows: "This building is provided with Performance Solutions design addressing the following Design Issues: 1. Window openings and the driveway opening to carpark are located less than 3m from the property boundary; 2. Fire Brigade Booster facility is located <10m from the building."
--	--

2. PROJECT STAKEHOLDERS

The following persons are part of the Fire Engineering Brief (FEB) process contributing to the development of the Performance Solutions and thereby considered to be members of the FEB team. The conversation with the stakeholders occurred via email and phone calls. Completed FER document is to be issued to QFES for review and acceptance.

Address	Phone	E-mail
Building Certifier: Pure Building Approvals PO Box 1632 Buderim, Qld 4556 Stewart Magill	5451 0579	stewart@purebuildingapprovals.com.au
Developer: DVB Projects Nick Lukowski	0455 858 233	nick@dvbprojects.com
Architect: Brick Architects Suite 2F, Building 2, Lakes Vista Office Park 2 Flinders Parade North Lakes, QLD 4509 Darren Sciberras	3910 3717	darren@brickarchitects.com.au
Fire Engineer: BDA Fire PO Box 1235 Maleny, QLD 4552 Mark Sharples	5499 9881	mark@bdafire.com.au

3. DRAWING REFERENCES

The following Brick Architects architectural drawings were used in preparation of this document and are provided in Appendix C for reference:

Drawing number	Revision	Date
WD.03	B	03/12/19
WD.04	B	03/12/19
WD.05	B	03/12/19
WD.07	P5	03/12/19
WD.08	P5	03/12/19
WD.510	P2	28/10/19
WD.511	P3	03/12/19
WD.512	P3	03/12/19

4. BUILDING DESCRIPTION

4.1. Building Classification, Type and Use

The subject building is a new development classified as a Class 2 residential building with a Class 7a carparking part with a rise in storeys of 4 and of Type A construction.

The building is expected to be used on a 24/7 basis for a long-term accommodation (assuming a mix of owner-occupiers and rental tenants).

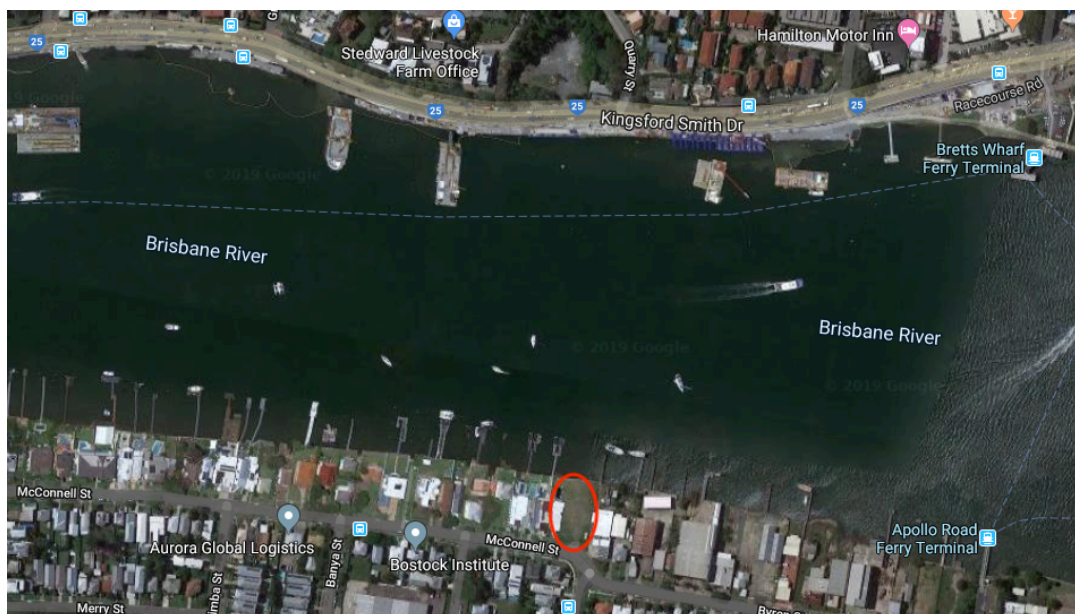


Figure 4.1: The location of the proposed development (indicated by the red oval).

4.2. Location and Access

The building is located on Brisbane riverbank in one of the inner-city suburbs. The allotment has a rectangular shape and is surrounded by the river from the north, other residential property from the west and a commercial property (a warehouse) from the east and a public road – McConnell Street from the south.

Fire services access to the building is to be from McConnell Street where the main entry to the building is located.

4.3. Dimensions and Proximities

The building has a triangular shape and a footprint of around 800m². The effective height of the building is less than 25m. The building's external wall on the west side is measured as being located less than 3m from the southern property boundary. The openings associated with the driveway serving the carparking level are also measured as being less than 3m from the property boundary.

The nearest two fire brigade stations are Cannon Hill fire station (permanent) at approximately 5.3km from the subject building and Camp Hill fire station (permanent) located 7km from the subject building.

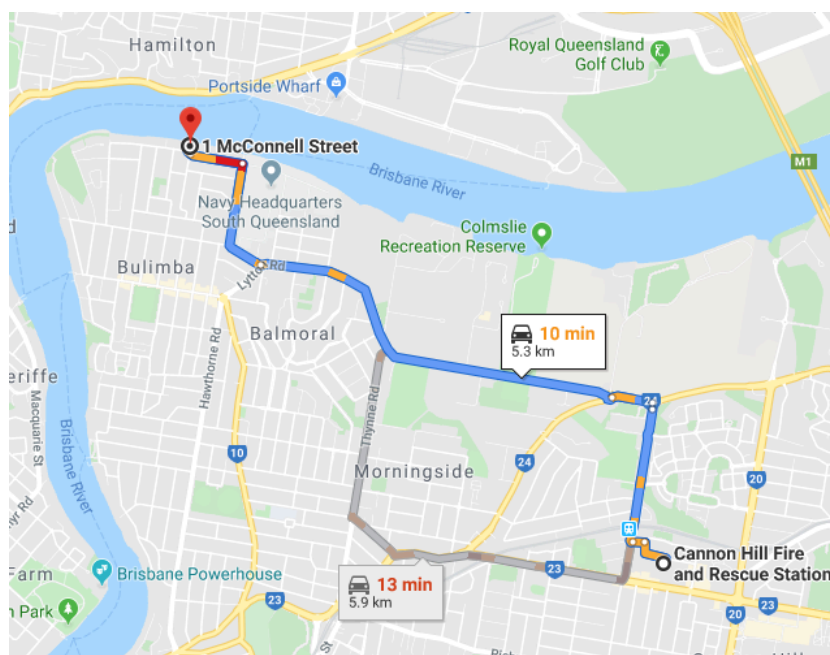


Figure 4.3: Location of the nearest fire brigade station.

4.4. Detailed Description

The building has a rise in storeys of 4 and a footprint greater than 500m².

The Basement (counted in the rise in storeys in accordance with the BCA Clause C1.2(b)(ii)) contains Class 7a carparking. A ramp connecting from the Ground Floor serves this level and continues via a driveway located in the south-west corner of the allotment to the public road. The driveway opening is measured as being located less than 3m from the property boundary.

The Ground Floor contains the above mentioned driveway and three 3-bedroom Sole-Occupancy Units, a common lobby and the main entry to the building, refuse rooms and communal open space.

Levels 1 and 2 have identical layout and contain four Sole Occupancy Units.

The building is served by a lift and one non-fire-isolated stair.

The external wall on the west side of the building (and associated window openings therein) are measured as being located <3m from the property boundary.

The building is served by a Fire Brigade Booster located in an enclosure in the south-west corner of the allotment on the Ground Floor level. The enclosure is measured as being located less than 10m from the external walls of the subject building.

4.5. Unusual Features and Other Important Considerations

There are no other unusual aspects attributed to the development other than the issues identified as variances from the BCA D-t-S Provisions.

4.6. Combustible Loading

An indication of fire load densities in various occupancies and building types is provided in Table 3.4.1a of the International Fire Engineering Guidelines³ and shows 300MJ/m² for a residential apartment and 200MJ/m² for a parking building.

This data has been obtained in a series of tests undertaken in the 1960's. It should be noted that the apartment as well as car content (materials) has likely changed since that time in general, with a change of materials predominantly used for furnishing and equipment (polymers) and also typically less content and more open space in modern homes. The fire load density is thus considered to be likely similar or lower to the indication in IFEG.

³ International Fire Engineering Guidelines. Edition 2005. ABCB 2005

5. OCCUPANT CHARACTERISTICS

5.1. Distribution & State

The BCA provides an upper occupancy limit for various occupancies, however not for residential apartments. It is considered reasonable to derive the number of occupants that would be located in the building/apartment for the majority of the time from the number of beds. This is in particular applicable to the night times (when generally the occupants are considered most vulnerable in a fire emergency). At some times, it can be expected that the number of occupants may be increased in individual apartments (e.g. birthday party, community meeting, family/interest group gathering, etc.). Similarly, at times, the number of occupants may be significantly less, especially during the day (during normal work/school times).

The BCA provides an upper occupancy limit for a carpark of 30m²/person (refer to the BCA Clause D1.13).

The state of the occupants affects their ability to recognise and interpret a fire alarm or fire cues (smoke, flames, noise) in a fire emergency situation and also the ability to react and take appropriate actions to avoid injury or death.

Sleeping occupants are expected to be located in the building. Occupants under influence of alcohol or medication/drugs can also be located in the building. This can vary depending on the socio-economic circumstances. It is however noted, that a new apartment building is more likely to attract occupants with a higher socio-economic status and thus lesser likelihood of alcohol/drug abuse. On the other hand, older demographic may be present and thus greater likelihood of prescription drugs or health issues that may effect the occupants' ability to evacuate in a fire emergency. Young families with small children could also be part of the demographic typical for this type of building.

The age and gender of occupants is considered to be generally representative of the general population. Between 1998 and 2018, the proportion of Australia's population aged 15-64 years grew slower than the growth of the remaining population and reached a peak of 67.5% in 2009, before declining to 65.5% by June 30, 2018. During the same period, the proportion of people aged 65 years and over increased from 12.2% to 15.7%. Conversely, the proportion of children under 15 years old decreased from 21.0% to 18.8%.

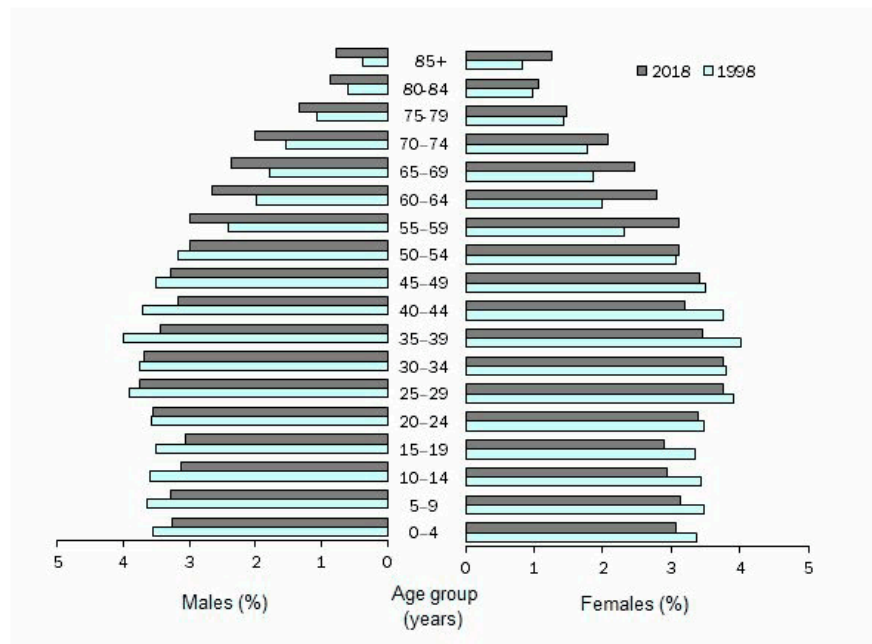


Figure 5.1: Population Structure, Age and sex – Australia – 1998 – 2018⁴.

5.2. Dispersal

Dispersal of occupants is considered to be directly related to the type of occupants in the individual SOUs (singles, couples, families). Clustering of occupants in a fire emergency may occur at some points along the evacuation routes most likely within the stairwells.

Dispersal of occupants in the carpark is likely to be relatively sparse and passengers from the same car are likely to move through the carpark together.

5.3. Attributes & Assistance

It is considered that the mobility of the occupants will represent the general population with vast majority of occupants being able-bodied. Occupants with physical disabilities (permanent or temporary – injuries), affecting their ability to evacuate can be present in the building. Visually and hearing impaired occupants can also be present in the building. The overview of disability prevalence in Australian population is summarised in the following figure⁵.

⁴ Australian Bureau of Statistics: 3101.0 – Australian Demographic Statistics, December 2018.

⁵ Disability, Ageing and Carers, Australia: Summary of Findings, December 2009. Australian Bureau of Statistics, Publication 4430.0 pp. 4

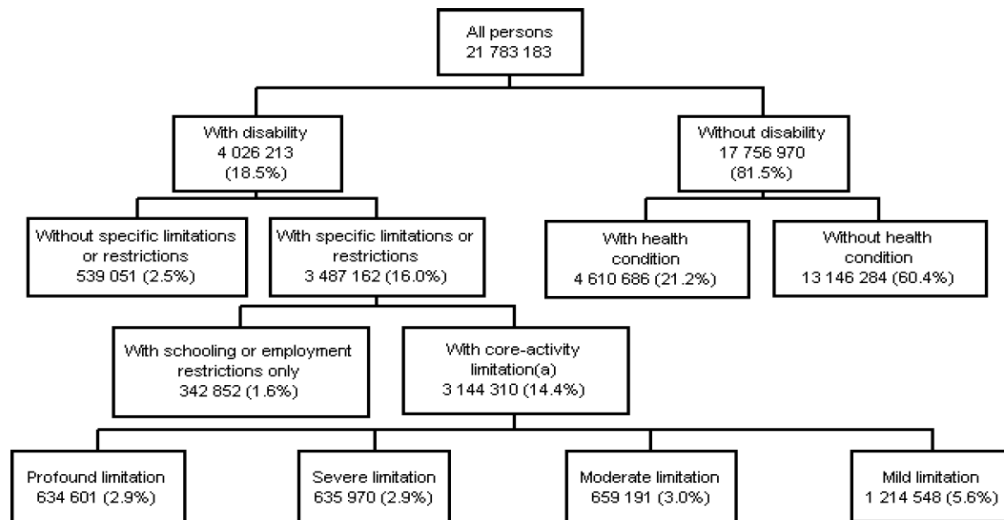


Figure 5.2: Overview of disability in Australia in 2009.

It is considered important to note that in a building of this type, there are limited mechanisms to control the occupant evacuation achieving response to a fire alarm in a pre-determined manner.

The occupants in a residential building are considered to possess the entire range of abilities to understand and interpret a fire alarm or other fire cues in a fire emergency situation. Some occupants may be very young or very old, under influence of alcohol or other drugs or having some degree of mental disability that can have adverse affect on the ability to implement decisions and their emergency behaviour.

A 2007 survey conducted by the Australian Bureau of Statistics, found that one in five (20%) Australians aged 16-85 years experienced one of the more common mental illnesses (such as anxiety, affective (mood) and substance use disorders in the preceding 12 months. This equates to 3.2 million people within the general population⁶. These statistics suggest that mental illnesses are more common than first thought and in turn have the potential to impact on the response of occupants to cues in a fire emergency.

The mental attributes of occupants as outlined above has the potential to impact on the decisions made during a fire, which ultimately can impact on the number of fatalities. The National Fire Incident Reporting System in the United States of America, which is a database formed from reports completed by fire fighters provided the following percentages of various pre-injury condition (where reported) for 1752 fatalities that occurred in apartment fires⁷:

- 54.1% were asleep
- 16.8% were awake or unimpaired

⁶ National Mental Health Report, 2010, Australian Government, pp.16

⁷ Ball, M 2011, Lecture 4, Fire Injury & Fatality, Course Notes, Centre for Environmental Safety and Risk Engineering, Victoria University, pp.5.

- 15.0% were handicapped or very old or very young
- 11.1% were impaired by drugs/alcohol
- 5.6% were bedridden

It should be noted that the National Fire Incident Reporting System in the United States of America does not cover all states. On this basis, it can be concluded that the data leads to an underestimation of fires and fatalities⁸. Notwithstanding this, the data can be used in this instance as it reinforces the fact that certain pre-injury conditions such as being asleep leads to the highest chance of fatalities occurring.

It is expected that occupants within one apartment are likely to have close relationships and thus exercise altruistic behaviour in a fire emergency.

Majority of the occupants are considered to not require assistance in a fire emergency evacuation. Some occupants may require some assistance or even full assistance. Required assistance may be provided by other occupants in the building (in particular occupants of the same apartment). Some occupants may need to rely on assistance provided by fire fighters' search & rescue operations to evacuate.

5.4. Training & Familiarity

Due to the type of the building and the nature of its occupancy, a pre-determined response from the occupants in a fire emergency situation is not likely to occur due to the lack of legislative requirements applicable to this type of building.

Majority of the occupants are not likely to have been trained in emergency management procedures. As part of the tenancy agreement & bylaws, information is expected to be provided in relation to the fire safety systems within the building and the expected/recommended response of the occupants in a case of fire emergency.

It is up to individual occupants to obtain sufficient understanding of the fire protection systems available as well as familiarising themselves with the emergency evacuation and response to a fire situation.

Some groups of occupants (very young and very old) are not expected to possess sufficient ability to undertake first aid fire fighting or to evacuate unassisted.

⁸ Ball, M 2011, Lecture 4, Fire Injury & Fatality, Course Notes, Centre for Environmental Safety and Risk Engineering, Victoria University, pp.4.

Long-term/permanent occupants are expected to be familiar with the building and be able to determine appropriate egress route(s) in fire emergency. In terms of short-term occupants or visitors way finding is likely to be aided by a relatively simple layout of the residential floors.

5.5. Dominant Occupant Groups and Roles

The residents represent the dominant occupant group in the building.

Other minor occupant groups in the residential parts are considered to be maintenance personnel and visitors. Visitors may be unfamiliar with the building, however, are likely to be accompanied by residents that can provide direction in a fire emergency. Maintenance personnel and cleaners may be unaccompanied, however present during normal business hours and expected to be able to recognise a fire alarm and determine appropriate egress route(s).

The predominant occupant roles in residential parts are considered to be parent-child, couples (partners) and single occupants.

An on-site building manager is not expected to be present in the subject building.

5.6. Activities at Fire Start

Open flame activities (such as welding) are not expected to occur in the building on a normal basis only as part of maintenance of the building.

There could be a whole range of activities being undertaken at the outbreak of a fire associated with occupants of a residential building. From the statistical evidence (see review in Section 6.6), the most likely activities associated with residential building fires include cooking and being asleep.

5.7. Fire Detection

Occupant response will depend on a number of factors, which include the type of fire detection, type of audible and visual alarms and the level of training received.

5.7.1 Detection Methods

5.7.1.1 Smoke Detectors (Alarms)

The incipient stage is normally characterised by smouldering combustion which produces smoke that may be sufficient to activate ionisation smoke detectors and the visible smoke period sufficient to activate photo-optical smoke detectors. Activation of these detectors is

considered to give the earliest possible alarm to initiate occupant response. A standard 20-second Alarm Verification Facility (detector's self-check) is usually provided on smoke detectors somewhat delaying the time between detection and notification via the alarm system (normally used to eliminate false alarms caused by spurious signals). Photo-optical smoke detectors are generally considered less prone to false alarms than ionisation smoke detectors in certain environments, similar to the subject building and are generally a preferred type of detection over the ionisation detectors in residential buildings. Photo-optical smoke detectors (alarms) are mandatory in bedrooms in all new dwellings in Queensland (Building Fire Safety Regulation 2008).

5.7.1.2 Thermal Detectors (Alarms)

For thermal (heat) detectors, activation will be dependant on the type selected, which includes fixed temperature (usually 57°C, but may be 88°C) or 'Rate of Rise', usually 6°C per minute combined with a fixed temperature setting. The 'Rate of Rise' detector will provide the earliest possible alarm where smoke detectors may be prone to unwanted alarms. Thermal detectors are less prone to false alarms than smoke detectors (due to different detection mechanism and corresponding design of the detector) and are recommended to be used in areas where smoke detectors may be subject to spurious signals and subsequent false alarms.

5.7.1.3 Occupants

People closer to the fire are likely to receive visual and olfactory cues. Olfactory (smell) cues of fire frequently occur in the "invisible" stage of fire development and audio-visual cues at the "visible" and "flaming" stages of fire development.

The Warren Centre fire reports⁹ suggest that visual cues occur when the smoke layer reaches down 5% of the room height.

This suggests that visual fire detection by occupants could be said to occur when the smoke layer is at 95% of the ceiling level. Normally a Fire Engineer would use a conservative 90% value as the initiating factor for occupant response and alarm.

Whilst the detection of fire may occur faster by the occupants, the notification or warning to all occupants in the building may not be provided as fast as with an automatic fire detection and alarm system.

⁹ Technical Papers, The Warren Centre for Advanced Engineering, University of Sydney. 1989

5.7.2 Alarms and Occupant Response

Occupant response to an alarm in the subject building is considered to be influenced by training received and the procedures in place.

Research by Proulx published in the SFPE handbook of Fire Protection Engineering (Second edition) establishes that the presumption, held in the fire protection industry during the early years since its inception, that occupants start evacuating immediately upon hearing a fire alarm is incorrect and that the occupants can in fact spend a substantial amount of time in the so-called pre-movement phase of evacuation consisting of gathering belongings, seeking further information or refusing to evacuate (complacency). Such behaviour applies predominantly to occupancies such as residential and also offices or retail.

For response (coping or pre-movement), research by Proulx published in the SFPE handbook of Fire Protection Engineering (Second edition) is utilised and Proulx advises that there are varying scenarios of occupancy and evacuation cues (alarms) that must be analysed before appropriate selection can be made (see Figure 5.3 below).

For this project, as a benchmark of the minimum required fire detection and alarm system, point W3 is appropriate and 5+ minutes has been selected as the average occupant (resident) response time.

Occupancy Type	W1 (min)	W2 (min)	W3 (min)
Offices, commercial and industrial buildings, schools, colleges and universities (Occupants awake and familiar with the building, the alarm system, and evacuation procedure.)	< 1	3	> 4
Shops, museums, leisure-sport centers, and other assembly buildings (Occupants awake but may be unfamiliar with building, alarm system, and evacuation procedure.)	< 2	3	> 6
Dormitories, residential mid-rise and high-rise (Occupants may be asleep but are predominantly familiar with the building, alarm system, and evacuation procedure.)	< 2	4	> 5
Hotels and boarding houses (Occupants may be asleep and unfamiliar with the building, alarm system, and evacuation procedure.)	< 2	4	> 6
Hospitals, nursing homes, and other institutional establishment (A significant number of occupants may require assistance.)	< 3	5	> 8
W1: live directives using a voice communication system from a control room with closed-circuit television facility, or live directives in conjunction with well-trained, uniformed staff that can be seen and heard by all occupants in the space W2: nondirective voice messages (prerecorded) and/or informative warning visual display with trained staff W3: warning system using fire alarm signal and staff with no relevant training			
Source: Adapted from <i>Fire Safety Engineering in Buildings, Part 1: Guide to the Application of Fire Safety Engineering Principles</i> , Table 21, British Standard Institute, DD240, London, 1997.			

Figure 5.3: Estimated response times for various occupancies and fire detection and alarm systems.

5.8. Travel Speed

For travel speed, the Fire Engineering Guidelines point the designer to various studies where the average walking velocity of 1m/sec for unimpeded persons travel speeds is considered appropriate. Travel speeds up or down stairs are modelled at 0.6m/s.

In the USA, the Americans with Disabilities Act includes studies of disabled egress times. This work concluded that average disabled egress velocities were 27 m/min (0.45m/sec), with a requirement to rest for 2 minutes every 30 metres. This gives an average velocity of 9.7 m/min (0.162m/sec) per 3.11 minute interval.

This figure needs to be considered in relationship to the queuing which occurs at bottlenecks, and with the average walking velocity of unimpeded persons of 72 m/min (1.2m/sec). The effect is that unaided the disabled person is not expected to be disadvantaged (the first thirty metres of open path travel is undertaken at an average velocity of 27 m/min (0.45m/sec)), and the reality is that assistance is normally offered, thus increasing the average velocity.

Some other velocities (to provide a sense of scale):

- Running, 100 m world record 600 m/min (10m/sec)
- Running, jog 300 m/min (5m/sec)
- Running, wet floors 130 m/min (2.17m/sec)
- Running, up stairs 33 – 68 m/min (0.55 – 1.13m/sec)
- Walking, fast 120 m/min (2m/sec)
- Walking, slow 50 m/min (0.83m/sec)
- Walking, upstairs, slope speed 31 m/min (0.52m/sec)
- Walking, darkness, unknown 18 m/min (0.17m/sec)
- Wading, knee deep 43 m/min (0.72m/sec)
- Wading, waist deep 18 m/min (0.3m/sec)
- Handicapped, fast walk 20 m/min (0.33m/sec)

With increased smoke optical density the travel speed of occupants is reduced as indicated on the following graph:

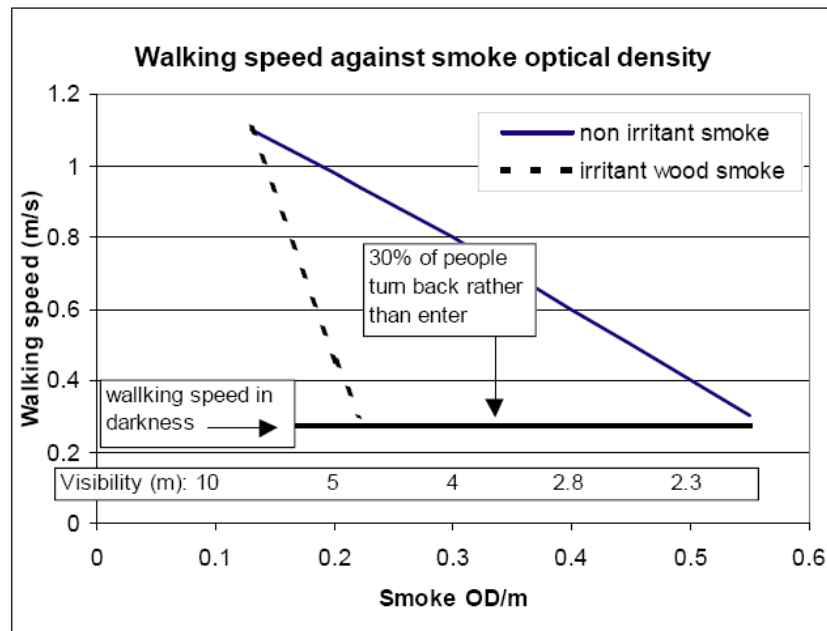


Figure 5.4: Travel speed affected by smoke.

5.9. Egress and Access

5.9.1. Egress

It is understood that travel distances along the public corridors and the egress routes are within the maximum travel distances set by the BCA for this building class.

5.9.2. Access

Access to the building will be generally available via the same paths that are used for egress.

6. HAZARD ANALYSIS AND FIRE SCENARIOS

6.1. Fire Initiation and Development

6.1.1 General

For this analysis it has generally been assumed that the fire begins to grow at the “effective ignition time” as shown in Figure 6.1 and the incipient stage has been ignored. This should be recognised as a very conservative approach. If a fire begins, it is likely to first go through an incubation period or incipient stage. Figure 6.1 below, adapted from NFPA 92B shows a typical time-based illustration of the heat release rate of a continuously growing fire, known as a t^2 fire.

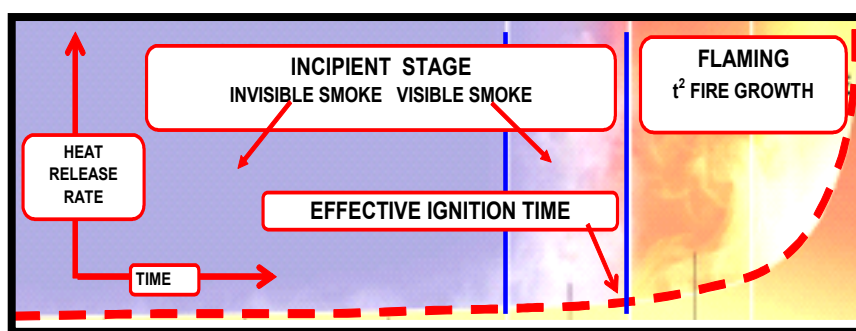


Figure 6.1: Fire growth curve. Note that during the incipient stage of fire, the effects on the occupants and the building are likely to be minimal.

6.1.2 Arson

Arson is only considered as a single incident where intentional ignition is effected without accelerants, thus it is considered that the fire scenarios and fire growth rates developed as part of the fire strategy will be applicable to arson fire scenarios resulting in one seat of fire and associated with the ignition of the fuel load items normally contained within the building.

6.2. Hazards

The objective of hazard analysis is to develop a comprehensive understanding of the hazards and risks associated with an operation of a building and of the adequacy of safeguards. Without such analysis, it is difficult to be confident that design and operation can be carried out with an adequate level of safety.

Consequently this section addresses any special feature of the building structure, contents and activities that may require special consideration.

The hazard associated with Design Issue 1 is in the potential that a fire occurring in an SOU containing an unprotected window opening located less than 3m from the property boundary will spread to the adjacent allotment or vice versa, a fire occurring on the adjacent allotment will spread to the subject building via the unprotected window openings located less than 3m from the property boundary. Similar hazard is identified in relation to the driveway opening, however the configuration, combustible materials and dimensions differ from window openings associated with the SOUs.

The hazard relating to the location of Fire Brigade Booster (FBB) enclosure addressed in Design Issue 2 is in the potential exposure of fire fighters to a fire situation when operating the FBB.

6.2.1 Smoking

In all occupancies, ignition sources may include smoking. Smoking is prohibited in public and workspaces however may occur in private homes. It is considered that smoking may be occurring in the subject building given its function and use.

Since September 2010, all cigarettes and tobacco sold in Australia are required to have Reduced Ignition Potential (RIP) characteristics, which significantly reduces any potential for discarded burning cigarettes to ignite other combustible materials.

6.2.2 Arson

In all occupancies, ignition sources may include arson. Arson incidents can be eliminated or at least reduced by appropriate security of the building and site by controlling the building and site entry and location of external combustibles such as garbage / recycling bins.

6.2.3 Ignition

The following ignition sources have been identified:

- Open flame and intentionally lit fires (cooking, arson);
- Abandoned, discarded material (smoking material).
- Electrical fault, friction;
- Mechanical failure;

6.2.4 Combustibles

The combustible loading outlined in Section 4.6 and specific hazards have been analysed and the following fire scenarios have been identified.

6.3. Fire Scenarios

These scenarios have been developed into appropriate design fires as described in Section 9, and as discussed therein, only credible fire scenarios should be considered.

6.3.1 Residential Sole-Occupancy Units

A fire starting in one of the residential apartments is considered as the most likely fire scenario. Ignition sources may include:

- Cooking
- Smoking
- Open flame and heat sources (candles, incense stick, mosquito coil, heaters, iron, hair straightener, etc.)
- Electrical fault

A fire in an apartment bedroom is likely to grow at a fast rate. Data from Initial Fires from Lund University¹⁰ indicates that a bed may burn at a medium to fast rate, and CIBSE TM19¹¹ indicates that a timber robe containing clothes can burn at an ultra-fast rate.

6.3.2 Carpark

In the carpark, ignition can result from:

- Electrical fault
- Vehicle accident

A fire in the car park is likely to be limited to two cars and develop at a medium growth rate, as shown in data from Joyeux¹².

The Melbourne MFB fire records¹³ show a rate of fire starts in car parks of about 0.00007 fires reported to the fire brigade per car space per year.

¹⁰ Sårdqvist S. 1993, Initial Fires – RHR, Smoke Production and CO Generation from Single Items and Room Fire Tests, Institute of Technology, Lund University, Sweden

¹¹ CIBSE TM19, 1995, Relationships for Smoke Control Calculations, The Chartered Institution of Building Services Engineers, London, UK

¹² Joyeux, D. 1997, Natural Fires In Closed Car Parks – Car Fire Tests, INC-96/294d-DJ/NB.

¹³ Metropolitan Fire & Emergency Services Board 2002, Data supplied on MFB Car Park Fires 1991-2000, Melbourne Vic Australia

6.3.2 Adjacent property

A fire occurring on the adjacent property is considered in the evaluation of the BCA Verification Method CV1(b), however only in terms of the level of radiant heat flux that a building is required to withstand for various distances from a fire source feature – the property boundary.

6.4. Smoke Development & Spread

The development and spread of smoke probably provides the greatest risk to life safety of occupants in a fire scenario. Smoke could spread throughout the building via a number of means depending on the smoke source and any compartmentation of the area.

Smoke development will be dependent on the materials used for building finishes and other combustible contents.

Smoke spread and impact will be dependent on the extent of separation. It is understood that in this building there are no requirements for smoke separation.

The Personal Protective Equipment and a breathing apparatus routinely used by attending fire fighters can mitigate impact of smoke on the fire fighters.

6.5. Fire Spread & Impact

Without intervention from occupants, brigade or suppression systems, fire is likely to spread throughout a fire compartment as far as the fuel load, fuel configuration, and ventilation conditions will allow. The temperature within the compartment will rise over time until a point where flashover may occur. Flashover is the very rapid growth of the fire to involve all available combustible fuels, including the gases produced by the fire.

It should be noted that whilst not representing fire compartments in accordance with the definition of the BCA, residential Sole-Occupancy Units are intended to be fire separated from the remainder of the building by their inherent construction (fire rated bounding walls, self-closing fire rated doors).

7. FIRE SUPPRESSION, DETECTION AND WARNING

7.1. General (required systems)

It has been identified that the following fire safety systems are required to be provided in the subject building to comply with the Deemed-to-Satisfy Provisions of the BCA. Subject to the outcome of the Fire Engineering Analysis, additional fire safety systems, features or provisions are required to be provided to support the Performance Solutions (refer Section 1.3 – Fire Safety Requirements).

Item	In accordance with	Notes
Fire Hydrant System & Fire Brigade Booster Facility	AS2419.1	
Fire Hose Reels	AS2441	Carparks only
Portable Fire Extinguishers	AS2444	
Emergency Exit Signs & Lighting	AS2293.1	
Automatic Smoke Detection and Alarm System	AS3786 & AS1670.1	In accordance with the BCA Specification E2.2a Clause 3 and Clause 7.

Table 7.1: Summary of required fire safety systems.

8. FIRE BRIGADE INTERVENTION

8.1. General

Fire Brigade intervention is first and foremost aimed at protecting life and namely the lives of those who may be inside a burning building. Upon arrival, the first assessment is of the condition of occupants. If occupants require assistance, rescue operations will take priority. If occupants are considered to be out of immediate danger, brigade activities will focus on fighting the fire.

Fire fighters enter a building on fire with Personal Protective Equipment (including a breathing apparatus) that enables them to operate under fire conditions.

8.2. Fire Brigade Intervention Model

Fire Brigade Intervention Model (FBIM) has not been prepared for this building. With distances of 5.3km and 7km from the two closest fire stations the fire brigade arrival is likely to be relatively fast upon receiving the notification about fire emergency.

Taking the travel speeds in an Urban Zone of 40km/h, the travel time from leaving the closest fire stations to the kerb arrival is estimated as between ~400 seconds (~7 minutes) and 630 seconds (10.5 minutes). This does not take to account detection, notification or departure times preceding the actual travel to the building on fire.

8.3. Specific Hazards

In the case of this building, a fire in the residential apartments is likely to be contained to a single apartment. Given that evacuation times may be extended if occupants are sleeping, it is possible that the brigade will arrive before the evacuation of the entire building is completed. However, if there are no occupants requiring rescue on the fire floor, it is likely that brigade will commence fighting the fire whilst occupants from other floors may be still evacuating.

It is considered that the fire fighters attending a fire in the subject building should not be impacted by the design issues addressed in this report. Fire fighters are equipped for and routinely operate under extreme heat conditions and thus potential exposure to a fire situation may not present the same level of risk to attending fire fighters as it does to the evacuating occupants. Protection to fire fighters operating the Fire Brigade Booster is proposed to be provided by fire rated construction surrounding the booster equipment.

9. DESIGN FIRES

Design fires are defined in accordance with the International Fire Engineering Guidelines that in Section 1.2.11.2 states:

“From the potential fire scenarios, the FEB team has to decide which scenarios are to be subjected to analysis. Usually, a number of severe scenarios, which have a reasonable probability of occurrence and significant potential for loss (life, property, etc.), are selected for analysis. Care and judgement should be used to avoid unnecessarily analysing events with a very low probability of occurrence, but where the scenario may have very high adverse consequences, due consideration should be given if not for the primary analysis at least in the sensitivity studies.”

Consequently only credible fire scenarios are to be considered in the FER analysis.

9.1. General

9.1.1 T² fires

T² (t-squared) fires are considered a useful approximation of pre-flashover fires. A t² fire is one where the burning rate varies proportionally to the square of time. Frequently, t² fires are classed by speed of growth and defined on the basis of the time required for the fire to grow to a rate of heat release of 1000 Btu/sec. The times related to each of these classes are as follow:

$$Q=(t/k)^2$$

Q is the heat release rate in MW

t is the time in seconds

k is the growth constant in units of sMW^{-1/2}

“t” values for the fire classes are:

Ultra-fast = 75 sec; Fast = 150 sec; Medium = 300 sec; Slow = 600 sec

These are shown in the Figure below together with some common fuels:

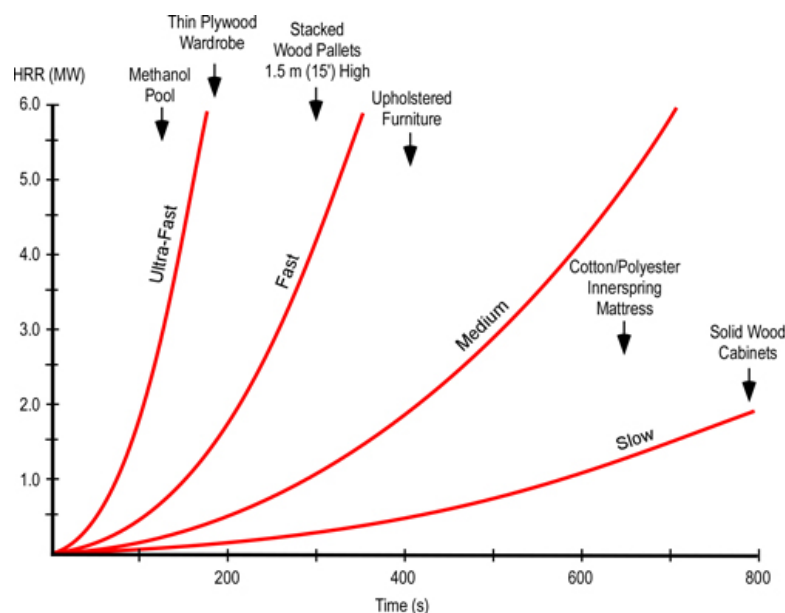


Figure 9.1: T² fire curves and some common fuels

9.2. Fuel and /or Ventilation Controlled Fires

The fire growth only represents the 'rate of fire growth' assuming that the fuel load is unlimited and the fire is not constrained by limited ventilation, i.e. it reaches flashover.

Most fires are either limited by fuel load or ventilation so the next step in determining the design fire is to determine where the fire growth should be capped. This requires research and judgement considering the total fuel load and available ventilation.

Quantitative assessment is frequently used in respect to the fire resistance of the bounding construction of compartment. The method of analysis, as described by Buchanan, calculates an actual fire time-temperature regime, dependent on compartment geometry, fire load, and ventilation characteristics. This is then compared to the standard time temperature regime as defined by AS1530.4.

The majority of data inputs are determined by the building design (e.g. floor area) however the fire load must be assumed. The Fire Safety Engineering Guidelines nominates typical fire loads for various occupancies (refer Section 4.6).

Ventilation controlled fire sizes can be estimated using the formula $Q_v = 1.26 \times A_v \times h_v^{1/2}$ (Buchanan), where A_v represents an area of the ventilation openings and h_v the height of the opening.

9.3. Real Fire Tests

Instead of relying solely on assumed fire growth rates and what cap to apply, BDA Fire in its standard assessment procedures uses fire test data from various sources reporting on real fire experiments and live fire tests to specify the design fires. Sources of this research include:

- US National Institute of Standards and Technology (NIST)
- SP Technical Research Institute of Sweden (SNTRI)
- SINTEF NBL (Norwegian Fire Research Laboratory)
- National Research Council Canada (NRC)

These tests are usually conducted using full-scale free burn testing using an industry size cone calorimeter where the HRR and products of combustion are gathered and analysed.

9.4. Project Specific Design Fires

To evaluate the impact of a fire within the building or from a fire source feature (Design Issue 1), a design fire with the following parameters is proposed to be used:

- Fire located in Unit G2 on the Ground Floor where openings in the external wall (unprotected and less than 3m from the property boundary) with the largest aggregate surface area are located.
- The fire is to be modelled as a black body emitter with a temperature of 1100°C (a conservative value representing well ventilated and fuelled fire such as a liquid pool fire – the more likely temperatures in enclosure fires are around 800°C - 1000°C).
- The fire is modelled as radiating via the openings (simultaneously and input into the model as two openings) that are located at 2.44m from the property boundary.

It is considered that the results should provide a largely conservative indication of the potential radiant heat achieved at and on the other side of the property boundary from a fire located within a unit and impacting on all window openings in question and are to be assessed against the BCA Verification Method CV1. Using a worse case aggregate size of the openings should provide a conclusive result that can apply to all other window openings being smaller or further from the property boundary.

The proposed method of evaluation of Design Issue 2 is qualitative, demonstrating how the rationale of D-t-S protection is applied to a Performance Solution configuration.

10. DESIGN TOOLS

BDA Fire uses a range of different design tools to conduct the fire safety analysis.

For this project, the following specific design tool is proposed to be used:

Radiation program – also part of the FireWind¹⁴ computer software package. The program allows a simple geometry representing the configuration of window openings (emitters) and to be input and it calculates the resulting radiant heat flux utilising the Stefan-Boltzman equation for radiative heat transfer and incorporating the configuration factors. The inputs required are physical dimensions of the radiating panel, temperature and emissivity and then the orientation to the point of interest located externally from this panel where the resulting heat flux is measured. The configuration of the model can be seen from the following figure:

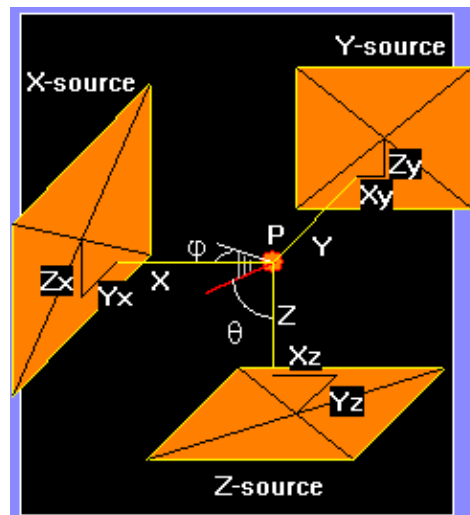


Figure 10.1: Configuration of radiators (at different orientations) and the receiver – point P where the maximum radiant heat flux is measured in Radiation program.

¹⁴ FireWind Suite of Software Version 3.6, June 7, 2006, Fire Modelling and Computing

11. ASSESSMENT METHODOLOGY AND ACCEPTANCE CRITERIA

11.1. Methodology

The Performance Requirements are the only part of the BCA to which a design must comply. The Objectives and Functional Statements are given solely as guidance to explain the intent of the Performance Requirements, as recognised by the BCA. The D-t-S Provisions are only one method of achieving the Performance Requirements. There is no obligation for a design to adopt either in part or in full the D-t-S Provisions.

The analysis adopts qualitative and quantitative evaluation and where quantitative evaluation is used deterministic tools are used.

Analysis is undertaken in accordance with Part A2.2 of the BCA and, where formulating an Performance Solution that is achieved by A2.2(1)(a) "compliance with all relevant Performance Requirements", other Relevant Performance Requirements are considered in accordance with A2.2(3). Where an Alternative Solution is achieved by A2.2 (1)(b) "the solution is at least equivalent to the Deemed-to-Satisfy Provisions" it is our interpretation that all indirect Performance Requirements are also deemed satisfied and are not individually addressed in the report.

Engineering judgment is used in the fire safety analysis only to determine and undertake appropriate assessment methods (calculations) to assess in both qualitative and quantitative terms the fire safety issues relevant to this protect.

11.2. Advice

Advice from QFES has not been sought. It is proposed to seek advice via issue of the FER document by the Building Certifier directly to QFES.

Advice on any insurance issues has not been sought.

11.3. Evaluation Extent

A performance-based approach is used to justify the design proposals. The methodology adopted generally follows the approach outlined in the International Fire Engineering Guidelines.

The evaluation depends on the number of sub-systems involved in the analysis. An evaluation can be a comparative, absolute or deterministic (probabilistic) type of evaluation.

Deterministic or Probabilistic methods can be used to provide greater insight into the evaluation and outcomes of the proposed designs.

11.3.1 Comparative approach

Typically, the fire safety provided by one element, or a sub-system, or the complete fire safety system, is compared to the level of fire safety that would be achieved in an identical building in which that element, sub-system or system is designed in compliance with the deemed-to-satisfy or prescriptive provisions.

A comparative approach aims to determine whether the performance solution is equivalent to (or better than) the deemed-to-satisfy or prescriptive design. The comparative approach is often referred to as a “Qualitative” approach.

11.3.2 Absolute approach

When an evaluation is carried out on an absolute basis, the results of the analysis of the trial design are matched, using the agreed acceptance criteria, against the objectives or performance requirements without comparison to D-t-S designs. The absolute approach is often referred to as a “Quantitative” approach. Meeting the acceptance criteria outlined by BCA Verification Methods falls within the absolute approach.

11.4. Acceptance Criteria – Fire Spread

For radiation heat flux on/from the unprotected window openings located less than 3m from the property boundary, acceptance criteria will be from the BCA Verification Method CV1 - Table CV1, which is given below and is also represented in graphical form in Figure 11.1:

CV1

Compliance with CP2(a)(iii) to avoid the spread of fire between buildings on adjoining allotments is verified when it is calculated that—

(a) a building will not cause heat flux in excess of those set out in column 2 of Table CV1 at locations within the boundaries of an adjoining property set out in column 1 of Table CV1 where another building may be constructed; and

(b) when located at the distances from the allotment boundary set out in column 1 of Table CV1, a building is capable of withstanding the heat flux set out in column 2 of Table CV1 without ignition.

Column 1	Column 2
Location	Heat flux (kW/m ²)
On Boundary	80
1m from boundary	40
3m from boundary	20
6m from boundary	10

Table 11.1: BCA Verification Method CV1 – Table CV1

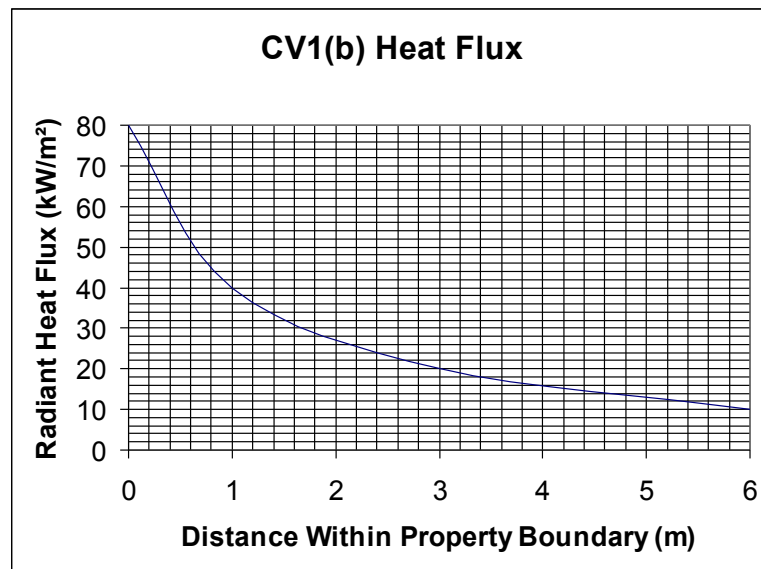


Figure 11.1: Graphical representation of Table CV1

11.5. Acceptance Criteria – Fire Brigade Intervention

The D-t-S Provisions of the BCA are deemed to provide an adequate level of life safety to fire fighters. The assessment demonstrates that the Performance Solution provides an equivalent level of life safety to a D-t-S design, and thus meets the Performance Requirements of the BCA.

The acceptance criteria are based on the ability to demonstrate that the fire fighters are able to safely operate the FBB despite the separation distance from the building being less than 10m.

12. FIRE ENGINEERING ANALYSIS

Design Issue 1 – Unprotected openings are located less than 3m from the property boundary.

Multiple window openings have been identified in the western external wall of the SOUs on the residential levels as being located less than 3m from the property boundary and therefore in variation from the D-t-S Provisions contained in the BCA. The western external wall is setback approximately 2.5m from the property boundary.

A Deemed-to-Satisfy (D-t-S) approach for protecting the window openings is to fix the windows closed or provide automatically closed windows and install internal or external wall wetting sprinklers or provide automatically closed or permanently fixed fire windows or automatically closed fire shutters (refer the BCA Clause C3.4).

However, the proposed Performance Solution is based on installation of radiant heat attenuation screens. These generally consist of a steel mesh held in a steel or aluminium frame that is fixed to a steel angle or box section support or directly onto the external wall of a building to cover the entire window opening. The original intent of such screen is for security, however in this case the proposed Performance Solution utilises the ability of the steel barrier of the screen to also attenuate (reduce) the radiant heat flux passing through the screen and further onto the window opening.

There are various products from different screen manufacturers on the market that are similar in construction and materials, however each have different specific characteristics such as steel wire type and diameter used for the mesh, weave density, method of fixing the mesh to the frame, and also method of fixing the screen to the wall, etc. as well as vary in the type of testing method used for demonstrating their performance when exposed to fire conditions (a single standard test for the given configuration has not been specified or not even agreed upon in the industry). Nevertheless, from the perspective of the proposed Performance Solution, the criterion for acceptance of a specific brand of screen is evidence (as specified by the BCA Clause A2.2) that the screens are capable of attenuating at least 40% of the radiant heat flux received at a distance between 1.5m and 3m from a fire source feature. Note that no protection of window openings is required by the BCA for distances of 3m or more.

The BCA Verification Method CV1 is proposed to be used to demonstrate that window openings (protected with tested attenuation screens) within 3m of the property boundary should not pose a significant risk of fire spread.

The unprotected window openings in the external wall have been identified. These are all measured at a distance of approximately 2.5m (varying between 2.44m and 2.55m) from the western property boundary and vary in size. The openings proposed to be protected with radiant

heat attenuation screens (18 off) are depicted in Figures 12.1 – 12.3 and are summarised in Table 12.1 below.

Unit	Room	Window Dimensions H x W (mm)	Area (m ²)	Aggregate (m ²)
G2	Bedroom 3	1700 x 2275	3.8675	14.2455
	Bedroom 2	1700 x 2275	3.8675	
	Dining	2900 x 1120	3.248	
	Dining	2900 x 1125	3.2625	
101 & 201	Living	2250 x 730	1.6425	12.21
	Living	2250 x 730	1.6425	
	Kitchen	1400 x 2720	3.808	
	Bedroom 2	2250 x 2275	5.12	
102 & 202	Bedroom 2	2250 x 2275	5.12	9.1452
	Bedroom 1	2320 x 765	1.7748	
	Bedroom 1	2320 x 970	2.2504	

Table 12.1: Summary of non-compliant window openings located within 3m from the property boundary. These window openings (18 in total) are all proposed to be addressed by a Performance Solution using radiant heat attenuation screens.

It should be noted that the protection has been provided to the openings associated with balconies of the SOUs or window openings oriented perpendicular to the property boundary by additional 'nib' walls extending past the openings so that direct line of sight from the nearest point of the property boundary from any point of the window opening is at a distance of at least 3m. The construction of these walls must be in line with the fire resistance levels required for the rest of the external walls.

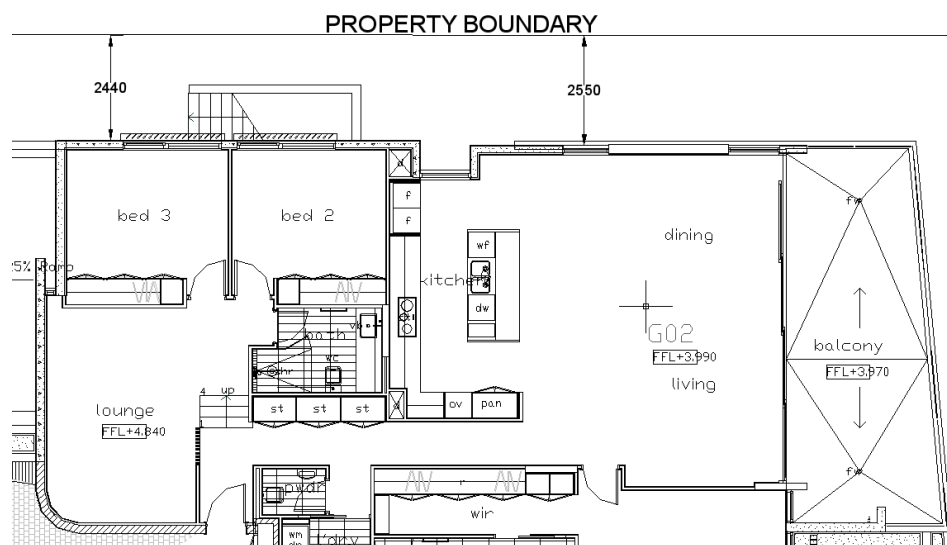


Figure 12.1: Bedroom 3, Bedroom 2 and two Dining room window openings in Unit G02 measured 2.44m and 2.55m from the western property boundary.

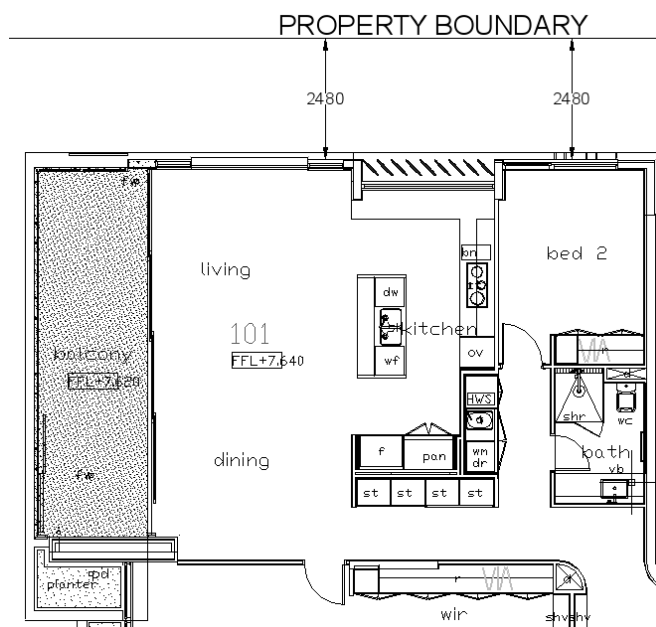


Figure 12.2: Two Living room, Kitchen* and Bedroom 2 window openings in Unit 101 (same as Unit 201 above) measured 2.48m from the western property boundary.

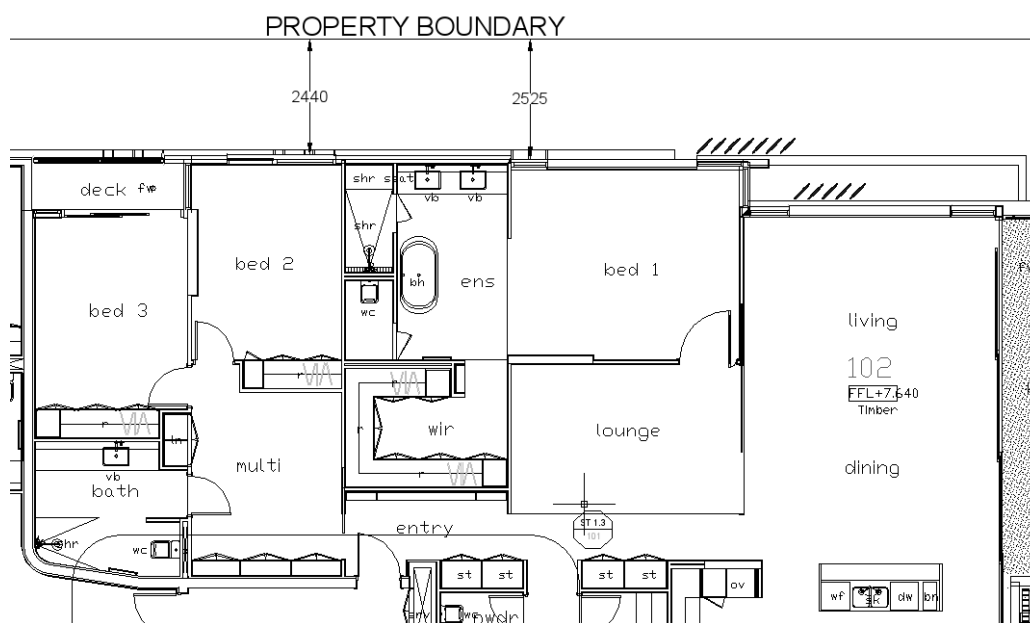


Figure 12.3: Bedroom 2 and two Bedroom 1 window openings in Unit 101 (same as Unit 202 above) measured 2.48m from the western property boundary.

It should be noted that the kitchen window in Unit G02 and the living room windows in Units 102 and 202 are located more than 3m from the property boundary and therefore don't require protection.

*In the case of the kitchen window of Unit 101 (and Unit 201), these are measured at ~2.925m from the property boundary (the 'target' i.e. a solid obstacle such as window pane is considered appropriate to be used rather than the opening in the wall formed by the adjacent walls) and thus

these window openings are included in the schedule on Table 12.1 above. Thereby, protection is still required with a radiant heat attenuation screen unless the window openings are set back further to achieve a 3m separation.

The size of the non-compliant openings, proximity to each other and their distance and orientation to the property boundary are considered. Judgement is used to determine the extent of the analysis of multiple openings with their proximity to each other.

The predominant mode of heat transfer in a fire spread situation between two buildings (or building and a fire source feature) is radiant heat, i.e. radiation similar to the visible light that transfers energy via electromagnetic waves. There are several factors affecting radiant heat transfer and the predominant one is the distance between an emitter and a receiver and their mutual configuration (how well they can 'see' each other in terms of angle of orientation and direct overlap). Secondary, the area and temperature of the emitter are important factors affecting the radiation heat flux received by objects in the vicinity of the emitter.

It is considered that if the worst case scenario can be shown in the analysis as meeting the acceptance criteria then all window openings in the subject building that are of the same size (or smaller) and configuration in respect to each other and to the property boundary should also meet the acceptance criteria.

It is expected that window openings in different SOU's should not have a cumulative effect on the impact from a fire situation (due to fire resisting construction between SOU's limiting fire spread).

The analysed window openings are all oriented parallel and measured at 2.44m from the property boundary (as a 'worst case' distance). Unit G02 contains openings with the largest aggregate area being four window openings, two associated with the bedrooms and being located close to each other and two associated with the dining room and thus serving the same internal space. The worst-case scenario is therefore considered to be a fire occurring in Unit G02 and impacting on all four window openings simultaneously (area of $\sim 14.25\text{m}^2$) at a distance of 2.44m from a property boundary.

A conservatively averaged radiator of 1100°C intensity is to be assumed to be uniformly distributed at the analysed window openings and the radiator is assumed to be at the window line.

The assumption of a 1100°C black body emitter (note that uniform temperature across the entire opening and black body emission are very unlikely to be achieved and in reality a significantly reduced emissivity may be expected) is considered sufficiently conservative to account for any flame extensions/wind factors which may influence radiant heat in a window where attenuation screens have become ineffective (due to deformation etc.) and are no longer forming an effective

barrier to flame extension. The fire models presented have therefore been simplified using a high intensity radiator to obtain a predictable result.

It is considered that the results should provide a largely conservative indication of the potential radiant heat achieved at the property boundary from a fire located within a unit and impacting on all window openings in question and are to be analysed against the BCA Verification Method CV1.

Verification of CV1(a)

CV1(a) is used to verify that the subject building is unlikely to contribute to fire spread to an adjacent building due to radiant heat.

As detailed above, rather than performing evaluations on each window opening (as part of CV1(a)) it is considered pertinent to assume a conservative scenario and demonstrate compliance. A fire fully involving an SOU and emitting uniformly at maximum intensity from the largest openings that are closer to each other and at the shortest distance from the boundary is considered to be a suitably conservative scenario. A fire involving more than one SOU is considered unlikely during the early stages of fire development (before fire brigade intervention occurs), as the SOU's are fire separated.

For further conservative approach being adopted, the window openings are input into the model as two openings ignoring the distance between the bedroom windows and the dining room windows, however incorporating the distance of ~5m between the two lots of windows as per the actual configuration.

The radiant heat flux is determined for the evaluated window opening using FireWind "Radiation" program. The radiant heat impact is also determined at 1m, 3m and 6m within the adjacent property in accordance with the CV1(a) methodology. The results of the model are tabulated below and the FireWind outputs are also given in Appendix A.

It can be seen from the results that the maximum radiant heat is achieved immediately opposite the larger of the two window openings modeled and the position of point 'P' is adjusted accordingly by offsetting the windows along the Y-axis. With increasing the distance the cumulative effect of the two openings can be seen as gradually increasing.

Distance within adjoining property (m)	Radiant Heat Flux determined from FireWind modelling (kW/m ²)	CV1(a) acceptance criteria (kW/m ²)	Pass/Fail
0	60.59	< 80	Pass
1	37.92	< 40	Pass
3	18.76	< 20	Pass
6	9.386	< 10	Pass

Table 12.2: Radiant heat flux values for the subject worst-case scenario. All window openings are demonstrated to be within the acceptance criteria.

Note that any attenuation provided by the proposed attenuation screens is not incorporated into the analysis for CV1(a). An emissivity of 1 is assumed for the modelling process whereas it is expected that attenuation of 30% - 40% would be likely to occur in a real fire situation. This approach is taken to account for the severe temperatures that may impact on an attenuation screen affixed to an opening in the room of fire origin (acknowledging that at some point the screen may fail or display a reduced effectiveness due to severe deformation).

It is shown that the subject windows meet the acceptance criteria of CV1(a).

Verification of CV1(b)

CV1(b) is used to verify that a fire in an adjacent building is unlikely to cause fire spread to the subject building by way of radiant heat impacting on openings.

The accepted interpretation of CV1(b) as it applies to BCA D-t-S Clause C3.2 is that a fire-rated wall and any openings within it must be capable of withstanding the radiant heat flux indicated by table CV1 (column 2) when situated a given distance within the property boundary table CV1 (column 1).

Table CV1 is given below and is also represented in graphical form in Figure 12.4:

Column 1	Column 2
Location	Heat flux (kW/m ²)
On Boundary	80
1m from boundary	40
3m from boundary	20
6m from boundary	10

Table 12.3: BCA Verification Method CV1 – Table CV1.

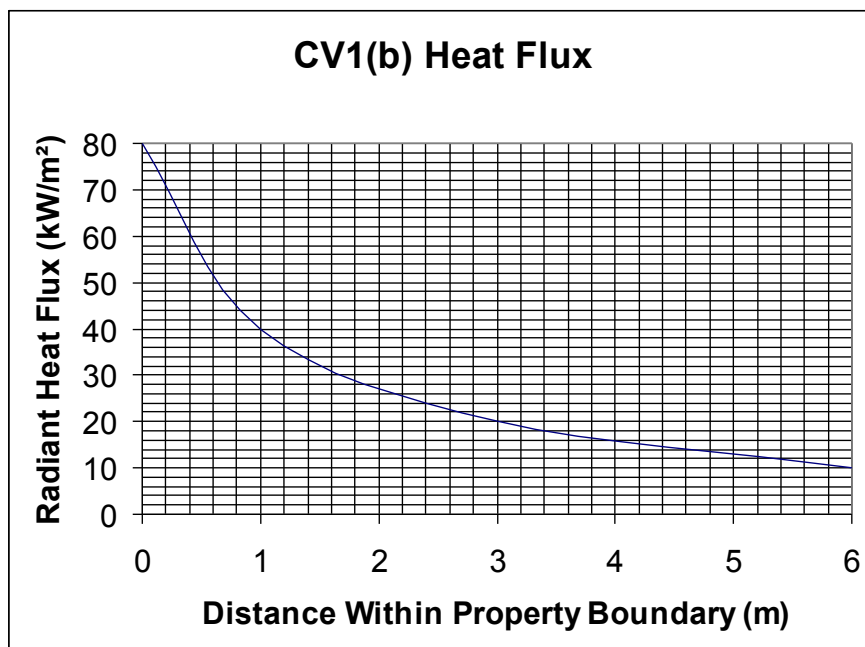


Figure 12.4: Graphical representation of Table CV1.

BCA Clause C3.2 specifies that protection of openings is only required within 3m of a property boundary. It can be inferred from this that any opening greater than 3m from the property boundary is D-t-S and therefore, referring to Table CV1, any opening receiving less than 20kW/m² is considered to be at a safe level of exposure.

Thus, for instance at a distance of 1m, the attenuation levels would have to be minimum 50% to reduce the heat flux of 40kW/m² to at least 20kW/m² (which would be the same as radiation received at 3m, for which protection is not required). From distance of 1.5m to 3m, attenuation of minimum 40% should achieve reduction of the radiant heat flux below 20kW/m².

The evaluation of openings using CV1(b) does not take into account the opening size or orientation. The only parameter of significance is the distance between the opening and the property boundary. Therefore satisfying the CV1(b) requirement for a given distance from the property boundary automatically achieves verification for all such openings at that distance.

Note: The radiant heat attenuation screens used for the following analysis are assumed to remain in place and to retain the level of performance achieving minimum 40% attenuation when subjected to incident radiant heat (if located between 1.5 – 3m from the property boundary).

Provision of radiant heat attenuation screens is considered sufficient to reduce the incident radiant heat flux to acceptable levels for any opening equal or greater than 1.5m from the property boundary, as indicated in Table 12.4 below. The minimum required attenuation screen performance is determined from the expected incident radiant heat (interpolated from Figure 12.4

that graphically represents the BCA Verification Method's CV1(b) acceptance criteria) at various distances within the property boundary.

Distance from property boundary (m)	Radiant heat interpolated from CV1 heat flux graph (Figure 12.4) (kW/m ²)	Minimum level of attenuation	Prediction of Incident Radiant heat flux expected on opening (kW/m ²) with screen provided
1	40	50%	20
1.5	32	40%	19.2
1.6	31	40%	18.6
1.7	30	40%	18.0
1.8	29	40%	17.4
2.0	27	40%	16.2
2.5	23	40%	13.8
3.0	20	40%	12.0

Table 12.4: Radiant heat attenuation screens with a minimum 40% attenuation performance are demonstrated to reduce the incident radiant heat to <20kW/m² for any opening located equal or greater than 1.5m from the property boundary.

The attenuation screens are shown to reduce the incident radiation below the required 20kW/m² acceptance level. CV1(b) is therefore considered to be satisfied for any opening equal to or greater than 1.5m from the property boundary provided that it is protected by a radiant heat attenuation screen achieving at least 40% attenuation.

In addition to the residential SOU window openings located less than 3m from the property and addressed in the above analysis, it is also identified that unprotected openings occur in the external walls on the Ground Floor surrounding the driveway serving the 'basement' carpark. In accordance with the BCA Clause C3.1(c) the openings between building elements such as columns, beams and the like, in the plane formed at the construction edge or perimeter of the building, are deemed to be openings in an external wall. The outline of Level 1 above the driveway forms the construction edge and thus the open planes on the south and west side of the driveway are considered openings and since these are located less than 3m from the western property boundary, they are required to be protected and are therefore in variation with the BCA D-t-S Provisions.

It is proposed to address this variation by a qualitative analysis provided in the following discussion. The intent of providing protection to openings in external walls is to maintain the fire resistance levels of walls that are required to be fire resistant due to their proximity to a fire source feature – a property boundary. It is considered that by protecting the openings, potential for fire spread between adjacent properties is limited however the fire spread is a function of available

combustible materials and the impacting radiant heat rather than the characteristics of the opening itself.

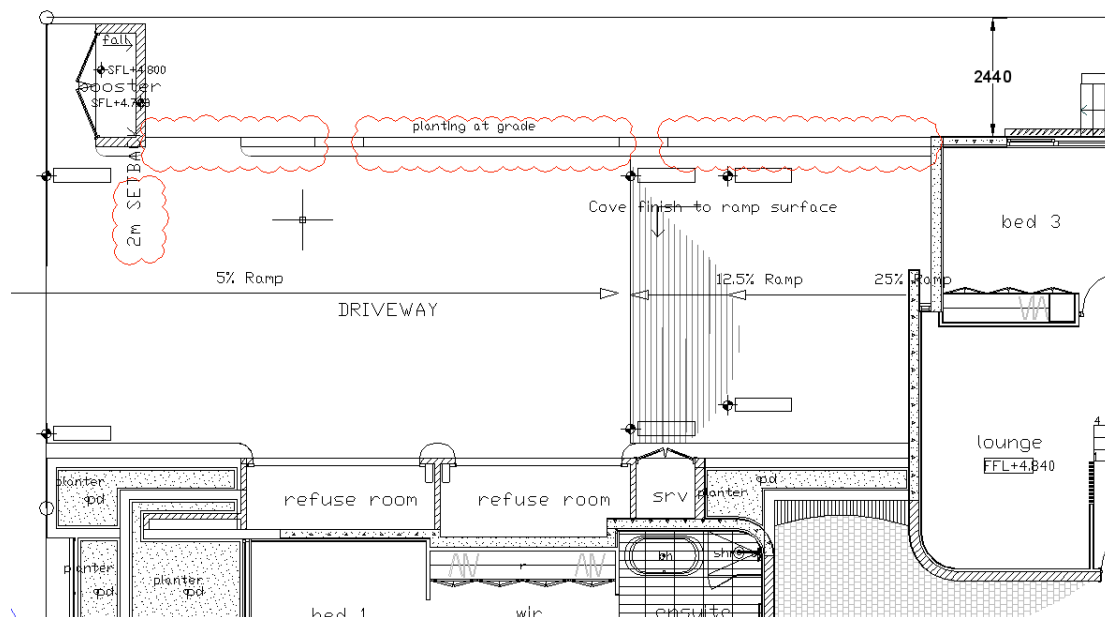


Figure 12.5: Unprotected openings in the external wall adjacent the driveway located less than 3m from the property boundary.

Given the use of the driveway for car movement and no carparking available on the Ground Floor level, it is considered very unlikely that a car will be located on the driveway at a position less than 3m from the property boundary where it would represent a potential combustible fire load that could be subject to fire spread from a fire occurring on the adjacent property or vice versa, it is considered very unlikely that a car would be on fire when located on the subject driveway.

It is therefore considered that there is a distinct lack of combustible materials that could become involved in fire when impacted upon by radiant heat from the fire source feature or vice versa, that could result in a fire size that would impact on the adjacent property via the unprotected openings. Note that the refuse rooms are located at least 6m from the construction edge and the subject openings and thus should be at a sufficient separation distance to not be subject to a radiant heat impacting from the fire source feature.

It is also considered that due to the substantial openness of the subject driveway and the associated natural ventilation provided in the area, a potential fire occurring on the driveway would be well ventilated and collection of hot gases that could result in increased radiation from the fire is not likely to occur.

The construction edge is measured at 2.45m from the property boundary, when the additional column thickness of 200mm and kerb thickness of 190mm is added to this distance, the driveway is located at 2.84m from the property boundary. A car representing the only reasonable fire load that

can be expected to be located on the driveway is not likely to be positioned immediately against the kerb and thus the shortfall of some 160mm from being at a separation distance of 3m from the property boundary and the combustible fire load is considered to be negligible. The potential for fire spread from or to the subject driveway is considered to be sufficiently limited by the separation distance achieved and the use and associated lack of combustible materials located on the subject driveway.

All openings in the subject building measured less than 3m from the property boundary are considered to be demonstrated to comply with the requirements of the CV1 verification method or by a qualitative analysis. The performance requirements of CP2 are considered satisfied using the BCA Assessment Method A2.2(2)(b)(i). An adequate level of performance is demonstrated to be maintained (by openings in the building's bounding construction) and therefore the performance requirements of CP2 are considered satisfied. The indirectly affected Performance Requirements of CP1 are also considered to be satisfied.

Design Issue 2 – Fire Brigade Booster facility is located <10m from the building.

The proposed location/protection of the Fire Brigade Booster (FBB) assembly does not meet the requirements of AS2419.1. The BCA requires that when a fire hydrant system is provided in a building it must be installed in accordance with AS2419.1. In turn, AS2419.1 requires a FBB to be located either within or affixed to the external wall of the building, in which case it must be separated from the building by a fire rated wall extending above and to the sides of the fire hydrant outlets (for a distance of not less than 2m each side of and 3m above the upper hose connections – effectively minimum 4m above the finished floor level); or remote from the building, in which case it must be located not less than 10m from the external wall of a building it serves and no fire rating is required as the distance is deemed to be sufficient to limit any exposure hazard from a fire occurring in the building.

The Fire Brigade Booster assembly is located on the south-west of the allotment on the Ground Floor (Level 1) adjacent to the driveway serving the 'basement' carpark and immediately adjacent to the overhang of Level 1 and thus effectively at the opening in the external wall of the building on the Ground Floor. The FBB is accessible by fire tender from the public road (McConnell Street).

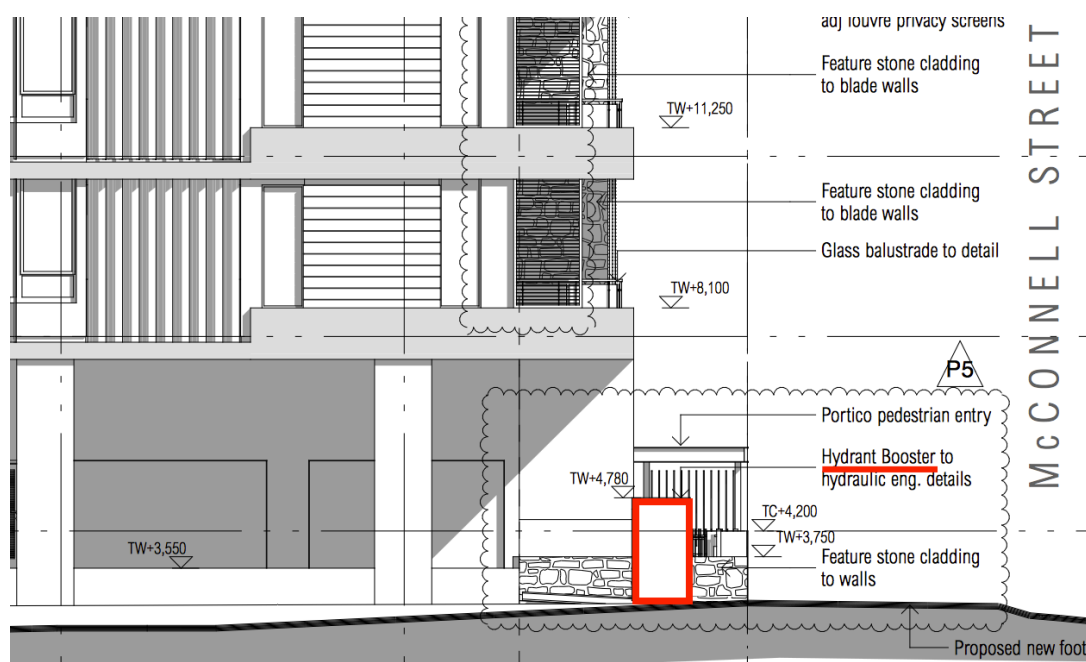


Figure 12.6: Location of the FBB enclosure.

The wall protecting the FBB from exposure to the building is not proposed to achieve dimensions required by AS2419.1 for not only aesthetic but also practical reasons. As a result of the proposed configuration of the building, a potential exposure of the FBB exists from a fire occurring within the driveway (considered to be a low likelihood of occurrence) or in Unit 101 located directly above. The proposed location therefore does not meet the requirements of AS2419.1 and therefore represents a variation to the BCA D-t-S Provisions.

It should be noted that on Levels 1 and 2 above, protection from exposure is likely to be achieved by the horizontal slab projection (approximately 2m) of Unit 101 and 201 balconies.

It is also noted that the proposed location of the FBB is in variation with AS2419.1 Clause 7.3(d)(i) as it is located not “within sight of the main entrance to the building”. The main entrance is located on the east side of the building at the end of the pathway along the east side connecting to the public road, whilst the FBB is located on the driveway on the south-west corner of the allotment. It is understood that the requirement is to facilitate the fire brigade intervention and enable visual communication between the crew operating the FBB and the fire fighters entering the building on fire or egressing from the building. It is understood that the communication can be achieved via two-way radio communication between the fire crews. The proposed location is subject to QFES acceptance of this operational variation.

The risk associated with the FBB not being provided at 10m from the external walls is in the potential exposure of the fire fighters operating the FBB to the radiant heat flux from the fire situation occurring in the building. Note that AS2419.1 uses the term ‘external wall’ as opposed to

‘openings in the external wall’, and does not take into account the actual location of any openings that could result in direct exposure to a compartment fire.

The intended protection of fire fighters is considered to relate to the time when the fire fighters are at the FBB and not as they are approaching the FBB as such protection (maintaining 10m distance from any external walls) could not be achieved when the FBB is located within or affixed to the external wall and the fire fighters could be exposed to radiant heat as they are approaching the FBB. In the subject configuration, the fire fighters should be able to approach the FBB from the street without passing in front of the building openings located less than 10m from the FBB.

The characteristics of radiant heat transfer are similar to the visible light that transfers energy via electromagnetic waves. There are several factors affecting radiant heat transfer and the predominant one is the distance between an emitter and a receiver (hence the requirement for minimum 10m distance) and their mutual configuration (how well they can ‘see’ each other).

Secondary, the area and temperature of the emitter are important factors affecting the radiant heat flux received by objects in the vicinity of the emitter. Prolonged exposure to radiant heat increases the temperature of the target and the likelihood of adverse effects. In terms of human exposure to radiant heat, this can result in injuries (superficial burns and blistering), overheating and dehydration and ultimately to death.

Similarly to obstacles in the path of visible light creating a shadow, obstacles in the path of radiant heat that absorb the heat energy from the source and do not emit this energy further (i.e. inert materials like concrete) can create a shadow and limit the effects of radiant heat flux on the target on the other side.

It is therefore proposed to combine the rationale of the two options for protection for FBB provided by AS2419.1 and provide a fire rated enclosure surrounding the FBB from the rear, sides and top that will effectively replicate the protection afforded by a D-t-S FBB located within the external wall with the added benefit of protection from above (in a D-t-S configuration there may be debris falling from above with no protection afforded to the fire fighters).

It should be noted that the AS2419.1 requirement for control valves to be located within 150mm from the face of the FBB enclosure is not applicable to this case and a minimum clear depth of 600mm is to be provided as well as minimum clear height of 2.1m so that the fire fighters operating the FBB can step inside the enclosure and be protected by the fire rated structure of the enclosure (FRL90/90/90).

It is required that the hydraulic services consultant/contractor include the detail of the FBB fire rated bunker and dimensions on their drawings.

It is therefore considered that adequate protection of fire fighters operating the FBB can be provided in a manner that is equivalent to the Deemed-to-Satisfy Provisions and the Performance Requirements of EP1.3 should therefore be satisfied.

13. DESIGN, CONSTRUCTION, COMMISSIONING AND MAINTENANCE

13.1. Design

The D-t-S fire safety features and any additional recommendations developed in this FER must be fully designed in detail in accordance with the appropriate Australian Standards, other design codes, legislation and regulations relevant to the project.

All designers must provide the required “Form 15” Compliance Certificate in accordance with the Building Act 1975 (Sections 10 & 50) and Building Regulation 2006 (Sections 46 & 48).

13.2. Construction and commissioning

All fire safety systems must be thoroughly constructed (installed) and commissioned in accordance with the relevant Australian Codes and Standards, and appropriate documentation completed. Note that some Australian Standards (such as AS2118 and AS1670) have specific additional installation certification.

All installers and contractors must provide the required “Form 16” Inspection Certificate in accordance with the Building Regulation 2006 (Sections 32, 43, 44, 46 & 47).

13.3. Maintenance

The Fire and Emergency Services Act 1990, Part 9A and the Building Fire Safety Regulation 2008, call up the on-going duties of building owners and occupiers which must be adhered to. These regulations also outline the requirements with regards to annual notification to the QFES regarding maintenance of special fire services, and the inspection and audit powers of the QFES.

The performance of the fire and life safety provisions is extremely important for the overall capability of the building to perform successfully under fire and evacuation conditions.

It is therefore of paramount importance that all fire safety provisions are maintained and used as originally intended. Specific requirements for inspections, testing and maintenance required under the Queensland Building Act, BCA and Australian Standards are required to be met. The requirements of the Building Fire Safety Regulation need to be observed and in particular fire and evacuation plans and instructions contained within the subject regulation.

The following fire safety systems are to be maintained in accordance with QDC MP6.1:

1. Fire extinguishers
2. Fire hydrant system
3. Fire doors
4. Automatic Fire Detection and Alarm System
5. Emergency lights and exit lights; Maintain in accordance with:

Emergency evacuation lighting for buildings AS/NZS 2293
Inspection and maintenance AS/NZS 2293.2
Emergency luminaries and exit signs AS/NZS 2293.3

Any future change of use, materials, paths of travel, occupant capacities or occupant types or characteristics must be addressed with this report and the conditions of Building Approval.

A record of inspections and testing should be lodged annually by the Building Manager (Body Corporate) with the Queensland Fire Emergency Services and a copy kept with the building records held on the premises and made available on request.

A suitable maintenance and management regime should be instigated (by others). The document should state specific use and limitations associated with the building and relative to the Fire Engineering Report.

A suitable, building specific, evacuation management plan is to be prepared for the building (by others). The subject plan is to be instigated and managed by the Building Manager (Body Corporate).

It is the responsibility of the Building Manager to adequately maintain the fire safety provisions in this building and to manage the safe evacuation of occupants in a fire emergency.

14. FIRE SAFETY MANAGEMENT

The Management in Use document is not assumed to be required for this building as the Performance Solution and the Fire Safety Requirements contained in this report do not effect operation of the subject building or the occupant evacuation in a fire emergency.

A formal evacuation plan, including the posting of procedures shall be implemented in accordance with AS3745-2010 (Amendment 1).

In the event of a change in building ownership or occupancy, BDA Fire recommends that the Building Owner ensure the FER be transferred to the new owner/occupier, and reviewed to assess its suitability. Where the building undergoes a change of use or change in design from the drawings referenced in this document, it should be referred to BDA Fire or another suitably qualified fire engineer for review.

15. OBJECTIVES

The objectives of the analysis are limited to achieving compliance with the Performance Requirements of the BCA as detailed below.

15.1. Legislative Objectives

The BCA has a number of Objectives that a building design should achieve in terms of fire safety. These objectives generally intend to:

- Safeguarding occupants whilst evacuating a building during a fire;
- Facilitating the activities of emergency services personnel;
- Providing facilities for occupants and the fire brigade to undertake fire-fighting operations;
- Preventing the spread of fire between buildings;
- Protecting other property from physical damage caused by structural failure of a building as a result of fire.

15.2. Client Objectives

It is understood that client's fire safety objectives for this building are limited to compliance with the Performance Requirements of the BCA. Compliance with the Performance Requirements of the BCA is considered by building regulations as providing adequate life safety and minimising the risk of fire spread within and between buildings to an acceptable level.

Consequently the strategy described within this document does not attempt to provide protection of the building fabric and contents as it is not a building regulatory issue and is considered as an issue solely for the building owner.

15.3. Fire Brigade Objectives

The QFES are required by their legal charter to protect life, property and the environment. The property protection objective of the QFES includes the subject property as well as other property (i.e. adjacent property). The objective of the proposed fire design for this building is therefore based on providing adequate means to facilitate QFES activities, as called up in the BCA.

15.4. Environmental Objectives

Environmental objectives are not included in the analysis.

16. ASSUMPTIONS

The following assumptions apply to the FER:

- 1) Fire safety installations are expected to be maintained in working order and fire safety provisions are expected to be provided and function as intended by the design.
- 2) It is expected that good housekeeping procedures would occur and egress provisions would be maintained at all times.
- 3) Occupants are considered to be familiar with or able to determine appropriate egress routes.
- 4) Occupants are considered to have a basic understanding of the fire safety installations in the building and to be able to interpret a fire alarm and react in a pre-determined way.
- 5) A suitable Evacuation Management Plan is assumed to have been instigated and managed by the Building Manager (Body Corporate) and incorporating the requirements supporting the Performance Solutions contained in the building.

17. LIMITATIONS

The following limitations apply to the FER:

- 1) BDA Fire accepts no responsibility for the design or installation of the building fire safety systems provisions or building construction. Review of design and construction issue documentation by BDA Fire relative to this FER will only be undertaken on a formal request and on the formal issuing of such documentation to BDA Fire.
- 2) The analysis is limited to the design issues identified in Section 1.
- 3) This FER has been formulated to provide a Performance Solution for the subject building as it relates to the BCA. Assessment of this FER is required to be undertaken by the Building Certifier and QFES as part of the Building Approval Process.
- 4) The use of the Australian Standards provides a pivotal role in deriving a solution to the design issue and is used in this FER in providing an outcome.
- 5) Calculations undertaken, whether this is in the form of simple hand calculations or use of computer models, are provided as secondary support mechanisms for FER outcomes.
- 6) 24 hour/ 7 days a week usage of the building is considered.
- 7) Terrorist acts, bomb threats or multiple fire starts are not considered in the FER.
- 8) Advice on any insurance issues has not been sought by BDA. Insurers are not nominated as being part of the FEB team and are outside of this fire safety analysis process.
- 9) The fire safety analysis detailed within the FER has been carried out in consultation with the stakeholders and is inclusive of a consensus/Delphi approach to the solution being utilised.
- 10) The FER is limited to describing the Performance Solution(s) and the fire safety provisions and aspects thereof. This report assumes all BCA Deemed-to-Satisfy Provisions are to be met except where varied by the Performance Solution contained within the FER.
- 11) Dissemination of information and actions required to be taken by others as contained in this FER, is not the responsibility of BDA Fire.

APPENDIX A FIREWIND RESULTS

CV1(a) Verification

Radiant Heat at the property boundary for four window openings (input as two) in the west external wall of the building located at a 2.44m distance from the property boundary.

Program Radiation

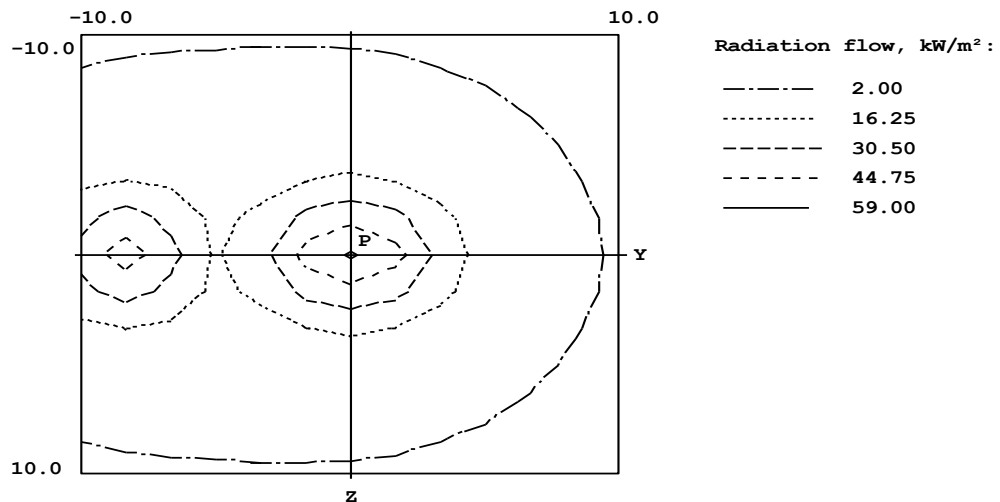
(All dimensions are in meters)

X-sources:

Radiation temperature 1100°C

Distance	Offset		Size of source		Opening
X	Yx	Zx	Y	Z	%
2.44	0	0	4.55	2	100
2.44	-8.3	0	2.245	2.9	100

RADIATION MAP YZ



Nodal radiation data, kW/m²:

Z \ Y	-10.00	-5.00	0.00	5.00	10.00
-10.00	1.358	1.659	1.658	1.150	0.598
-5.00	6.290	6.194	8.403	3.908	1.145
0.00	35.00	14.80	60.59	10.68	1.583
5.00	6.290	6.194	8.403	3.908	1.145
10.00	1.358	1.659	1.658	1.150	0.598

Orientation of maximum radiation flow

at point P(0,0,0): $\theta = 90.0^\circ$, $\varphi = -1.4^\circ$

CV1(a) Verification

Radiant Heat 1m within the adjacent property boundary for four window openings (input as two) in the west external wall of the building located at a 2.44m distance from the property boundary.

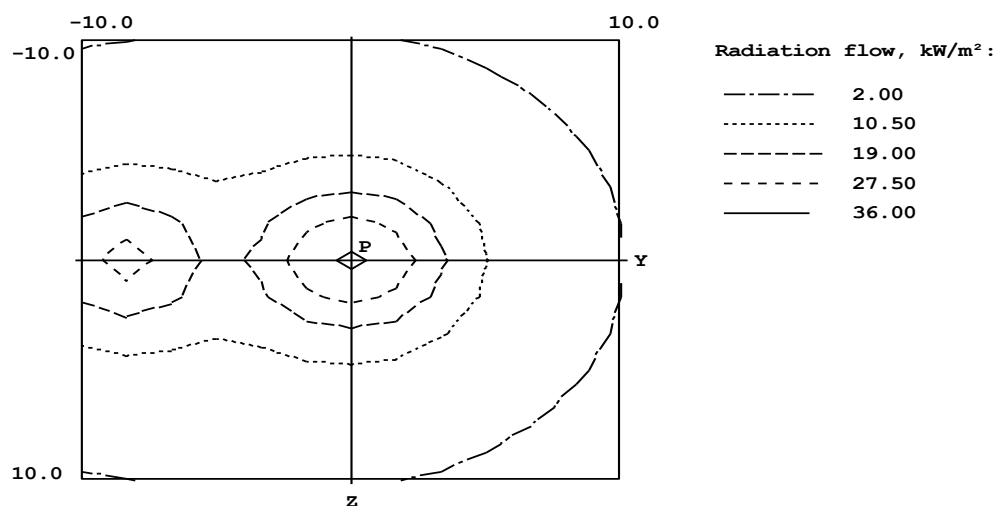
Program Radiation

(All dimensions are in meters)

X-sources:

Radiation temperature 1100°C

Distance	Offset		Size of source		Opening
X	Yx	Zx	Y	Z	%
3.44	0	0	4.55	2	100
3.44	-8.3	0	2.245	2.9	100

RADIATION MAP YZ**Nodal radiation data, kW/m²:**

Z \ Y	-10.00	-5.00	0.00	5.00	10.00
-10.00	1.788	2.184	2.174	1.526	0.810
-5.00	6.988	7.399	9.311	4.708	1.511
0.00	24.22	16.15	37.92	10.74	2.049
5.00	6.988	7.399	9.311	4.708	1.511
10.00	1.788	2.184	2.174	1.526	0.810

Orientation of maximum radiation flow

at point P(0,0,0): $\theta = 90.0^\circ$, $\varphi = -2.8^\circ$

CV1(a) Verification

Radiant Heat 3m within the adjacent property boundary for four window openings (input as two) in the west external wall of the building located at a 2.44m distance from the property boundary.

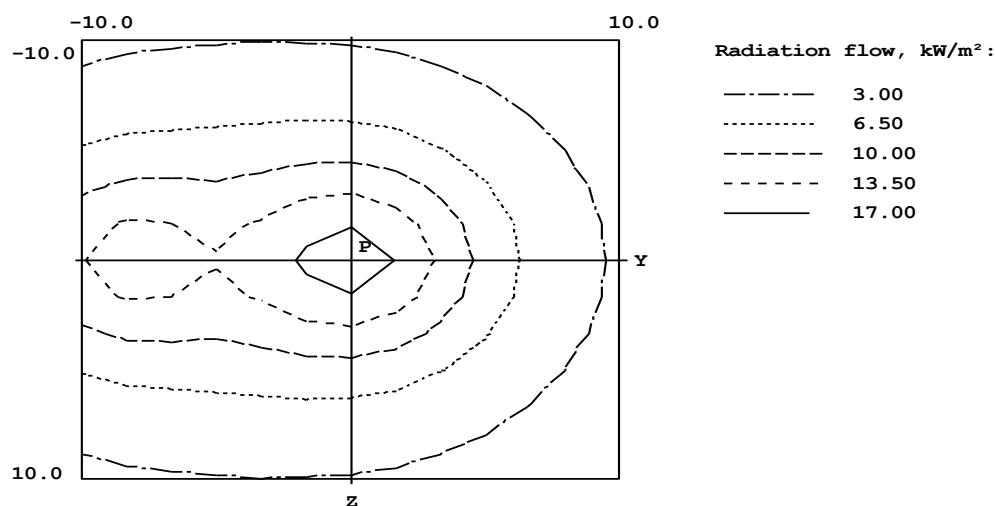
Program Radiation

(All dimensions are in meters)

X-sources:

Radiation temperature 1100°C

Distance	Offset		Size of source		Opening
X	Yx	Zx	Y	Z	%
5.44	0	0	4.55	2	100
5.44	-8.3	0	2.245	2.9	100

RADIATION MAP YZ**Nodal radiation data, kW/m²:**

Z \ Y	-10.00	-5.00	0.00	5.00	10.00
-10.00	2.349	2.861	2.823	2.040	1.144
-5.00	6.648	7.809	8.679	5.102	1.996
0.00	13.31	13.72	18.76	8.825	2.582
5.00	6.648	7.809	8.679	5.102	1.996
10.00	2.349	2.861	2.823	2.040	1.144

Orientation of maximum radiation flow

at point P(0,0,0): $\theta = 90.0^\circ$, $\varphi = -5.9^\circ$

CV1(a) Verification

Radiant Heat 6m within the adjacent property boundary for four window openings (input as two) in the west external wall of the building located at a 2.44m distance from the property boundary.

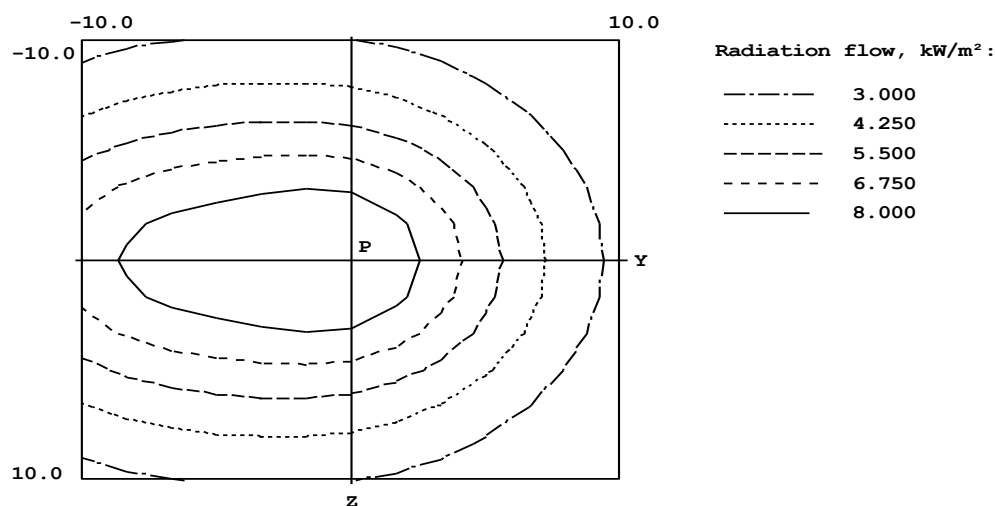
Program Radiation

(All dimensions are in meters)

X-sources:

Radiation temperature 1100°C

Distance	Offset		Size of source		Opening
X	Yx	Zx	Y	Z	%
8.44	0	0	4.55	2	100
8.44	-8.3	0	2.245	2.9	100

RADIATION MAP YZ**Nodal radiation data, kW/m²:**

Z \ Y	-10.00	-5.00	0.00	5.00	10.00
-10.00	2.570	3.082	3.014	2.288	1.410
-5.00	5.146	6.329	6.402	4.375	2.202
0.00	7.284	8.906	9.386	5.992	2.665
5.00	5.146	6.329	6.402	4.375	2.202
10.00	2.570	3.082	3.014	2.288	1.410

Orientation of maximum radiation flow

at point P(0,0,0): $\theta = 90.0^\circ$, $\varphi = -9.0^\circ$

APPENDIX B FIRE ENGINEER'S CV**NAME: MARK PHILLIP SHARPLES****ADDRESS: PO BOX 1235
MALENY QLD 4552
AUSTRALIA****CONTACTS: BUSINESS 61 7 5499 9881
MOB 0407 591 187
EMAIL mark@bdafire.com.au****DOB August 26, 1955**

- 2019 – 1999** Company Director
Building Design Alternatives Pty Ltd trading as BDA Fire – Own company
Providing services in Performance Based Fire Safety Assessments,
Building Code advice, Fire Systems Design, Fire Safety Consulting
Services including audits, evacuation plans
- 1999 – 1998** Manager
Building Safety Services Pty Ltd a business unit of Lincoln Scott Australia Pty
Ltd
Specialising in Fire Modelling Analysis, Performance Based Design and
Fire Risk Assessments, CFD modelling. Responsible for: budgets,
delivery of quality and cost effective product
- 1998 – 1992** Fire Services Designer and Fire Services Manager
Lincoln Scott Australia Pty Ltd
Responsible for: training, quality control, new business, design, client
liaison
- 1992 - 1985** Fire Services Discipline Leader
Crooks, Michelle, Peacock & Stewart
Fire services design, specification writing
- 1985 – 1983** Own Company providing Specialist Fire Design Services
Flaghbah Pty Ltd
- 1983 – 1981** Senior Design Draftsman Fire Protection
Wormald International (Tyco) Brisbane Queensland
Design, site supervision, project manager, estimating
- 1980 – 1979** Grade 3 Draftsman
Fire Control Pty Ltd (Tyco) Sydney NSW
- 1979 – 1976** Draftsman in Fire Protection
Wormald International (Tyco), Sydney NSW
- 1976 – 1973** Trainee Draftsman (fire protection systems)
Fire Control Pty Ltd (Tyco) Sydney NSW

Overall Fire Service Design Experience includes:

Design, documentation and administration of Automatic Fire Sprinkler Systems, Hydrants and Hose Reels, Water Spray Systems, Fire Alarm and Detection Systems and Evacuation Systems, Aspirating Detection Systems and Gaseous Systems.

PROFESSIONAL INFORMATION

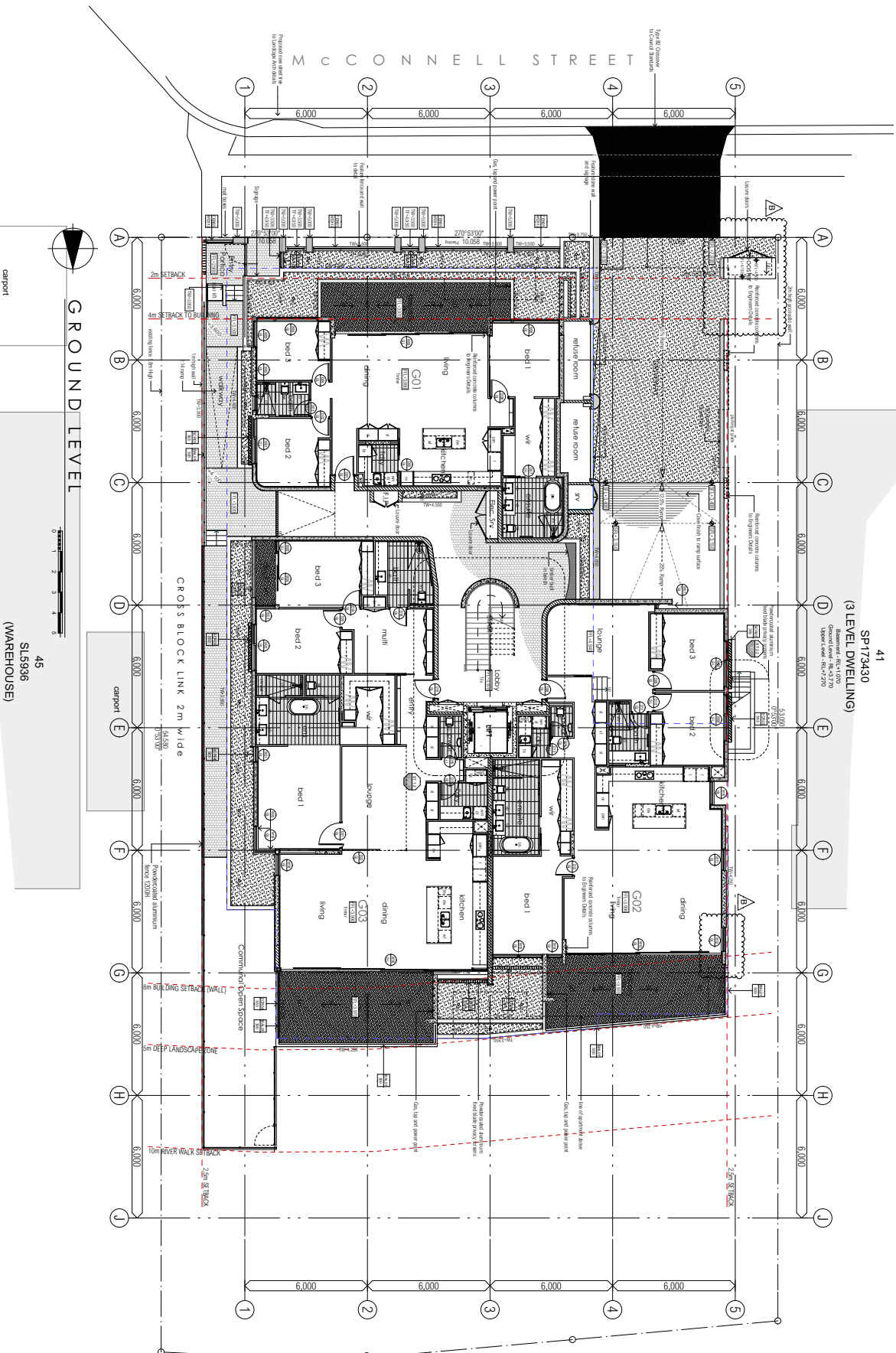
2015	CEng MIFireE, RPEQ 16019
2009	QBCC Licence – Fire Safety Professional No 1162228
2003	Masters of Fire Safety Engineering University of Western Sydney, NSW
1999	Graduate Certificate in Performance-Based Building Fire Codes Victorian University of Technology
1994	Certificate of Fire Engineering (Credit level) NSW TAFE

Current Memberships	Member - National Fire Protection Association (USA) Individual Member - Fire Protection Association Member - Institute of Fire Engineers Member - Society of Fire Safety Member - Society of Fire Protection Engineers (USA)
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APPENDIX C DRAWINGS

The following Brick Architects architectural drawings were used in preparation of this document and are provided herein for reference:

Drawing number	Revision	Date
WD.03	B	03/12/19
WD.04	B	03/12/19
WD.05	B	03/12/19
WD.07	P5	03/12/19
WD.08	P5	03/12/19
WD,510	P2	28/10/19
WD,511	P3	03/12/19
WD,512	P3	03/12/19



BRISBANE RIVER



03.12.19 B Building Approval Issue
07.11.19 A Building Approval Issue
DATE: ISSUE AMENDMENTS
BRICX
173430
173430

Proposed
Apartment Development
At
1-5 McConnell Street
Bulimba, QLD
For
DVB Projects Pty Ltd
DRAWING
Ground Level

DATE	SCALE	DRAWN
JAN 2019	1:200 (A4, 1:100 (A1))	myls
DATE NO.	DWG. NO.	REV.
NL1820	WD.03	B



BRIC
ARCHITECTS

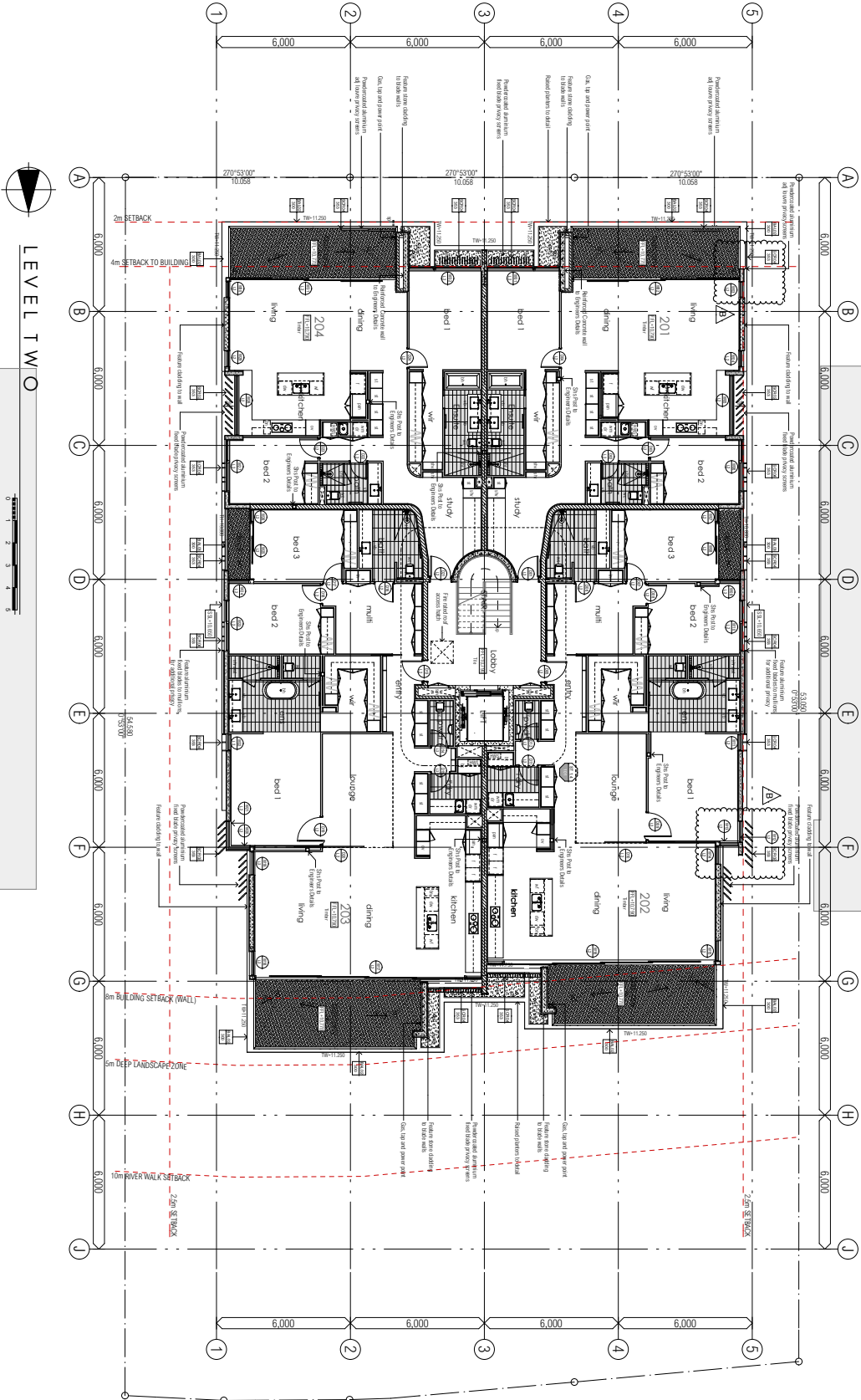
BRICKNICKS, MY LAD
Suite 25, Building 2, Lakeside Office Park
2 Ponderosa Drive, North Las Vegas, NV 89030
T + (702) 250-2707
E - info@bricknicks.com

Proposed
Apartment Development
At
1-5 McConnell Street
Bulimba, QLD
For
DVB Projects Pty Ltd

DRAWINGS
Level 1

DATE	SCALE	DRAWN
JAN 2019	1:200@A3, 1:1000@A1	mg/ds
JOB No. NL1820	DWG. No. WD.04	Rev. B

MCCONNELL STREET



41
SP173430
(3 LEVEL DWELLING)

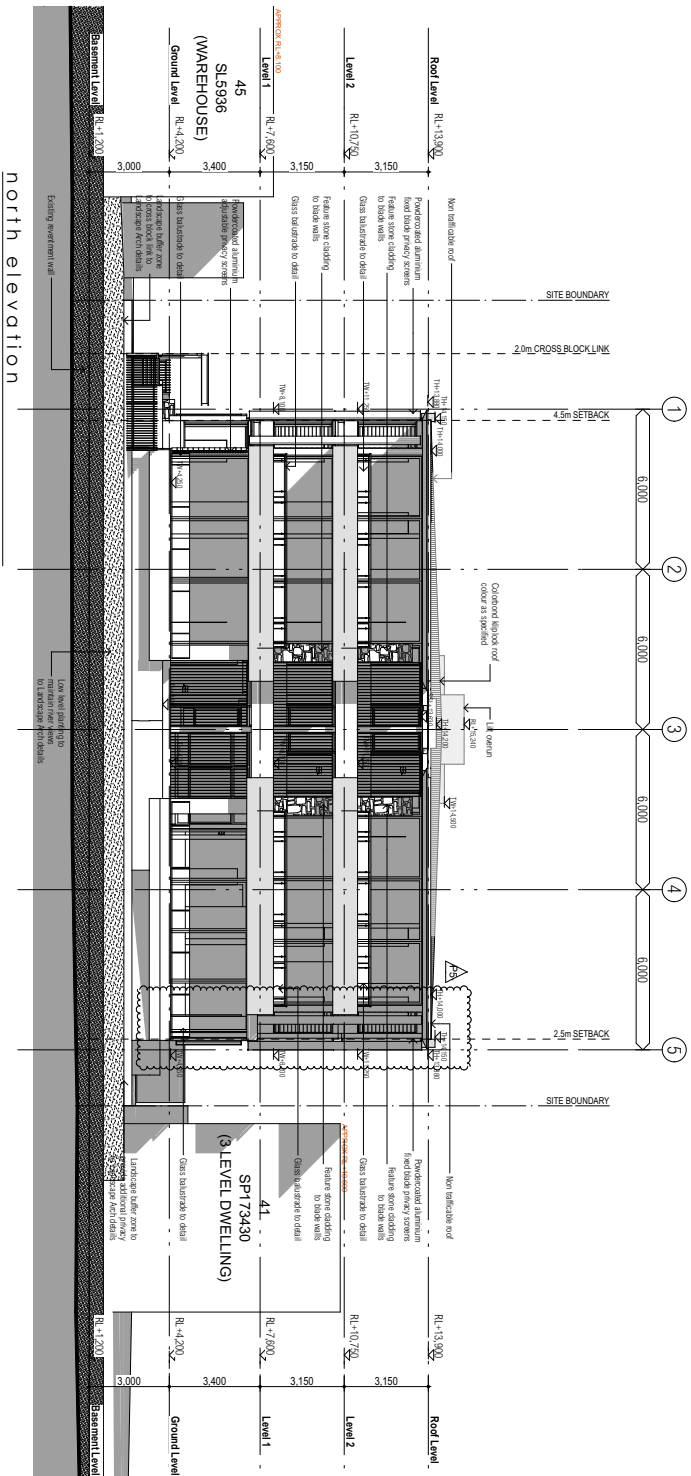
BRISBANE RIVER



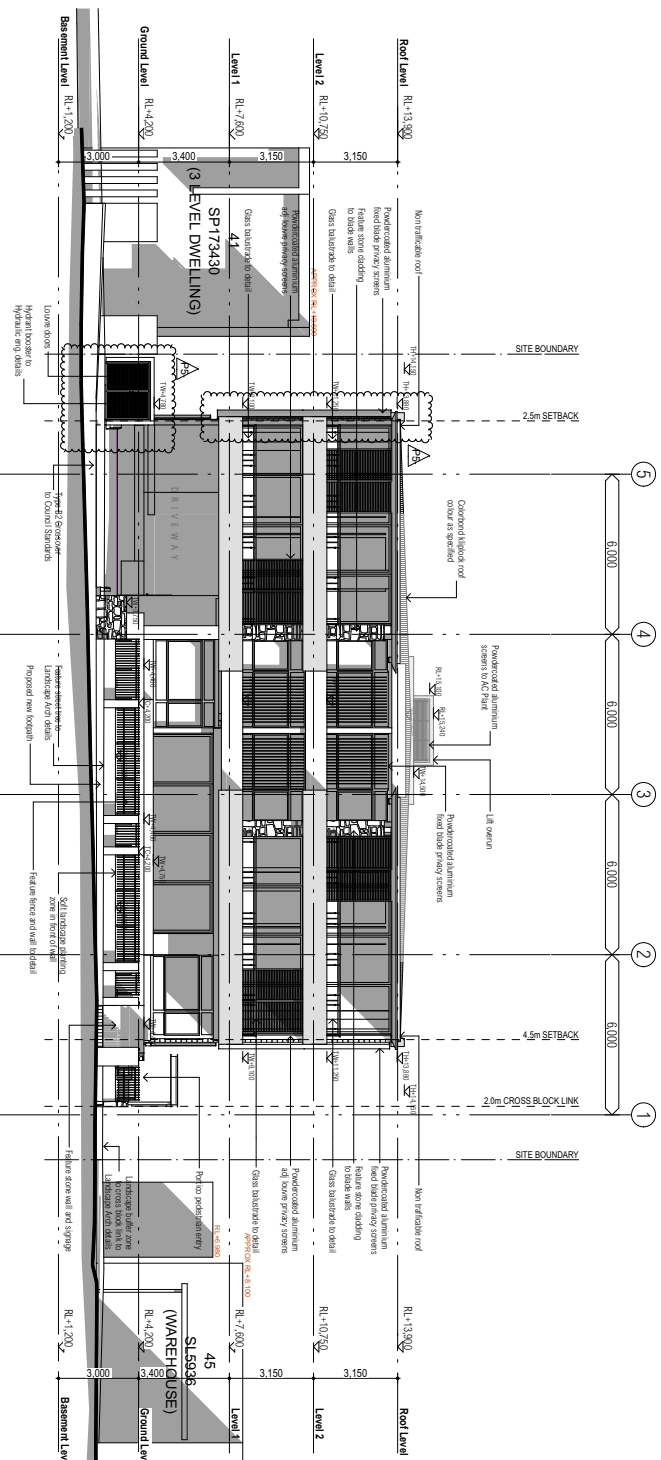
03.12.19 B Building Approval Issue
08.11.19 A Building Approval Issue
DATE: ISSUE AMENDMENTS

Proposed
Apartment Development
At
1-5 McConnell Street
Bulimba, QLD
For
DVB Projects Pty Ltd
DRAWING
Level 2

DATE	SCALE	DRAWN
JAN 2019	1:200@A, 1:100@A1	myls
DLN No.	DWG. No.	Rev.
NL1820	WD.05	B



north elevation



south elevation

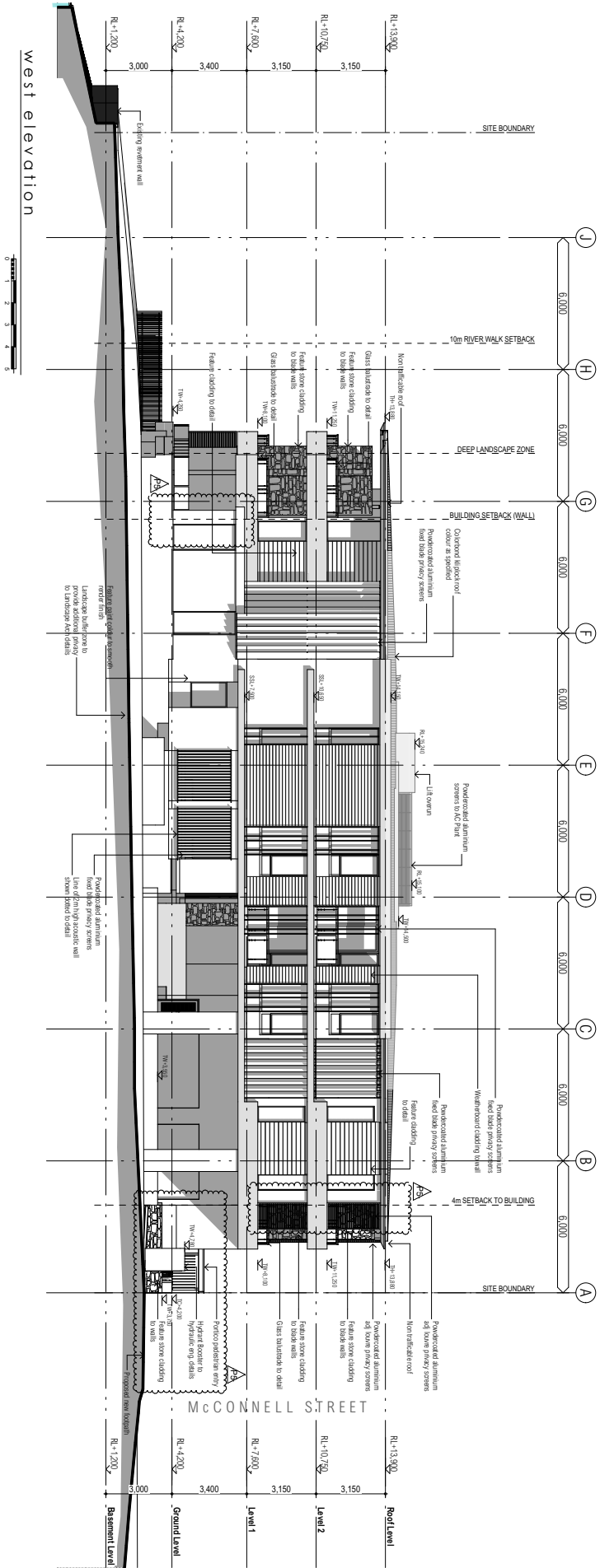
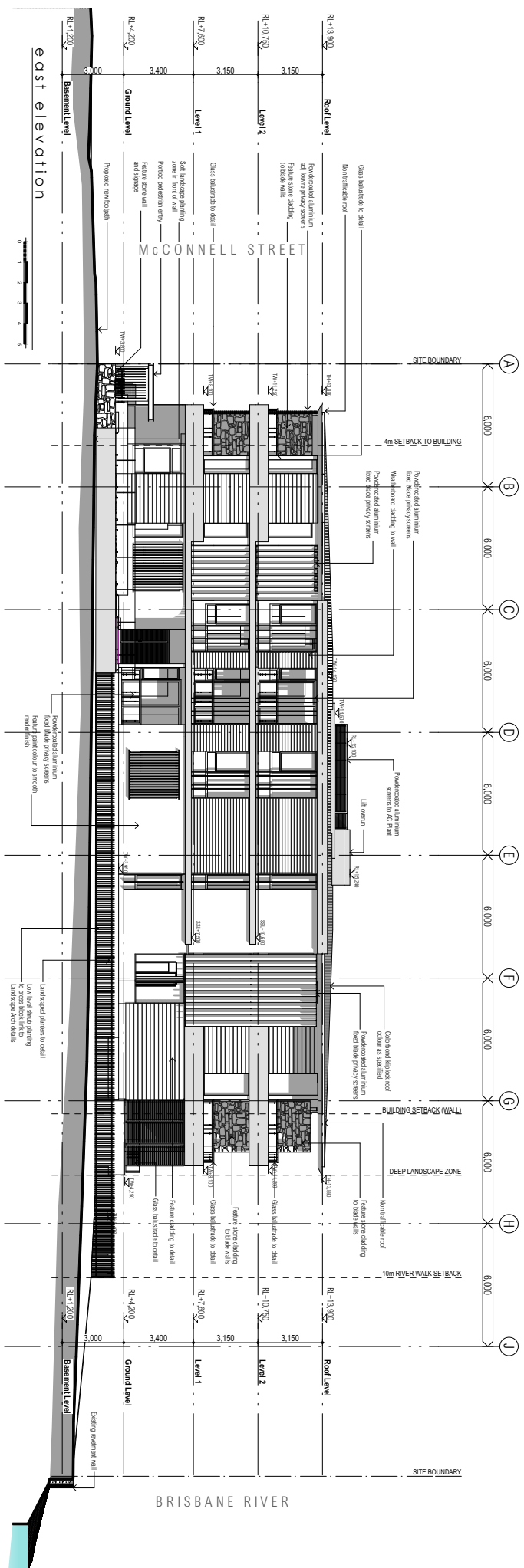


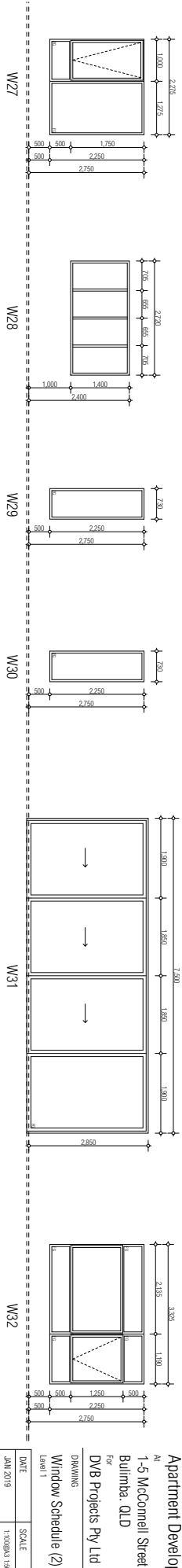
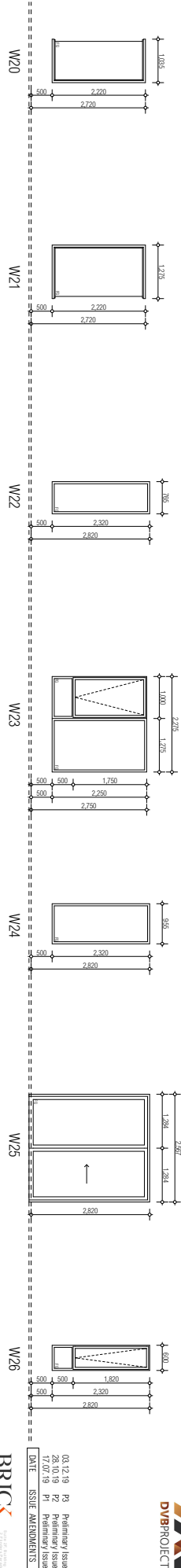
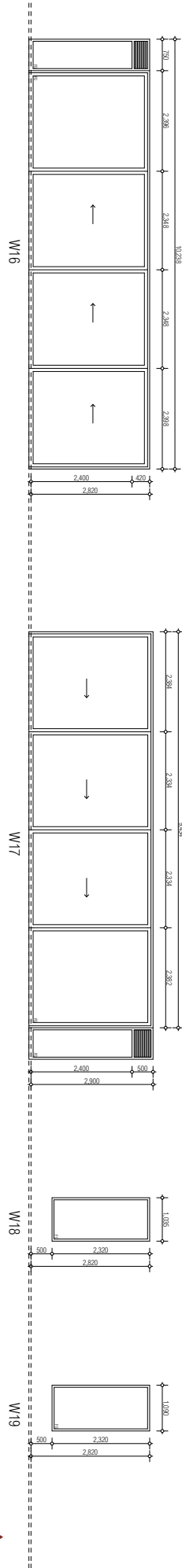
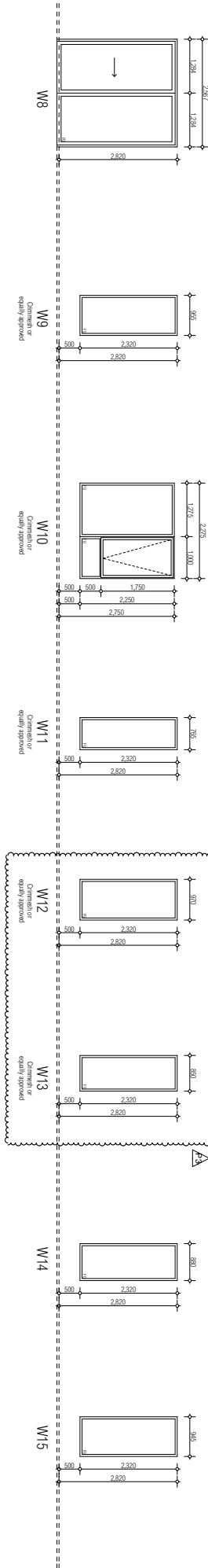
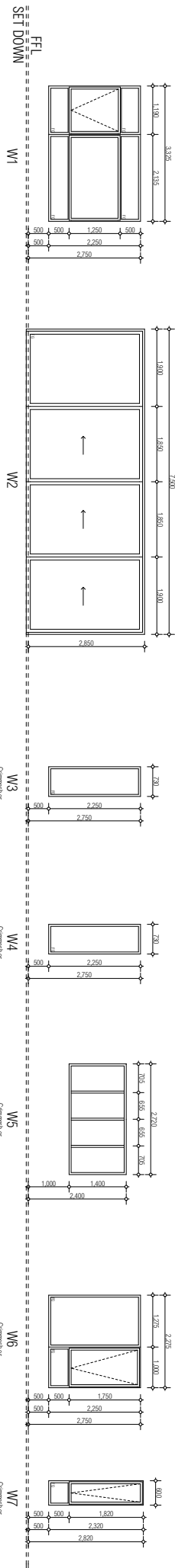
03.12.19 P2 Council Co-ordination Issue
10.01.20 P2 Council Co-ordination Issue
22.08.19 P3 Council Co-ordination Issue
27.05.19 P2 Preliminary - Pre-tender Issue
13.02.19 P1 Preliminary - Pre-tender Issue

DATE ISSUE AMENDMENTS
BRIC 1-5
BRIC 1-5

Proposed
Apartment Development
At
1-5 McConnell Street
Bulimba, QLD
For
DVB Projects Pty Ltd
DRAWING
Elevations 1

DATE	SCALE	DRAWN
JAN 2019	1:200 (A1, 1:100 (A1)	myls
DATE NO.	DWG. NO.	REV.
NL1820	WD.07	P5



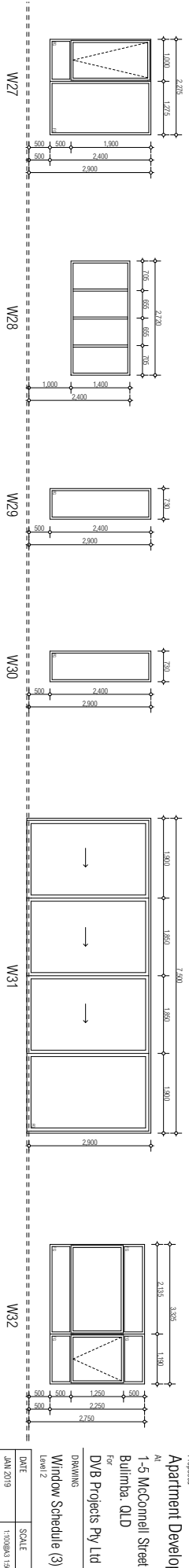
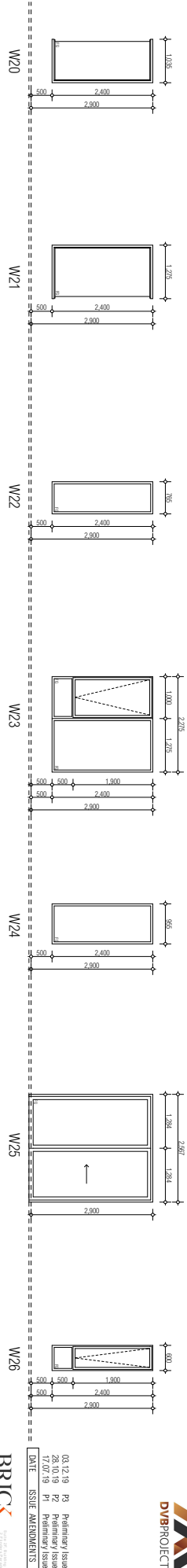
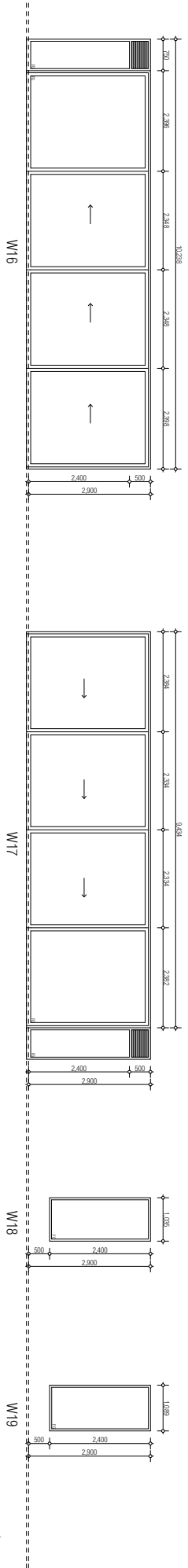
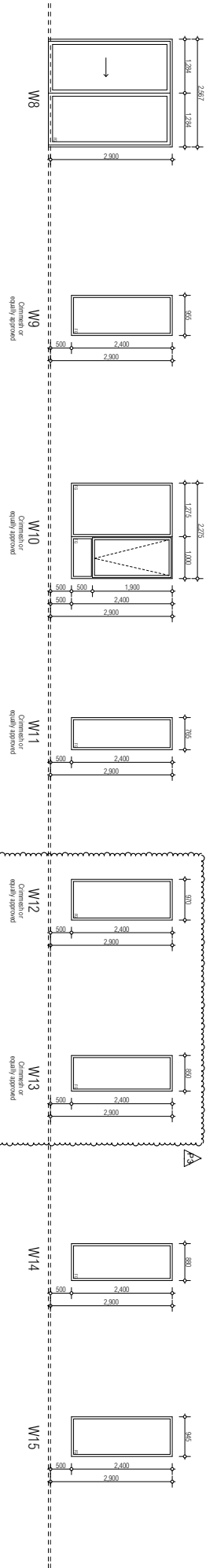
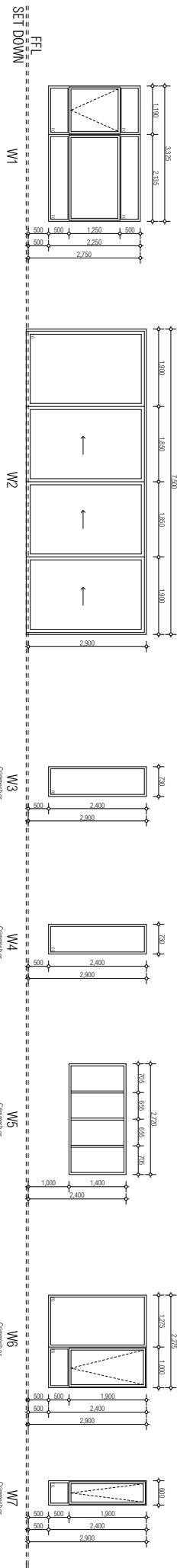


03.12.19 P3 Preliminary Issue
28.10.19 P2 Preliminary Issue
17.07.19 P1 Preliminary Issue
DATE: ISSUE AMENDMENTS

BRICX
100% Australian Owned & Operated
100% Australian Made
100% Australian Sourced

Proposed
Apartment Development
At
1-5 McConnell Street
Bulimba, QLD
For
DVB Projects Pty Ltd
DRAWING
Window Schedule (2)
Level 11

DATE	SCALE	DRAWN
JAN 2019	1:100 (AS 1500A1)	myls
DLN No.	DWG. No.	Rev.
NL1820	WD.511	P3

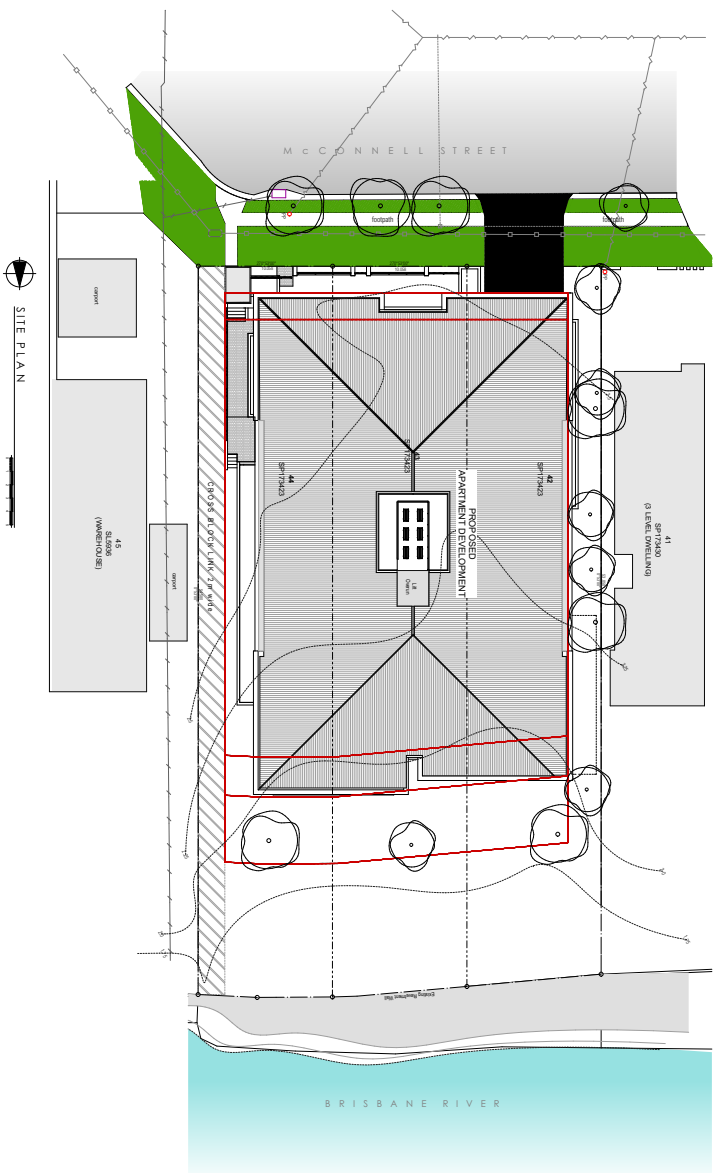


03.12.19 P3 Preliminary Issue
28.10.19 P2 Preliminary Issue
17.07.19 P1 Preliminary Issue
DATE: ISSUE AMENDMENTS

BRICX
Building Research Institute of Queensland
100 St. George's Road, Brisbane, QLD 4000
Tel: 07 3250 1000
Fax: 07 3250 1001
Email: info@bricx.com.au

Proposed
Apartment Development
At
1-5 McConnell Street
Bulimba, QLD
For
DVB Projects Pty Ltd
DRAWING
Window Schedule (3)
Level 2

DATE	SCALE	DRAWN
JAN 2019	1:100 (AS 1500A1)	mg/bs
DLN No.	DWG. No.	Rev.
NL1820	WD.512	P3



18.06.20 C Construction Issue
03.04.20 B Construction Issue
30.01.20 A Construction Issue

DATE ISSUE AMENDMENTS

BRIC BRICKWORK & CONSTRUCTION
18.06.20 C

Proposed
Apartment Development
At
1-5 McConnell Street
Bulimba, QLD
For
DVB Projects Pty Ltd
DRAWING
Site Plan

DATE	SCALE	DRAWN
JAN 2019	1:200(A4, 1:100(A1) mpts	
DATE NO.	DWG. NO.	REV.
NL1820	WD.01	C

F01 Finishes and Fixtures Schedule

Project Name: 1-5 McConnell Street

Project Address: Bulimba

Client: DVB Projects

Project Number: 19001



Date: 16.10.2020

Issue: 2

Revisions:

A	30.07.2019	Design Development
1	15.10.2020	For Construction
2	16.10.2020	For Construction

Notes:

This schedule is not to be used as the basis for procurement.

All fittings are to be ordered by contractor based on information provided in the contract set of drawings.

The schedule should be referred to for additional details & finishes for the specified items only.

Contractor to check availability & order fittings, fixtures & appliances before required on site.

All fittings to be installed as per manufacturer's recommendations and instructions.

Installation instructions for all items to be integrated into joinery to be checked against shop drawings prior to manufacture of cabinetry.

Refer to drawings for specific fitting locations.

Fixings of all fittings to be concealed unless otherwise specified.

Georgia Cannon takes no responsibility for fittings not installed or applied as per manufacturer's instructions.

All proposed substitutions or change of installation to be approved by Georgia Cannon and the Client.

All warranties and instruction booklets to be handed over to Client in good order.

If anything in the below schedule or associated documents should be found to be unclear, the Contractor will request clarification from the Designer prior to proceeding.

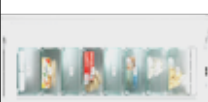
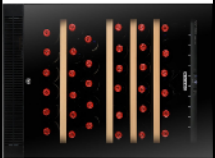
Project No: 19001
Project Name: 1-5 McConnell Street
Client: DVB Projects

Fixtures, Fitting and Equipment Schedule

Georgia Cannon Interior Design
Issue: Design Development
Date: 16.10.2020 Rev: 2

DWG Code	Item	Description	Supplier	Location	Image	Rev	Comments
FX1	Induction Cooktop	Miele 4 zone induction cooktop Code: KM 7201 FR Dims: 574W mm	Miele	Type 01, Type 05 Kitchens		1	
FX2	Wall Oven	Miele 76L pyrolytic oven Code: H 2850 BP Dims: 568W x 595H mm	Miele	Type 01, Type 05 Kitchens			
FX3		DELETED				1	
FX4	Rangehood	53cm inbuilt rangehood Code: DA 2450 Dims: 532W x 372D mm	Miele	Type 01, Type 05 Kitchens			

FX5	Integrated Dishwasher	60cm integrated dishwasher Code: G 4980 SCVi Dims: 600W x 805-870H x 570D mm	Miele	Type 01, Type 05 Kitchens	
FX6	Integrated Fridge	Integrated French Door Fridge Code: .RS90A1 Dims: 896W x 1798H x 606W mm	Fisher and Paykel	Type 01, Type 05 Kitchens	
FX7	Induction Cooktop	4 zone induction cooktop Code: KM 6357 Dims: 806W x 51H x 526D mm	Miele	Type 02, Type 03, Type 04 Kitchens	
FX8	Wall Oven	76L pyrolytic oven Code: H 7260 BP Dims: 595W x 595H x 546D mm	Miele	Type 02, Type 03, Type 04 Kitchens	
FX9	Wall Combi Oven	48L Steam Combi Oven Code: DGC 7440 Dims: 595W x 456H x 555D mm	Miele	Type 02, Type 03, Type 04 Kitchens	 1

FX10	Rangehood	90cm inbuilt rangehood Code: DA 2390 Dims: 884W x 297D mm	Miele	Type 02, Type 03, Type 04 Kitchens		
FX11	Integrated Dishwasher	60cm integrated dishwasher Code: G6767 SCVi XXL Dims: 600W x 845-910H x 570D mm	Miele	Type 02, Type 03, Type 04 Kitchens		
FX12	Vertical Freezer	Integrated Column Freezer Left Hand Hinge Code: FNS 37402 I	Miele	Type 02, Type 03, Type 04 Kitchens		2
FX13	Vertical Fridge	Integrated Column Refrigerator Right Hand Hinge Code: KS 37422 ID	Miele	Type 02, Type 03, Type 04 Kitchens		2
FX14	Underbench Wine Fridge	60cm under bench wine fridge Code: VWS050SBA-X Dims: 595W x 820H x 561D mm	Vintec	All kitchens		1

FX15	Bin	OneToFive WasteBin System to suit 450mm cabinet width Capacity: 2 x 32L buckets Code : 502.92.610	Hafele	All kitchens	Or similar approved.
FX16	Cutlery Tray	Stainless steel cutlery organiser to suit drawer dimensions	Hafele	All kitchens	Or similar approved.
FX17	Utensils Divider	Stainless steel utensils organiser to suit drawer dimensions	Hafele	All kitchens	Or similar approved.
FX18	Joinery Handle Type 1 - General Long	H-U-I-85 Urban pull handle Code : 115.98.034 Finish: Feature powder coat colour F7, refer finishes schedule Dims: 200L mm	Hafele	All below bench joinery throughout and tall joinery in laundry and secondary robes	Refer drawings for locations.
FX19	Joinery Handle Type 2 - General Short	H-U-I-85 Urban pull handle Code : 115.98.031 Finish: Feature powder coat colour F7, refer finishes schedule Dims: 100L mm	Hafele	All below bench joinery throughout and tall joinery in laundry and secondary robes	Refer drawings for locations.



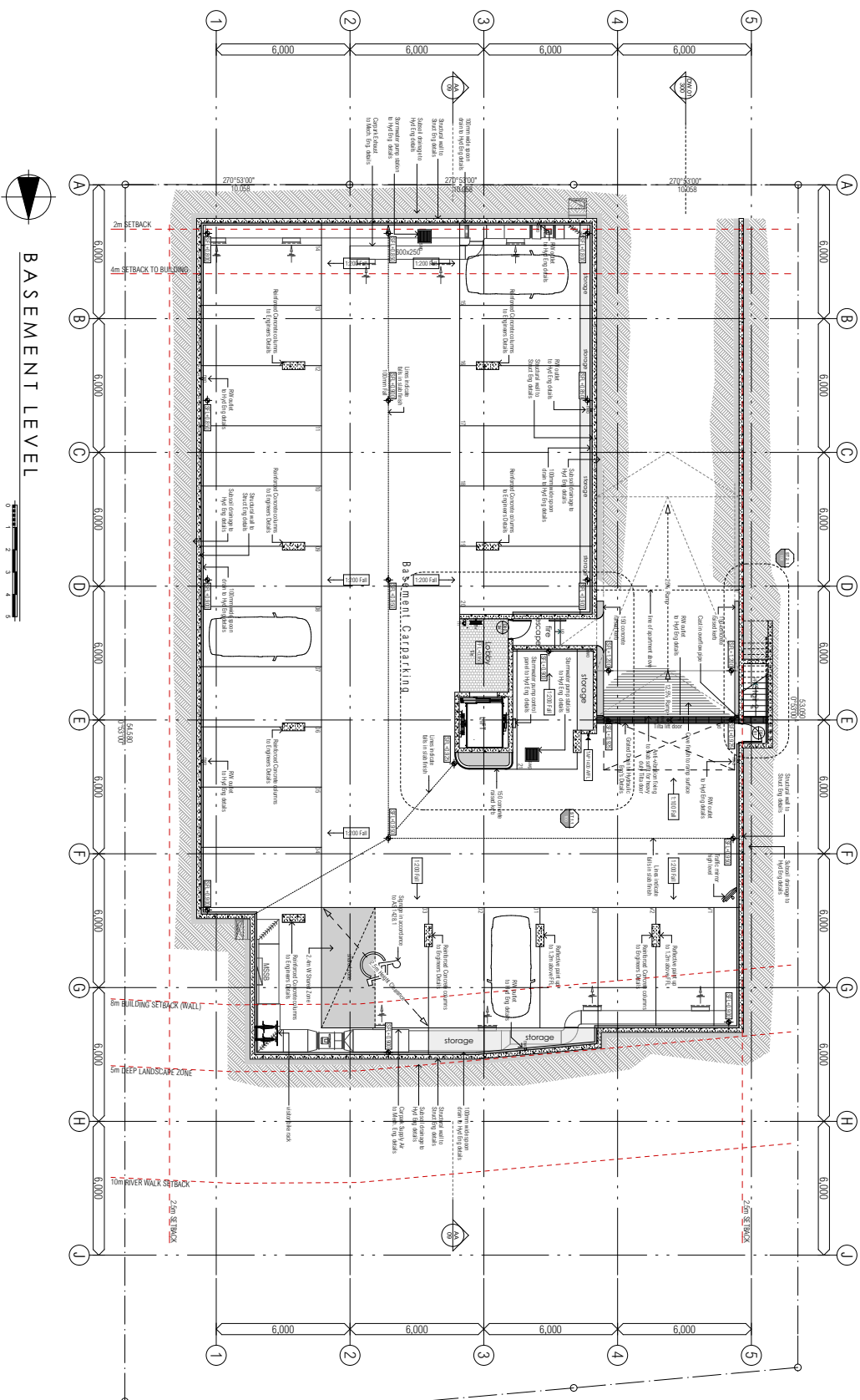
FX20	Joinery Handle Type 3 - Feature	L'ala Pull Code: R2202Z Finish: White Opaque Dims: 40W x 220L x 22D mm	Pittella	All tall joinery in kitchen, corridors and WIR	Refer drawings for locations.
FX21	Sink Mixer	Vivid Slimline P/Out Sink Mixer Finish: Brushed Nickel Code: 2310722	Reece	All kitchens	
FX22a	Undermount Sink	Franke Ancona Anx110-48 Sink Finish: Stainless Steel Code: 2400800	Reece	Type 01, Type 05 Kitchens	
FX22b	Undermount Sink	Franke Bow Bxx210-68 Sink Pack Finish: Stainless Steel Code: 2400787	Reece	Type 02, Type 03, Type 04 Kitchens	
FX23	Washing Machine	9kg front loading washing machine Code: WWG 360 Dims: 596W x 850H x 643D mm	Client	All laundries	

FX24	Dryer	9kg heat pump dryer Code: TWJ 660 WP Dims: 596W x 850H x 643D mm	Client	All laundries		1
FX25	Undermount Sink	Frankie Ancona Anx110-34 Sink Finish: Stainless Steel Code: 2400799	Reece	All laundries		1
FX26	Sink Mixer	Vivid Slimline Sink Mixer Finish: Brushed Nickel Code: 2204642	Reece	All laundries		1
FX27	Undermount Basin	Posh Solus Undercounter Basin Finish: White Code: 9508224	Reece	All bathrooms		1
FX28	Wall mounted sink mixer and spout	Mizu Drift Mk2 Wall Mounted Basin Mixer Set Finish: Brushed Nickel Code: 9509139	Reece	All bathrooms		1

FX29	Back to wall toilet suite	American Standard Heron Toilet Suite Code: .9508894 (KIT)	Reece	All bathrooms and powder rooms		1	Refer drawings for locations.
FX30	Toilet roll holder	Mizu Drift Straight Toilet Roll Holder Finish: Brushed Nickel Code: .9508232	Reece	All bathrooms and powder rooms		1	
FX31	Shower	Mizu Drift Single Waterrail Finish: Brushed Nickel Code: .9508172	Reece	Bathrooms Apartment Types 01 and 05		1	
FX32	Shower	Mizu Drift Twin Waterrail with Mizu Drift Overhead Shower 200 Finish: Brushed Nickel Code: .9508181 and 95081186	Reece	Bathrooms Apartment Types 02, 03 and 04		1	
FX33	Shower mixer	Mizu Drift Mk2 Shower Mixer Finish: Brushed Nickel Code: .9509137	Reece	All bathrooms		1	

FX34	Towel Rail	Mizu Drift Single Towel Rail 700mm Finish: Brushed Nickel Code: .9508229	Reece	All bathrooms		1
FX35	Robe Hooks	Mizu Drift Robe Hook Finish: Brushed Nickel Code: .9508231	Reece	All bathrooms and powder rooms, refer wet area elevations (D200 series)		1
FX36	Wall mounted basin	Capri Mini Wall Mounted Basin Finish: White Solid Surface Dims: 450W x 185D x 300H mm	ABI Interiors	All powder rooms		
FX37	Basin mixer	Mizu Drift Mk2 Basin Mixer Finish: Brushed Nickel Code: .9509135	Reece	All powder rooms		1
FX38	Feature Mirror	Custom 'pill' shaped mirror Dims: 700mm H x 500W Finishes: Silver backed mirror with 3mm aluminium angle frame finished in powder coat Dulux Oyster Matt	Contractor	Powder Rooms		Refer D200 Series Wet Area drawings.

FX39	Bin	OneToFive Wastebin System to suit 300mm cabinet width Capacity: 2 x 8L buckets Code: 502.92.610	Hafele	All bathrooms	Or similar approved.
FX40	Bath — Freestanding	Clark Round Freestanding Bath 1600L Finish: White Code: 2001261	Reece	Apartment Types 03, 04 — Ensuite	1
					
FX41	Bath — Back to Wall	Clark Round Back to Wall Bath 1600L Finish: White Code: 2001257	Reece	Apartment Types 01, 02 — Ensuite	1
					
FX42	Bath — Inset	Caroma Classic 1500 Island Bath Finish: White Code: 2005725	Reece	Apartment Type 05 — Ensuite	
					

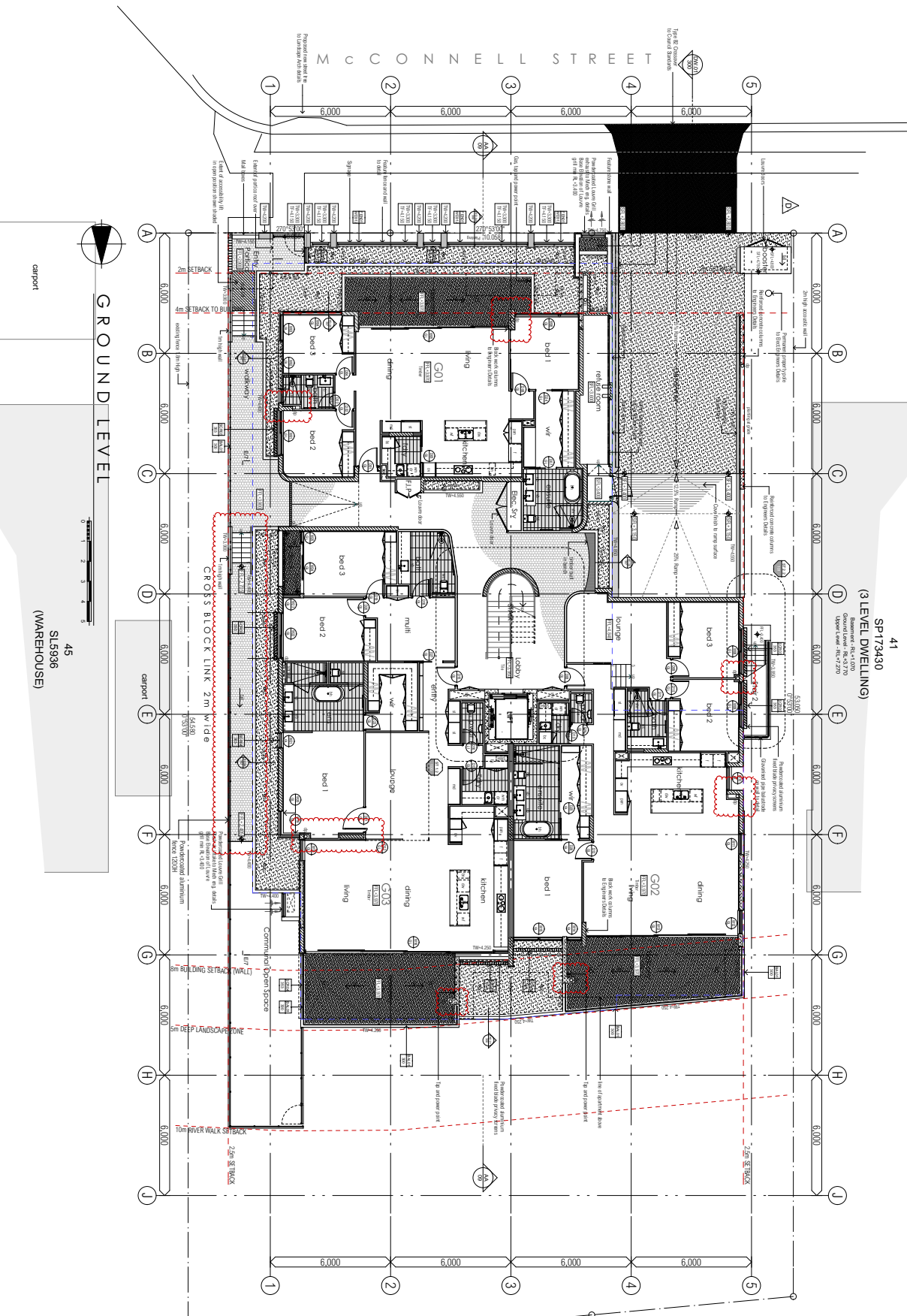


18.06.20 E Construction Issue
20.06.20 E Construction Issue - Final Review
03.04.20 C Construction Issue - General Revision
30.01.20 B Construction Issue
05.11.19 A Building Approval Issue

DATE: ISSUE AMENDMENTS
BRICX
18.06.20 E
20.06.20 E
03.04.20 C
30.01.20 B
05.11.19 A

Proposed
Apartment Development
At
1-5 McConnell Street
Bulimba, QLD
For
DVB Projects Pty Ltd
DRAWING
Basement Level

DATE	SCALE	DRAWN
JAN 2019	1:200 (A4, 1:100 (A1))	myls
JAN No.	DWG. No.	Rev.
NL1820	WD.02	E



41
SP173430
(3 LEVEL DWELLING)

GROUND LEVEL
(WAREHOUSE)



BRISBANE RIVER

30.07.20 M Construction Issue - Drawings
23.07.20 L Construction Issue - E-Infy Star
16.07.20 K Construction Issue - Detail Room
24.06.20 J Construction Issue - Door Numbers
25.06.20 H Construction Issue - Wall Types
12.06.20 H Construction Issue - Wall Types
09.06.20 G Construction Issue - Floor Level
05.05.20 F Construction Issue - Floor Level

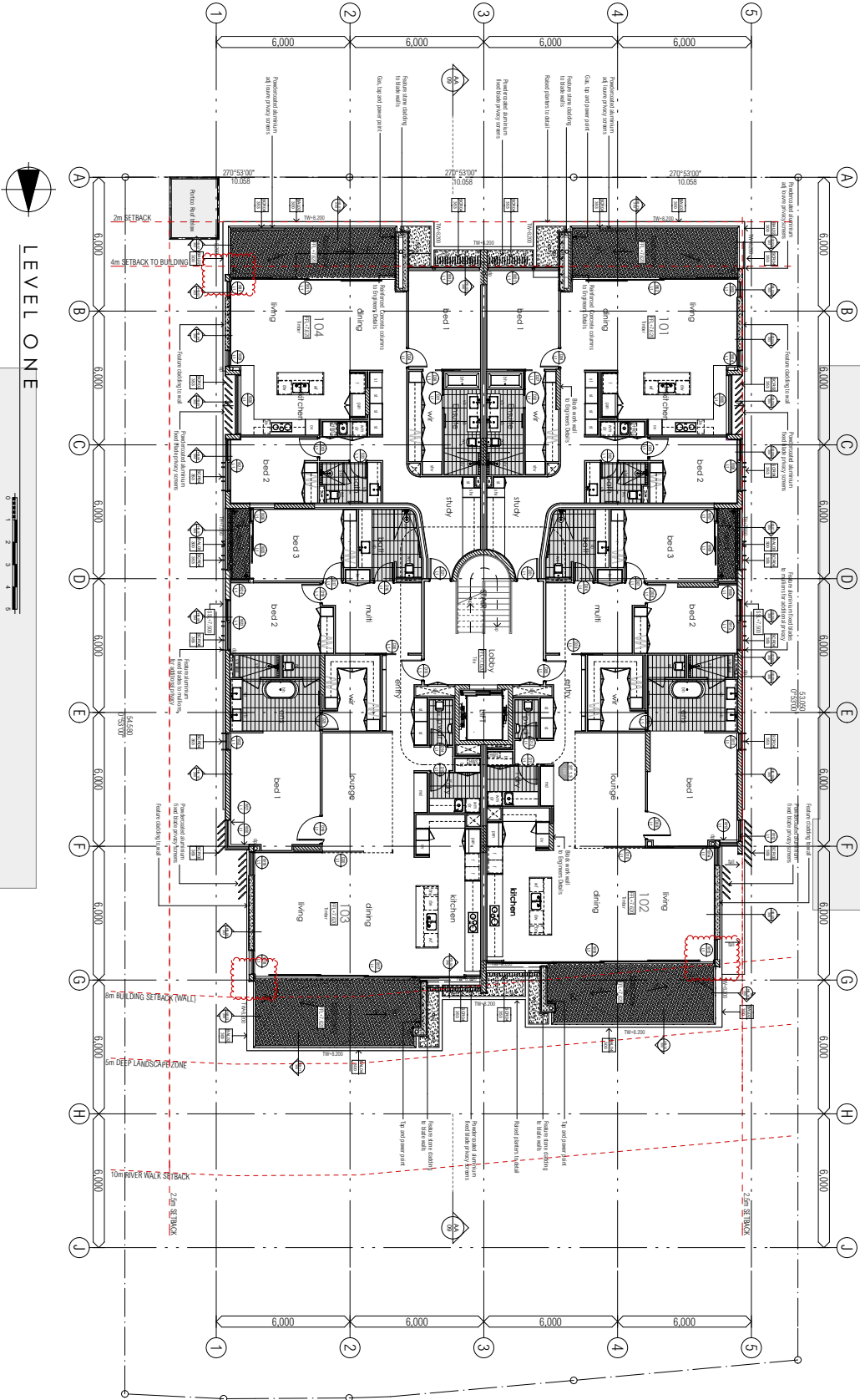
DATE: ISSUE AMENDMENTS

Proposed
Apartment Development
At
1-5 McConnell Street
Bulimba, QLD
For
DVB Projects Pty Ltd
DRAWING
Ground Level

DATE	SCALE	DRAWN
JAN 2019	1:200 (A1, 1:100 (A1)	myls
DATE NO.	DWG. NO.	REV.
NL1820	WD.03	M

MCCONNELL STREET

41
SP173430
(3 LEVEL DWELLING)



BRISBANE RIVER



22.10.20 0 Construction Issue - N/A Null Added
13.10.20 N Construction Issue - N/A Null Added
21.08.20 M Construction Issue - Blockwork Wall
20.07.20 K Construction Issue - Blockwork Wall
16.07.20 J Construction Issue - Blockwork Wall
24.06.20 J Construction Issue - Door Numbers
18.06.20 J Construction Issue - Door Numbers

DATE: ISSUE AMENDMENTS

Proposed
Apartment Development
At
1-5 McConnell Street
Bulimba, QLD
For
DVB Projects Pty Ltd
DRAWING
Level 1

DATE	SCALE	DRAWN
JAN 2019	1:200 (A1, 1:100 (A1)	myls
DATE NO.	DWG. NO.	REV.
NL1820	WD.04	0



BRIC
ARCHITECTS

BRIC Architects, P.C. Ltd.
Suite 25, Building 2, Lab on Water Office Park
2 Freedom Parkway, North Las Vegas, NV 89131
T + 1 702 392 2707
E bric@bricarchitects.com

Proposed
Apartment Development
At
1-5 McConnell Street
Bulimba, QLD
For
DVB Projects Pty Ltd

DRAWING
level 1

DATE	SCALE	DRAWN
JAN 2019	1200@63, 1:1000@A1	mg/ds
JOB No. NL1820	DWG. No. WD.04	Rev. L



BRIC
ARCHITECTS

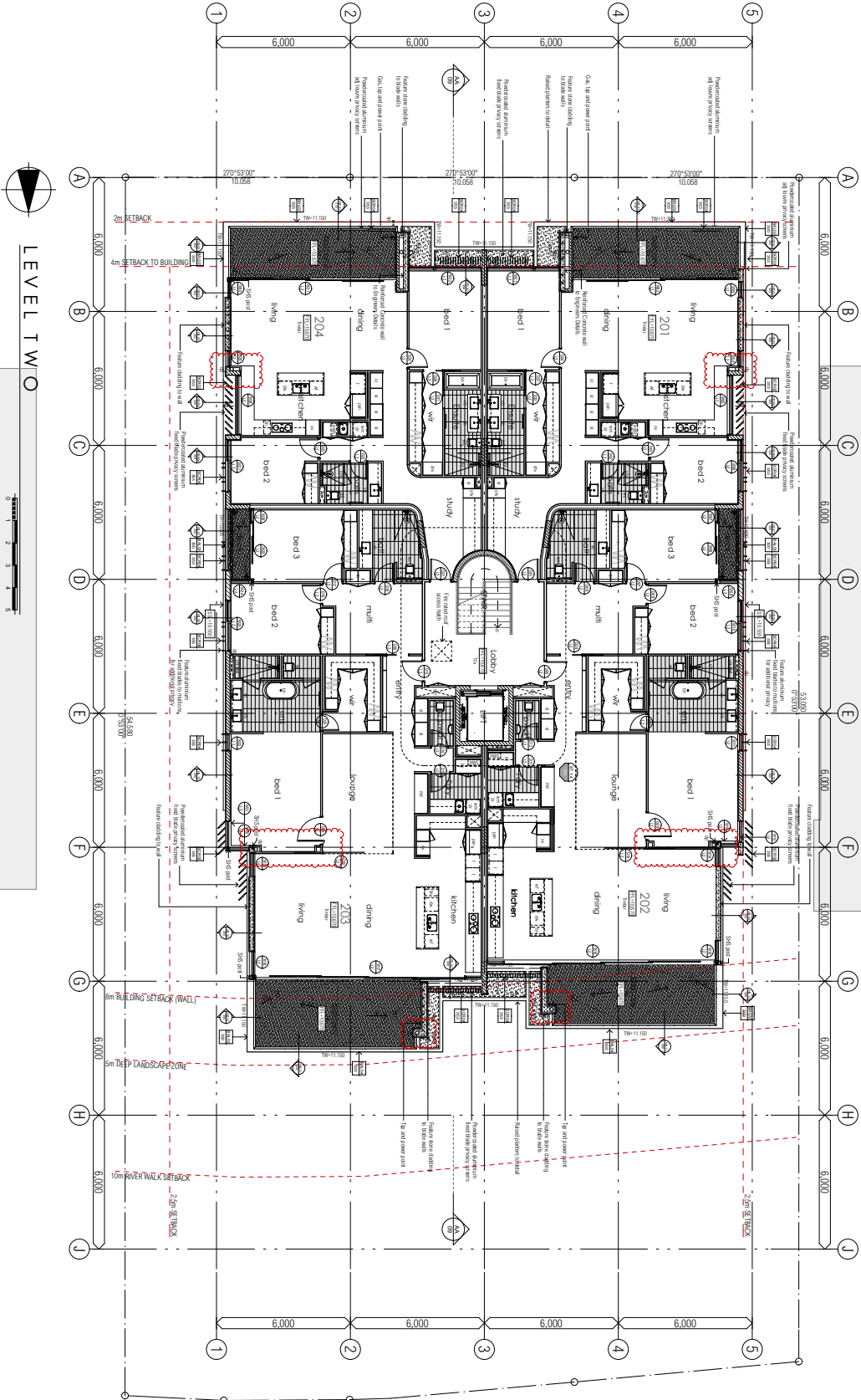
BRIC ARCHITECTS, P.C., Ltd.
Suite 250, Building 2, Lakeside Office Park
2700 Lakeside Parkway, Suite 250
North Las Vegas, NV 89130
Tel: 702.498.8888
Fax: 702.498.8889
www.bricarchitects.com

Proposed
Apartment Development
At
1-5 McConnell Street
Bulimba, QLD
For
DVB Projects Pty Ltd

DRAWINGS
Level 2

DATE	SCALE	DRAWN
JAN 2019	12.000@A3, 1:1.000@A1	mg/s
JOB No.	DWG. No.	REV.
NL1820	WD.05	N

MCCONNELL STREET



45
SL5936
(WAREHOUSE)

BRISBANE RIVER

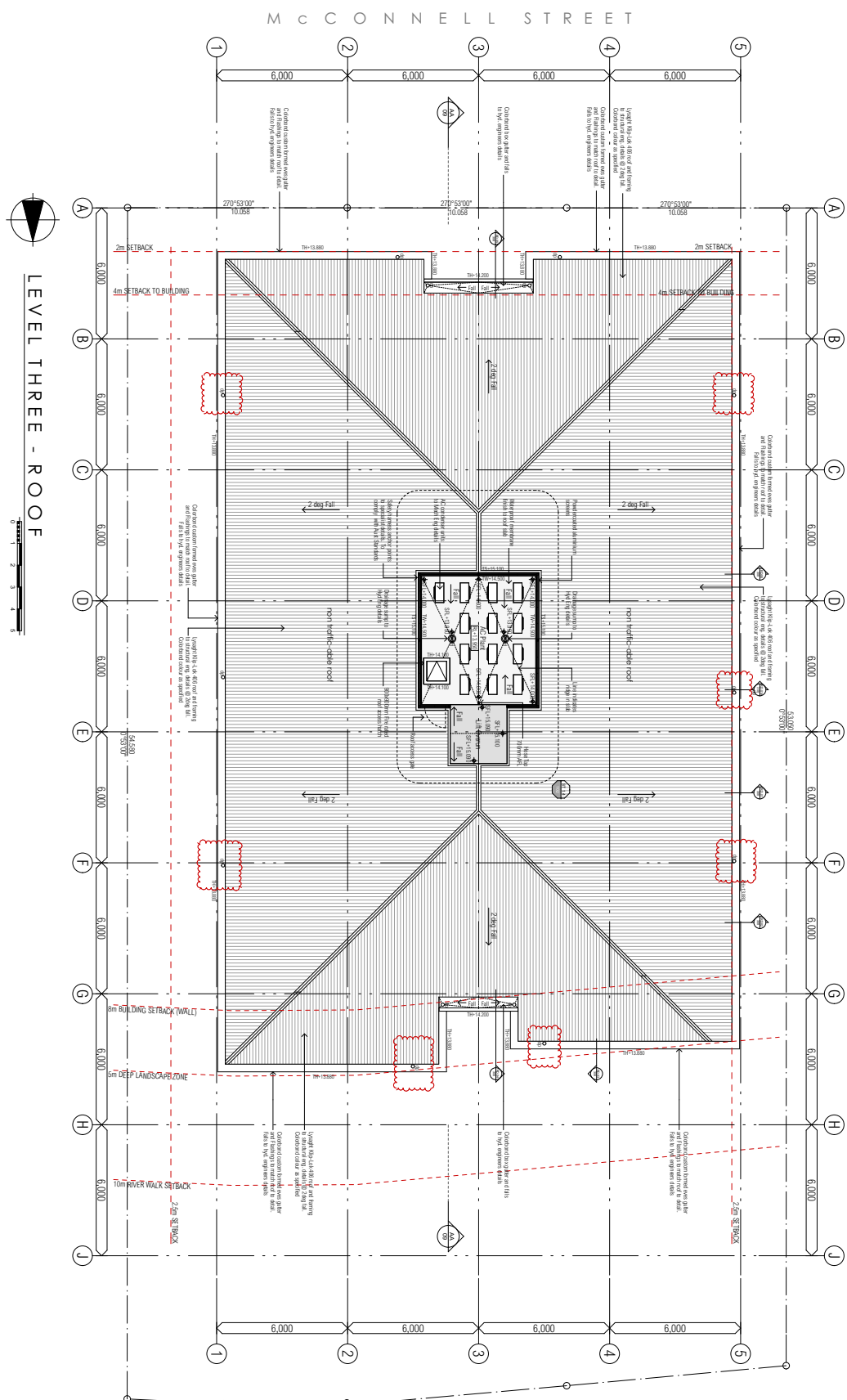


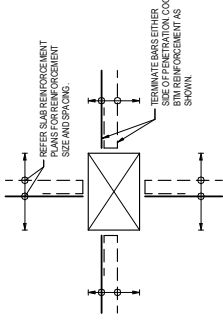
30.07.20 K Construction Issue - Drawings
24.06.20 J Construction Issue - Door Numbers
12.06.20 H Construction Issue - Wall Types
09.06.20 G Construction Issue - Wall Types
05.05.20 F Construction Issue - Floor Level

DATE: ISSUE AMENDMENTS

Proposed
Apartment Development
At
1-5 McConnell Street
Bulimba, QLD
For
DVB Projects Pty Ltd
DRAWING
Level 2

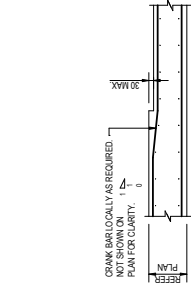
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DLG No.	WD.05	Rev.
NL1820		K





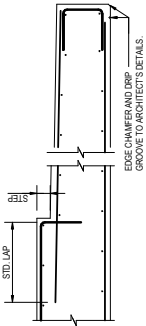
TYPICAL REINFORCEMENT DETAIL AROUND PENETRATIONS

SCALE: NTS
SEE REF IN CONJUNCTION WITH REINFORCEMENT PLANS AND ASSOCIATIVE NOTES AND LEGENDS.



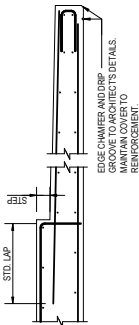
TYPICAL REINFORCEMENT STEP AT WET AREAS

SCALE: 1/20



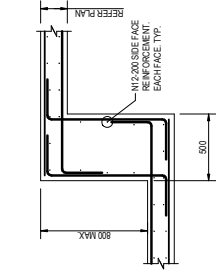
TYPICAL SUSPENDED SLAB EDGE DETAILS ≥ 300 THICK SLAB

SCALE: 1/20



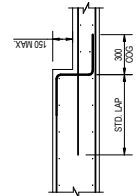
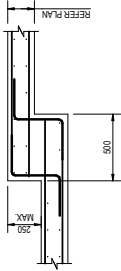
TYPICAL SUSPENDED SLAB EDGE DETAILS ≤ 300 THICK SLAB

SCALE: 1/20



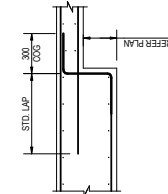
TYPICAL SLAB STEP DETAILS

SCALE: 1/20



TYPICAL SLAB STEP DETAIL

SCALE: 1/20

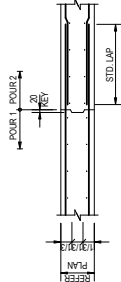


TYPICAL SLAB SOFFIT STEP

SCALE: 1/20

CONSTRUCTION JOINT DETAIL - CJ

SCALE: 1/20
KEY JOINTS MAY BE REPLACED WITH GREEN CUT OR SCABBLED FACE TO EXPOSE AGGREGATE.



DONOT SCALE THIS DRAWING IF IN CONFLICT - A307

CLIENT

FOR CONSTRUCTION

Revision

Issue Details

Revised

By

Date

PROJECT 9336
APARTMENT DEVELOPMENT
1-5 MCCONNELL ST BULMBA

SLAB DETAILS

REV

A

SCALE 1:20 AT A1

S-01-020

Drawn: BJS

Checked: GH

Approved:

Project: 9336

Issue Details

Revised

By

Date

PROJECT 9336

APARTMENT DEVELOPMENT

1-5 MCCONNELL ST BULMBA

SLAB DETAILS

REV

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S-01-020

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APARTMENT DEVELOPMENT

1-5 MCCONNELL ST BULMBA

SLAB DETAILS

REV

A

SCALE 1:20 AT A1

S-01-020



CC1

SCALE 1:20



DONOT SCALE THIS DRAWING. IF IN DOUBT - ASK?

CLIENT

FOR CONSTRUCTION

McVeigh

AGN: 36 325 378 207
PTY LTD AGN 125 378 207
66 Doggett Street
Neustadt, Old 4/06
PO Box 2401
Fortitude Valley, Qld 4106
Ph 07 3252 0838
Fax 07 3252 0711

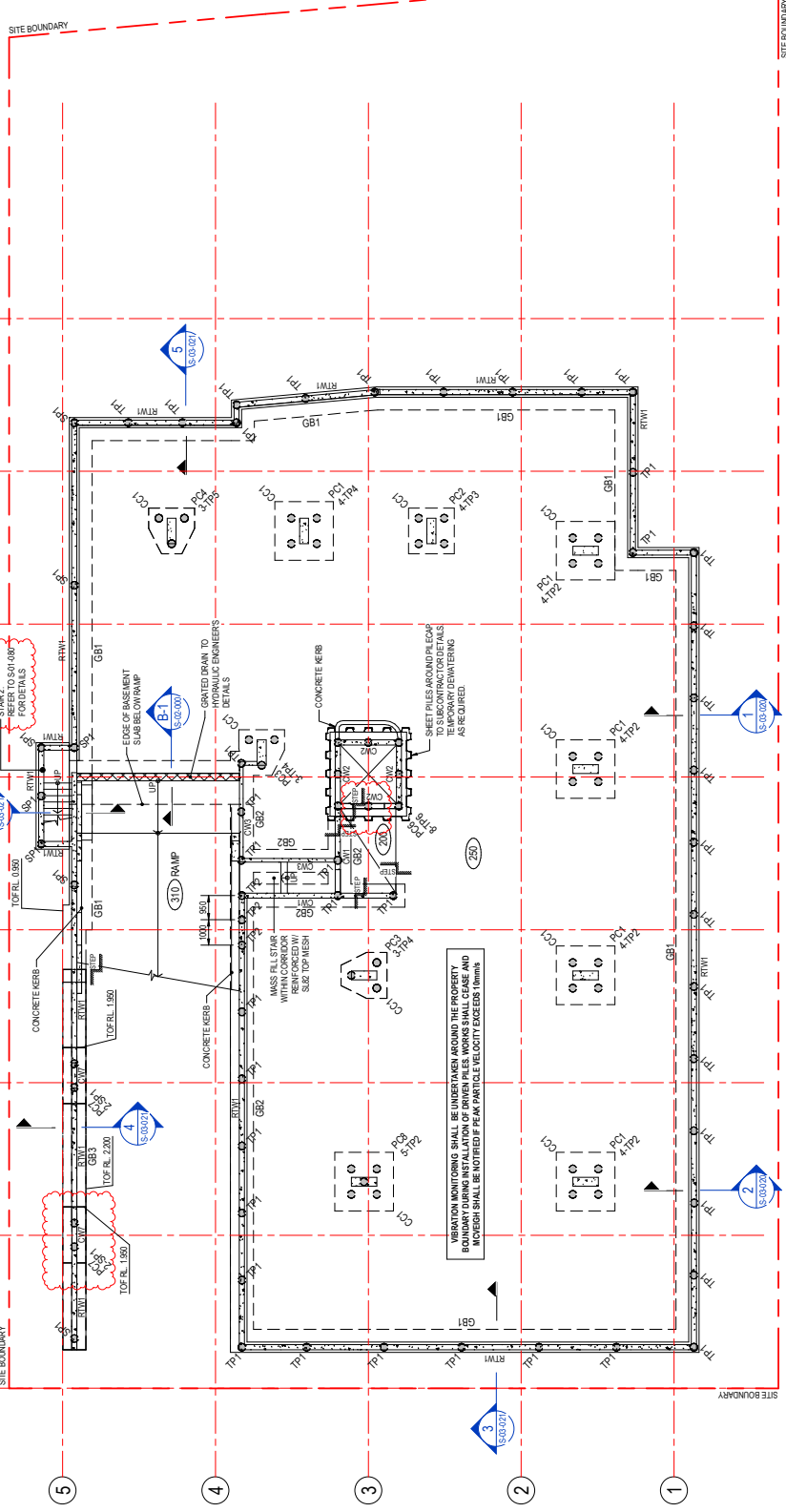
[illegible]

SUSPENDED SLAB NOTES:

1. REFER TO DRG. S40001 FOR GENERAL NOTES.
2. REFER TO ARCHITECTURAL DRAWINGS FOR ALL SETOUT, STEPS, FALLS AND REGRATES.
3. BUILDER TO CO-ORDINATE SLABS WITH MECHANICAL, ELECTRICAL, HYDRAULIC AND CO-ORDINATE DOCUMENTS TO ALLOW FOR SERVICE REQUIREMENTS.
4. NO PENETRATIONS, RECESSES OR CHASES OTHER THAN THOSE SHOWN ON STRUCTURAL DRAWINGS SHALL BE MADE IN CONCRETE MEMBERS WITHOUT PRIOR APPROVAL OF THE ENGINEER.
5. N.L.B. WALLS TO HAVE 20mm JOINT FILLER TO TOP OF WALL.

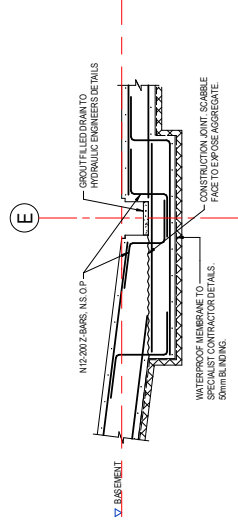
LEGEND

- | | | | | | | | | | | | | | |
|--------|-----------------------------|----------------|--------------------------------------|---|---|---|--|--------------------------|--------------------|--|--|---------------------|---------------------|
| STEP 1 | STEP 1 IN SUB. REFER. ARCH. | SUB. THICKNESS | FALL IN SUB. REFER. ARCH. FOR LEVELS | CONCRETE COLUMN. REFER DETAILS ON DRG. S-01-000 | MASONRY BLOCK WALL. REFER SCHEDULE ON DRG. S-01-000 | INSIT CONCRETE WALL. REFER TO DETAILS ON DRG. S-01-041. | LOAD BEARING ELEMENT UNDER PENETRATION | DENOTES DOWNLOADED JOINT | DENOTES SAWN JOINT | DENOTES 2" (51.00) LONG TRIM BAR AT REINFORCEMENT CORNER | 20 SERIES REINFORCING DETAIL WALL. REFER S-04-000 FOR DETAIL | FOR DETAIL S-01-041 | FOR DETAIL S-01-041 |
| STEP 2 | STEP 2 IN SUB. REFER. ARCH. | SUB. THICKNESS | FALL IN SUB. REFER. ARCH. FOR LEVELS | CONCRETE COLUMN. REFER DETAILS ON DRG. S-01-000 | MASONRY BLOCK WALL. REFER SCHEDULE ON DRG. S-01-000 | INSIT CONCRETE WALL. REFER TO DETAILS ON DRG. S-01-041. | LOAD BEARING ELEMENT UNDER PENETRATION | DENOTES DOWNLOADED JOINT | DENOTES SAWN JOINT | DENOTES 2" (51.00) LONG TRIM BAR AT REINFORCEMENT CORNER | 20 SERIES REINFORCING DETAIL WALL. REFER S-04-000 FOR DETAIL | FOR DETAIL S-01-041 | FOR DETAIL S-01-041 |



BASEMENT SLAB AND FOOTING PLAN

SCALE 1 : 100
NOTE: HYDROSTATIC SLAB CAST ON WATERPROOF MEMBRANE.



SECTION
SCALE 1:20

[illegible]

SLAB REINFORCEMENT NOTES

1. PROVIDE SLAB DISTRIBUTION REINFORCEMENT
N12-300, LAP 400 U.O.
2. REFER S-001 FOR STRUCTURAL NOTES.
- 2800 DENOTES REINFORCEMENT

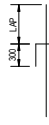


BAR LAYING SEQUENCE



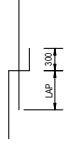
TYPICAL RISER PENETRATION

NOT TO SCALE



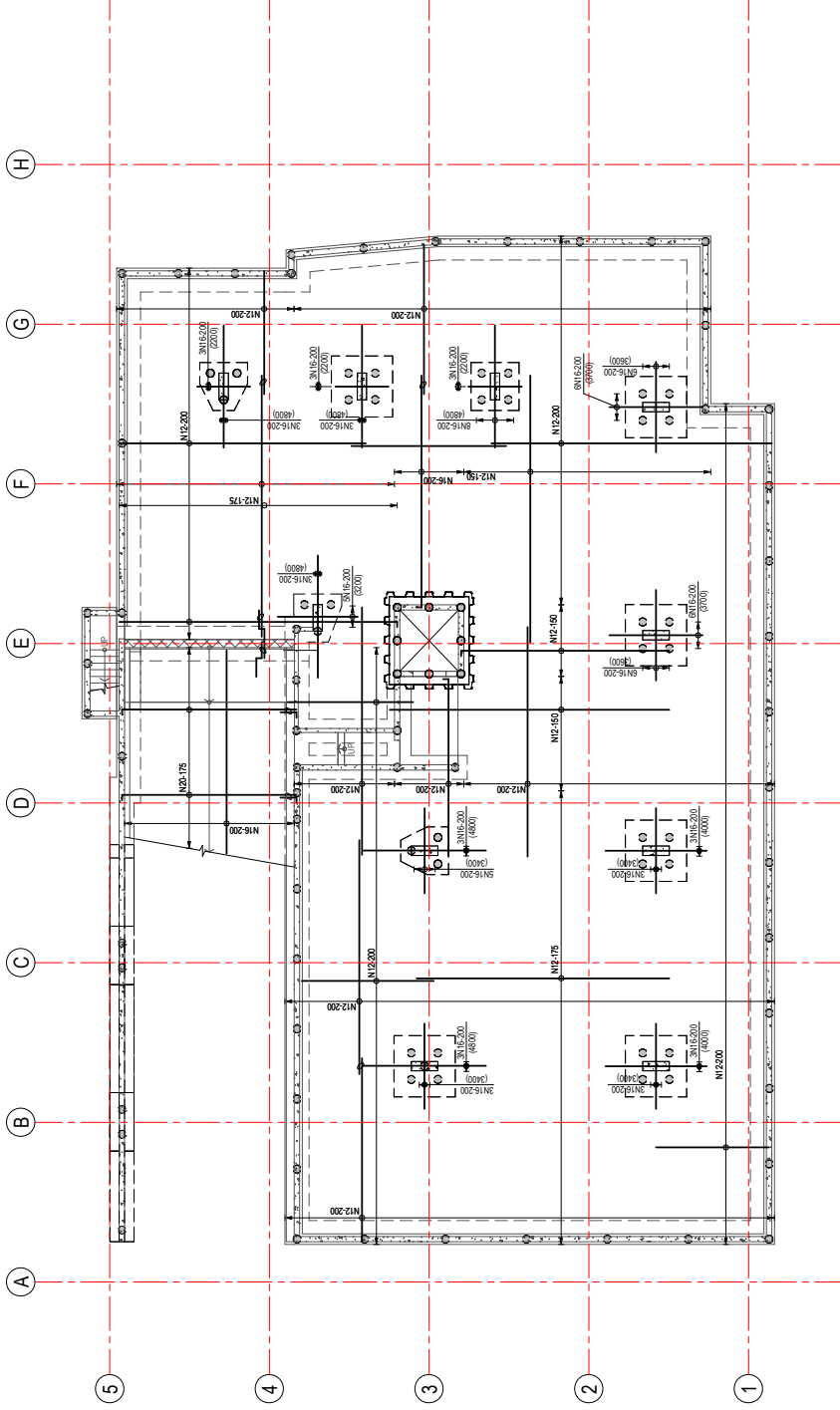
TYPICAL STEP IN BTM.

KLINGLÖNK
NOT TO SCALE



TYPICAL STEP IN TOP

NOT TO SCALE



BASEMENT SLAB BOTTOM REINFORCEMENT

SCALE 1 : 100

DO NOT SCALE THIS DRAWING IF IN DOIRT - A507



CLIENT

FOR CONSTRUCTION



	Revision	Issue Details	Date
1	FOR INFORMATION	RM	05/19
2	FOR INFORMATION	RM	26/19
3	FOR INFORMATION	RM	28/19
4	PALE GAS AND REINJECTION	SLS	03/19
5	FOR INFORMATION	SLS	20/10/19
A	FOR CONSTRUCTION	RM	12/02/19
B			
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X			
Y			
Z			

BASEMENT SLAB BOTTOM
REINFORCEMENT

PROJECT 9336
APARTMENT DEVELOPMENT
1-5 MCCONNELL ST. BULIMBA

SCALE 1 : 100 AT A1

S-02-010

Apply structural principles to commercial low-rise constructions

To: Dion@hutchies.com.au

From: tess@hutchies.com.au

Subject: 95 Robertson Street – Fortitude Valley - New project commercial low rise.

Hi Dion,

Welcome to Hutchinson Builder. In the internship and cadet program we teach overview all aspects of project management to building the structure. Today we will be running through structural principles that are applied on site. There are 6 topics to run through today so please refer to the documents attached at the bottom for visual references.

1. Apply structural principles to planning

The classification of a building or part of a building is determined by the purpose for which it is designed, constructed or adapted to be used. As per the NCC there are 10 building classifications - A low rise commercial building belongs to Class 2 to Class 9. Today the project we will be referring to is a new project in Brisbane, Fortitude Valley called 95 Robertson Street. This project is classified under class 5 – an office building used for professional or commercial purposes, with a gross floors area not exceeding 2000 square metres, not including type A or Type B construction.

The main structural principles that apply to commercial low rise structure erection and demolition include, loads and loading, forces and section properties. In any building design, the strength and stability of an overall building and its individual components are the most important aspects. The structure of a building is what maintains the shape of the building when subjected to forces. The forces on a building include dead, live and wind loads.

- The dead load on a structure is the result of the weight of the permanent components, such as beams, floor slabs, columns and walls. These components will produce the same constant 'dead' load during the lifespan of the building. Dead loads are exerted in the vertical plane.
- The live loads are all unfixed items in a building (such as people and furniture) result in a live load on the structure. Live loads are exerted in the vertical plane. They are variable as they depend on usage and capacity.
- Wind load is considered to be dynamic as it varies greatly in intensity from time to time. Wind loads are very different to dead loads and live loads. Wind loads typically act laterally/horizontally on walls and may act up and down on roofs.
- From there all the materials to build the structure has a load path. It's the direction in which each consecutive load will pass through connected materials. The sequence commences at the highest point of the structure, working all the way down to the footing system – ultimately transferring the total load of the structure to the foundation. So, the lowest structural member must be strong enough to support all the members above it. See photo for reference.

Next is to determine the strength and stability of an overall building and its components. This is understood by structural calculations to work out the effects of all the forces acting on any components on the building. You can visualise which portion of the building's load is transmitted to which structural element by following the load paths.

The two main principles of structural effectiveness are:

4. Mechanical properties – strength, toughness, elasticity, plasticity, ductility, malleability, brittleness, hardness
5. Section properties - the mathematical properties of structural shapes

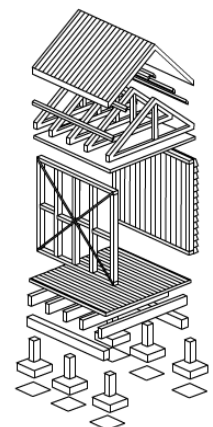
Section properties have nothing to do with the strength of a material but are based solely on the shape of a section. It explains why some shapes are more efficient at supporting loads than others.

The members used on a structure can shape the integrity and structural effectiveness on a building. Some include – Columns, bearers, floors and footings. Let's go through the structural performance characteristics.

Beams

Simply supported beams - are supported at each end only. If downwards pressure is applied bending would occur at the middle of the beam

Continuously supported beams - are supported by three or more support points. They deflect less than simple beams of the same span because the positive and negative bending cancel each other out. Generally, 20% more efficient than a simple span

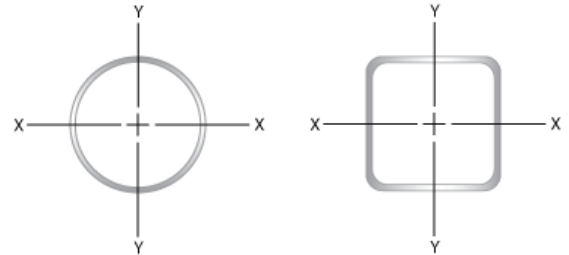


Cantilever beams - overhang their supports. The cantilever section of the beam cannot support the same loads as the back span which is the section of beam between the supports. A typical allowance for the amount of cantilever in a beam is 30% of the back span therefore a 45 m beam could have a cantilever section 15 m long.

Structural performance include – bending, neutral axis, internal moments of resistance, beam shape, bending moments & shear forces.

Columns

Columns are vertical support members subjected to compressive loads. They are also referred to as pillars, posts, stanchions and struts. The most efficient shape for a column is the circular hollow section (CHS). The second most efficient shape is the square hollow section (SHS).



Structural performance include – Axially loaded column, non-axially loaded column, buckling, slenderness ratio & end fixity and effective length

Retaining walls

A retaining wall is a wall built to hold back soil. It is required to support soil where a sloping site requires excavation and either there is insufficient room or it is impractical to batter the soil. Retaining walls must be able to resist soil pressures to be a stable structure. Walls of a certain height may need to be designed by a qualified structural engineer.

Structural performance include – Inclined retaining wall, gravity retaining wall and cantilver retaining wall.

Concrete slab

Concrete slabs are similar to beams as they span horizontally between supports and may be simply supported, continuously supported or cantilevered. Slabs are:

- Relatively thin structural members which are normally used as floors and occasionally roof systems in multi-storey buildings
- Constructed of reinforced concrete poured into formwork or trenches
- Either ground slabs or suspended slabs. Ground slabs will be the focal point for this unit.

Ground slabs are poured directly into excavated trenches in the ground and rely on the existing ground for support. The ground (or foundation) must be strong enough to support the concrete slab. Foundations with high moisture content will make soils reactive creating foundation expanding or contracting, which can damage the slab and other building materials, such as brickwork.

Structural performance include – Foundation movement, slab bending & stiffening beams

Other characteristic include roof trusses and wind bracing. Understanding how these structural elements are going to work in conjunction with each other to create a structure is the first steps to planning the works.

In order to build a new structure sometimes you have to demolish what is existing on the site. All demolition operations are to be in accordance with Australian Standards and Codes of Practices including: Work Health and Safety Regulations 2011 (Qld), Demolition Code of Practice 2013 (Qld) and AS 2601: The demolition of structures. There are many things to look out for before, during and after demolition to please ensure you are aware of all legislation before starting. Please see attached a demolition specification and demolition plan from the client to adhere by, for this project we will be demolishing two existing two storey buildings.

2. Structural integrity of buildings

The building and construction industry uses a wide range of skilled workers who are employed in an equally wide range of working environments. There are many professionals involved in building design and a variety of tradespeople responsible for the numerous stages in the construction process, such as:

- a. Architects
- b. Engineers
- c. Drafts people
- d. Building surveyors
- e. Land surveyors
- f. Quantity surveyors

Please see attached a different specification for the construction of 95 Robertson Street. Attached is a roof, cladding and structural steel specification. Architects or designers create construction specifications before work actually starts. But many involve project engineers for technical help.

You must prepare a range of documentation to see a building project through to completion, including - title, permits, specifications, plans and reports.

Title

A land title is an official record of who owns a piece of land. It can also include information about mortgages, covenants, caveats and easements. It contains:

- A Plan with lot number
- Name of owner
- Reference numbers
- Certificate stamp

See attached a site plan of the proposed buildings, that is similar to a title – it has the positioning, client, and client land marks.

Permit

A construction permit or building permit is a permit required in most jurisdictions for:

- New construction
- Adding onto pre-existing structures
- Major renovations.

A building permit is the document which shows that your plans have been approved by a building surveyor. The building surveyor checks that the plans meet building regulations

Please see attached appendix R from the tender documents – approval, permits and the responsibility matrix. This table reflects relevant party responsibility's for managing and the costs to obtain approvals and permits.

Project specifications

Project specifications contain all the written information that accompanies the plans. Your building specifications provide supplementary information to the drawings, and they take precedence over any notations on the drawings. The sections included in a project specification include descriptions about:

- The job
- The site
- The proprietor
- Other parties in the contract arrangement (e.g. a trades section detailing standards and quality of work).

Additional information might include items listed by the architect and set by the Australian Standards in tabular form, such as:

- Windows, showing frame material and type of glass
- Doors, specifying size, material and the swing on the door
- Finishes to walls, floors and ceilings
- Door types and models of locks, latches, hinges, push plates and pull handles

Plans

Plans come in different formats to cover different purposes. The plan of the subdivision is prepared for planning approval prior to the development of the land. It is a good source of information relating to adjoining properties.

Please see attached floor plans for 95 Robertson Street basement and level 1. Floor plans are like cross sections which are taken horizontally halfway up the wall and are drawn to scale. Floor plans show a vast amount of detail including:

- All horizontal dimensions such as room size and wall thickness
- Size and location of windows and doors
- Location of fixtures and fittings
- Any particular requirements in a room such as floor coverings
- An indication of the materials used for wall construction
- The overall floor areas

Reports

The reports you need to prepare prior to construction include the, condition report, soil report & engineer's drawings. They contain:

- Information on the existing site such as the location of services
- Instructions for building complex structures
- An assessment on the bearing capacity of the soil.

See attached the landscape concept report for the development application created by the developer. At the end of the document a code of compliance is added in to ensure this building complies. Remember for this scenario we will be only making reference to the basement and level office.

NCC requirements for bushfire, high wind, earthquake and alpine environments

The NCC provides technical information for the design and construction of building structures and it defines the minimum standards of relevant health and safety including structural safety. You must incorporate the relevant

NCC sections into the design and construction of structures being developed, making particular consideration of structures built in the following areas: Bushfire areas, high wind areas, earthquake areas, alpine environments.

Bush fires

All buildings located in a designated bushfire prone area are to be constructed in accordance with the requirements of AS 3959 Construction of buildings in bushfire prone areas. Please also reference the NCC volume 1 construction in bushfire prone areas.

High wind areas

The NCC gives guidelines to ensure buildings constructed in designated high wind areas are provided with sufficient restraint to transfer wind forces to the ground to prevent collapse, uplift or sliding of the footing systems. The following wind regions:

- Region A - Normal
- Region B - Intermediate
- Region C - Tropical cyclones
- Region D - Severe tropical cyclones.

High wind areas are regions that have design wind speeds which are calculated in accordance with AS 1170.2.

Earthquake areas

Construction requirements for earthquake areas are necessary for buildings within areas of seismic activity. The two different areas are categorised by an acceleration coefficient (as determined under AS1170.4 and as outlined in the NCC) which is:

- Equal to 0.12 but less than 0.15
- 0.15 or greater

Alpine areas

Alpine areas are defined as 1,200 m or more above Australian height datum (AHD) for NSW, ACT and Victoria and 900 m or more above AHD for Tasmania.

In relation to 95 Robertson Street, Brisbane isn't considered an alpine area, however could be subject to bush fires and high winds due to the Queensland climate and track record over the past decade. As for earthquake we have seismic activity occurring from time to time but generally at such a low level that has little to no community impact. Saying this it's important to understand the environmental impacts that could harm the integrity of the structure.

New and emerging building technologies

Any new technology must satisfy performance requirements, and this can be determined by using the following assessment methods:

- Documentary evidence
- Verification methods
- Expert judgement
- Comparison to deemed to satisfy provisions

The NCC examines the following

Area	Explanation
Suitability of materials	Materials must be chosen that are suitable for their purpose. Every part of the building must be constructed in an appropriate manner which satisfies all the requirements of the NCC.
Evidence of suitability	Substantial evidence must be provided to support the use of the new technology.
Fire requirements	New technologies must demonstrate suitability and conform to the deemed to satisfy provisions in relation to the fire resistance level (FRL), conform to the deemed to satisfy provision in relation to early fire hazard indices and have resistance to the incipient spread of fire.

At 95 Robertson Street Hutchinson Builder have been asked to create a green edge meaning a higher percentage of plants and environmentally friendly. This concept is new and is taking off in the construction industry, creating a building with a green star rating is on the forefront of developer's mind.

Pre-commencement site inspection

Before commencing work, a site inspection should occur to ensure that all contract documentation clearly reflects the actual site. Such inspections can avoid unnecessary wastes of time and money.

3. Footing systems

Set out footing systems

Footings are the construction that transfers the load from the building to the foundation.

There are many things to consider such as:

- The type of the foundation soil – the NCC sets out the requirements for minimum bearing pressures
- The choice of an appropriate footing system, such as – columns, concrete or beams

Always set out your footings in accordance with the building plan. Other considerations will include damp coursing and the provision of termite barriers.

Structural integrity of the footings

In order to assess the structural integrity of footings specified within your building plan refer to –

- National Construction Code: Volume 1, Parts B1.4, F1.9, F1.10
- AS/NZS 2904 'Damp-proof courses and flashings'
- AS 3660 'Termite management'

Lay footings specified in building's plan, checking for compliance with project documentation

Slab footings consist of concrete beams and floors across the entire floor plan. Slabs are also referred to as slab floors, slab on ground or raft slabs. Slab is the general term used to refer to any of the available types of slabs.

The stiffened raft slab is the simplest and most common slab construction available.

Waffle raft slab construction is quite different from stiffened raft and footing slab structures. The slab ribs are formed on top of the ground using a grid of polystyrene void forms which are laid out on a levelled area. It is ideally suited to very reactive clay sites and does not have the problems associated with stiffened raft slabs that have their beams embedded in the reactive clays

A pile is a vertical structural element of a deep foundation, driven deep into the ground at the building site. Prefabricated piles are driven into the ground using a pile driver which are either wood, reinforced concrete or steel. Concrete piles are available in square, octagonal, and round cross-sections (like Franki piles) and are reinforced with rebar and prestressed. Steel piles are either pipe piles or a beam section (like an H-pile)

For homes and light commercial buildings, concrete piers are concrete columns that are formed by pouring liquid concrete into holes drilled into the ground. They can be designed to carry virtually any load. They are effective for most soil types in areas which have little or no earthquake or hurricane activity. For commercial buildings, reinforced concrete piers and beams are concrete columns that contain reinforced steel positioned so that the two materials act together for increased strength.

As there is many types of different footings available, it is important to get a site report and then decide which is best for the structure. As this project is a commercial building it is highly likely that the footing will be similar to what was just mentioned – concrete columns into the ground as they are suitable for most soil types, it seems like a save option for a commercial building.

Check damp coursing, provision of termite barriers and other relevant techniques

Damp proof course (DPC) is a barrier of impervious material built into a wall or pier to prevent moisture from moving to any part of the building. The DPC is built into base wall brickwork. It bridges brick skins and/or the brick and pier. The DPC is laid into the brick wall approximately two courses (two bricks) below the lowest timber member, typically the bearer.

Damp proof courses are also installed to buildings constructed on concrete slabs. The DPC, commonly called the 'flashing', is run around the perimeter of the building attached to the wall frame just above the top plate. It is angled down to the brickwork where it is embedded just below the weep hole.

All new buildings must have their primary building elements (structural elements) built with termite resistant materials or be protected against termite attack. Concrete slabs form part of the termite barrier. However, termites may be able to access timber framing at the edges of the slab, around service pipes and box-outs for plumbing fixtures or through naturally occurring cracks in the concrete.

4. Floor systems

When constructing the floor system, it is important to take into consideration the type of flooring, the laying of pipes and reinforcement. Structural floor systems include concrete slab floor, brick bases, engineered timber products, panel systems of concrete and AAC and timber and steel floor construction. You must always check that what is specified within your building plan is assessed for structural integrity as well as compliance with relevant codes and construction principles.

Concrete slabs

Concrete slabs are floor systems of concrete and steel reinforcing. They are constructed on the ground, various types of slabs include:

- Slab on the ground – Supported on the ground
- Stiffened raft slab – Supported on the ground with a separate edge strip footing'
- Slab subfloor – Sits on engineered reinforced strip footing foundation primarily made from concrete, steel mesh and rebar for added strength

Remember to always refer to AS 2870 for the minimum dimensions and specification for the depth, width and spacing of beams and slab thickness

Brick bases

There's a range a brick flooring these include pavers and engineered bricks. Pavers are generally used because they do not raise the level of the floor, and they place a significantly lower weight load on the subfloor. Engineering bricks the standard thick bricks that you will see used in the construction of buildings. Their size means that they raise the level of the floor while also placing a lot of weight on the subfloor.

Engineered timber products, panel systems & timber a steel floors

Engineered hardwood floating timber floors combines the sophistication of real hardwood timber with an ingenious construction delivering a stable floor and making installation easy over many surfaces. Once installed, no additional work is required; it can be installed quickly and enjoyed immediately.

Panel systems is a great flooring solution that provides the feel of a solid concrete floor and no squeak without the big price tag and timber floors these are ideal for commercial purposes due to it's beautiful appearance, durability and strength. Steel floors are most suitable for factory areas with very heavy traffic, or to span openings in floors.

For the Robertson Street office, the client has chosen solid timber flooring due to the fact mentioned above it's a beautiful appearance, durable, strong and low maintenance, and it also fit along with the overall theme of the office.

Make sure that you always supervise the laying of the floor so that it specifies with the building plan and is checked for compliance against your project documentation

5. Structural wall systems and wall cladding systems

Construction principles/performance characteristics of structural wall systems, wall cladding systems

Wall systems - Provide structural support to roof systems, allow for installation of services, provide a means to apply external and internal linings. When planning, coordinating and managing structural wall systems you need to identify both the wall system and cladding system.

Structural wall systems include:

1. Composite walls featuring tilt-slab, post and beam, pole and truss and portal frame
2. Earth walls, including rammed earth and mud brick
3. Framed walls incorporating timber, engineered timber products and lightweight section steel
4. Masonry wall incorporating cavity brick, single-leaf masonry and lightweight concrete (AAC)

Remember to read over the requirements listed in the NCC volume 1 B1.4 Determination of structural resistance of materials and forms of construction also please find a specification for wall cladding from the client for the Robertson St project for reference.

Erecting wall systems and wall cladding systems

Once you have identified all the technical wall system components it is important that you identify, implement and check the processes for erecting wall systems against the manufacturer specifications and relevant Australian standards and codes. A critical part of this planning requires you to check your wall system components and wall cladding system complies with relevant Australian standards, codes and manufacturer specifications.

The cladding specification from the client mentioned above will also be able to help with the construction of the wall systems to make sure a copy is on site for the tradesmen to read before starting the job.

Building plans and relevant standards and codes to ensure appropriate allowances

You must ensure that all building plans and relevant standards and codes are identified and implemented to ensure appropriate allowances have been made for relevant services to be installed. Common systems include – plumbing and electrical.

All pipes should be properly clipped to the frame to avoid water hammer and pipe vibration. All plumbing fixtures should be adequately attached to the frame. Check for leaks before installing internal linings and the electrician

should be provided with suitably marked working drawings indicating the precise location of all installations using manufacturer's specifications. Remember the plumbers and electricians also have a responsibility to check their work and double check with will be on complications in the future. The NCC volume 3 is the plumbing code and is something that the plumbers would use to keep their work compile.

AS 1684.2 gives details about design solutions for bracing and fixings. AS/NZS 4791, AS/NZS 4534, AS 1397 and AS 1214 outline the corrosion protection requirements of fixings.

Install windows and external doors

There are many different window types to choose from – remember to refer to the AS 1288 or AS 2047 to understand the requirements. For this project we will be going with a double hung window as per the specification from the client. Window frame manufacturers produce a range of readily available frames. Their sizes are detailed on a schedule. A typical schedule details the appearance of the window frame when viewed from the outside. It also shows the finished height and width of the frame.

External timber door frames are generally made by specialist joinery companies. The jambs and head of the door frames have two rebates. One accommodates the door, and the other accommodates a flywire door. Some manufacturers also provide grooves in the back of the jambs for side flashing. The sill is usually made from a dense weather-resistant timber, with a sloping rebate to shed water. A drip groove on the underside stops water from running back in under the sill. For more information and requirements on the correct doors for the building, please refer to NCC volume 1: D2.19 or the schedule from the client, please see attached.

6. Structural roof system and roof cladding systems

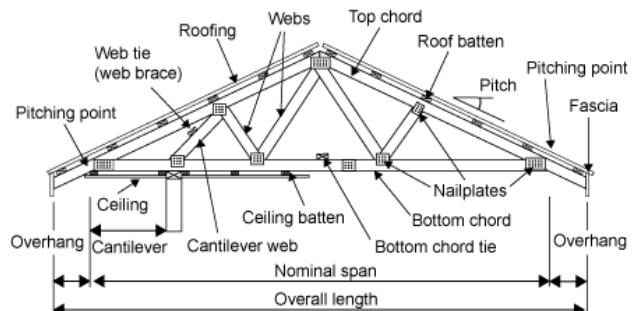
Structural integrity of the structural roof system and roof cladding system

A roof system is the structure that forms the roof of a building. In Australia the roof system may be made up of: A timber frame roof built on-site, A prefabricated truss roof in which major components are constructed in a factory and then assembled on-site.

A 'coupled' roof is a conventional roof that is constructed on-site. It uses ceiling joists, hanging beams, strutting beams, struts, under purlins, collar ties, rafters and ridge boards.

Manufactured timber roof trusses provide a structurally efficient alternative to timber beams. They place greater emphasis on axial loading of members and less on bending. The advantages of trusses include the following:

- They are strong, but light to erect
- They can be made to suit most roof shapes
- There is less on-site fabrication, therefore less site labour is required
- They are less affected by bad weather
- Factory production allows automated production
- Better quality control is possible
- Trusses make maximum structural use of the timber
- Trusses are capable of long spans
- Internal walls are usually non-load bearing, therefore lighter weight internal walls are possible



Compliance requirements	Truss types for hip roofs	Truss camber
The design of a timber roof truss must accord with engineering principles and with AS 1720.1. This includes the wind design. AS 4440 'Installation of nail plated timber roof trusses' provides details for correct practices when installing roof trusses. Trusses are usually spaced at regular intervals, typically 600 mm, 900 mm or 1,200 mm apart depending on the mass of the roofing material and local practice.	Hip end trusses include various types required to shape a hip end. The following diagram shows the basic concept: • Truncated standard truss • Truncated girder truss • Hip truss • Jack truss • Creeper truss • Scissor truss • Bell truss • Bowstring truss • Cantilever truss • Cut off truss • Half truss	During production, trusses improve on traditional rafter design by forcing an upward bend into the chords of trusses called 'camber'. A camber helps to resist loads (the amount of bend is calculated to help resist the load of tiles and ceiling lining). The calculations are designed to ensure the truss eventually flattens out to provide straight chords once it is fully loaded.

Roof cladding is the material used to protect the building from the extremes of the weather. The two most common options are roof tiles and metal roof sheeting. Roof tiles are particularly suited to the Australian climate, which generally does not have high winds or snow loads. These elements are most likely to reduce the life of roof tiles.

For Robertson Street the roof will not be used as a communal area like some projects, therefore the client will probably choose something like a roof sheeting. Roof sheeting is available in various profiles and materials. Generally, roof sheets can be used on any roof type, but each particular profile has a particular range of roof pitches in which it is most efficient. The standard corrugated profile has the widest range of applications and it is the only profile that lends itself to curving.

Check construction of roof system and roof cladding system

Service penetrations may need to be made to the roof for services (e.g. ducts, plumbing and electrical service lines). All require a hole through the deck to allow the pipe or wires to pass through. Care must be taken, since separation of the waterproofing membrane often occurs at such penetration.

Skylights - Skylights are made from a variety of materials including plastics (ABS, acrylic, polycarbonate and others), glass, aluminium, steel and stainless steel. Generally, these materials have a long life in Australian conditions. Refer to NCC Volume 1: Section J and Part F4.

Roof ventilators - For some buildings, fume hoods may be required to exhaust air out the roof through a duct or opening. Care must be taken to prevent leakage into the rooms below

Ensure quality of finished roof system

Roof framing checklist – this checklist is to ensure the roof frame is quality. If these steps are followed it will be compliance with the NCC requirements

Quality Procedure - Checklist

- | | |
|---|---|
| <ul style="list-style-type: none"> • Rise and pitch of roof against plan • Correct propping of ridge, hips, valleys, rafters and under purlins at correct centres • Adequate collar ties • Line of rafter, hips and valleys • Support to strutting beams | <ul style="list-style-type: none"> • Fascia and barge boards • All tie-downs and fixings • Ceiling joist and alignment with rafters • Hanging beams • Trimmers for location • Trimming to manhole |
|---|---|

Roof truss checklist – this checklist is to ensure the roof truss is quality. If these steps are followed it will be compliance with the NCC requirements

Quality Procedure - Checklist

- | | |
|---|---|
| <ul style="list-style-type: none"> • Truss layout plan • Manufacturer's specifications for tie-downs, bracings and lateral stability • Roof truss certification • Adequacy of supporting structure • Dimension, overall width and length of wall for fit | <ul style="list-style-type: none"> • Support to girder trusses • Plumb and spacings • All tie-downs and fixings • Location of specialised trusses • Trusses have not been modified on-site • Eave overhangs • Trimming to manhole. |
|---|---|

0431 CLADDING**1 GENERAL****1.1 RESPONSIBILITIES****General**

General: Provide lightweight external wall cladding and associated work as documented

1.2 CROSS REFERENCES**General**

Requirement: Conform to the following worksection(s):

- *General requirements*
- *Insulation and Sarking Membranes*
- *Partitions Framed and Lined*
- *Metalwork*
- *Schedule 01 External Finishes and Assemblies*

1.3 INTERPRETATION**Abbreviations**

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

- AAC: Autoclaved aerated concrete.
- CCA: Copper chrome arsenate.
- CFC: Compressed fibre cement.
- EIFS: External insulated finishing system.
- FC: Fibre cement.
- LOSP: Light organic solvent preservative.

1.4 TOLERANCES**Permitted deviations**

Profiled metal sheet cladding: To AS 1562.1 clause 4.2.3

Flat sheet and panel cladding: To the manufacturer's recommendations.

Plank and weatherboard cladding: 5mm from a 1.8m straightedge or to the manufacturer's recommendations.

1.5 SUBMISSIONS**Fire performance**

Combustibility: Submit evidence of conformance to PRODUCTS, **FIRE PERFORMANCE, Combustibility.**

Fire hazard properties: Submit evidence of conformance to PRODUCTS, **FIRE PERFORMANCE, Fire hazard properties.**

Fire-resistance level: Submit evidence of conformance to PRODUCTS, **FIRE PERFORMANCE, Fire-resistance of building elements.**

Operation and maintenance manuals

General: Submit manufacturer's published use, care and maintenance requirements.

Products and materials

Type tests: As appropriate for the project, submit evidence of conformance to the following:

- Metal cladding generally: Cladding and fastenings to AS 1562.1 clause 5.5 for resistance to wind pressures.
- Metal cladding in cyclonic regions to AS/NZS 1170.2: Cladding and fastenings to AS 1562.1 clause 5.6.
- Plastic cladding: Cladding and fastenings to AS 1562.3 Section 5 for resistance to wind forces and resistance to impact.

Prototypes

General: Erect a prototype of each panel type, including at least one example of each component in the system to verify selections submitted as samples, to demonstrate aesthetic effects, to set quality standards for materials and execution and to verify performance, including wind loading.

Inclusions:

- Typical components, attachments to building structure and methods of installation.
- Window opening with cladding panel, trim and returns.
- Sealant filled joint.

Samples

Finish: Submit samples of the cladding material showing the range of variation available.

Shop drawings

Composite panels: Submit shop drawings to a scale that best describes the detail, showing the following:

- Dimensioned elevations of all elements.
- Details of construction, connections and all support systems.
- Dimensions of all typical elements and of any special sizes and shapes.
- Provision for the exclusion and/or drainage of moisture.
- Jointing details and method of fixing between individual elements and between this installation and adjacent work, including adjustment.
- Sealant types and full size sections of all sealant-filled joints and backing rods.
- Provision for thermal movement.
- Provision for movement under seismic and wind loads.
- Sequence of installation.
- Co-ordination requirements with other work.
- Schedule of materials, finishes, componentry, hardware and fittings.

Subcontractors

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

Seamed sheet metal cladding: Submit evidence of experience with non-ferrous cladding installation.

Warranties

Cladding materials: Submit the manufacturer's published product warranties.

Design

The contractor is to undertake structural design and certification for the adequacy of the support structure. Submit calculations and other data demonstrating detailed compliance with performance criteria.

1.6 INSPECTION**Notice**

Inspection: Give sufficient notice so that the framing, sarking, vapour barrier and insulation may be inspected before they are covered up or concealed.

2 PRODUCTS**2.1 GENERAL****Storage and handling**

Requirement: Store and handle materials to the manufacturer's recommendations and the following:

- Protect materials including edges and surfaces from damage.
- Keep dry and unexposed to weather.
- Do not drag sheets or panels across each other or over other materials.
- AAC panels: Stack on edge, support off the ground and level to avoid sagging and damage to ends, edges and surfaces.
- Metal panels: Store unpacked panels by size in racks and protect from scratching, warping or bending.
- Sheeting: Stack flat and off the ground on at least 3 evenly placed bearers.
- Store metal materials away from uncured concrete and masonry on a level base.
- Do not store metal materials in contact with other materials which may cause staining, denting or other surface damage.
- Use gloves when handling precoated metal cladding material.

Product identification

General: Marked to show the following:

- Manufacturer's identification.
- Product brand name.
- Product type.
- Quantity.
- Product reference code and batch number.
- Date of manufacture.

Components

Fasteners and ties: Type, size, corrosion resistance class and spacing to the cladding manufacturer's recommendations.

Flashings: To AS/NZS 2904.

2.2 FIRE PERFORMANCE**Combustibility**

Cladding: Tested to AS 1530.1.

Fire hazard properties

Bonded laminated materials: Tested to AS/NZS 1530.3. Fire hazard indices, as follows:

- Spread of Flame Index: 0.
- Smoke-Developed Index: ≤ 3 .

Fire-resistance of building elements

Fire-resistance level: Tested to AS 1530.4.

2.3 COLORBOND® STEEL AND ZINCALUME® STEEL**General**

Requirement: COLORBOND® steel or ZINCALUME® steel profiled sheet metal cladding.

Design and installation: To AS 1562.1.

Stainless steel: To ASTM A240/A240M

Flashing: To AS/NZS 2904.

Material and colour: To match the cladding material.

Rib notching: To match the cladding material.

Fasteners

Type, size, corrosion resistance class and spacing to the cladding manufacturer's recommendations.

Finish for exposed fasteners on coloured cladding: Prefinish exposed fasteners with an oven baked polymer coating to match the cladding material.

Fasteners to timber battens: Provide fasteners long enough to penetrate the thickness of the batten without piercing the underside.

2.4 ALUMINIUM CASSETTE PANELS**Generally**

A prefabricated, fixed panel system divided into individual panels as indicated on architectural drawings, factory formed from 3mm thick PVDF coated aluminium, with folded edges and sealed joints typically fixed over a hot dip galvanised steel frame.

Include all framing members, fixings and accessories necessary to complete the work.

Unless noted, fixings shall be not less than Corrosion Class 4 (AS 3566). Include separation washers of appropriate size and type. Visible fixings shall have coloured heads. Colour to be selected.

Framing member sizes and spacings, shown on the drawings are indicative only. The contractor is to undertake structural design and certification for the adequacy of the support structure.

The contractors must be specifically experienced in the fabrication and application of aluminium cassette panel installations.

2.5 EXTRUDED ALUMINIUM CLADDING**Generally**

A system of extruded aluminium panels installed horizontally or vertically as a rain screen facade, typically fixed over a hot dip galvanised steel subframe.

Include all framing members, fixings and accessories necessary to complete the work.

Unless noted, fixings shall be not less than Corrosion Class 4 (AS 3566). Include separation washers of appropriate size and type. Visible fixings shall have coloured heads. Colour to be selected.

Framing member sizes and spacings, shown on the drawings are indicative only. The contractor is to undertake structural design and certification for the adequacy of the support structure.

The contractors must be specifically experienced in the fabrication and application of aluminium panel installations.

2.6 ALUMINIUM CLADDING

Generally

A prefabricated aluminium cladding system, designed, detailed and installed in accordance with the approved samples and shop drawings. Include all framing members, fixings and accessories necessary to complete the work. *Refer Schedule 01 – External finishes and assemblies*

Unless noted, fixings shall be stainless steel in accordance with manufacturer's requirements

Framing member sizes and spacings, shown on the drawings are indicative only. The contractor is to undertake structural design and certification for the adequacy of the support structure.

The installers must be approved by the supplier of the materials, specifically trained and experienced in the fabrication and application of aluminium cladding.

2.7 STEEL PANEL CLADDING

Generally

A prefabricated, fixed watertight cassette panel system divided into individual panels as indicated on architectural drawings, factory formed from 1.2mm thick (minimum) Colorbond steel, with folded edges, fixed over a hot dip galvanised steel frame.

Include all framing members, fixings and accessories necessary to complete the work.

Unless noted, fixings shall be not less than Corrosion Class 4 (AS 3566). Include separation washers of appropriate size and type. Visible fixings shall have coloured heads. Colour to be selected.

Framing member sizes and spacings, shown on the drawings are indicative only. The contractor is to undertake structural design and certification for the adequacy of the support structure.

The contractors must be specifically experienced in the fabrication and application of steel and steel installations.

2.8 FIBRE CEMENT CLADDING

Generally

Standard: To AS/NZS 2908.2.

Cladding, eaves and soffit linings: Type A Category 3 (modulus of rupture $\geq$ 7MPa).

Sheet cladding

General: Provide a proprietary system of single faced fibre cement sheets.

Arrangement: Set out in even panels with joints coinciding with framing.

Eaves and soffit lining

Sheets: Single faced fibre cement.

2.9 COMPRESSED FIBRE CEMENT CLADDING SYSTEMS

Compressed fibre-cement (CFC) sheeting shall be a complete proprietary system of compressed, autoclaved, cellulose fibre reinforced cement sheet, manufactured in accordance with AS/NZS 2908.2: Flat sheets.

The sheets shall be smooth and even, square edged, and free of imperfections.

The system shall be selected for the conditions and performance requirements and installed in accordance with the Manufacturer's Instructions and relevant Standards.

Include required sub-framing, fixings, jointing, trims and accessories.

Edges: Square

2.10 TIMBER CLADDING**Timber**

Hardwood: To AS 2796.1

- Grade: To AS 2796.2

Seasoned cypress pine: To AS 1810

Softwood: To AS 4785.1

- Grade: To AS 4785.2

Fasteners

LOSP treated timber and non-corrosive timber cladding: Hot-dip galvanized steel.

CCA treated timber and corrosive timber cladding (including western red cedar or redwood): Stainless steel type 316 or silicon bronze.

Hardwood cladding: Bullet head and plain shank nails, if the cladding is painted and nails are punched and stopped.

Softwood cladding: Flat head and plain shank nails, if cladding is painted.

CCA treated softwood cladding: Deformed shank (ring or annular) flat head nails.

Unpainted cladding/framing joints: Do not use machine driven T head nails.

2.11 STONE CLADDING**Generally**

Refer *Stone Cladding* Worksection

2.12 COMPONENTS**Flashings**

Standard: To AS/NZS 2904.

3 EXECUTION**3.1 PREPARATION****Substrates or framing**

Requirement: Before fixing cladding, check the alignment of substrates or framing and adjust if required.

Flexible underlay: Check that the underlay is restrained.

3.2 CONSTRUCTION GENERALLY**Generally**

Provide a cladding system and associated work which

- Remains intact and waterproof under the local or regional ambient climatic conditions.
- Provides adequate means of dealing with vapour pressure, condensation, corrosion and thermal movement.
- Conforms to loading requirements of balustrades, where applicable.
- Satisfies other specified performance requirements

Fixings

Fixing method: As documented or to one of the following fixing methods to the manufacturer's recommendations:

- Steel framing: Screw.
- Timber framing: Nail or screw.
- Minimum penetration for profiled metal sheets: 30 mm for timber framing.

Horizontal cladding surface:

- Minimum slope: 1:15.
- Staining: Slope away from visible vertical facade areas to prevent staining.

Defective components: Do not install component parts which are defective, including warped, bowed, dented, abraded or broken members.

Damaged parts: Remove and replace damaged members during installation.

Accessories and trim

Requirement: Provide accessories and trim required to complete the installation, or as documented.

Corner flashing for profiled and seamed metal sheets: Finish off at corners with purpose-made folded flashing strips.

Metal separation

Requirement: Prevent direct contact between incompatible metals, and between green hardwood or chemically treated timber and aluminium or coated steel, by either of the following methods:

- Apply an anti-corrosion, low moisture transmission coating to contact surfaces.
- Insert a separation layer.

Incompatible metal fixings: Do not use.

Proprietary systems or products

Product fixing: Fix proprietary systems to the manufacturer's recommendations.

Loads

The installed work, including anchorages, fixings and framing, shall accommodate all permanent and temporary loads (including wind and maintenance loads) without failure or defects

Ensure that no base-structure loads, including loads resulting from short or long-term structural deflection or shortening of base-structure, are transferred to the installed cladding, unless indicated on the shop drawings and approved.

Verify that base-structure concrete has cured and reached sufficient strength to support cladding loads.

Bearing surfaces in permanent contact shall be cleaned before installation.

Drainage and water shedding

Where the bottom edge of cladding terminates above other finished cladding surfaces, make provision to drain or deflect water to prevent cumulative staining of lower surfaces.

Do not fix through horizontal surfaces of visible flashings and cappings.

Temporary coatings

On or before completion of the works, or before joining up to other surfaces, remove all traces of temporary coatings used as a means of protection.

Cladding sheet installation

Swarf: Remove swarf and other debris as soon as it is deposited.

Accessories: Provide material with the same finish as cladding sheets.

Corner flashing

Requirement: Finish off at corners with purpose-made folded flashing strips.

Ambient climatic conditions

The installed work shall withstand all static and dynamic wind forces applicable to the site in accordance with the relevant Standards.

- Wind loading to AS 1170.2 or AS/NZS 1170.2:
- Design and construction details for cyclonic areas to AS 1684.3

Movement

The installed work and connections shall accommodate expansion, contraction, deflection and related movements from any cause in the base-structure, the substrates to which the work is fixed, and within the work, without failure and silently.

Control joints

Construct suitable control joints where indicated or required, in accordance with the Manufacturer's Instructions and relevant Standards.

The movement capability of control joints shall be sufficient to accommodate required movements in the substrate or base-structure, and within finished work.

Control joints in finished work shall extend full depth to substrate or base-structure, and shall coincide with joints in substrates and base-structure.

Control joints and fillers to surfaces with required fire-resistance, acoustic-ratings, or air sealing requirements shall have the same rating, unless otherwise approved.

Control joint spacing shall not exceed the lesser of the Manufacturer's Instructions, the structural grid dimensions, the spacing indicated on the Drawings, or the relevant Standard requirements.

Verify width and spacing of control joints before commencing. Do not relocate or eliminate joints indicated on the Drawings, or make joints not indicated, without approval.

Thermal movement

The installed work shall accommodate the thermal movements based on recorded ambient temperature range for the site location, but not less than -5 C-degrees to +50 C-degrees. Submit verification.

Enable thermal movement to take place freely in the plane of the system without causing harmful buckling, failure of joint seals, undue stress on fasteners or other harmful effects.

Connections

The installed work shall be connected to the base-structure or substrate in a neat, substantial manner by correctly selected and located connections so that loads can be transferred from the work to the base-structure or substrate in a manner, which prevents displacement, distortion, or damage to the connections, substrate or the adjacent work. Connections shall accommodate movement requirements.

Concealed and visible fixings

Unless otherwise indicated or approved, fixings to finished work shall be concealed.

Where visible fixings are required, indicate head types, finish and alignment tolerances of visible fixings on shop drawings.

Visible fixings shall match control samples, and shall be evenly and neatly located, aligned and finished to match adjacent substrate.

Install visible fixings after finishing adjacent surfaces where practicable to prevent paint smears or other damage. Include required spaces, grommets and accessories. Use correctly sized tools to prevent mechanical damage.

Concrete substrates

Check base-structure and concrete reinforcement shop drawings and carry out site survey to verify profiles and suitability of fixing locations. Indicate relationship between fixings and reinforcement on shop drawings of this trade.

Smoke isolation

The installed system shall ensure smoke isolation between floors and elsewhere as required, which comply with statutory requirements. Indicate details of smoke isolation on shop drawings.

Provide suitable smoke isolation in accordance with the statutory requirements, including fixed baffles, fire safing, and sealing. Baffles shall be durable and non-corroding.

Corrosion

Materials and products, including fixings, concealed and structural components, shall be corrosion-resistant or protective coated to prevent corrosion.

Compatibility

Adjacent materials and products shall be chemically and electrolytically compatible with each other, substrates, and adjacent work, or shall be separated by suitable products and procedures. Adjacent materials and products, including adhesives and sealants, shall not stain or contaminate, and shall not cause visual or structural defects in adjacent materials.

Weather protection

The installed work, including all joints, shall exclude water and weather from the interior side of the system at the design wind pressures and all weather conditions, and shall discharge water, including leakage and condensation, into the appropriate drainage system. Water shall not be trapped or retained within the system.

Thermal properties (external walls)

The installed work shall provide continuous thermal insulation to minimise heat gain or loss between the inside of the building and the surroundings not less than the required thermal resistance rating, in accordance with relevant Standards and statutory requirements.

The thermal resistance rating shall not be less than required by the BCA.

Verify required thermal properties with computations and shop drawings, and indicate insulation type, density and thickness, location of moisture vapour barriers and other items, which may affect thermal performance.

Refer *Thermal Insulation* worksection

Air leakage / infiltration

The installed work shall minimise air infiltration. Provide suitable seals, sealing and baffles.

Self generated and structure borne noise

The installed work and component parts shall function noiselessly under all conditions including substrate movements, temperature range, wind, air infiltration, maintenance and cleaning operations.

The system shall not generate noise due to whistling, creaking, drumminess or rattle.

Services reticulation

Build-in, cover and conceal reticulated services passing through the work. Construct suitable openings and passages for the unrestricted installation of such services by the relevant Services Contractor. Coordinate with relevant Services Drawings and Specification.

Provide suitable access covers where required for later maintenance or replacement.

Secondary framing and bracing

Provide sufficient additional framing and bracing to ensure the work is rigid and safe under all loading conditions, including later applied work by other trades, and at openings, terminations and junctions.

Additional framing and bracing shall be integrated with the work and concealed.

Applied work by other trades may include lighting, fixtures, equipment and signage. Coordinate with related trades as required and verify types and loads of applied work.

Where secondary steelwork has not been designed by the Engineer, Contractor to provide and pay for all engineering and certification to any secondary steelwork that may be required to support the entire cladding installation, and to meet the performance requirements of this worksection.

Framing shall be concealed, unless noted. Coordinate with trades for adjacent work.

Framing shall be hot dip galvanized after fabrication in accordance with the relevant Standards, unless otherwise indicated as protective coated.

- AS/NZS 4680: Hot-dip galvanized (zinc) coatings on fabricated ferrous articles.

Cladding tolerances

Spacing of supporting members: $\pm 5\text{mm}$ on the nominated support member spacing

Cladding panel fabrication tolerances shall not exceed:

- Length and width: $\pm 2\text{mm}$.
- Diagonals: $\pm 3\text{mm}$.
- Flatness: $\pm 1\text{mm}$ per 1 metre length, maximum 2mm.
- Edge straightness: $\pm 1\text{mm}$ per 1 metre length, maximum 2mm.
- Maximum corner radius shall be 3mm.

Joints:

- Cladding panel edges shall align from one panel to another to ensure continuous and even joints of uniform width along each joint alignment and plane of finished work.
- Joint widths and misalignment shall not vary in excess of $\pm 10\%$ of the design width.
- Vertical or horizontal misalignment at the abutting ends of cladding: $\leq 2\text{mm}$

Installation tolerances shall not be cumulative. Site check the cumulative effect of base-structure tolerances and adjust installation locations as required

Include additional steel framing and furring required by this trade for levelling or otherwise to ensure that the substrate framing tolerances are within the cladding manufacturer's substrate instructions.

Vermin

The complete installation shall be vermin-proof. Provide approved corrosion resistant flashings and baffles, and construct work to prevent access and concealed breeding places for vermin.

Flatness and alignment

Selection of materials, reinforcement, fabrication and installation procedures shall ensure a high standard of surface flatness, joint and edge straightness, and alignment of mating surfaces.

Develop suitable procedures for cutting and cut edge treatment, stiffening and the tightening of fixings to prevent distortion or warping.

Provide sufficient support framing, backing sheets, ribs and material thickness to prevent visible undulations.

Staining

Parapets, cappings and related minor horizontal surfaces shall not over-flow or shed water onto adjacent visible cladding surfaces.

Minor horizontal surfaces shall be sloped to ensure surface water and moisture drains back into adjacent roof drainage system.

Include additional vertical ribs, upstands or other drainage methods where there is a risk of over-flow due to surface ponding, wind effects, or over-run from adjacent steeper surfaces.

3.3 COLORBOND® STEEL AND ZINCALUME® STEEL CLADDING**Installation**

Swarf: Remove swarf and other debris as soon as it is deposited.

Ground clearance: Maintain documented clearance.

Cutting sheets: Wherever possible, factory cut to length. Do not use an abrasion disc.

Accessories: Provide material with the same finish as cladding sheets.

3.4 ALUMINIUM CASSETTE PANELS**Generally**

Custom cladding shall be complete approved systems to match control samples, design developed, detailed and installed in accordance with the approved shop drawings. Unless noted otherwise the panels will be installed as a cassette system to suppliers recommended fixing details.

Submit shop drawings and computations. Include details of junctions and compatibility with other cladding components and adjacent work.

Cladding panels/trays shall be factory manufactured complete with fixing points and stiffening. Support framing, fixings and concealed surfaces shall have an approved corrosion-resistant treatment.

Panels are to be fabricated in a numbered sequence in order to ensure consistency of colour and finish.

Maintain continuous 'as-built' elevation drawings with the date of installation of each panel referenced to the panel numbering system and retain a copy on-site for inspection without notice.

Edges and corners

Unless noted otherwise the following shall apply:

- Panel edges shall be folded and dressed down
- Panel corners and joints shall be brought to tight hairline and sealed.

Panel backing

Where required, cladding panels shall be fixed over an 'A' grade plywood backing, not less than 12mm thickness, or other suitable backing sheet to ensure sound deadening and stiffening.

Backing shall accommodate thermal expansion without buckling or delamination.

Preparation and Storage

Metal panels shall be kept dry and protected from damage. Panels shall be delivered with a protective plastic film to the exposed faces.

Installation

Before lifting cladding panels into position, inspect each panel for surface and edge damage in excess of the control samples, and verify that each panel is complete with all fixings and accessories, and is correctly numbered.

Do not install panels that do not comply with installation tolerances and remove from site.

Install the cladding system in accordance with approved shop drawings, prototypes and construction methods and to comply with the performance requirements and relevant Standards.

Panels shall be fixed in a manner to allow for thermal expansion and contraction of the metal. Fixing shall be by screwing or using bolt hooks to fix the panels directly to the substrate. All fixings shall be stainless steel.

Panels are to be erected in numbered sequence

Install the system plumb, level and true to line within required tolerances, without warp or rack, suitably anchored to the base-structure. Do not bend or deform work during installation.

Loads

Ensure that no base-structure loads, including loads resulting from short or long-term structural deflection or shortening of base-structure, are transferred to the installed cladding, unless indicated on the shop drawings and approved.

Verify that base-structure concrete has cured and reached sufficient strength to support cladding loads.

Bearing surfaces in permanent contact shall be cleaned before installation.

Drainage and water shedding

Where the bottom edge of cladding terminates above other finished cladding surfaces, make provision to drain or deflect water to prevent cumulative staining of lower surfaces.

Do not fix through horizontal surfaces of visible flashings and cappings.

Joints

All joints shall be sealed with a neutral cure; non-acid based 100% pure silicone rubber sealant over a closed cell-backing rod.

Colour: To be advised.

Cladding support

Cladding panels shall be factory manufactured complete with fixing points and stiffening. Support framing, fixings and concealed surfaces shall have an approved corrosion-resistant treatment.

Panels shall not be less than 1.2mm thickness

3.5 COMPLETION**Protection**

Surface protection: Protect finished surfaces and applied finishes from damage.

3.6 WARRANTY**Generally**

Provide warranties for materials and workmanship in the form of interlocking warranties from the supplier and the installer against the failure of materials and execution under normal environment and conditions of use. Refer *General requirements* worksection

Certification

Submit written certification for the following:

- That the completed work is compliant with the Contract Documents and is in accordance with the manufacturer's requirements for the correct selection and installation of the components and complete systems
- That the installed systems and components are in accordance with the relevant Australian Standards nominated in this worksection.

Where the work includes more than one proprietary system, include each manufacturer's certification of its own work, and that the interface details with the adjacent proprietary systems do not reduce or modify that manufacturer's warranty.

4 SELECTIONS**4.1 CLADDING FINISHES AND SYSTEMS****Generally**

Refer *Schedule 01 - External Finishes and Assemblies*

REVISION HISTORY

Revision	Date	Description
-	25/02/2021	TENDER

0421 ROOFING**1 GENERAL****1.1 RESPONSIBILITIES****General**

General: Provide a roofing system and associated work as documented and which satisfies the product performance requirements.

Ambient climatic conditions

Design rainfall intensity: To AS/NZS 3500.3

Atmospheric Classification

Category to AS/NZS 2312:

Roof access

General: To AS 1657

1.2 CROSS REFERENCES**General**

Requirement: Conform to the following worksections and documents:

- *General requirements*
- *Building Access Safety Systems*
- *Waterproofing: External and tanking*
- *Schedule 01: External Finishes and Assemblies*
- *Structural engineer's drawings*
- *Hydraulics and mechanical engineer's drawings*

1.3 INTERPRETATION**Definitions**

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

- Ancillary for tile roofing: A moulded non-metallic product used to finish the roof, includes apex, ridge, and barge tiles.
- Roof tile: A moulded interlocking non-metallic product used to form the field of the roof.

1.4 TOLERANCES**Sheet metal roofing**

Supporting members: To AS 1562.1 clause 4.2.3.

Tile roofing

Roof tiles: Dimensional tolerance to AS 2049 clause 5.2.

Battens: To AS 2050 clause 3.2.

1.5 SUBMISSIONS**Certification**

Design of glazed roofing: Submit an engineer's certificate confirming conformance to AS 1288.

Operation and maintenance manuals

On completion: Submit a manual of recommendations from the roofing manufacturer or supplier for the maintenance of the roofing system including, frequency of inspection and recommended methods of access, inspection, cleaning, repair and replacement.

Products and materials

Type tests: As appropriate for the project, submit evidence of conformance to the following:

- Metal roofing generally: Roof sheeting and fastenings to AS 1562.1 clause 5.4 for resistance to concentrated load and AS 1562.1 clause 5.5 for resistance to wind pressure.
- Metal roofing in cyclonic regions to AS/NZS 1170.2: Roof sheeting and fastenings to AS 1562.1 clause 5.6.

Samples

Requirement: Submit samples of the following, showing the range of variation available:

- Trims and accessories with a colour finish.

- Seamed sheet metal roofing:
 - . Custom profiled flashings and cappings.
 - . Pre-weathered finish to sheet metal.
 - . Sealants.

Tests

Internal downpipes: Complete site tests to each stack hydrostatically in stages 2 storeys high for two hours. Remedy defects and retest if necessary.

Shop drawings

General: Submit shop drawings to a scale that best describes the details required.

Warranties

Requirement: Refer to the *General Requirements worksection*

Roofing materials: Submit the manufacturer's published product warranties.

2 PRODUCTS**2.1 STORAGE AND HANDLING****Storage and handling**

Storage: Store roofing materials, as follows:

- Metal roofing materials: Away from uncured concrete and masonry, on a level base and not in contact with other materials that cause staining, denting or other surface damage.
- Shingles and shakes: Under cover and clear of the ground, to the manufacturer's recommendations, protected from damage and weather.

Handling: Handle metal roofing materials, as follows:

- Use gloves when handling pre-coated metal roofing material.
- Use soft soled shoes when fixing or working on roofs.
- Protect edges and surfaces from damage. Do not drag sheets across each other or over other materials.

Safety mesh

Standard: To AS/NZS 4389.

2.2 PROFILED SHEET METAL ROOFING**Standard**

Design and materials: To AS 1562.1

Fasteners

Finish: Prefinish exposed fasteners with an oven baked polymer coating to match the roofing material.

Fastenings to timber battens: Provide fastenings just long enough to penetrate the thickness of the batten without piercing the underside.

Profiled fillers

Type: Purpose-made closed cell polyethylene foam profiled to match the roofing profile.

Location: Provide profiled fillers under flashings to the following:

- Ridges.
- Eaves.
- Lapped joints in roof sheeting.

Safety mesh

Standard: To AS/NZS 4389.

Insulation spacers

General: A proprietary system consisting of galvanised bars and supporting brackets to raise the roof sheet above the purlin, creating a defined space between the safety mesh and the roof sheet for the insulation and including the following:

- Able to achieve BCA compliant Total R-Value (RT) when used in conjunction with approved insulation blankets
- Rated for use in cyclonic regions across the full range of bracket heights, where applicable.

- Available in a range of bracket heights to ensure the insulation recovers to its full design thickness in accordance with BCA requirements.
- Compatible with both pierce fixed and concealed fixed roofing systems.

2.3 ROOF PLUMBING

General

Description: Flashings, cappings, gutters, rainheads, outlets, downpipes and accessories necessary to complete the roofing system.

Flashing and capping: Notched to match profile of roof sheeting.

Matching fascia/barge capping: If the selected eaves gutter is a proprietary high front pattern forming part of a combined system of gutter, fascia and barge, provide matching proprietary fascias and barge cappings to roof verges and edges.

Standards

Roof drainage: To AS/NZS 3500.3

Metal rainwater goods: To AS/NZS 2179.1

Flashings and cappings: To AS/NZS 2904

2.4 GLAZED ROOFING

Description

General: Sloped overhead glazing fixed to glazing bars or directly to the roof framing with the necessary supports, trim, flashings and sealants.

Glass selection and installation: To AS 1288.

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

2.5 SKYLIGHTS

Description

General: A proprietary skylight system including framing, fixing, trim, accessories and flashings.

Standard: To AS 4285

Skylights (roof lights) in bushfire prone areas: To AS 3959 clause 5.6.5, AS 3959 clause 6.6.5, AS 3959 clause 7.6.5, AS 3959 clause 8.6.5, or AS 3959 clause 9.6.3, as applicable to the site's Bushfire Attack Level (BAL).

2.6 ROOF VENTILATORS

Description

General: A proprietary roof ventilator system including framing, fixing, trim, accessories and flashings. Finish to match roofing

2.7 ROOF HATCHES

Generally

A proprietary all-metal hatchway with gas strut assisted opening, including framing, fixing, trim, seals, accessories and flashings.

Types: Refer *Schedule 01: External Finishes and Assemblies Schedule*

2.8 BUILDING ACCESS SAFETY EQUIPMENT

Generally

Refer *Section 0193 – Building Access Safety Systems* worksection

2.9 PLATFORMS, WALKWAYS AND LADDERS

Generally

Refer *Section 0193 – Building Access Safety Systems* worksection

3 EXECUTION

3.1 STORAGE AND HANDLING

Sheet metal roofing

Storage: Store metal roofing materials away from uncured concrete and masonry, on a level base. Do not store materials in contact with other materials which may cause staining, denting or other surface damage.

Handling: Handle roofing materials as follows:

- Use gloves when handling pre-coated metal roofing material.
- Use soft soled shoes when fixing or working on roofs.
- Protect edges and surfaces from damage. Do not drag sheets across each other or over other materials.

3.2 INSTALLATION

Protection

General: Keep the roofing and rainwater system free of debris and loose material during construction and leave them clean and unobstructed on completion. Repair damage to the roofing and rainwater system.

Touch up: If it is necessary to touch up minor damage to pre-painted metal roofing, do not overspray onto undamaged surfaces.

Thermal movement

Requirement: Provide for thermal movement in the roof installation and the structure, including movement in joints and fastenings.

Pan type sheets

Removal: Capable of being de-indexed and removed without damage.

Curved corrugated sheet

General: Form by rolling from material recommended for curving or bullnosing. Minimise crimping or creasing across the face of the sheet. Trim off crimped or creased edges and ends.

Metal separation

Requirement: Prevent the following:

- Direct contact between incompatible metals.
- Direct contact between green hardwood or chemically treated timber and aluminium or coated steel
- Run-off from copper and copper alloys onto aluminium, zinc, galvanized, or aluminium/zinc-coated surfaces.
- Run-off from inert catchment surfaces such as glazed terracotta, prepainted steel, aluminium and aluminium/zinc onto galvanized surfaces.

Methods of avoiding contact between incompatible metals include:

- Applying an anti-corrosion low moisture transmission coating such as zinc or barium chromate primer or aluminium pigmented bituminous paint to contact surfaces.
- Inserting a separation layer such as polyethylene film or adhesive tape, or bituminous felt.

3.3 PROFILED SHEET METAL ROOFING

Installation

Standard: To AS 1562.1

Swarf: Remove swarf and other debris as soon as it is deposited.

Accessories: Provide accessories with the same finish as roofing sheets to complete the roofing installation.

Ridges and eaves

Sheets ends: Treat as follows:

- Project sheets 50mm into gutters.
- Close off ribs at bottom of sheets using mechanical means or with purpose-made fillers or end caps.
- Turn pans of sheets up at tops and down into gutters by mechanical means.
- Provide pre-cut notched eaves flashing and bird proofing where necessary.
- Close off ridges with purpose-made ridge fillers of closed cell polyethylene foam.

Ridge and barge

Capping: Finish off along ridge and verge lines with purpose-made ridge capping or barge rolls.

Sprung curved ridge

General: Lay the roofing sheets in single lengths from eaves to eaves by naturally curving the sheets over the ridge.

Ridge: Seal side laps at the ridge and extend the sealant to the point where the roof pitch equals the recommended pitch of the roofing profile.

End laps

General: If end laps are unavoidable, and the sheet profile is not suitable for interlocking or contact end laps, construct a stepped type lap, in accordance with the product manufacturer's details

3.4**3.5 ROOF PLUMBING****Jointing sheet metal rainwater goods**

Butt joints: Make joints over a backing strip of the same material.

Soldered joints: Do not solder aluminium or aluminium/zinc-coated steel.

Sealing: Seal fasteners and mechanically fastened joints. Fill the holes of blind rivets with silicone sealant.

Flashings

Installation: Flash roof junctions, upstands, abutments and projections through the roof. Preform to required shapes if possible. Notch, scribe, flute or dress down as necessary to follow the profile of adjacent surfaces. Mitre angles and lap joints 150mm in running lengths. Provide matching expansion joints at 6.0m maximum intervals.

Upstands: Flash projections above or through the roof with two part flashings, consisting of a base flashing and a cover flashing, with at least 100mm vertical overlap. Provide for independent movement between the roof and the projection.

Large penetrations: To low pitch roofs extend the base flashing over the roofing ribs to the ridge to prevent ponding behind the penetrating element.

Wall abutments: Where a roof abuts a wall, provide as follows:

- In masonry walls, planked cladding or concrete: Step in courses to the roof slope. Interleave with damp proof course, if any.
- In masonry: Build into the full width of the outer leaf. Turn up within cavity, sloping inward across the cavity and fixed to or built in to the inner leaf at least 75mm above.
- In concrete: Turn 25mm into joints or grooves, wedge at 200mm centres with compatible material and point up. Alternatively, fix a proprietary or purpose made termination bar, or flashing, to face of concrete and seal with suitable neutral cure sealant.

Fixing to masonry or concrete: Step in courses to the roof slope. Interleave with damp proof course, if any.

Pipe flashings: Trim the flexible collar to suit pipe size and fit to pipe. Apply sealant to underside of flexible flange. Press base to the roof, smooth out and fasten. Don't fully extend to allow for vibration.

Existing flashings and cappings: Existing flashings and cappings to tiled roofs shall be modified as required and where noted on the drawings. Where flashings are required to be installed as an extension to, or adjacent to existing flashings, provide materials of the same size and finish and compatible with the roofing system.

Where flashings and cappings have deteriorated and are to be replaced, install new flashings that are complementary to the existing roof system and are similar in size and finish to the existing materials. Avoid installing materials that are incompatible with the existing metals or will cause galvanic corrosion.

Box gutters

Prefabricate gutters to the required shapes and sizes as shown on the drawings. Form stop ends, sumps, downpipe nozzles, bends and returns. Dress downpipe nozzles into outlets. Provide overflows to prevent back flooding.

Gutter and sump support: Provide framing and lining of adequate design to avoid distortion of the gutter from any reason. Line the whole area under the gutters and sumps.

Metal separation: Prevent direct contact between incompatible metals, and between green hardwood or chemically treated timber and aluminium or coated steel, by either applying anti-corrosion, low moisture transmission coating to contact surfaces or inserting a separation layer.

Design and installation: To AS 1562.1 and Lysaght Cyclonic Area Design Manual, where applicable.

Install gutters with a minimum fall of 1 in 200 maximum towards the outlets.

Provide expansion joints in guttering longer than 30m.

Hail guards: Install grating over the whole of the box gutter, over all box gutter sumps and over the edges of roofing sheeting entering box gutters.

Overflows: Provide overflows to prevent back-flooding. Size to pass 100% of the design rainfall. Discharge overflows in visible locations and so water does not enter the building or cause damage to the building.

Sumps: Minimum 150mm deep and the full width of the box gutter, unless otherwise indicated

Gratings: Install removable gratings over rainheads and sumps.

Leaf guards to gutter outlets: Leaf guards shall be provided on all box gutter sumps. Material shall match the gutter. All guards shall be removable. Leaf guards shall project above the top of the sump not less than half the depth of the gutter.

The protective plastic film should be stripped off immediately on installation

Sweep all metallic swarf and other debris from roof areas and gutters at the end of each day and at the completion of the installation.

Eaves gutters

General: A proprietary metal eaves gutter and accessories formed and precoated to match the roof cladding system.

Prefabricate gutters to the required sizes as shown on the drawings. Form stop ends, downpipe nozzles, bends and returns. Fix with neutral cure sealant and fasteners conforming to AS 3566 Class 4

Design and installation: To AS 1562.1 and Lysaght Cyclonic Area Design Manual, where applicable.

Installation: Install gutters with a minimum fall of 1 in 500 maximum towards the outlets.

Provide expansion joints in guttering longer than 30m.

The protective plastic film should be stripped off immediately on installation

Sweep all metallic swarf and other debris from roof areas and gutters at the end of each day and at the completion of the installation.

Valley gutters

Profile to suit the valley boarding. Turn back both edges 180mm x 6mm radius. Nail or screw to the valley boarding at the top end to prevent the gutter creeping downwards.

Gutter spouts

Unless noted otherwise, to match roofing materials

Overflows

Installation: Cast into concrete upstands flush with outside face.

Maintain constant offset from top or base of upstand. Dress waterproof membrane into overflows

Roof outlets

General: Proprietary funnel shaped outlets cast into the roof slab, set flush with membrane, with a removable grating and provision (e.g. clamp ring) for sealing the membrane into the base of the outlet. Grating shall be capable of removable without affecting membrane.

Standard: To AS CA55.

Balcony and walkway outlets

General: Proprietary outlets cast into the balcony and walkway slabs.

Standard: To AS CA55.

External downpipes

Prefabricate downpipes to the required section and shape. Connect heads to gutter outlets and, if applicable, connect feet to rainwater drains.

Downpipe support: Provide supports and fixings for downpipes. Where downpipes are supported away from walls, provide standoff brackets and ties in matching material.

Fixings: Neutral cure sealant and fasteners conforming to AS 3566 Class 4.

Fixings are to be compatible with downpipe material.

Internal downpipes

Access: Provide access openings as follows:

- At each junction and bend.
- At the foot of each stack.
- At every second floor level.

Sound insulation: Mineral fibre pipe insulation 50mm thick, spirally bound on with 1.5mm wire at 150mm pitch.

Building in: If pipes are built into masonry or concrete, spiral wrap the pipe (and insulation, if any) with building paper.

Rainwater disposal

System: Refer hydraulics drawings.

3.6 COMPLETION

Reinstatement

Extent: Repair or replace damage to the roofing and rainwater system. If the work cannot be repaired satisfactorily, replace the whole area affected.

Touch up: If it is necessary to touch up minor damage to prepainted metal roofing, do not overspray onto undamaged surfaces.

Cleaning

Roofing and rainwater drainage system: Remove debris, metal swarf, solder, sealants and unused materials.

Exposed metal surfaces: Clean surfaces of substances that interfere with uniform weathering or oxidation.

Roof plumbing: Clean out spoutings, gutters and rainwater pipes after completion of roof installation.

Certification

Submit written certification for the following:

- That the completed work is compliant with the Contract Documents and is in accordance with the manufacturer's requirements for the correct selection and installation of the components and complete systems
- That the installed systems and components are in accordance with the relevant Australian Standards nominated in this worksection.

Where the work includes more than one proprietary system, include each manufacturer's certification of its own work, and that the interface details with the adjacent proprietary systems do not reduce or modify that manufacturer's warranty.

3.7 WARRANTY

Generally

Provide warranties for materials and workmanship in the form of interlocking warranties from the supplier and the installer against the failure of materials and execution under normal environment and conditions of use.

Refer *General requirements* worksection

4 SELECTIONS

4.1 ROOFING FINISHES AND SYSTEMS

Generally

Refer *Schedule 01 - External Finishes and Assemblies*

REVISION HISTORY

Revision	Date	Description
-	25/02/2021	TENDER

0341 STRUCTURAL STEEL**1 GENERAL****1.1 RESPONSIBILITIES****General**

Requirement: Provide structural steelwork, as documented.

Performance

Construction category: To AS/NZS 5131

Adjoining elements: Provide for the fixing of adjoining building elements that are to be connected to or supported on the structural steel.

1.2 CROSS REFERENCES**General**

Requirement: Conform to the following worksections:

- *General requirements.*
- *ESD and Greenstar requirements*
- *Steel: Hot-dip galvanised coatings*
- *Steel: Protective paint coatings for steelwork*
- *Structural fire protection systems*

Structural Engineer's documentation

The structural engineer's documentation shall take precedence over the requirements of this worksection for all items relating to structural performance. This worksection shall take precedence over the structural engineer's documentation for all items relating to appearance and the disposition of elements

1.3 STANDARDS**General**

Materials and design: To AS 4100.

Materials and design of cold-formed decking, purlins and girts: To AS/NZS 4600.

Composite steel-concrete construction including profiled steel sheeting and shear connectors: To AS/NZS 2327.

Fabrication and erection: To AS/NZS 5131.

1.4 INTERPRETATION**Abbreviations**

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

- AESS: Architecturally Exposed Structural Steelwork.
- CC: Construction Category.
- NDE: Non-Destructive Examination.

Definitions

General: For the purposes of this worksection the definitions given in AS/NZS 5131 apply.

1.5 TOLERANCES**General**

Requirement: To AS/NZS 5131 Section 12 and Appendix F.

Tolerance class: 1.

1.6 SUBMISSIONS**Fabrication details**

Distortions: Submit proposals for the following:

- Preventing or minimising distortion of galvanised components, welded components or welded and galvanised components.
- Restoration to the designed shape.

Identification marks: If members and/or connections will be exposed to view, submit details of proposed marking.

Program: Submit a fabrication program showing the proposed sequence of operations and time required.

Execution details

Anchor bolts: If anchor bolts do not meet documented location tolerances, submit proposals for rectification before proceeding.

Bolting connections: For connections not documented, submit proposals.

Bolt tensioning procedure: Submit details of procedure, equipment to be used and calibration of the process.

Site base plate holing: If hand cutting of bolt holes in column base plates is required, submit details.

Purlins and girts: If purlins and girts support components other than roofing or cladding, submit details.

Site modifications: Submit details of proposed on-site modifications or rectifications to any steel member, connection component, mechanical fastener, weld or corrosion protection.

Splices: If variations to documented splice locations or additional splices are proposed, submit details.

Temporary connections or attachments: If not documented, submit details.

Undocumented weld types: Submit proposals for weld type and electrodes.

Welding plan: Submit a welding plan to AS/NZS 5131 clause 7.2.

Work method statement: Before any erection work commences, submit a work method statement to AS/NZS 5131 clause 11.2.3.

Products and materials

Steel members and sections: Submit test reports or test certificates conforming to AS 4100 clause 2.2.2.

Bolts, nuts and washers: Submit test reports or test certificates conforming to AS/NZS 1252.1 Section 6.

Verification testing of bolt assemblies: Submit test reports or certificates conforming to AS/NZS 1252.2 Section 2, together with the Supplier Declaration of Conformity (SDoC).

Anchor bolts: If anchors, other than those documented, are required or proposed for supporting or fixing structural steel, submit evidence of the anchor capacity to carry the load.

Substitution: If alternative sections or connections are proposed, submit details.

Records

Survey: Submit survey of erected structural steel to verify components have been installed as documented.

Drawings: Submit as-built structural drawings, upon completion.

Samples

AESS: Submit samples of Architecturally Exposed Structural Steelwork.

Minimum sample size: 0.1 m².

Shop detail documentation

General: Submit shop detail documentation to a scale that best describes the detail, conforming to AS/NZS 5131 clause 4.4.

Subcontractors

General: Submit names and contact details of proposed fabricator, detailer and installer.

Responsibilities: Submit names and contact details corresponding to the person/organisation assigned responsibility to the items listed in AS/NZS 5131 Table B3.

Tests

Site tests: Submit results, as follows:

- Bars and sections: Non-destructive tests.
- Plates: Ultrasonic tests.
- Welds: Non-destructive examinations.

1.7 INSPECTION**Notice – off site**

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

- Materials including welding consumables before fabrication.
- Testing of welding procedures and welder qualification tests.
- Commencement of shop fabrication.
- Commencement of welding.
- Complete penetration butt welds before the placement of root runs.
- High-strength bolt tensioning (when completed off-site).
- Completion of fabrication before surface preparation.

- Surface preparation before protective coating.
- Completion of protective coating before delivery to site.

Notice – on site

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

- Steelwork on-site before erection.
- Anchor bolts in position before casting in.
- Steelwork and column bases erected on site, before grouting, encasing, site protective coating or cladding.
- Tensioning of bolts in categories 8.8/TB and 8.8/TF.
- Reinforcement and formwork in place before any encasement.
- Completed grouting, encasement, fire protection or site applied protective coating.

2 PRODUCTS**2.1 GENERAL****Materials**

Requirement: To AS/NZS 5131 Section 5.

Storage and handling

Requirement: Pack, support, transport and handle members and components without overstressing, deforming or damaging them or their protective coating.

Damaged items: Rectify or replace. Do not assemble into the structure without approval.

Protection: Wrap or otherwise protect members or components to prevent damage to surface finishes during handling and erection.

Storage: Store off the ground.

Lifting points: Do not allow steel slings to come into direct contact with coated steelwork.

Purchasing and traceability

Purchasing documentation and procedure: To AS/NZS 5131 clause 4.6

Level of traceability: As defined in AS/NZS 5131 clause 4.7

2.2 STRUCTURAL STEEL**Steel members and sections steel grade table**

Type of steel	Minimum grade
Hot-rolled sections to AS/NZS 3679.1 and SA TS 102	300
Welded sections to AS/NZS 3679.2	300
Hot-rolled plates, floor plates and slabs to AS/NZS 3678 and SA TS 102	250
Hot-rolled flat products to AS/NZS 1594	HA300
Hollow sections to AS/NZS 1163 and SA TS 102: Circular sections less than 166 mm nominal outside diameter	C250
Hollow sections to AS/NZS 1163 and SA TS 102: Sections other than circular sections less than 166 mm nominal outside diameter	C350
Cold-formed purlins and girts to AS 1397	G450, Z350 or Z450

Certification

Steel: Minimum requirements for test and inspection certificates, to the following:

- Hot-rolled bars or sections: To AS/NZS 3679.1 clause 11.2.4
- Welded I sections: To AS/NZS 3679.2 clause 11.2.4
- Hot-rolled plate: To AS/NZS 3678 clause 11.2.4
- Cold-formed hollow sections: To AS/NZS 1163 clause 11.2.4

Testing

Requirement: Refer *Structural Engineer's* drawings

Ultrasonic testing of plates

Quality level: To AS 1710

2.3 PURLINS AND GIRTS

General

Material selection and design: To Manufacturer's recommendations with material selection aligned to environmental exposure conditions.

2.4 PURLIN BRIDGING AND ACCESSORIES

General

Material: Use materials and corrosion protection compatible with the documented purlins and girts.

Bridging: Required as documented, to control lateral deflection and twist of the purlins and girts.

2.5 MECHANICAL FASTENERS

Standards

Bolts: To AS 1110.1, AS 1111.1 and AS/NZS 1252.1

Nuts: To AS 1112.1, AS 1112.2, AS 1112.3, AS 1112.4 and AS/NZS 1252.1

Bolting category

Requirement: Refer *Structural Engineer's* drawings

Certification

High-strength bolt assemblies: Minimum requirements for test reports, to AS/NZS 1252.1 clause 6.4.2

Finish

Bolts, nuts and washers: Hot-dip galvanized to AS/NZS 1214, corrosion-free, and in serviceable condition.

Purlin bolts

Description: Coated steel bolts with integral washers on both the head and nut for use with purlins and girts.

Refer *Structural Engineer's* drawings

Permalite purlin bolts

Description: Grade A4-70 316 stainless steel bolts for use with Permalite aluminium purlins and girts, coated with a 15-25 micron fluoro-polymer coating. Refer *Structural Engineer's* drawings

Anchor bolts

Hexagonal bolts: To AS 1111.1

Hexagonal nuts: To AS 1112.3

Plain washers: To AS 1237.1

Requirement: Provide each anchor bolt with 2 nuts and 2 oversize washers with sufficient thread for the levelling nut and washer to set below the base plate.

Mechanical and chemical anchors: To SA TS 101, installed to manufacturer's recommendations:

2.6 OTHER MATERIALS

Welding consumables

Requirement: To the relevant part of the AS/NZS 1554 series.

Studs and shear connectors

Requirement: To AS/NZS 5131 clause 5.6

Grout

Requirement: To AS/NZS 5131 clause 5.8

3 EXECUTION

3.1 PREPARATION, ASSEMBLY AND FABRICATION

Identification

Traceability: To AS/NZS 5131 clause 6.2

Marking: Provide marks or other means of identifying each member compatible with the finish, for setting out, locating, erecting and connecting the steelwork to the marking plans.

Hard stamping: To AS/NZS 5131

High-strength bolting: If the work includes more than one bolting category, mark high-strength structural bolted connections with a 75mm wide flash of colour, clear of holes.

Cold-formed members: Clearly mark material thickness.

Monorail beams: Identify and mark rated capacity in conformance with AS 1418.18 clause 5.12.6

Natural beam camber

General: If steel beams have a natural camber, within the straightness tolerance, fabricate the steelwork element with the camber up.

Cutting

Shearing: Do not shear edges in areas designated as yielding regions for seismic design to AS 4100 earthquake design categories D and E.

Shaping

Requirement: Where forming, shaping or correcting distorted members, avoid damage and conform to AS/NZS 5131 clause 6.6

Holing

Slotted holes: Do not use slotted holes for connections, other than those documented.

Tolerances

Measurement: Check tolerances by measurement after fabrication and application of corrosion protection.

3.2 WELDING**General**

Requirements: To AS/NZS 5131 Section 7.

Standard: To AS/NZS 1554.1

Weld category

Weld categories not documented: Category GP.

Weld type

Weld type not documented: Submit proposals for weld type and electrodes.

Non-destructive weld examination (NDE)

Requirement: To AS/NZS 5131 clause 13.6.2

Non-visual NDE: By a third party testing authority.

Repairs: Repair welds revealed as faulty by NDE and repeat the examination.

Site welds

Completion: Weld only when correct alignment and preset or camber have been achieved.

3.3 MECHANICAL FASTENING**Connection contact surfaces**

General: To AS/NZS 5131 clause 8.4.1.

Bolting category 8.8/TF: Clean, as rolled and free from applied finishes.

Washers

Requirement: Place one washer under the part rotated during tightening process (nut or bolt head).

Tensioning of bolting categories 8.8/TB and 8.8/TF

Method: Use part-turn method or a direct tension indicator device.

Permanent bolting

Completion: Bolt only when correct alignment and preset or camber has been achieved.

3.4 SURFACE PREPARATION AND TREATMENT**General**

Requirement: Conform to *Steel – hot-dip galvanised coatings* worksection and/or *Steel - protective paint coatings* worksection, as appropriate.

3.5 SPECIAL FINISHES**General**

Requirement: Apply special finishes as documented in **SELECTIONS**

3.6 METAL SPRAYING**General**

Standard: To ISO 2063.2

Requirement: Apply sprayed metal finishes as documented

Process: Electric arc.

Application: Apply the coating as soon as possible after blasting.

3.7 FIRE PROTECTION COATINGS

General

Requirement: Apply fire protection to structural steelwork to *0346 Structural fire protection systems*.

3.8 ARCHITECTURALLY EXPOSED STRUCTURAL STEELWORK

General

Requirement: Provide AESS to AS/NZS 5131 Section 10 and as documented in **SELECTIONS**

AESS category

AESS category: To AS/NZS 5131 clause 10.2

Fabrication

Additional requirements: To AS/NZS 5131 clause 10.4

Corners and edges: Grind smooth sharp, marred, or roughened corners and edges.

Rough surfaces: Deburr and ground smooth.

Erection

Additional requirements: To AS/NZS 5131 clause 10.5

3.9 ERECTION

General

Execution: Make sure every part of the structure has sufficient design capacity and is stable under construction loads produced by the construction procedure.

Temporary work

General: Provide all necessary temporary bracing or propping.

Temporary connections: Detail required cleats, if not shown on shop detail documentation.

Temporary members: If temporary members are required, fix so as not to weaken or deface permanent steelwork.

Anchor bolts

General: For each group of anchor bolts, provide a template with set-out lines clearly marked for positioning the bolts when casting in.

Beam camber

Requirement: If beam elements have a camber (natural or induced), erect them with the camber up.

Site work

General: Other than work shown on the shop detail documentation as site work, do not fabricate, modify or weld structural steel on-site.

Purlins

Trimming members: Provide to support edges of roof sheeting along hips, valleys and roof penetrations.

Movements

General: Allow for thermal movements during erection.

Grouting at supports

Preparation: Before grouting steelwork supported by concrete or masonry, set steelwork on packing or wedges.

- Permanent packing or wedges: Form with solid steel or grout of similar strength to the permanent grout.
- Temporary packing or wedges: Remove before completion of grouting.

Timing: Grout at supports before constructing supported floors, walls and roofing.

Temperature: Do not grout if the temperature of the base plate or the footing surface exceeds 35°C.

Drifting

Limitation: Use drifting only to bring members into position, without enlarging holes or distorting components.

3.10 REPAIRS

General

Requirement: Repair finishes to restore the full integrity of any coating.

Temporary connections

General: Remove temporary cleats on completion and restore the surface.

3.11 COMPLETION**Tolerances**

Conformance: After completing erection, verify conformance with AS/NZS 5131 Section 12 and Appendix F.

Certification

Submit written certification for the following:

- That the completed work is compliant with the Contract Documents and is in accordance with the manufacturer's requirements for the correct selection and installation of the components and complete systems
- That the installed systems and components are in accordance with the relevant Australian Standards nominated in this worksection.

Where the work includes more than one proprietary system, include each manufacturer's certification of its own work, and that the interface details with the adjacent proprietary systems do not reduce or modify that manufacturer's warranty.

3.12 WARRANTY**Generally**

Provide warranties for materials and workmanship in the form of interlocking warranties from the supplier and the installer against the failure of materials and execution under normal environment and conditions of use. Refer *General requirements* worksection

4 SELECTIONS**4.1 STRUCTURAL STEELWORK****General**

Refer *Structural Engineer's* drawings

4.2 PROTECTIVE COATINGS**General**

Refer to the following worksections, where applicable:

- *Hot-dip galvanised coatings*
- *Steel - protective paint coatings*
- *Structural fire protection systems*
- *Painting*

4.3 FEATURE EXPOSED STEELWORK**General**

Refer to *Schedule 01 – External Finishes and Assemblies* and *Schedule 02 – Internal Finishes and Assemblies*

4.4 SPECIAL FINISHES**General**

Refer to *Schedule 01 – External Finishes and Assemblies* and *Schedule 02 – Internal Finishes and Assemblies*

REVISION HISTORY

Revision	Date	Description
-	25/02/2021	TENDER

0201 DEMOLITION**1 GENERAL****1.1 RESPONSIBILITIES****General**

General: Carry out demolition, as documented.

1.2 CROSS REFERENCES**General**

Requirement: Conform to the following:

- *General requirements*
- *ESD and Greenstar requirements*

1.3 STANDARD**General**

Demolition: To AS 2601.

1.4 INTERPRETATION**Definitions**

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

- Demolition: The complete or partial dismantling of a building or structure, by pre-planned and controlled methods or procedures.
- Dilapidation record: The photographic or video and written record made before commencement of demolition work of the condition of the portion of the existing building being retained, adjacent buildings, and other relevant structures or facilities.
- Dismantle: The reduction of an item to its components in a manner to allow re-assembly.
- Recover: The disconnection and removal of an item in a manner to allow re-installation.

1.5 SUBMISSIONS**Authority approvals**

Evidence of compliance: Before commencing demolition, submit evidence of the following:

- Requirements of authorities relating to the work under the contract have been ascertained.
- A permit to demolish has been obtained from the appropriate authority.
- A scaffold permit has been obtained from the appropriate authority (if scaffolding is proposed to be used).
- Certification that each person having access to the construction site has completed an OHS induction training procedure that is site-specific.
- Precautions necessary for protection of persons and property have been taken and suitable protective and safety devices have been provided to the approval of the relevant authority.
- Treatment for rodent infestation has been carried out and a certificate has been obtained from the appropriate authority.
- Fees and other costs have been paid.
- Wheel loads of tipping or loading vehicles.

Execution details

Requirement: Submit the following, as documented:

- Hazardous Substances Management Plan.
- Investigation and work plan.

Off-site disposal locations: Submit details of the proposed locations for the disposal of material required to be removed from the site, and evidence of conformance with the requirements of relevant authorities.

Recycling: Submit details of the proposed recycling facility.

- Certification: Submit evidence of delivery of recycled materials.
- Concrete crushing: If proposed on site, submit details of plant and environmental controls.

Stockpile locations: Submit details of the proposed locations of on-site stockpiles for demolished materials for recycling in the works. Coordinate with the locations for storage of other waste streams and prevent mixing or pollution.

Records

Dilapidation record:

- Before demolition: Submit to each owner of each adjacent property, a copy of the part of the record relating to that property and obtain their written agreement to the contents.
- Rectification work: Submit written acceptance of rectification works from the owner of each adjoining property affected.

Tests

Requirement: Submit test results of compliance tests for building service components to be re-used.

1.6 INSPECTION**Notice**

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

- Adjacent structures before commencement of demolition.
- Services before disconnection or diversion.
- Trees as documented to be retained, before commencement of demolition.
- Contents of building before commencement of demolition.
- Structure after stripping and removal of roof coverings and external cladding.
- Underground structures after demolition above them.
- Excavations remaining after removal of underground work.
- Site after removal of demolished materials.
- Services after reconnection or diversion.

2 PRODUCTS**2.1 DEMOLISHED MATERIALS****Demolished material classes**

Ownership and implementation: Comply with the **Demolished material classes table**.

Demolished material classes table

Class	Requirement	Ownership
Recovered items for re-use in the works	Recover without damage items identified in the Recovered items for re-use in the works schedule	Principal/proprietor
Recovered items for delivery to the principal	Recover without damage items identified in the Recovered items for delivery to the principal schedule	Principal/proprietor
Demolished material for recycling in the works	Stockpile material identified in the Demolished material for recycling in the works schedule	Contractor
Demolished material for recycling off site	Demolish and deliver for recycling material identified in the Demolished material for recycling off-site schedule	Contractor
Dismantle for relocation as part of the works	Dismantle without damage and store items identified in the Dismantle for relocation schedule	Principal/proprietor
Demolished for removal for removal from site	Remove from the site demolished materials identified in the Demolish for removal schedule . Do not burn or bury on site Transit: Prevent spillage of demolished materials in transit	Contractor

3 EXECUTION**3.1 SUPPORT****Identified hazardous substances**

Register: Hazardous substances have been identified as present on site and a Hazardous substances register has been prepared.

Audit

Requirement: Prepare a Hazardous Substances Management Plan to AS 2601 clause 1.6.1

Include the following:

- Asbestos or material containing asbestos.

- Flammable or explosive liquids or gases.
- Toxic, infective or contaminated materials.
- Radiation or radioactive materials.
- Noxious or explosive chemicals.
- Tanks or other containers which have been used for storage of explosive, toxic, infective or contaminated substances.

Removal of hazardous substances

Standard: To AS 2601 clause 1.6.2.

3.2 INVESTIGATION AND WORK PLAN**General**

Work plan: Submit the work plan before demolition or stripping work. Include the check list items appropriate to the project from AS 2601 Appendix A, and the following information:

- The method of protection and support for adjacent property.
- Locations and details of necessary service deviations and terminations.
- Confirmation of the sequence of work.
- Requirements of AS 2601 Section 2 Planning and execution.
- If the demolition program results in components temporarily cantilevered, provide a certificate from a professional engineer.
- Proposals for the safe use of mobile plant on suspended structural members including provisions for the protection of lower floors in the event of structural failure.
- If implosion methods are proposed, provide a separate report of methods and safeguards.

3.3 SUPPORT**Temporary support**

General: If temporary support is required, certification for its design and installation is required from a professional engineer engaged by the contractor.

Existing buildings: Until permanent support is provided, provide temporary support for sections of existing buildings which are to be altered and which normally rely for support on work to be demolished.

Ground support: Support excavations for demolition of underground structures.

Adjacent structures: Provide supports to adjacent structures where necessary, sufficient to prevent damage resulting from the works.

- Lateral supports: Provide lateral support equal to that given by the structure to be demolished.
- Vertical supports: Provide vertical support equal to that given by the structure to be demolished.

Permanent supports

General: If permanent supports for adjacent structures are necessary and are not documented, give notice and obtain instructions.

3.4 PROTECTION**Encroachment**

General: Prevent the encroachment of demolished materials onto adjoining property, including public places.

Weather protection

General: If walls or roofs are opened for alterations and additions or the surfaces of adjoining buildings are exposed, provide temporary covers to prevent water penetration. Provide covers to protect existing plant, equipment and materials intended for re-use.

Dust protection

General: Provide dust-proof screens, bulkheads and covers to protect existing finishes and the immediate environment from dust and debris.

Security

General: If a wall or roof is opened for alterations and additions, provide security against unauthorised entry to the building.

Temporary screens

General: Fill the whole of designated temporary openings or other spaces using dustproof and weatherproof temporary screens, fixed securely to the existing structure, and install to ensure appropriate shedding of water to avoid damage to retained existing elements or adjacent structures and contents.

Type: Timber framed screens sheeted with 12mm plywood and painted. Seal the junctions between the screens and the openings.

Temporary access

General: If required, provide a substantial temporary doorset fitted with a rim deadlock, and remove on completion of demolition.

Exposed surfaces

General: Where necessary, protect and weatherproof the surfaces of adjacent structures exposed by demolition.

Existing services

Location: Before commencing demolition, locate and mark existing underground services in the areas that will be affected by the demolition operations.

Utility services: Contact DIAL BEFORE YOU DIG to identify location of underground utility services pipes and cables.

Excavation: Do not excavate by machine within 1 m of existing underground services.

Fixed items

Individual protection: Protect the following items in their existing positions:

- Sewer easement entry and discharge points at boundary

Recovered items

General: Recover all components associated with the listed items that are essential for their re-use. Minimise damage during removal.

3.5 DEMOLITION – BUILDING WORKS**Dilapidation record**

Purpose: Use the dilapidation record to assess the damage and making good arising out of demolition work.

Availability: Keep the records of the investigations on site and available for inspection until the date of practical completion of the contract.

Encroachment

General: If encroachments from adjacent structures are encountered and are not documented, give notice and obtain instructions.

Concrete slabs

General: Using a diamond saw, neatly cut back or trim to new alignment with a clean true face existing concrete slabs to be partially demolished or penetrated.

Recycling: If concrete crushing is proposed on site, submit details of plant and environmental controls.

Material below grade

Remaining voids: Stabilise and provide barriers.

Explosives

General: Do not use explosives.

3.6 DEMOLITION – BUILDING SERVICES**General**

General: Decommission, isolate, demolish and remove from the site all existing redundant equipment including associated components that become redundant as a result of the demolition.

Breaking down: Disassemble or cut up equipment where necessary to allow removal.

Demolition of refrigeration systems

Standard: To AS/NZS 5149.4.

Components for re-use

General: Before returning to service, clean components and test for conformance to Australian Standards, as required.

3.7 COMPLETION**Notice of completion**

General: Give at least 5 working days' notice of completion of demolition so that adjacent structures may be inspected following completion of demolition.

Reinstatement

Assessment of damage: Use the dilapidation record to assess the damage and rectification work arising from the demolition work.

Rectification: Repair damage arising out of demolition work. Obtain written acceptance from the owner of each adjoining property of the completeness and standard of the rectification work.

Temporary support

General: Remove at completion of demolition.

REVISION HISTORY

Revision	Date	Description
-	25/02/2021	TENDER

DEMOLITION NOTES

NOTIFY ALL RELEVANT LOCAL AUTHORITIES
FOR DISCONNECTION AND SEALING PROCEDURES FOR
EXISTING SERVICES

EXISTING/FUNCTIONING COMMON SEWER EASEMENTS TO BE PROTECTED AND MAINTAINED DURING DEMOLITION. REFER TO AUTHORITIES AND CIVIL ENGINEER

ENSURE POWER SUPPLY IS DISCONNECTED BEFORE COMMENCING DEMOLITION WORKS

REMOVE ALL EXISTING TREES AND VEGETATION ON SITE
MAINTAIN AND PROTECT EXISTING STREET TREES AS
REQUIRED BY DA CONDITIONS

COMPLY WITH ALL RELEVANT SAFETY STANDARDS INCLUDING REQUIREMENTS FOR REMOVAL OF HAZARDOUS MATERIALS

DURING DEMOLITION CONTROL DUST, DEBRIS PROTECT WATERWAYS AND COMPLY WITH CONDITIONS SET OUT IN THE DA

SITE TO BE CLEARED OF ALL MATERIALS AND LEFT CLEAN AND SAFE



SIGN

	PRELIMINARY	DATE
01	CRAPT TIDACKER 65.9E	180
02	70% TIDACKER 65.9E	180

PERMISSION

QUALITY ASSURANCE
PK IS A CERTIFIED COMPANY TO ISO 9001-2015

THIS PROJECT IS SUBJECT TO THE IN-QUANTITY ASSURANCE SYSTEM.

☒	3D-BIM/4D DESIGN REVIEW FOR THE PROJECT'S COMPLETE DESIGN DEVELOPMENT REVIEW FOR THE PROJECT'S COMPLETE	DATE OF REVIEW 02/07/2025
☒	TRADITIONAL DOCUMENTATION REVIEW FOR THE PROJECT'S NOT TO BE COMPLETED	DATE OF REVIEW 21/02/2025
☐	CONSTRUCTION DOCUMENTATION REVIEW FOR THE DRAWING IS NOT TO BE COMPLETED	

IF THIS DRAWING IS STAMPED UNCONTROLLED COPY, IT WILL NOT BE CONSIDERED A

NOTES

THIS DRAWING IS CONFIDENTIAL AND SHALL REMAIN THE PROPERTY OF BAKER KATSAULOS (AKS) PVT LTD. CHECK AND REVEAL DRAWINGS ON SITE PRIOR TO COMMENCEMENT. DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER CONTRACT DOCUMENTS. DO NOT SCALE DRAWINGS. USE ROUNDED DIMENSIONS ONLY. SEEK CLARIFICATION OF INACCURACIES / CONFLICTS.

DRAWN	DATE	CHECKED	PLOT DATE	JOB NO.
DN	25.02.2021	JM	01.03.2021	19095



Product

95 ROBERTSON ST
95 ROBERTSON STREET
FORTITUDE VALLEY QLD 4006

FENDER KATSAIDIS

WWW.FKAUSTRALIA.COM
L4, 123 ECKLE STREET, BRISBANE
QUEENSLAND 4000 AUSTRALIA
TELEPHONE: +61 7 3666 0661
FENDER KATSAUDIS (AUSTR) PTY LTD ACN 092 943 036

ISSUE PURPOSE
TENDER ISSUE

DRAWING NO. 02 REV.



NOT FOR CONSTRUCTION

APPENDIX R- APPROVALS, PERMITS ETC- RESPONSIBILITY MATRIX

The following table reflects the relevant parties' responsibility for managing and the costs to obtain approvals, permits and the like. Any other approvals, permits, connections, works, inspections, certifications (and payment of associated fees, charges, levies, and the like) required to complete the Works, but not specifically noted in the below table, will be the **responsibility** of the successful Tenderer and therefore need to be allowed for accordingly.

Activity, Approval, Permit etc	Compile application, submit & manage approval	Payment of application, connection, infrastructure, and headwork fees, charges, levies, contribution & the like	Responsibility for the costs to design, construct, install, connect, inspect, certify as required etc	Coordination / management of the design, construction, installation, connection, inspection, certification as required etc
Development Approval Decision Notice	Principal	Principal	NA	NA
Q Leave / Portable Long Services Leave	Contractor	Contractor	NA	NA
Demolition Permit	Contractor	Contractor	Contractor	Contractor
QFES	Contractor	Contractor	Contractor	Contractor
Operational Works Earthworks, Stormwater, ESC.	Principal Note: includes application fee	Contractor	Contractor	Contractor
Operational Works – other i.e., Water, Landscaping (Self Certification), Signage	Contractor	Contractor	Contractor	Contractor
Building Permits	Contractor	Contractor	Contractor	Contractor
Plumbing, Drainage, Trade Waste	Contractor	Contractor	Contractor	Contractor
Final Certification / Certificate of Classification	Contractor	Contractor	Contractor	Contractor
Environmental Permits	Contractor	Contractor	Contractor	Contractor
New supplies & connection for all services to mains/ trunk infrastructure - sewer and water,	Principal Note: includes application fee	Contractor	Contractor	Contractor
New supplies & connection for all services to mains/	Contractor	Contractor	Contractor	Contractor

Activity, Approval, Permit etc	Compile application, submit & manage approval	Payment of application, connection, infrastructure, and headwork fees, charges, levies, contribution & the like	Responsibility for the costs to design, construct, install, connect, inspect, certify as required etc	Coordination / management of the design, construction, installation, connection, inspection, certification as required etc
trunk infrastructure including, power, gas, comms, NBN (including works beyond the site boundary)				
Sewer Build over Application	Contractor	Contractor	Contractor	Contractor
Relocation of existing services, infrastructure, lighting, signals, and the like	Contractor	Contractor	Contractor	Contractor
Cross overs, footpaths, and the like	Contractor	Contractor	Contractor	Contractor
Transport & Main Roads	Contractor	Contractor	Contractor	Contractor
Temporary Services and Connections	Contractor	Contractor	Contractor	Contractor
Other	Contractor	Contractor	Contractor	Contractor

THIS APPROVAL SHOULD NOT BE
TAKEN TO CONSTITUTE PERMISSION
TO ENTER NEIGHBOURING
PROPERTIES TO CONSTRUCT
(INCLUDING ASSOCIATED WORKS
SUCH AS DRAINAGE AND EXCAVATION)
ANY BUILT TO BOUNDARY WALL OR
FENCES. PERMISSION MUST BE
OBTAINED FROM RELEVANT
PROPERTY OWNERS.

95 ROBERTSON ST.

FORTITUDE VALLEY

Revision C

LANDSCAPE CONCEPT REPORT

DOCUMENT REGISTER

Project	95 Robertson Street		
Report Title	Landscape Concept Report for Development Application		
Revision Version	C		
Document No.	19122.01		
Prepared for	Empirica Developments		
Authors	Lat27		
Revision	Date	Approved	Details of Revision
A	29/05/2020	Nathalie Ward	Draft for Review
B	24/07/2020	Nathalie Ward	For Approval
C	07/08/2020	Nathalie Ward	For Approval

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SITE CONTEXT & LOCALITY

The site is located in the middle of Robertson St, Fortitude Valley, just a short walk to the James Street shopping and dining precinct and a short walk to Brunswick Street. The area is of a mixed use character consisting of high density apartment complexes, commercial and industrial premises, within a popular retail food and entertainment precinct.

Brisbane City Council (BCC) classifies Robertson Street as a Locality Street. The site is zoned MU1 for Mixed Use and must respond accordingly to Development Code 9.3.3 Centre or Mixed Use Code.

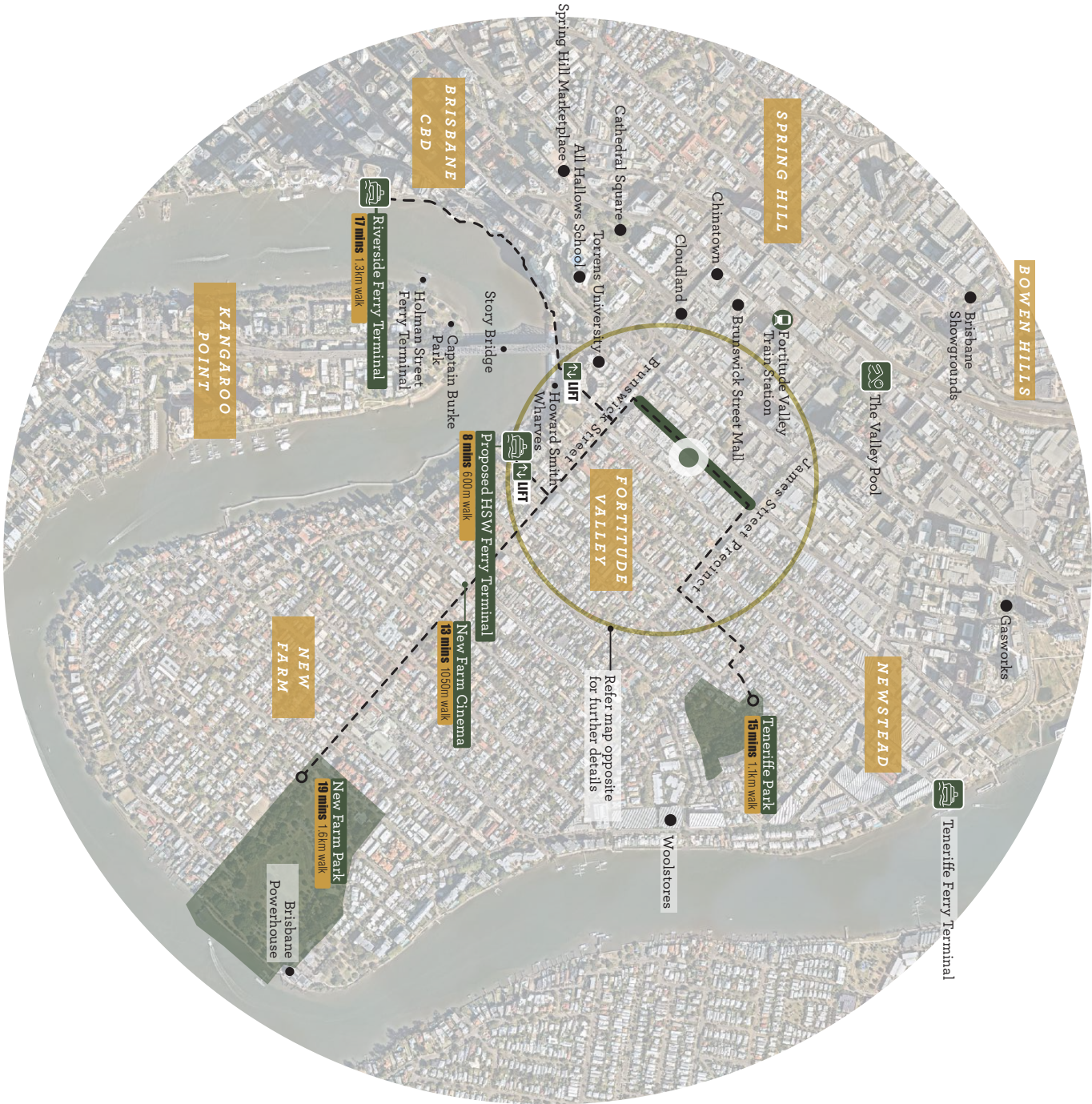
It is the intention of this report to address the landscape design and amenity component of the project to improve the user experience and visual outcome. Design elements including shade, screening, framing views, legibility, and responses for integrating climatic factors of heat and light. Accessibility is to be woven into the fabric of the landscape design to achieve a compliant project.

This report will highlight key opportunities to complement the local neighbourhood and proposed architecture.



SITE CONTEXT & LOCALITY

The 1.5km context map facilitates analysis of the wider area in which the site sits and provides a view of what connections and amenity are within reach of the site.



SITE CONTEXT & LOCALITY

Viewing the site at a 500m scale provides context of the many immediate walkable attractions and amenities.

Due to its location, the 95 Robertson Street site is incredibly well serviced from a walkability perspective.

Local bus stops can be accessed on Brunswick Street, a couple of doors down from the site with the Blue Glider stopping on Ann Street and Fortitude Valley Train Station an easy 9min walk away.



QUALITIES OF GREAT PUBLIC REALMS

Introduction

The landscape design response for the publicly accessible (streetcape works) landscape works is informed by the following qualities of great places

1.

People come first



Vibrant neighbourhoods, cooling, shady spaces will become increasingly important. Small-scale spaces with its high amenity and seating will be vital to creating a sense of neighbourhood for local residents.

2.

Resilience + Adaptation



Creating climatically and socially-responsive places are essential to future-proof their design. Non-tangible elements such as ensuring maximum digital interactive and functional flexibility will ensure Robertson Street maintains its currency and ability to embrace change.

3.

Complexity



The key to creating the complex and stimulating space is to apply a variety of urban grains that define spaces and cater to the needs of many groups of people. Precincts that buzz throughout the day and night feel alive because they attract crowds seeking things to do and see.



4.

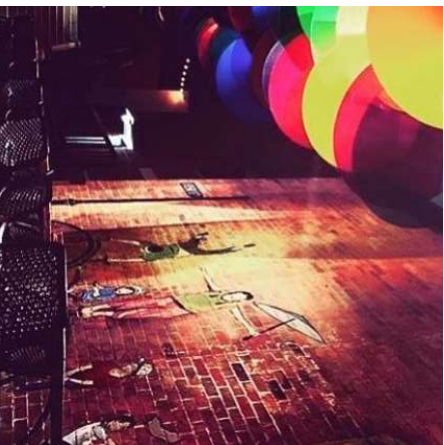
Ephemera



Impermanence is the cornerstone of innovation and city-making. The shifting sands of urban development stimulates dynamism and creativity such that people will travel long distances to experience the newness of a place.

5.

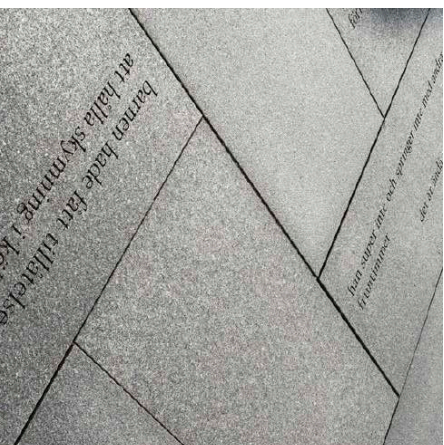
Cultural Expression



Overt cultural expression creates a tolerant, inclusive social environment where the public realm is owned by all its inhabitants.

6.

The Physical Place



The landscape of Fortitude Valley is undergoing rapid change and the need to embed the evolving narrative of the community into the materiality of new development is paramount. Using distinctive and robust materials and high quality finishes will ensure the longevity of this place.

7.

Connectivity

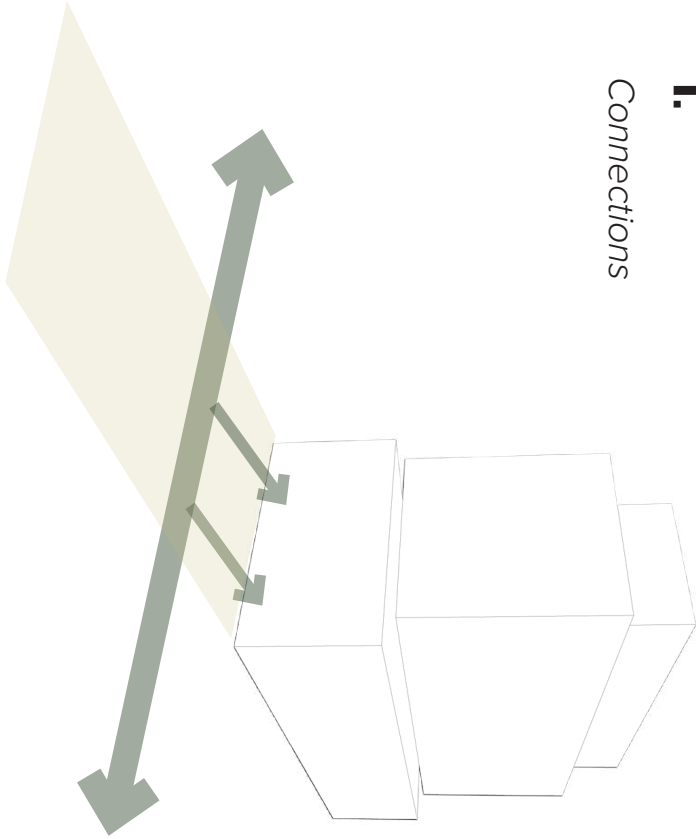


Clear, defined lines of sight welcome new visitors to a place and impart an innate understanding of the lay of the land.

**DESIGN
DRIVERS**

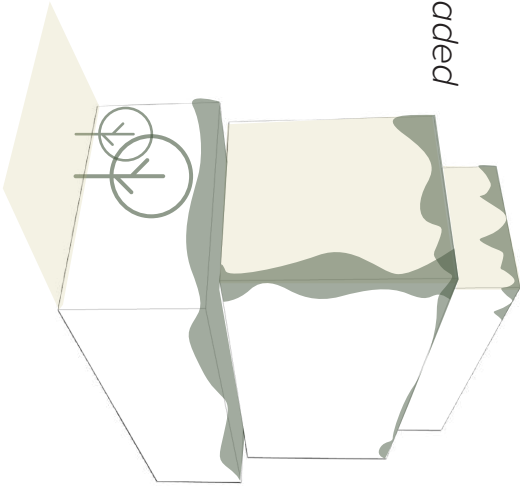
1.

Connections



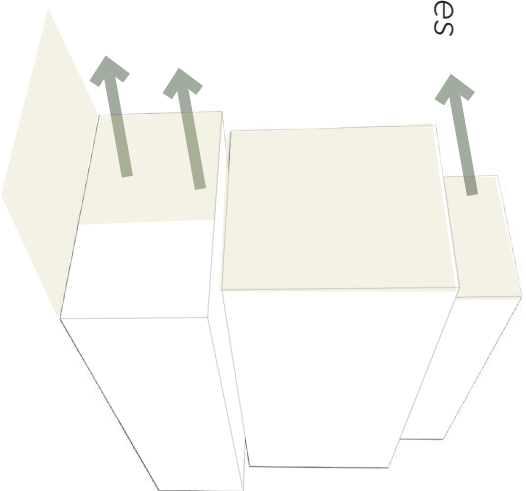
2.

Green & Shaded



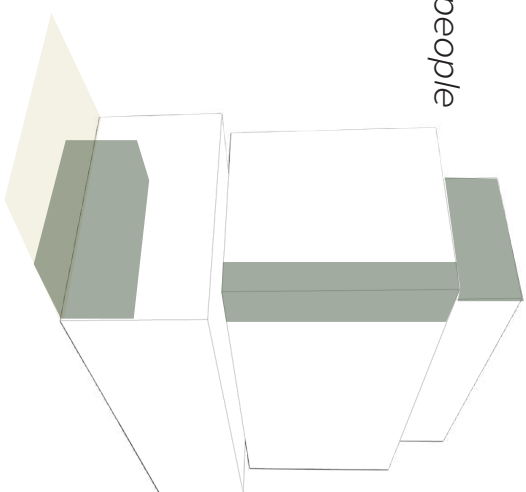
1.

Permeable edges



2.

Places for people



EXISTING STREET CONDITIONS

The following captures Lat27's understanding of the required streetscape works that are to be delivered as part of the project scope, as per the BCC planning framework.

Neighbourhood Plan

Title Area: 1093 m2

Planning Scheme: Brisbane City Plan 2014

City Plan 2014 Zone: MU1 Mixed use (Inner City)

The purpose of the mixed use zone is to provide for a variety of uses & activities, including, for example, business, residential, retail, service industry, tourist accommodation or low impact industrial uses or activities

Relevant City Plan 2014 Overlays:

- + Bicycle Network overlay
- + Critical Infrastructure and Movement network
- + Overland flow flood planning area
- + Potential and actual acid sulphate soils
- + Road hierarchy overlay
- + Streetscape hierarchy overlay
- + Transport air quality corridor
- + Transport noise corridor overlay

Neighbourhood Plan:

Fortitude Valley neighbourhood plan
James St Precinct – NPP-005

Streetscape Hierarchy

- + Robertson Street - Locality Street - Type 7

Locality Street - Type 7

- + Required verge width 2.1m to 2.49m
- + Unobstructed pavement width 1.2m
- + Paving materials: Asphalt
- + Tactiles: Supplier Chelmsstone, Urbanstone or approved equivalent. Size 300 x 300mm colour: CC 'Pewter'
- + Driveways: Broom finished concrete
- + Street trees: not required
- + Garden beds: minimum widths: 750mm to 1.15m wide.
- + Max basement incursion: 0.5m

A



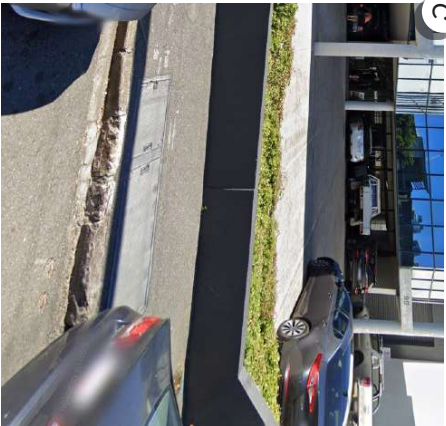
Existing electrical pole with overhead power east of pole to be protected & retained.

B



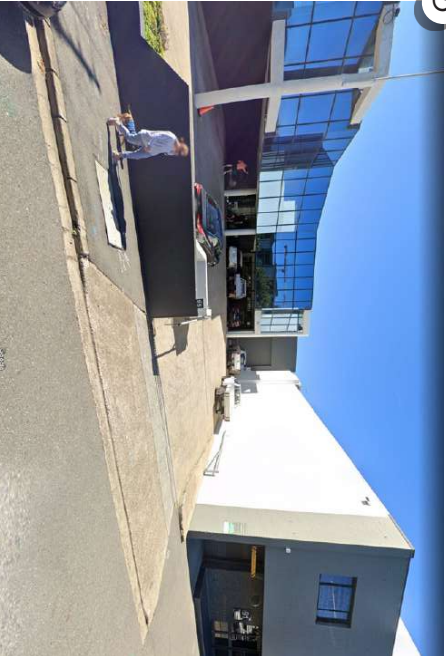
Existing electrical pits to be protected & retained

C



Existing electrical pits to be protected & retained

D



Existing electrical pits to be protected & retained

NOTE:
Existing utilities and streetscape infrastructure to be confirmed on-site

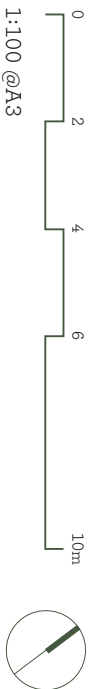
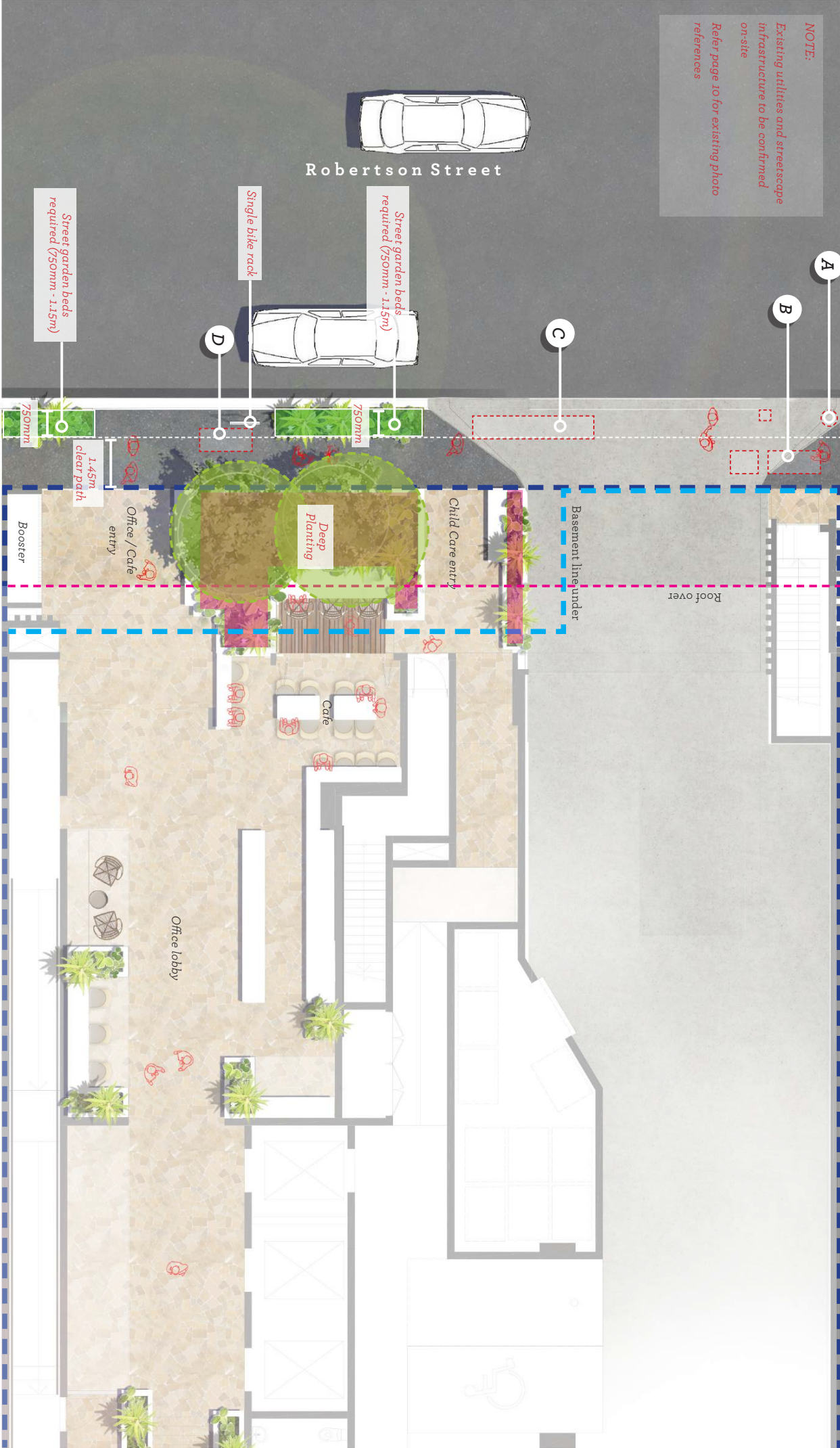
CONCEPT PLANS



STREET INTERFACE, concept plan

Property boundary

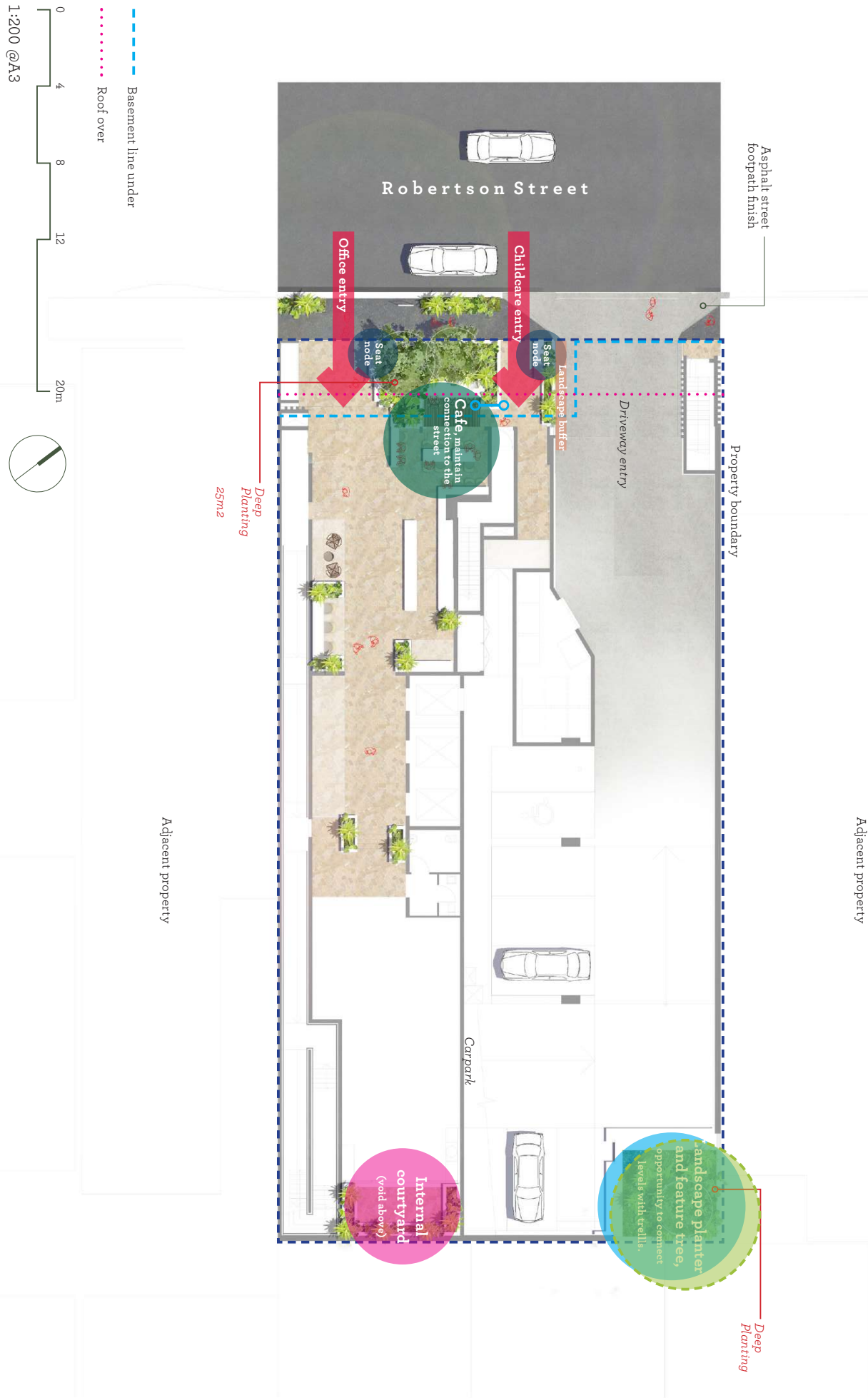
NOTE:
Existing utilities and streetscape
infrastructure to be confirmed
on-site
Refer page 10 for existing photo
references



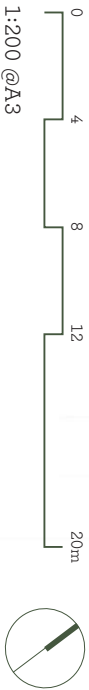
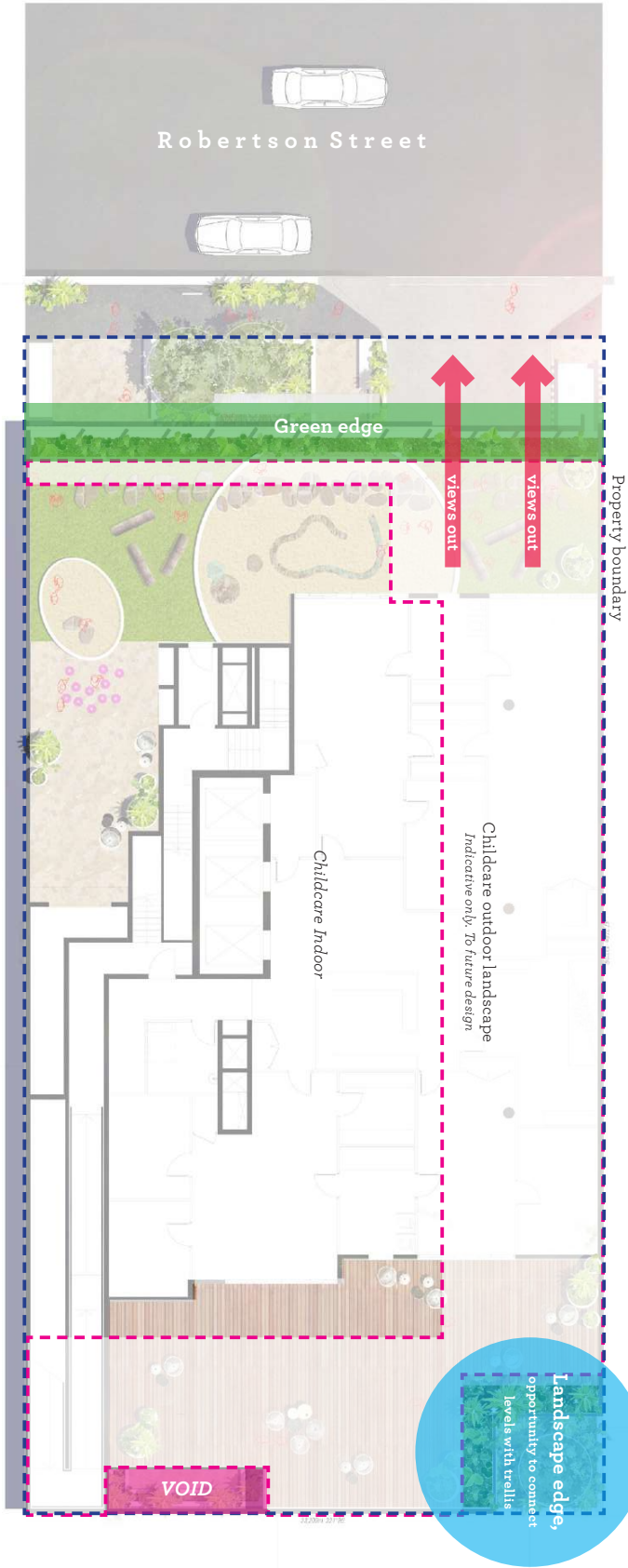
STREETSCAPE, *landscape outcome*



GROUND LEVEL, concept plan

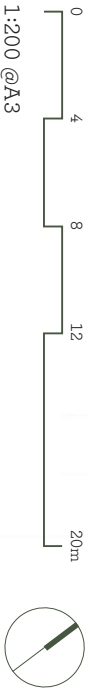
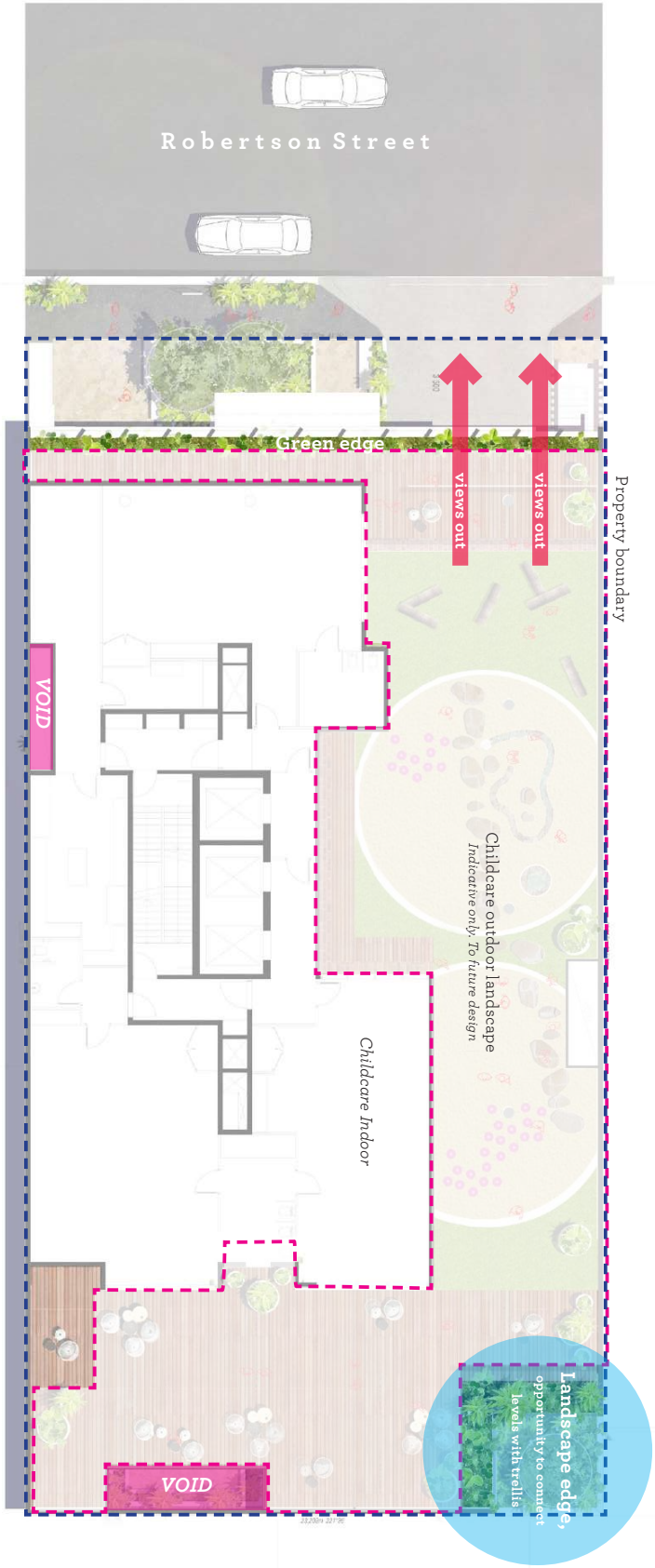


LEVEL ONE, concept plan

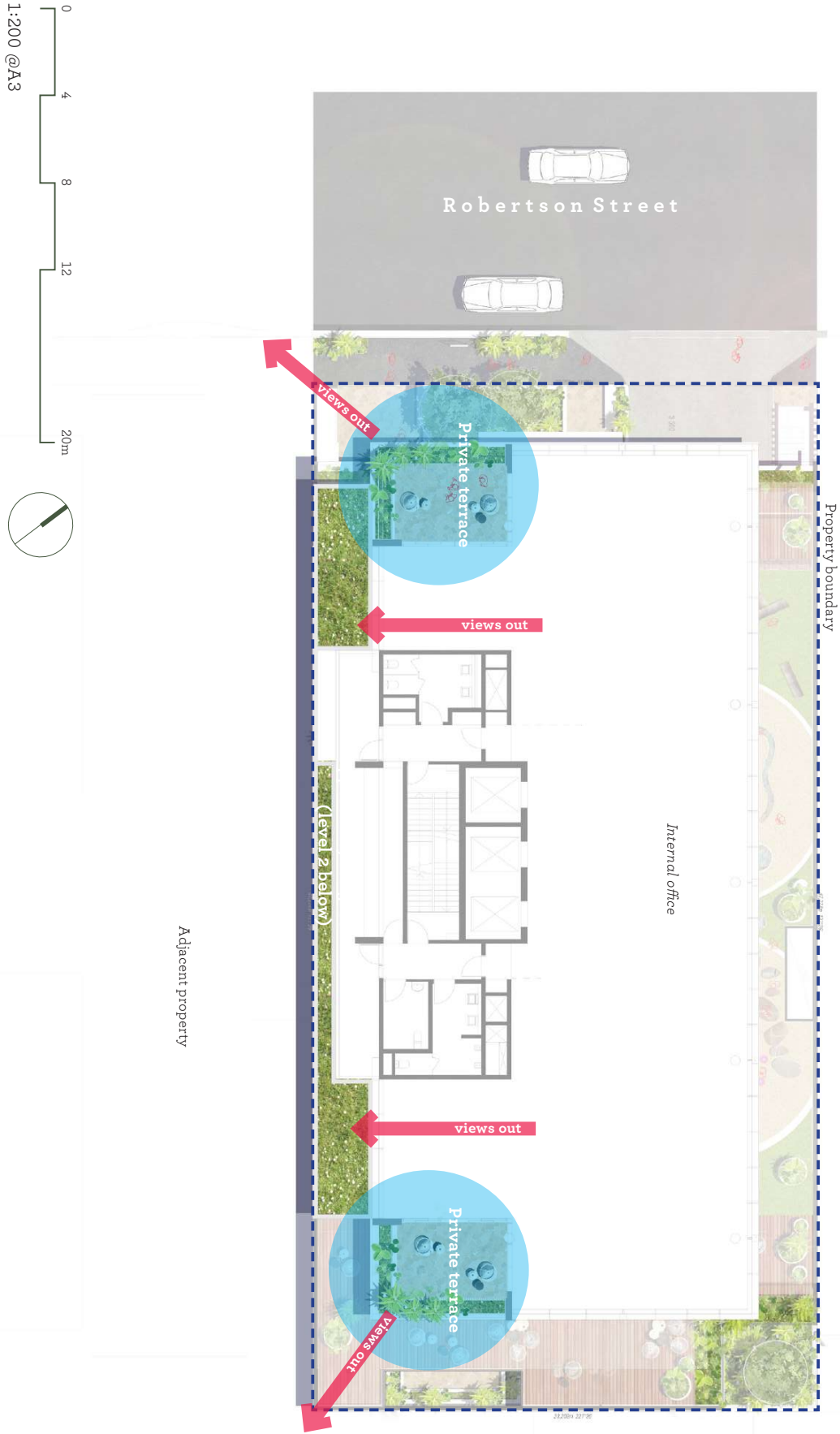


1:200 @A3

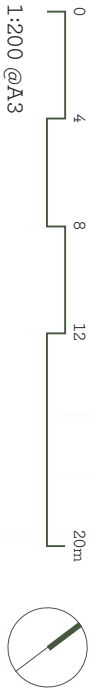
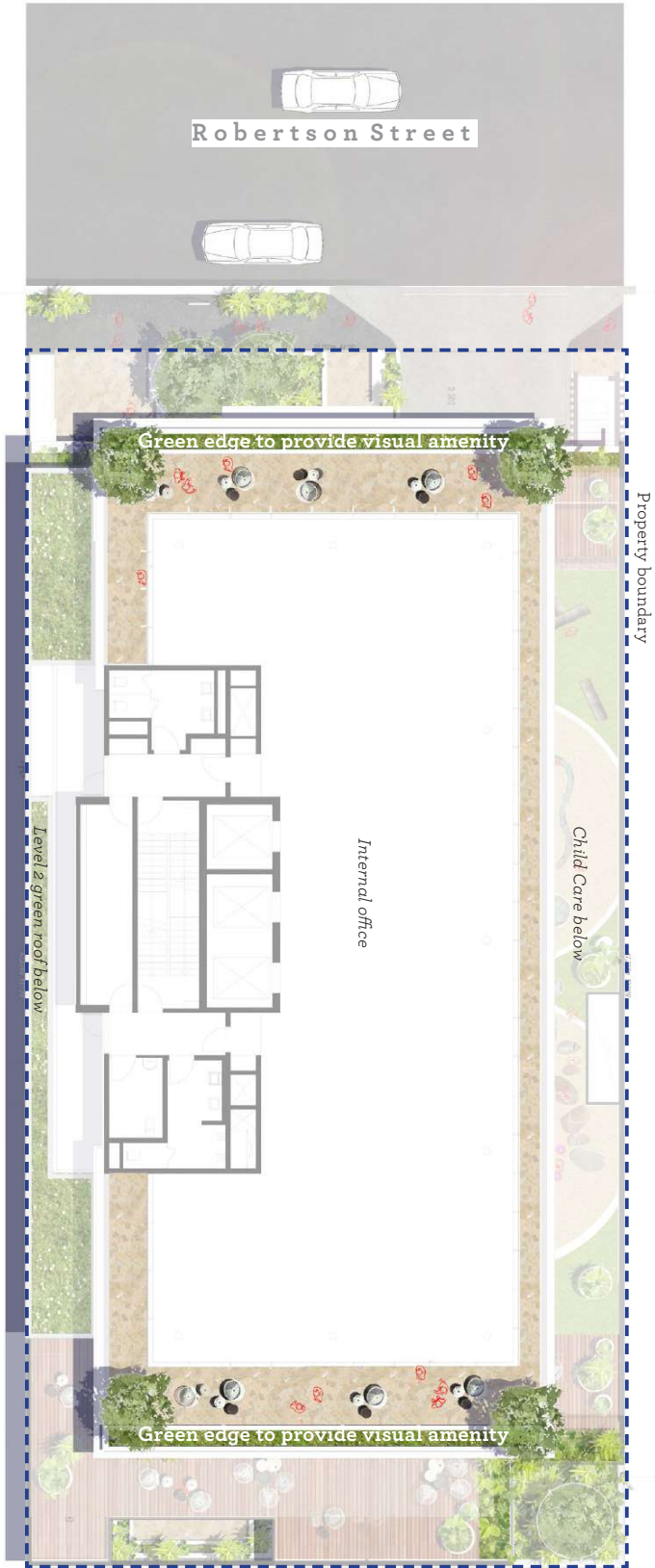
LEVEL TWO, concept plan



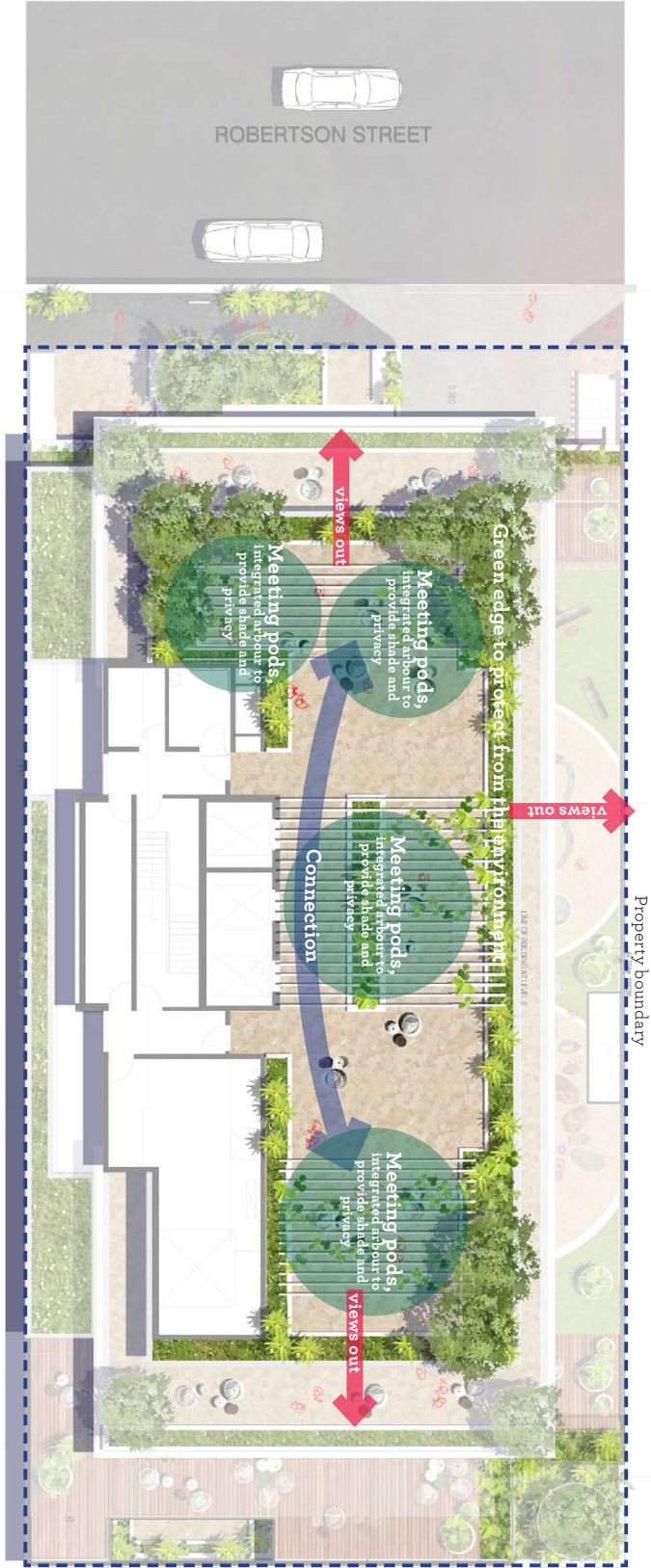
LEVEL THREE TO SEVEN, concept plan



LEVEL EIGHT, concept plan

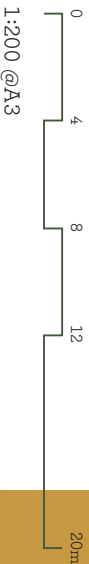
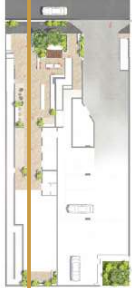


ROOF TERRACE, concept plan



GROUND LEVEL, section AA

- 1) Asphalt footpath
- 2) Proposed canopy tree
- 3) Raised planter wall with integrated seating to entry
- 4) Facade planters to L1 & L2
- 5) Deep planting on natural ground
- 6) Raised edge planter and integrated seat wall
- 7) Internal landscape with suitably selected indoor species



GROUND LEVEL, section DD

- Internal landscape with suitably selected indoor species
- 1) Balcony planters enabling views pt whilst providing green relief to the facade
- 2) Built up integrated seat wall planters
- 3) Tree behind (deep planting) Basement in front - Ensures deep planting access to natural ground
- 4) Light weight green roof - level 2
- 5)



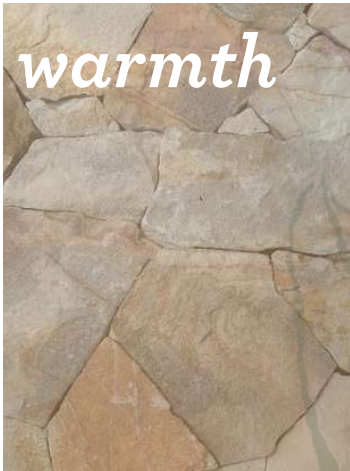
MATERIALS PALETTE, entry



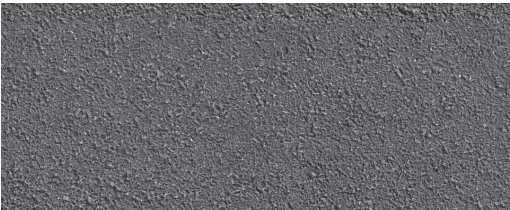
Broom finished concrete, driveway



Warm, natural tones throughout pavements and podium planter walls - achieved through sandstone, porphyry and gravels



'Pewter' tactile tiles

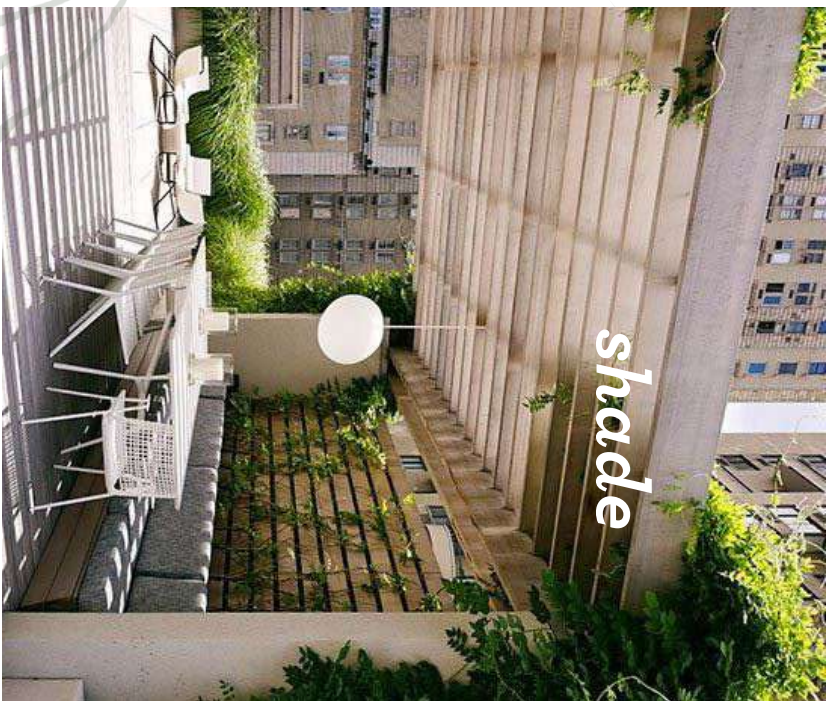


Asphalt footpath

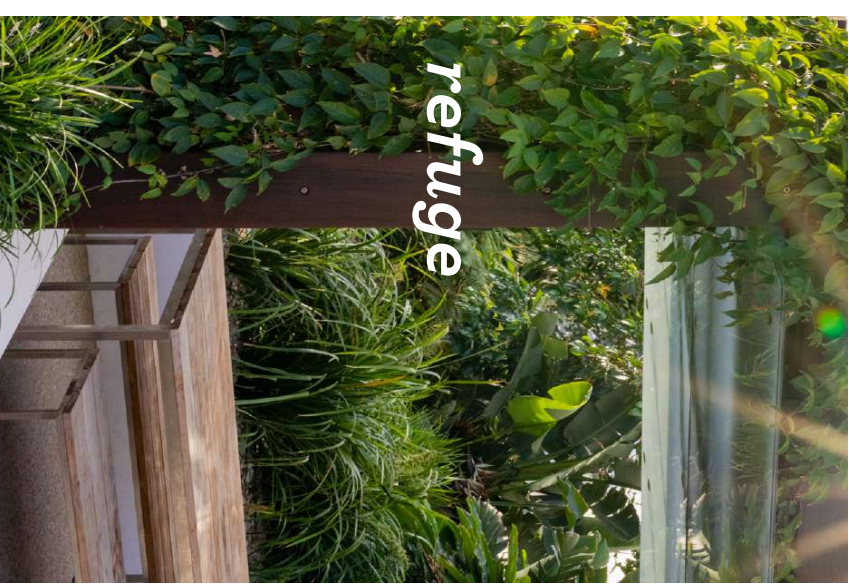


Vegetation used to soften edges and visually break down facades

MATERIALS PALETTE, roof terrace



High-quality concrete seating walls



Vegetation used to soften edges and visually break down facades

MATERIALS PALETTE

Character

Planting palette and composition will provide a rich, diverse and subtropical setting reflecting Brisbane's outdoor lifestyle and riverside location. The built form creates a myriad of micro-climates that require specific responses related to species selection, and light / shade availability. A comprehensive palette has been created to ensure an integrated planting scheme is carried throughout the development. Species have been selected for their hardiness, low maintenance, low water requirements, and suitability to Brisbane's subtropical climate.

The site includes internal and external podium planting, balcony planting, 'green walls', raked gardens and planting to the streetscape. Species have selected to suit the relevant growing conditions.

CPTED principles have been considered to ensure clear sightlines to common areas, the streetscape and entry points. Planting design will be balanced to afford casual surveillance and privacy where required.

Shade trees and understorey planting along Robertson Street will be of a sub-tropical nature, in keeping with the existing character and in accordance with the relevant BCC codes (Chapter 3).

SHADE TREES at street interface and deep planting

- 1. Agathis robusta
- 2. Elaeoarpus eumundi
- 3. Pongamia pinnata
- 4. Syzygium tierneyanum



STREETSCAPE

- 1. Gazania rigens
- 2. Myoporum ellipticum
- 3. Liriope muscari 'Evergreen Giant'
- 4. Westringia fruticosa (prostrate)



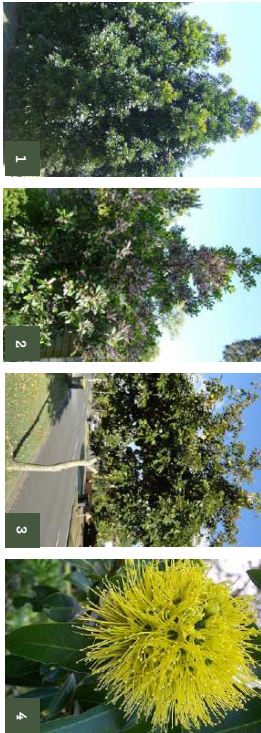
FOYER and ENTRY

- 1. Adiantum fragans
- 2. Alcantarea imperialis
- 3. Alpinia mutica
- 4. Alpinia zerumbet
- 5. Aspidistra elatior
- 6. Blechnum gibbum
- 7. Cyathea cooperi
- 8. Ficus pumila
- 9. Heliconia rostrata
- 10. Monstera deliciosa
- 11. Neoregelia sp (Bromeliads)
- 12. Philodendron 'xanadu'
- 13. Plectranthus australis
- 14. Senecio serpens



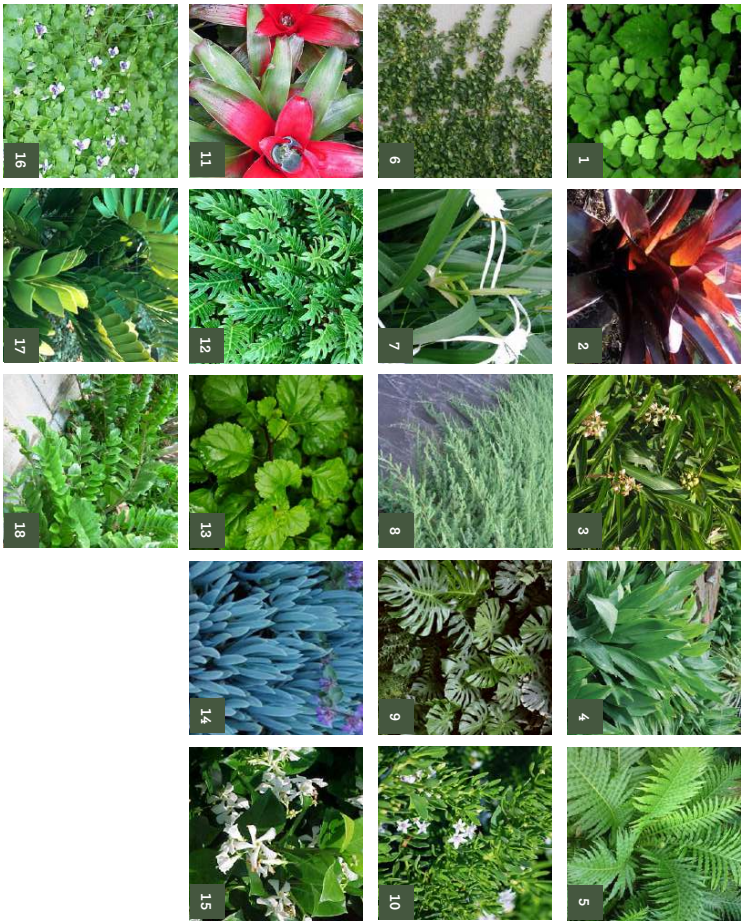
SHADE TREES on roof terrace

1. Elaeocarpus eumundii
2. Elaeocarpus reticulatus
3. Pongamia pinnata
4. Xanthostemon chrysanthus



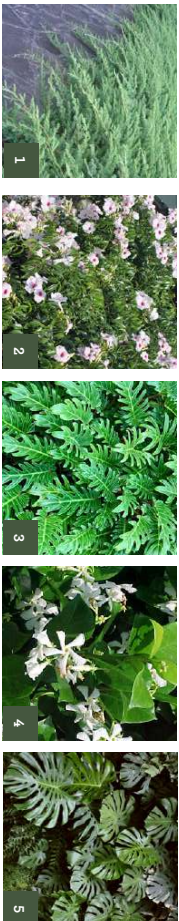
PODIUM PLANTERS at various levels

1. Adiantum fragans
2. Alcantarea imperialis
3. Alpinia mutica
4. Aspidistra elatior
5. Blechnum gibbum
6. Ficus pumila
7. Hymenocallis littoralis
8. Juniperus confertus
9. Monstera deliciosa
10. Myoporum ellipticum
11. Neoregelia sp (Bromeliad)
12. Philodendron 'xanadu'
13. Plectranthus australis
14. Senecio serpens
15. Trachelospermum jasminoides 'Tricolour'
16. Viola hederacea
17. Zamia furfuracea
18. Zamioculcas zamifolia



GREEN EDGE on levels 2 and 8

1. Juniperus confertus
2. Pandorea jasminoides
3. Philodendron Xanadu
4. Trachelospermum jasminoides
5. Monstera deliciosa



PLANNING REQUIREMENTS

GREEN EDGES, podium & facade planting

The proposed building fosters key opportunities to apply the principles of the New World City Design Guide: Building that Breathe.

The key principles;

- + Climate
 - + Shade
 - + Daylight penetrations
 - + Breezes
 - + Protection from the weather

The key elements that are applied throughout the landscape and public realm are;

 - + Activation of the streetscape - through outdoor dining and public open space, generous entrances and trees to shade the street
 - + Provision of deep planting at ground level
 - + Numerous opportunities for external break out space for tenants to *occupy the outdoor space* within the building footprint - balconies
 - + Fostering views from the upper terraces on all levels
 - + Natural daylight penetration
- select species throughout to ensure architecture articulation is optimised in providing daylight penetration to spaces such as Outdoor dining.
 - + Green facades provide visual and environmental relief
 - + Shade provided by tree canopy is present within the ground level.
 - + Living Greenery - presented through vertical green, elevated balcony gardens, ground plane gardens and street trees. A high level maintenance strategy has been applied to ensure robust and longevity within the landscape



PLANTING, maintenance

Where planting is proposed at 95 Robertson Street, the following landscape planting maintenance strategy is provided as a guide. This strategy is indicative only and based on projects of similar scale and complexity.

The finalised maintenance and access plan will require inputs from specialist access and safety sub-contractors to resolve all aspects of details and integration within total the building maintenance strategy. For any access for building or planting maintenance; access methods are to align with building owners and building managers safety procedures / OH&S standards.

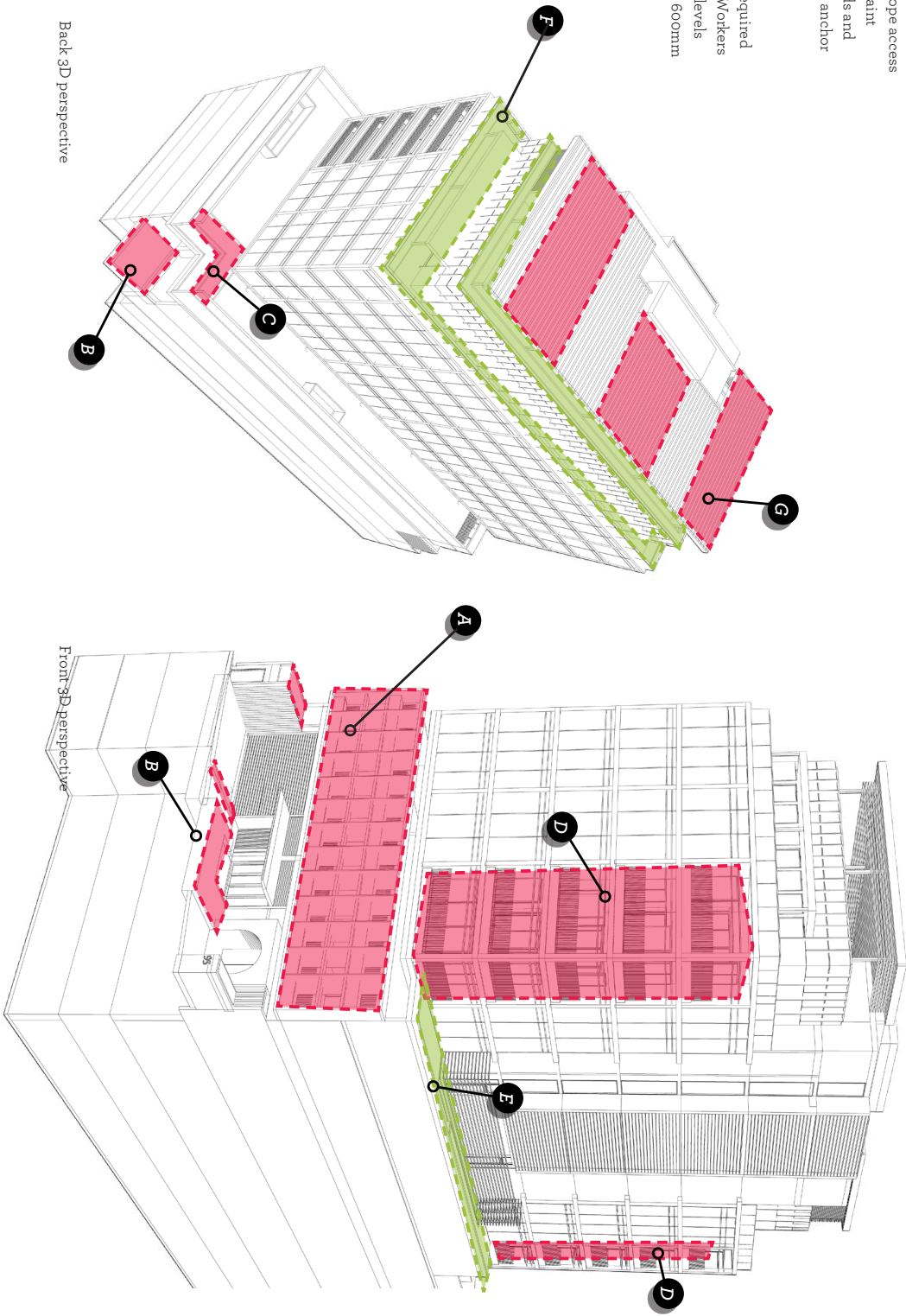
All podium / facade planting illustrated is grown from containerised planters that align with BCC standards for podium planting soil depth. All planting areas are watered by an automated irrigation system unless otherwise noted. Concealed hose cocks shall be provided at 20m centres



Fall arrest System / Rope access system - use of a restraint such as safety lanyards and harnesses attached to anchor points.



Limited technology required to maintain planters. Workers can access from floor levels and plants are within 600mm reachable height.



PLANTING, maintenance

Level	Zone	Fully irrigated	Containerised planters with soil profile and drainage aligning with BCC standards	Planting intent	Planting Maintenance	Access for maintenance
Front Facade, Robertson Street	A	Yes	Yes	Sprawling ground covers grown from irrigated containerised planters – various levels throughout the building.	Internal planter: Planting to be pruned from associated level via openable glazing	Clip on rope / abseiling maintenance system with access to full perimeter of planter.
				Planting growth habit typically 1-1.5m sprawling below height of planter	Facade planters: Maintenance via internal space to minimise rope access maintenance. Watering by integrated irrigation system.	For any access for building or planting maintenance of the lower floors a Boom lift via the Robertson st driveway or Rope access over facade edge may be required.
Ground Floor	B	Yes	Yes	Low height planting to enable views and consider CPTED. Species to be shade tolerant for internal foyer spaces.	Planting to be pruned and maintained from Ground level	Standard maintenance from ground level with no fall from heights issues.
				Internal foyer planting to be suitable internal species. Consideration of an indoor plant hire scheme.		Access methods to align with building owners and building managers safety procedures / OH&S standards
L 1, 2	C	Yes	Yes	Trailing vines / sprawling ground covers grown from irrigated containerised planters.	Planting to be pruned via rope access with limited access required to beyond vertical face. Watering by integrated irrigation system.	Clip on rope maintenance system with access to full perimeter of planter.
				Planting growth habit typically 1-1.5m vertically below height of planter.		
Level 3, 4, 5, 6, 7	D	Yes	Yes	Internal trailing vines / sprawling ground covers grown from irrigated containerised planters .	Planting to be pruned via adjacent level, via internal access. Watering by integrated irrigation system.	Clip on rope maintenance system with access to full perimeter of planter.
				Planting growth habit typically 1-1.5m vertically below height of planter		
Level 2 green roof	E	Yes	Yes	Trailing vines / sprawling ground covers grown from containerised planters on level 2 roof.	Planting to be pruned via Level 2 with a fall arrest system. Watering by integrated irrigation system.	Clip on rope maintenance system with access to full perimeter of planter.
						Access methods to align with building owners and building managers safety procedures / OH&S standards
Level 8	F	Yes	Yes	Trailing vines / sprawling ground covers grown from irrigated containerised planters.	Planting to be pruned via Level 8 with a fall arrest system and limited access beyond the vertical face. Watering by integrated irrigation system.	Clip on rope maintenance system with access to full perimeter of planter.
				Planting growth habit typically 1-1.5m vertically below height of planter.		
Roof Terrace	G	Yes	Yes	Trailing vines / sprawling ground covers grown from irrigated containerised planters.	Planting to be pruned via the roof terrace with a fall arrest system to ensure safety beyond balustrade if required. Limited access required to beyond vertical face.	Clip on rope maintenance system with access to full perimeter of planter.
				Planting growth habit typically 1-1.5m vertically below height of planter.	Watering by integrated irrigation system.	Access methods to align with building owners and building managers safety procedures / OH&S standards

DEEP PLANTING, ground floor

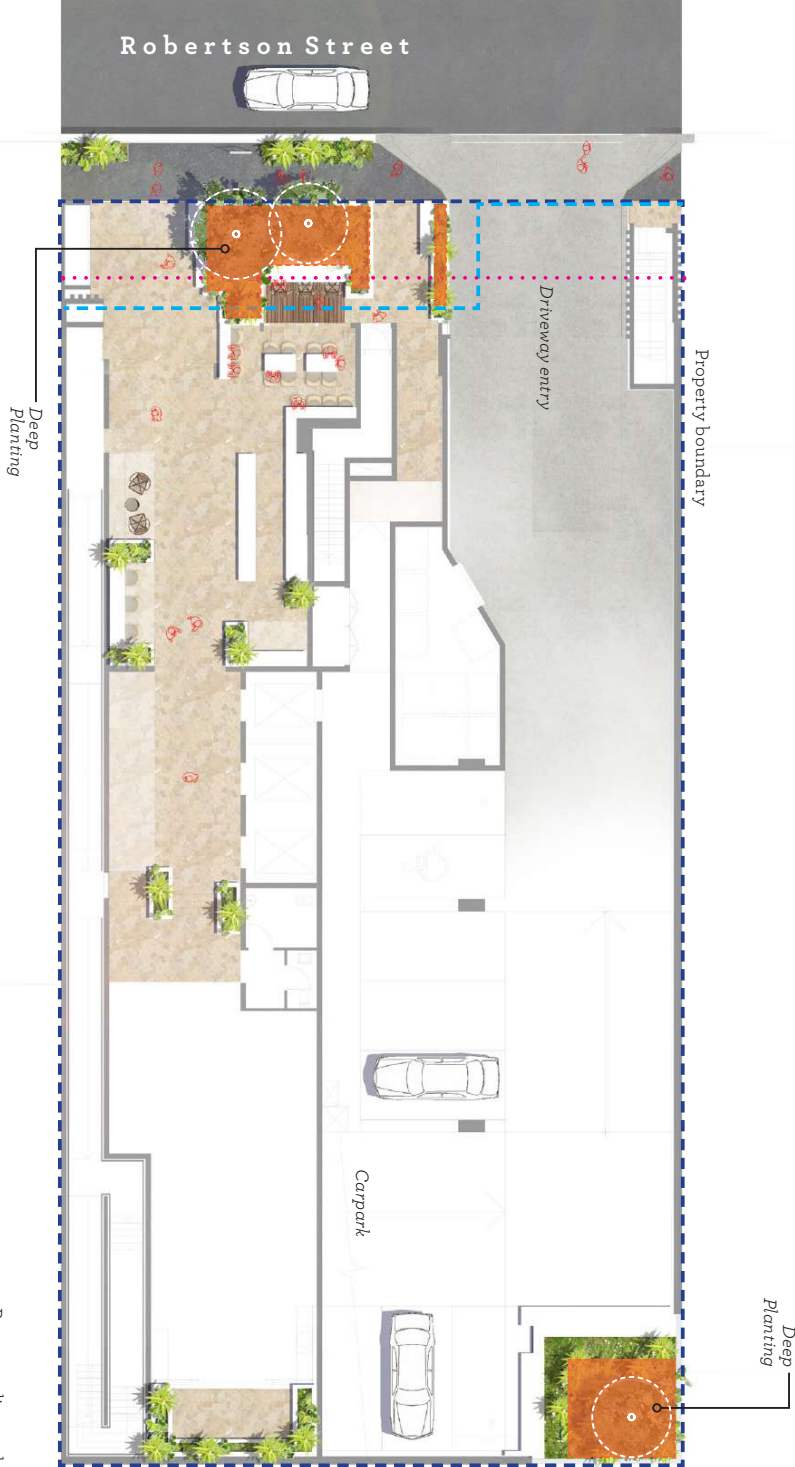
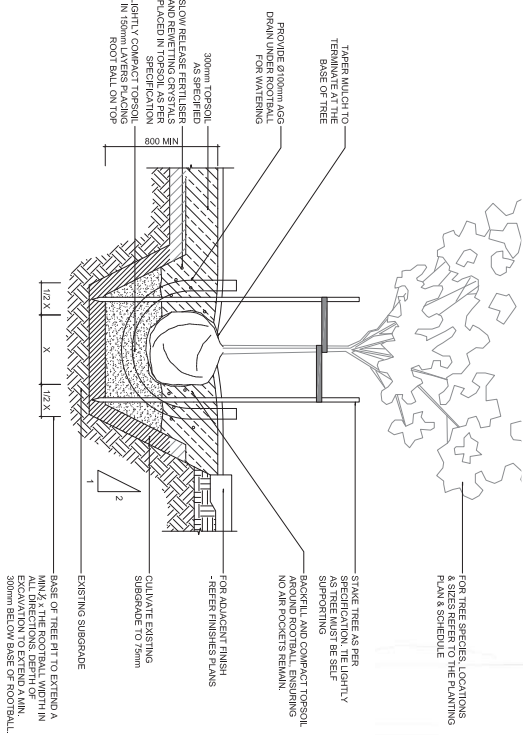
Planting Depths

Deep planting to 95 Robertson Street consists of two areas, one enhancing the street-scape facade between both entries and one at the rear of the site, affording a green backdrop to the carpark entry, extending the green canopy up through the levels.

The parameters meets BCC requirements in access to natural ground, with basement extents set back to enable deep planting, access to open sky with the roof overhead setback from property boundary and will be irrigated.

Refer below for typical detail indicating available soil profile necessary to support robust, healthy canopy tree growth.

Typical Tree Detail on natural ground



SPECIFICATIONS, *landscape notes*

Typical Planting Details

Planting Depths

- Landscape works on podium will include containerised planting in 'raised planters' and or recesses in podium construction. Planting on podium will comply to the following minimum depths:
- Trees - 1000mm;
 - Large shrubs - 800mm;
 - Small shrubs and ground covers - 600mm
 - Planters will be mounded where possible to reduce the height of vertical walls.

Irrigation

Landscape works is to include a reticulated drip irrigation system (connected to irrigation tank or town water resource) to all containerised planting areas with drainage connected to the storm water system. The final system design will be included in detailed design.

Specification notes

All plants shall be true to scheduled nomenclature, well formed, and hardened off nursery stock. Form and habit shall be normal for the plant as scheduled. Standards Conform to the following referenced documents:

- AS 4419-2003 Soils for landscaping and garden use
- AS 3743-2003 Potting Mixes
- AS 4454-2003 Composts, soil conditioners and mulches
- NATSPEC Guide: Specifying Trees - a guide to assessment of tree quality (Clark, R. 2003)
- AS 4373-2007 Pruning of amenity trees

Maintenance regime

Following date of Brisbane City Council approving the landscape works 'On Maintenance' the contractor shall be responsible to Maintain the Landscape for a 12 month period or until 'Off Maintenance' approval is achieved with BCC.

Summary of Work include but not limited to:

- Watering of garden beds and trees
- Weeding of garden beds, trees and pavements
- Supply and installation of mulch to maintain minimum depths as specified
- Pruning, trimming and tree surgery
- Pest and disease control of garden beds, planting and trees
- Replacement of dead, failed or significantly diseased (50% of foliage) plants and trees
- Removal of rubbish and debris from garden areas
- Keeping of log book

Watering: Coordinate the water supply and confirm the watering regime against State and Local Government legislation and restrictions at time of maintenance period. Program of watering shall ensure health and vigour of all vegetation is maintained.

Without restrictions the contractor shall provide a minimum water application of 25mm per week to each area of vegetation.

Weeding: Spray or hand removal of all broad leaf plants and grasses considered invasive to the locality. Spray treatment is by non-residual Glyphosate.

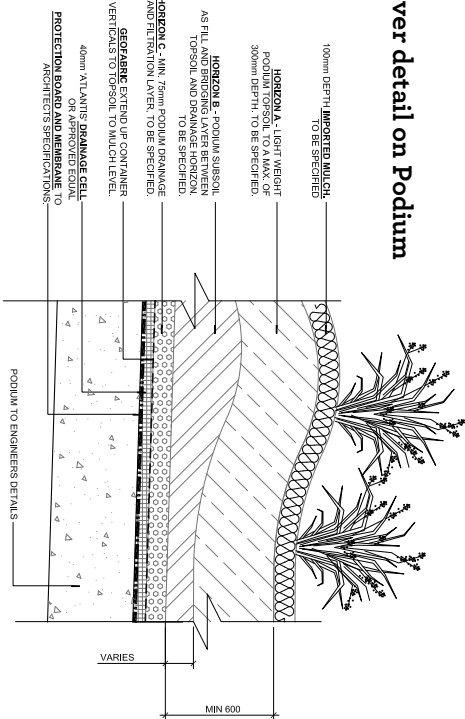
Fertilising: Application of the approved slow release fertilisers shall be strictly in accordance to manufacturer's specifications and rates, to ensure health and vigour of all vegetation is maintained.

Beyond the time frame of a standard maintenance period (12 months) the landscape works will require replenishment of planting to maintain its high levels of health and appearance.

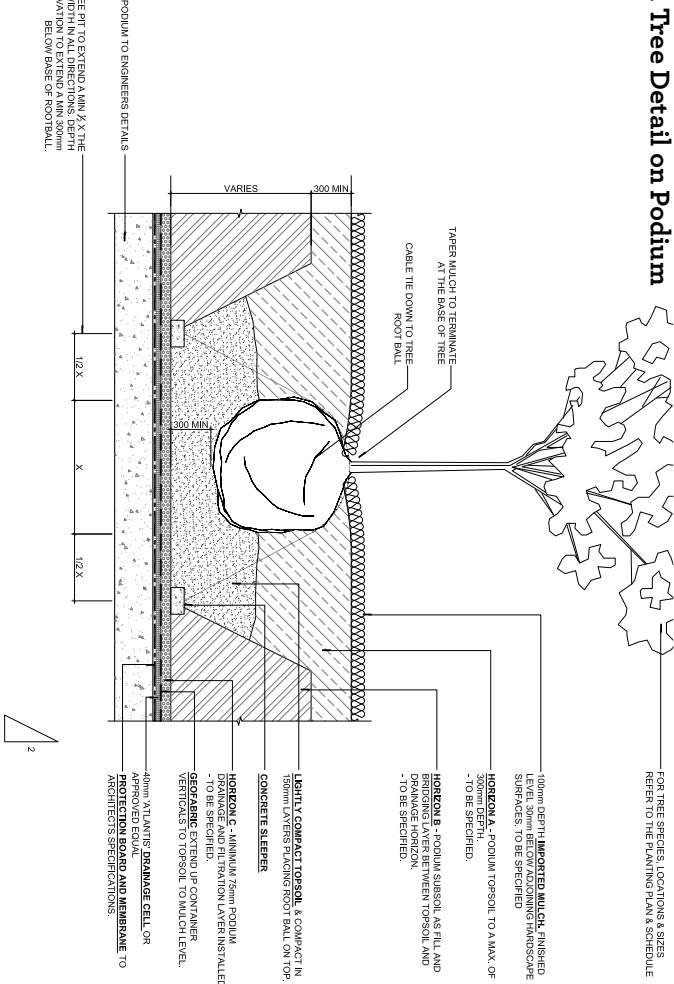
Typical Details

The following typical construction details are to be used where shrub and tree planting occurs on podium.

Typical shrub and ground cover detail on Podium



Typical Tree Detail on Podium



CODE COMPLIANCE

BCC CENTRE OR MIXED USE CODE RESPONSE - LANDSCAPE

9.3.3 Centre or mixed use code—Criteria for assessable development_PART Table 9.3.3.3.A—Performance outcomes and acceptable outcomes

*Relevant section of code referred

PERFORMANCE OUTCOMES		ACCEPTABLE OUTCOMES	RESPONSE
PO55	Development provides landscaping on site to:	AO55 Development provides landscaping that:	Complies with Performance outcome 55
	(a) contribute positively to the subtropical character, amenity and microclimate of the site and the centre or mixed use area; (b) support the retention of existing significant vegetation and large subtropical shade trees; (c) support the establishment of subtropical streets and planting; (d) contribute to site amenity for building occupants, users, residents and adjoining residents; (e) balance the bulk and scale of the building and minimise impact to adjoining residents, uses and streetscape; (f) reduce the area of impervious surfaces and support stormwater quality; (g) reduce glare and manage heat; (h) contribute to the mitigation of noise, air and visual impacts of major transport infrastructure; (i) contribute to a safe and useable pedestrian environment.	(a) integrates with site layout and building design at ground, podium, balcony and rooftop levels; (b) is sited to retain and protect existing significant vegetation; (c) buffers adjoining residential uses or areas, with advanced trees and a minimum of 2 tiers to achieve screening and visual softening; (d) supports building height transitions, where required; (e) is accessible for watering and maintenance; (f) screens or buffers driveways, service and loading areas, plant rooms or other utilities; (g) allows for the overlooking of the street and pedestrian entry areas from the building; (h) emphasises clear pedestrian entry points. Note—No overall percentage of open space and landscaping is prescribed for non-residential development. Note—This is demonstrated in a landscape concept plan. Note—Landscape design incorporates planting in accordance with the Planting species planning scheme policy. Note—The location, design and provision of communal and private open space for residential uses must be in compliance with the Multiple dwelling code.	(a) Contributes to the Sub-tropical character through significant planting to the facade (b) Not applicable due to existing vegetation not present on site prior to development (c) Streetscape provides for sub-tropical understory planting, private works provides raised planters integrated into the built form providing tree planting at the street frontage. (f) area of impervious surface increased through the integration of on grade landscape (g) reduction in heat through the integration of landscape to facade and on grade landscape (i) a safe pedestrian environment through the consideration of CPTED at each entry
PO56	Development incorporates deep planting which:	AO56.1 Development locates deep-planting areas:	Complies with Acceptable outcome 56.1
	(a) supports the retention and protection of existing significant vegetation and large subtropical shade trees; (b) provides for the establishment of vegetation to contribute to the landscape character of the centre or mixed use area; (c) is grouped with deep-planting areas on adjacent sites to maximise contiguous areas of deep planting; (d) is open to the sky with access to light and rainfall and into the natural ground with no underground development; (e) is planted with large subtropical tree species that at maturity are complementary in scale and height to the building form; (f) is capable and supported to grow and at maturity provide effective shade or screening to buildings, outdoor spaces or adjoining uses; (g) balances hard-stand areas and provides shade and informal recreation spaces that are directly accessible from residences, building tenancies or the street frontage.	(a) to retain and protect existing significant vegetation and large subtropical shade trees; (b) to buffer adjacent residential areas; (c) to support building height transitions, where required; (d) to provide an entry statement; (e) to shade publicly accessible areas, private outdoor and communal open space.	(d) the landscape incorporated provides an entry statement with access to natural ground due to the arrangement of the basement below and building above (e) provides deep planting adjacent to outdoor areas.
AO56.2 Development: (a) provides for a minimum 10% of the site area for deep planting; (b) ensures that each deep-planting area has a minimum area of 25m ² and a minimum dimension of 4m in any direction.		Complies with PO56	

BCC CENTRE OR MIXED USE CODE RESPONSE - LANDSCAPE (CONT.)

PERFORMANCE OUTCOMES		ACCEPTABLE OUTCOMES	RESPONSE
	AO56.3	Development provides deep-planting areas that are: (a) exclusively for landscaping; (b) not containing vehicle manoeuvring areas, pedestrian paths, surface structures or infrastructure, sub-surface structures or infrastructure; (c) able to accommodate trees planted in natural ground with no development underneath; (d) 100% open to the sky; (e) able to be accessed for maintenance purposes.	Complies with 56.3 (a), (b), (c), (e).
	AO56.4	Development provides trees in deep-planting areas which: (a) are capable of growing to a minimum canopy diameter of 5m and/or a minimum height of 5m within 5 years of planting; (b) are subtropical tree species consistent with the Planting species planning scheme policy. Note—Tree species should be chosen to respond to particular site location or design needs. Where site circumstances permit, tree species that are complementary in scale and height to the building form should be selected. Note—Tree height and canopy spread will be dependent on species.	Complies with 56.4 (a), and (b).
	AO56.5	Development provides a minimum of 25% of all trees as advanced stock.	Complies with AO56.5

BCC LANDSCAPE CODE RESPONSE

PERFORMANCE OUTCOMES		RESPONSE
PO1 Development ensures that trees are protected from development impacts.	AO1.1 Development ensures that trees identified in a landscape concept plan or development approval are retained and protected in accordance with AS 4970-2009 – Protection of trees on development sites.	N/A - No existing trees on site.
	AO1.2 Development ensures that tree surgery and pruning is carried out in accordance with AS 4373-2007 Pruning of amenity trees for: (a) vegetation damaged as a result of the development; (b) vegetation requiring pruning of branches and/or roots.	N/A - No existing trees on site.
PO2 Development provides acoustic barriers and long fences along street frontages which: (a) are enhanced by appropriate planting; (b) are of high visual quality; (c) are designed for longevity; (d) provide maintenance access and promote pedestrian permeability in appropriate circumstances.	AO2.1 Development ensures that an acoustic barrier or fence which is required by a use code to be provided along a fence or within the site: (a) is designed in compliance with the standards in the Infrastructure design planning scheme policy; (b) incorporates elements of visual interest appropriate to the scale of the development for a fence or acoustic barrier over 40m long; (c) incorporates a gate for maintenance access to the street frontage side of the barrier or fence if a gate can open on to a publicly accessible area within the site; (d) incorporates a gate or appropriately designed opening for public pedestrian access where linking two publicly accessible areas.	Not Applicable.
	AO2.2 Development ensures that a planting buffer required by a use code for an acoustic barrier or fence incorporates: (a) species in accordance with the Planting species planning scheme policy; (b) a minimum of 2 tier planting.	Not Applicable.
PO3 Development provides species as a screen or buffer which maintain the amenity of adjoining premises.	AO3 Development ensures that a landscape buffer required by a use code incorporates: (a) species in accordance with the Planting species planning scheme policy; (b) a minimum of 2 tier planting.	Not Applicable. Building abuts adjoining wall of adjacent property. Level 2 planting to green roof provides a level of green relief in relation to overlooking
PO4 Development has artificial growing environments which: (a) maximise opportunities for high-quality landscape planting; (b) Incorporate water conservation measures.	AO4.1 Development provides drainage for podium planters which is connected to the stormwater drain and allows for flush out.	Complies with AO4.1: Podium planters will be connected to stormwater drainage with flushing points - to be designed and coordinated in the detailed design phase.
	AO4.2 Development provides species which are chosen to ensure the long-term performance and access requirements of the landscape.	Complies with AO4.2: Species proposed have been selected for their hardiness, low maintenance and water requirements. Suitability in relation to Queensland's subtropical climate. All planting species selected satisfy the Planting Species Planning Scheme Policy and specific species as per BCC locality guidelines for this site. Micro-climate is also considered as the development presents a range from full sun to full shade.
	AO4.3 Development provides podium planting in compliance with BSD-9010, BSD-9011, BSD-9012.	Complies. The proposed landscape will be designed and constructed in accordance to BCC Standard Details and Specifications and current best practice - refer podium planting detail and specification sheet.

0431 CLADDING**1 GENERAL****1.1 RESPONSIBILITIES****General**

General: Provide lightweight external wall cladding and associated work as documented

1.2 CROSS REFERENCES**General**

Requirement: Conform to the following worksection(s):

- *General requirements*
- *Insulation and Sarking Membranes*
- *Partitions Framed and Lined*
- *Metalwork*
- *Schedule 01 External Finishes and Assemblies*

1.3 INTERPRETATION**Abbreviations**

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

- AAC: Autoclaved aerated concrete.
- CCA: Copper chrome arsenate.
- CFC: Compressed fibre cement.
- EIFS: External insulated finishing system.
- FC: Fibre cement.
- LOSP: Light organic solvent preservative.

1.4 TOLERANCES**Permitted deviations**

Profiled metal sheet cladding: To AS 1562.1 clause 4.2.3

Flat sheet and panel cladding: To the manufacturer's recommendations.

Plank and weatherboard cladding: 5mm from a 1.8m straightedge or to the manufacturer's recommendations.

1.5 SUBMISSIONS**Fire performance**

Combustibility: Submit evidence of conformance to PRODUCTS, **FIRE PERFORMANCE, Combustibility.**

Fire hazard properties: Submit evidence of conformance to PRODUCTS, **FIRE PERFORMANCE, Fire hazard properties.**

Fire-resistance level: Submit evidence of conformance to PRODUCTS, **FIRE PERFORMANCE, Fire-resistance of building elements.**

Operation and maintenance manuals

General: Submit manufacturer's published use, care and maintenance requirements.

Products and materials

Type tests: As appropriate for the project, submit evidence of conformance to the following:

- Metal cladding generally: Cladding and fastenings to AS 1562.1 clause 5.5 for resistance to wind pressures.
- Metal cladding in cyclonic regions to AS/NZS 1170.2: Cladding and fastenings to AS 1562.1 clause 5.6.
- Plastic cladding: Cladding and fastenings to AS 1562.3 Section 5 for resistance to wind forces and resistance to impact.

Prototypes

General: Erect a prototype of each panel type, including at least one example of each component in the system to verify selections submitted as samples, to demonstrate aesthetic effects, to set quality standards for materials and execution and to verify performance, including wind loading.

Inclusions:

- Typical components, attachments to building structure and methods of installation.
- Window opening with cladding panel, trim and returns.
- Sealant filled joint.

Samples

Finish: Submit samples of the cladding material showing the range of variation available.

Shop drawings

Composite panels: Submit shop drawings to a scale that best describes the detail, showing the following:

- Dimensioned elevations of all elements.
- Details of construction, connections and all support systems.
- Dimensions of all typical elements and of any special sizes and shapes.
- Provision for the exclusion and/or drainage of moisture.
- Jointing details and method of fixing between individual elements and between this installation and adjacent work, including adjustment.
- Sealant types and full size sections of all sealant-filled joints and backing rods.
- Provision for thermal movement.
- Provision for movement under seismic and wind loads.
- Sequence of installation.
- Co-ordination requirements with other work.
- Schedule of materials, finishes, componentry, hardware and fittings.

Subcontractors

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

Seamed sheet metal cladding: Submit evidence of experience with non-ferrous cladding installation.

Warranties

Cladding materials: Submit the manufacturer's published product warranties.

Design

The contractor is to undertake structural design and certification for the adequacy of the support structure. Submit calculations and other data demonstrating detailed compliance with performance criteria.

1.6 INSPECTION**Notice**

Inspection: Give sufficient notice so that the framing, sarking, vapour barrier and insulation may be inspected before they are covered up or concealed.

2 PRODUCTS**2.1 GENERAL****Storage and handling**

Requirement: Store and handle materials to the manufacturer's recommendations and the following:

- Protect materials including edges and surfaces from damage.
- Keep dry and unexposed to weather.
- Do not drag sheets or panels across each other or over other materials.
- AAC panels: Stack on edge, support off the ground and level to avoid sagging and damage to ends, edges and surfaces.
- Metal panels: Store unpacked panels by size in racks and protect from scratching, warping or bending.
- Sheeting: Stack flat and off the ground on at least 3 evenly placed bearers.
- Store metal materials away from uncured concrete and masonry on a level base.
- Do not store metal materials in contact with other materials which may cause staining, denting or other surface damage.
- Use gloves when handling precoated metal cladding material.

Product identification

General: Marked to show the following:

- Manufacturer's identification.
- Product brand name.
- Product type.
- Quantity.
- Product reference code and batch number.
- Date of manufacture.

Components

Fasteners and ties: Type, size, corrosion resistance class and spacing to the cladding manufacturer's recommendations.

Flashings: To AS/NZS 2904.

2.2 FIRE PERFORMANCE**Combustibility**

Cladding: Tested to AS 1530.1.

Fire hazard properties

Bonded laminated materials: Tested to AS/NZS 1530.3. Fire hazard indices, as follows:

- Spread of Flame Index: 0.
- Smoke-Developed Index: ≤ 3 .

Fire-resistance of building elements

Fire-resistance level: Tested to AS 1530.4.

2.3 COLORBOND® STEEL AND ZINCALUME® STEEL**General**

Requirement: COLORBOND® steel or ZINCALUME® steel profiled sheet metal cladding.

Design and installation: To AS 1562.1.

Stainless steel: To ASTM A240/A240M

Flashing: To AS/NZS 2904.

Material and colour: To match the cladding material.

Rib notching: To match the cladding material.

Fasteners

Type, size, corrosion resistance class and spacing to the cladding manufacturer's recommendations.

Finish for exposed fasteners on coloured cladding: Prefinish exposed fasteners with an oven baked polymer coating to match the cladding material.

Fasteners to timber battens: Provide fasteners long enough to penetrate the thickness of the batten without piercing the underside.

2.4 ALUMINIUM CASSETTE PANELS**Generally**

A prefabricated, fixed panel system divided into individual panels as indicated on architectural drawings, factory formed from 3mm thick PVDF coated aluminium, with folded edges and sealed joints typically fixed over a hot dip galvanised steel frame.

Include all framing members, fixings and accessories necessary to complete the work.

Unless noted, fixings shall be not less than Corrosion Class 4 (AS 3566). Include separation washers of appropriate size and type. Visible fixings shall have coloured heads. Colour to be selected.

Framing member sizes and spacings, shown on the drawings are indicative only. The contractor is to undertake structural design and certification for the adequacy of the support structure.

The contractors must be specifically experienced in the fabrication and application of aluminium cassette panel installations.

2.5 EXTRUDED ALUMINIUM CLADDING**Generally**

A system of extruded aluminium panels installed horizontally or vertically as a rain screen facade, typically fixed over a hot dip galvanised steel subframe.

Include all framing members, fixings and accessories necessary to complete the work.

Unless noted, fixings shall be not less than Corrosion Class 4 (AS 3566). Include separation washers of appropriate size and type. Visible fixings shall have coloured heads. Colour to be selected.

Framing member sizes and spacings, shown on the drawings are indicative only. The contractor is to undertake structural design and certification for the adequacy of the support structure.

The contractors must be specifically experienced in the fabrication and application of aluminium panel installations.

2.6 ALUMINIUM CLADDING

Generally

A prefabricated aluminium cladding system, designed, detailed and installed in accordance with the approved samples and shop drawings. Include all framing members, fixings and accessories necessary to complete the work. *Refer Schedule 01 – External finishes and assemblies*

Unless noted, fixings shall be stainless steel in accordance with manufacturer's requirements

Framing member sizes and spacings, shown on the drawings are indicative only. The contractor is to undertake structural design and certification for the adequacy of the support structure.

The installers must be approved by the supplier of the materials, specifically trained and experienced in the fabrication and application of aluminium cladding.

2.7 STEEL PANEL CLADDING

Generally

A prefabricated, fixed watertight cassette panel system divided into individual panels as indicated on architectural drawings, factory formed from 1.2mm thick (minimum) Colorbond steel, with folded edges, fixed over a hot dip galvanised steel frame.

Include all framing members, fixings and accessories necessary to complete the work.

Unless noted, fixings shall be not less than Corrosion Class 4 (AS 3566). Include separation washers of appropriate size and type. Visible fixings shall have coloured heads. Colour to be selected.

Framing member sizes and spacings, shown on the drawings are indicative only. The contractor is to undertake structural design and certification for the adequacy of the support structure.

The contractors must be specifically experienced in the fabrication and application of steel and steel installations.

2.8 FIBRE CEMENT CLADDING

Generally

Standard: To AS/NZS 2908.2.

Cladding, eaves and soffit linings: Type A Category 3 (modulus of rupture $\geq$ 7MPa).

Sheet cladding

General: Provide a proprietary system of single faced fibre cement sheets.

Arrangement: Set out in even panels with joints coinciding with framing.

Eaves and soffit lining

Sheets: Single faced fibre cement.

2.9 COMPRESSED FIBRE CEMENT CLADDING SYSTEMS

Compressed fibre-cement (CFC) sheeting shall be a complete proprietary system of compressed, autoclaved, cellulose fibre reinforced cement sheet, manufactured in accordance with AS/NZS 2908.2: Flat sheets.

The sheets shall be smooth and even, square edged, and free of imperfections.

The system shall be selected for the conditions and performance requirements and installed in accordance with the Manufacturer's Instructions and relevant Standards.

Include required sub-framing, fixings, jointing, trims and accessories.

Edges: Square

2.10 TIMBER CLADDING

Timber

Hardwood: To AS 2796.1

- Grade: To AS 2796.2

Seasoned cypress pine: To AS 1810

Softwood: To AS 4785.1

- Grade: To AS 4785.2

Fasteners

LOSP treated timber and non-corrosive timber cladding: Hot-dip galvanized steel.

CCA treated timber and corrosive timber cladding (including western red cedar or redwood): Stainless steel type 316 or silicon bronze.

Hardwood cladding: Bullet head and plain shank nails, if the cladding is painted and nails are punched and stopped.

Softwood cladding: Flat head and plain shank nails, if cladding is painted.

CCA treated softwood cladding: Deformed shank (ring or annular) flat head nails.

Unpainted cladding/framing joints: Do not use machine driven T head nails.

2.11 STONE CLADDING

Generally

Refer *Stone Cladding* Worksection

2.12 COMPONENTS

Flashings

Standard: To AS/NZS 2904.

3 EXECUTION

3.1 PREPARATION

Substrates or framing

Requirement: Before fixing cladding, check the alignment of substrates or framing and adjust if required.

Flexible underlay: Check that the underlay is restrained.

3.2 CONSTRUCTION GENERALLY

Generally

Provide a cladding system and associated work which

- Remains intact and waterproof under the local or regional ambient climatic conditions.
- Provides adequate means of dealing with vapour pressure, condensation, corrosion and thermal movement.
- Conforms to loading requirements of balustrades, where applicable.
- Satisfies other specified performance requirements

Fixings

Fixing method: As documented or to one of the following fixing methods to the manufacturer's recommendations:

- Steel framing: Screw.
- Timber framing: Nail or screw.
- Minimum penetration for profiled metal sheets: 30 mm for timber framing.

Horizontal cladding surface:

- Minimum slope: 1:15.
- Staining: Slope away from visible vertical facade areas to prevent staining.

Defective components: Do not install component parts which are defective, including warped, bowed, dented, abraded or broken members.

Damaged parts: Remove and replace damaged members during installation.

Accessories and trim

Requirement: Provide accessories and trim required to complete the installation, or as documented.

Corner flashing for profiled and seamed metal sheets: Finish off at corners with purpose-made folded flashing strips.

Metal separation

Requirement: Prevent direct contact between incompatible metals, and between green hardwood or chemically treated timber and aluminium or coated steel, by either of the following methods:

- Apply an anti-corrosion, low moisture transmission coating to contact surfaces.
- Insert a separation layer.

Incompatible metal fixings: Do not use.

Proprietary systems or products

Product fixing: Fix proprietary systems to the manufacturer's recommendations.

Loads

The installed work, including anchorages, fixings and framing, shall accommodate all permanent and temporary loads (including wind and maintenance loads) without failure or defects

Ensure that no base-structure loads, including loads resulting from short or long-term structural deflection or shortening of base-structure, are transferred to the installed cladding, unless indicated on the shop drawings and approved.

Verify that base-structure concrete has cured and reached sufficient strength to support cladding loads.

Bearing surfaces in permanent contact shall be cleaned before installation.

Drainage and water shedding

Where the bottom edge of cladding terminates above other finished cladding surfaces, make provision to drain or deflect water to prevent cumulative staining of lower surfaces.

Do not fix through horizontal surfaces of visible flashings and cappings.

Temporary coatings

On or before completion of the works, or before joining up to other surfaces, remove all traces of temporary coatings used as a means of protection.

Cladding sheet installation

Swarf: Remove swarf and other debris as soon as it is deposited.

Accessories: Provide material with the same finish as cladding sheets.

Corner flashing

Requirement: Finish off at corners with purpose-made folded flashing strips.

Ambient climatic conditions

The installed work shall withstand all static and dynamic wind forces applicable to the site in accordance with the relevant Standards.

- Wind loading to AS 1170.2 or AS/NZS 1170.2:
- Design and construction details for cyclonic areas to AS 1684.3

Movement

The installed work and connections shall accommodate expansion, contraction, deflection and related movements from any cause in the base-structure, the substrates to which the work is fixed, and within the work, without failure and silently.

Control joints

Construct suitable control joints where indicated or required, in accordance with the Manufacturer's Instructions and relevant Standards.

The movement capability of control joints shall be sufficient to accommodate required movements in the substrate or base-structure, and within finished work.

Control joints in finished work shall extend full depth to substrate or base-structure, and shall coincide with joints in substrates and base-structure.

Control joints and fillers to surfaces with required fire-resistance, acoustic-ratings, or air sealing requirements shall have the same rating, unless otherwise approved.

Control joint spacing shall not exceed the lesser of the Manufacturer's Instructions, the structural grid dimensions, the spacing indicated on the Drawings, or the relevant Standard requirements.

Verify width and spacing of control joints before commencing. Do not relocate or eliminate joints indicated on the Drawings, or make joints not indicated, without approval.

Thermal movement

The installed work shall accommodate the thermal movements based on recorded ambient temperature range for the site location, but not less than -5 C-degrees to +50 C-degrees. Submit verification.

Enable thermal movement to take place freely in the plane of the system without causing harmful buckling, failure of joint seals, undue stress on fasteners or other harmful effects.

Connections

The installed work shall be connected to the base-structure or substrate in a neat, substantial manner by correctly selected and located connections so that loads can be transferred from the work to the base-structure or substrate in a manner, which prevents displacement, distortion, or damage to the connections, substrate or the adjacent work. Connections shall accommodate movement requirements.

Concealed and visible fixings

Unless otherwise indicated or approved, fixings to finished work shall be concealed.

Where visible fixings are required, indicate head types, finish and alignment tolerances of visible fixings on shop drawings.

Visible fixings shall match control samples, and shall be evenly and neatly located, aligned and finished to match adjacent substrate.

Install visible fixings after finishing adjacent surfaces where practicable to prevent paint smears or other damage. Include required spaces, grommets and accessories. Use correctly sized tools to prevent mechanical damage.

Concrete substrates

Check base-structure and concrete reinforcement shop drawings and carry out site survey to verify profiles and suitability of fixing locations. Indicate relationship between fixings and reinforcement on shop drawings of this trade.

Smoke isolation

The installed system shall ensure smoke isolation between floors and elsewhere as required, which comply with statutory requirements. Indicate details of smoke isolation on shop drawings.

Provide suitable smoke isolation in accordance with the statutory requirements, including fixed baffles, fire safing, and sealing. Baffles shall be durable and non-corroding.

Corrosion

Materials and products, including fixings, concealed and structural components, shall be corrosion-resistant or protective coated to prevent corrosion.

Compatibility

Adjacent materials and products shall be chemically and electrolytically compatible with each other, substrates, and adjacent work, or shall be separated by suitable products and procedures. Adjacent materials and products, including adhesives and sealants, shall not stain or contaminate, and shall not cause visual or structural defects in adjacent materials.

Weather protection

The installed work, including all joints, shall exclude water and weather from the interior side of the system at the design wind pressures and all weather conditions, and shall discharge water, including leakage and condensation, into the appropriate drainage system. Water shall not be trapped or retained within the system.

Thermal properties (external walls)

The installed work shall provide continuous thermal insulation to minimise heat gain or loss between the inside of the building and the surroundings not less than the required thermal resistance rating, in accordance with relevant Standards and statutory requirements.

The thermal resistance rating shall not be less than required by the BCA.

Verify required thermal properties with computations and shop drawings, and indicate insulation type, density and thickness, location of moisture vapour barriers and other items, which may affect thermal performance.

Refer *Thermal Insulation* worksection

Air leakage / infiltration

The installed work shall minimise air infiltration. Provide suitable seals, sealing and baffles.

Self generated and structure borne noise

The installed work and component parts shall function noiselessly under all conditions including substrate movements, temperature range, wind, air infiltration, maintenance and cleaning operations.

The system shall not generate noise due to whistling, creaking, drumminess or rattle.

Services reticulation

Build-in, cover and conceal reticulated services passing through the work. Construct suitable openings and passages for the unrestricted installation of such services by the relevant Services Contractor. Coordinate with relevant Services Drawings and Specification.

Provide suitable access covers where required for later maintenance or replacement.

Secondary framing and bracing

Provide sufficient additional framing and bracing to ensure the work is rigid and safe under all loading conditions, including later applied work by other trades, and at openings, terminations and junctions.

Additional framing and bracing shall be integrated with the work and concealed.

Applied work by other trades may include lighting, fixtures, equipment and signage. Coordinate with related trades as required and verify types and loads of applied work.

Where secondary steelwork has not been designed by the Engineer, Contractor to provide and pay for all engineering and certification to any secondary steelwork that may be required to support the entire cladding installation, and to meet the performance requirements of this worksection.

Framing shall be concealed, unless noted. Coordinate with trades for adjacent work.

Framing shall be hot dip galvanized after fabrication in accordance with the relevant Standards, unless otherwise indicated as protective coated.

- AS/NZS 4680: Hot-dip galvanized (zinc) coatings on fabricated ferrous articles.

Cladding tolerances

Spacing of supporting members: $\pm 5\text{mm}$ on the nominated support member spacing

Cladding panel fabrication tolerances shall not exceed:

- Length and width: $\pm 2\text{mm}$.
- Diagonals: $\pm 3\text{mm}$.
- Flatness: $\pm 1\text{mm}$ per 1 metre length, maximum 2mm.
- Edge straightness: $\pm 1\text{mm}$ per 1 metre length, maximum 2mm.
- Maximum corner radius shall be 3mm.

Joints:

- Cladding panel edges shall align from one panel to another to ensure continuous and even joints of uniform width along each joint alignment and plane of finished work.
- Joint widths and misalignment shall not vary in excess of $\pm 10\%$ of the design width.
- Vertical or horizontal misalignment at the abutting ends of cladding: $\leq 2\text{mm}$

Installation tolerances shall not be cumulative. Site check the cumulative effect of base-structure tolerances and adjust installation locations as required

Include additional steel framing and furring required by this trade for levelling or otherwise to ensure that the substrate framing tolerances are within the cladding manufacturer's substrate instructions.

Vermin

The complete installation shall be vermin-proof. Provide approved corrosion resistant flashings and baffles, and construct work to prevent access and concealed breeding places for vermin.

Flatness and alignment

Selection of materials, reinforcement, fabrication and installation procedures shall ensure a high standard of surface flatness, joint and edge straightness, and alignment of mating surfaces.

Develop suitable procedures for cutting and cut edge treatment, stiffening and the tightening of fixings to prevent distortion or warping.

Provide sufficient support framing, backing sheets, ribs and material thickness to prevent visible undulations.

Staining

Parapets, cappings and related minor horizontal surfaces shall not over-flow or shed water onto adjacent visible cladding surfaces.

Minor horizontal surfaces shall be sloped to ensure surface water and moisture drains back into adjacent roof drainage system.

Include additional vertical ribs, upstands or other drainage methods where there is a risk of over-flow due to surface ponding, wind effects, or over-run from adjacent steeper surfaces.

3.3 COLORBOND® STEEL AND ZINCALUME® STEEL CLADDING**Installation**

Swarf: Remove swarf and other debris as soon as it is deposited.

Ground clearance: Maintain documented clearance.

Cutting sheets: Wherever possible, factory cut to length. Do not use an abrasion disc.

Accessories: Provide material with the same finish as cladding sheets.

3.4 ALUMINIUM CASSETTE PANELS**Generally**

Custom cladding shall be complete approved systems to match control samples, design developed, detailed and installed in accordance with the approved shop drawings. Unless noted otherwise the panels will be installed as a cassette system to suppliers recommended fixing details.

Submit shop drawings and computations. Include details of junctions and compatibility with other cladding components and adjacent work.

Cladding panels/trays shall be factory manufactured complete with fixing points and stiffening. Support framing, fixings and concealed surfaces shall have an approved corrosion-resistant treatment.

Panels are to be fabricated in a numbered sequence in order to ensure consistency of colour and finish.

Maintain continuous 'as-built' elevation drawings with the date of installation of each panel referenced to the panel numbering system and retain a copy on-site for inspection without notice.

Edges and corners

Unless noted otherwise the following shall apply:

- Panel edges shall be folded and dressed down
- Panel corners and joints shall be brought to tight hairline and sealed.

Panel backing

Where required, cladding panels shall be fixed over an 'A' grade plywood backing, not less than 12mm thickness, or other suitable backing sheet to ensure sound deadening and stiffening.

Backing shall accommodate thermal expansion without buckling or delamination.

Preparation and Storage

Metal panels shall be kept dry and protected from damage. Panels shall be delivered with a protective plastic film to the exposed faces.

Installation

Before lifting cladding panels into position, inspect each panel for surface and edge damage in excess of the control samples, and verify that each panel is complete with all fixings and accessories, and is correctly numbered.

Do not install panels that do not comply with installation tolerances and remove from site.

Install the cladding system in accordance with approved shop drawings, prototypes and construction methods and to comply with the performance requirements and relevant Standards.

Panels shall be fixed in a manner to allow for thermal expansion and contraction of the metal. Fixing shall be by screwing or using bolt hooks to fix the panels directly to the substrate. All fixings shall be stainless steel.

Panels are to be erected in numbered sequence

Install the system plumb, level and true to line within required tolerances, without warp or rack, suitably anchored to the base-structure. Do not bend or deform work during installation.

Loads

Ensure that no base-structure loads, including loads resulting from short or long-term structural deflection or shortening of base-structure, are transferred to the installed cladding, unless indicated on the shop drawings and approved.

Verify that base-structure concrete has cured and reached sufficient strength to support cladding loads.

Bearing surfaces in permanent contact shall be cleaned before installation.

Drainage and water shedding

Where the bottom edge of cladding terminates above other finished cladding surfaces, make provision to drain or deflect water to prevent cumulative staining of lower surfaces.

Do not fix through horizontal surfaces of visible flashings and cappings.

Joints

All joints shall be sealed with a neutral cure; non-acid based 100% pure silicone rubber sealant over a closed cell-backing rod.

Colour: To be advised.

Cladding support

Cladding panels shall be factory manufactured complete with fixing points and stiffening. Support framing, fixings and concealed surfaces shall have an approved corrosion-resistant treatment.

Panels shall not be less than 1.2mm thickness

3.5 COMPLETION**Protection**

Surface protection: Protect finished surfaces and applied finishes from damage.

3.6 WARRANTY**Generally**

Provide warranties for materials and workmanship in the form of interlocking warranties from the supplier and the installer against the failure of materials and execution under normal environment and conditions of use. Refer *General requirements* worksection

Certification

Submit written certification for the following:

- That the completed work is compliant with the Contract Documents and is in accordance with the manufacturer's requirements for the correct selection and installation of the components and complete systems
- That the installed systems and components are in accordance with the relevant Australian Standards nominated in this worksection.

Where the work includes more than one proprietary system, include each manufacturer's certification of its own work, and that the interface details with the adjacent proprietary systems do not reduce or modify that manufacturer's warranty.

4 SELECTIONS**4.1 CLADDING FINISHES AND SYSTEMS****Generally**

Refer *Schedule 01 - External Finishes and Assemblies*

REVISION HISTORY

Revision	Date	Description
-	25/02/2021	TENDER

95 ROBERTSON ST

95 Robertson Street. Fortitude Valley

SCHEDULE 04A-DOORS AND DOOR HARDWARE

EMPIRICA DEVELOPMENTS.

24 FEBRUARY 2021 | REVISION 01 | TENDER ISSUE | JOB 19095



SCHEDULE 04 –DOORS AND DOOR HARDWARE

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SCHEDULE 04 –DOORS AND DOOR HARDWARE

SCHEDULE 4A: DOOR TYPE SCHEDULE					
DOOR TYPE	ROOM NAME	NOMINAL PANEL HEIGHT	NOMINAL PANEL WIDTH	QTY	COMMENTS
Ad1					
	OFFICE LOBBY SLIDING ENTRY	2150	900 / 900	1	Refer to Schedule 01 - External Finishes and Assemblies & Façade report
Ad2					
	TENANCY LIGHT COURT / FT02 - GROUND	2400	1 400 / 1 400	1	Refer to Schedule 01 - External Finishes and Assemblies & Façade report
	TYPICAL OFFICE BALCONY/ FT04 - L3-L7	2750	1200 / 1200	10	Refer to Schedule 01 - External Finishes and Assemblies & Façade report
	TENANCY TERRACE - L8 - FT05	2700	1550/1550	2	Refer to Schedule 01 - External Finishes and Assemblies & Façade report
	TENANCY / TERRACE - L8 - FT05	2700	1550	2	Refer to Schedule 01 - External Finishes and Assemblies & Façade report
CES1					
	CHILD CARE ENTRY LOBBY	2400	1 420	1	Custom Timber with steel frame with heavy duty pivot hinge- Refer to Drawing A6003
CSC1					
	SERVICE CUPBOARD	2400	600	8	Refer to Drawing A4750
CSC3					
	SERVICE CUPBOARD	2400	600	3	Refer to Drawing A4750
	SERVICE CUPBOARD	2400	600	6	Refer to Drawing A4750
	SERVICE CUPBOARD	2400	720	1	Refer to Drawing A4750
	SERVICE CUPBOARD	2400	900 / 900	2	Refer to Drawing A4750
CSC4					
	SERVICE CUPBOARD	2380	800 / 800	17	Refer to Drawing A4750
CSS2					
	FIRE STAIR (TO STREET)	2400	900 / 420	1	
	FIRE STAIR (TO STREET)	2100	920 / 420	1	
	FIRE STAIR (TO STREET)	2400	920	1	
CSS3					
	FIRE STAIR	2400	920	18	
CSS6					
	FIRE STAIR	2400	920	16	
EGF3					
	CHILDCARE TERRACE	2700	1 000 / 1 000	6	
	CHILDCARE TERRACE	2700	950 / 950	1	
	CHILDCARE TERRACE	2700	1100 / 1100 / 1100	2	
	CHILDCARE TERRACE	2700	1 300 / 1 300 / 1 300	1	
	GROUND FLOOR LOBBY BALCONY	2700	830 / 830	1	
EGS1					
	TERRACE ACCESS L3	2400	920	2	
	CHILDCARE TERRACE	2700	920	2	
	CHILDCARE TERRACE	2700	920	2	
ESS1					
	PLANTROOM/STORE	2400	920	1	
ESS10					
	EXTERNAL GAS METER CUPBOARD	600	450 / 450	1	Custom Door - Refer to Drawing A900
	EXTERNAL FIRE BOOSTER	1500	790 / 790	2	Custom Door - Refer to Drawing A900
FGC5					
	TYPICAL FEMALE WC	2400	1 000	7	Cavity Automatic frameless glazed sliders / Dorma HD 200 Series / Motion sensor
	TYPICAL MALE WC	2400	1 000	6	Cavity Automatic frameless glazed sliders / Dorma HD 200 Series / Motion sensor
FSS1					
	TYPICAL ACCESSIBLE AMENITIES	2400	920	9	
FSS4					
	EOT CHANGE ROOMS	2400	920	4	
	WC GROUND FLOOR TENANCY	2400	820	1	
Od1					
	CARPARK ACCESS	4600	6800	1	Refer to Schedule 01 - External Finishes and Assemblies
Od2					
	REFUSE ROOM	2400	1800	1	Refer to Schedule 01 - External Finishes and Assemblies
OGF1					
	TENANCY ACCESS L8	2100	1 200	1	Frameless glazed sliding door
OSS1					
	TENANCY ACCESS L8	2340	920	2	Framless glazed swing door with pivot hinges of partition system
PSS1					
	COMMS ROOM BASEMENT 1	2400	920	1	
	PLANT ROOMS	2400	820	8	
	SERVICE ACCESS	2400	920	1	
	PUMP ROOM	2400	920	1	
	PUMP ROOM	2400	920 / 920	1	
	REFUSE ROOM	2400	920	1	
	SWITCHROOM	2400	920	2	
SSF2					
	SUBSTATION	3100	1 400 / 1 400	1	Fire rated double sliding door - Refer to Energex and PE Consulting Engineers drawings for specifications
SSS1					
	BICYCLE STORAGE	2400	920	1	Custom Timber with steel frame A6301 - Provide proximity card reader on outside of door
	CLEANERS STORE	2400	920	1	
	TERRACE ACCESS - L9	2400	920	1	
	DAS ROOM	2400	920	1	
	TRADE WASTE	2400	920	1	
SSS5					
	SUBSTATION	2400	820 / 520	1	
	SUBSTATION	2400	920	1	

SCHEDULE 04 –DOORS AND DOOR HARDWARE

DOORS AND DOOR HARDWARE

1 GENERAL

EXCLUSIONS

Automatic Doors *[sliding hinged and revolving automatic doors]*

Refer Schedule 01- External Finishes and Assemblies

Overhead Doors *[lift up, bi-fold and roller shutter doors]*

Refer Schedule 01- External Finishes and Assemblies

Toilet partition doors and hardware

Refer Schedule 03 - Internal Fittings, Fixtures and Appliances

Joinery Doors

Refer Schedule 02 - External Finishes and Assemblies

Joinery door hardware

Refer Schedule 03 - Internal Fittings, Fixtures and Appliances

SCHEDULE 04 –DOORS AND DOOR HARDWARE

2 CORE AND CORRIDOR DOORS

CSS2 ESCAPE STAIR TO STREET – SOLID SINGLE SWING

Frame:	FRM1 - 1.6mm thick, pressed metal fire rated jamb. Paint finish
Door panel:	48FR2M - 48mm flush panel, - / 120 / 60 FRL door with mild steel cladding. Paint finish
Size:	Refer to Door Type Schedule 4A
Opening:	Refer to Door Type Schedule 4A
Kickplate:	1.2mm thick Grade 304 stainless steel, satin finish high to match skirting wall x width of door
Vision panel:	N/A.
Grilles:	Refer <i>Mechanical Consultant's</i> drawings
Hinges:	H1 – 4 x 100mm x 100mm Novas 304 Grade Ball bearing hinges. Satin stainless steel
Lock / Latch:	L8 - Novas 6120 single action lock with 60mm backset and L31 - Novas NH096 Strike Shield lock protector plate. Satin stainless steel
Operation:	Outside cylinder opened by key. Inside handle always operative. Single action escape function.
Furniture:	F1 - Novas Designer B series 79 handle on round rose. Satin stainless steel and Lockwood 9500/9600 Series Rim Type Panic Exit Device on escape side where required to comply with DDA requirements
Closer:	C2 - Novas 1500BCSIL Series Standard Arm Closer / Parallel Arm Closer. Silver. Mount on push side of door
Seals:	S1 - Raven RP70Si rebated into base S3 - PyroPanel intumescent perimeter hot smoke seal S4 - Raven RP150 to perimeter. Colour - Black
Stop:	N/A.
Signage:	Install signage in accordance with the BCA and statutory requirements
Extent:	Doors discharging from Escape Stairs to the street

CSS3 LOBBY / CORRIDOR TO ESCAPE STAIR – SOLID SINGLE SWING

Frame:	FRM1 - 1.6mm thick, pressed metal fire rated jamb. Paint finish
Door panel:	48FR2M - 48mm flush panel, - / 120 / 60 FRL door with mild steel cladding. Paint finish
Size:	Refer to Door Type Schedule 4A
Opening:	Refer to Door Type Schedule 4A
Kickplate:	1.2mm thick Grade 304 stainless steel, satin finish, high to match skirting wall x width of door
Vision panel:	VP1 - 600 x 100mm with 13mm Pyrodur glass
Grilles:	Refer <i>Mechanical Consultant's</i> drawings
Hinges:	H1 – 4 x 100mm x 100mm Novas 304 Grade Ball bearing hinges. Satin stainless steel
Lock / Latch:	L6 - Novas 6150 Exit Latch with 60mm backset. Satin stainless steel and Lockwood Padde Series ES2100 Monitored Electric Strike. Refer to Security Consultant's documents. Provide proximity card reader to the lobby to allow restricted access to stair
Operation:	Stair side handle is always inoperative. Electric strike is unlocked by proximity card rear. Outside handle always operative. Single action escape function. Electric strike to disengage on power failure or activation of the fire alarm. Provide proximity card reader to inside face of each stair landing to allow restricted access.
Furniture:	F1 - Novas Designer B series 79 handle on round rose. Satin stainless steel
Closer:	C2 - Novas 1500BCSIL Series Standard Arm Closer / Parallel Arm Closer. Silver.
Seals:	S1 - Raven RP70Si rebated into base S3 - PyroPanel intumescent perimeter hot smoke seal S4 - Raven RP150 to perimeter. Colour - Black
Stop:	DS3 - Novas 550 cylindrical door stop. 75 x 19mm. Satin chrome. Provide spacer where required
Signage:	Install signage in accordance with the BCA and statutory requirements
Extent:	Doors discharging into Escape Stairs

SCHEDULE 04 –DOORS AND DOOR HARDWARE

CSS4 LIFT PIT ACCESS – SOLID SINGLE SWING

Frame:	FRM1 - 1.6mm thick, pressed metal fire rated jamb. Paint finish
Door panel:	48FR2P - 48mm flush panel, - / 120 / 60 FRL door with exterior grade plywood facings. Paint finish
Size:	Refer drawings
Opening:	Refer drawings
Kickplate:	1.2mm thick Grade 304 stainless steel with satin finish. high to match skirting wall x width of door.
Vision panel:	VP1 - 600 x 100mm with 13mm Pyrodur glass
Grilles:	Refer <i>Mechanical Consultant's</i> drawings
Hinges:	H1 - 4 x 100mm x 100mm Novas 304 Grade Ball bearing hinges. Satin stainless steel
Lock / Latch:	L4 - Novas 6115 Storeroom Lock with 60mm backset. Satin stainless steel finish.
Operation:	Outside handle always inoperative. Key retracts bolt / Inside handle always operative. Single action escape function. Interlock system required.
Lock / Latch:	L6 - Novas 6150 Exit Latch with 60mm backset. Satin / Polished stainless steel and Lockwood Padde Series ES2100 Monitored Electric Strike. Refer to Security Consultant's documents. Provide proximity card reader to the lobby to allow restricted access to stair
Operation:	Lobby side handle always inoperative handle. Electric strike unlocked by proximity card reader / Lift pit side handle always operative Single action escape function.
Furniture:	F1 - Novas Designer B series 79 handle on round rose. Satin stainless steel
Closer:	C2 - Novas 1500BCSIL Series Standard Arm Closer / Parallel Arm Closer. Silver. Mount on push side of door
Seals:	S1 - Raven RP70Si rebated into base S3 - PyroPanel PFS2003 hot smoke seals to perimeter. S4 - Raven RP150 to perimeter. Colour - Black
Stop:	DS1 - Novas 290 half-moon door stop. Satin chrome finish. Provide spacer where required
Signage:	Install signage in accordance with the BCA and statutory requirements
Extent:	Lift pit access

CSS6 DOORS OPENING OFF SMOKE LOBBIES – SOLID SINGLE SWING

Frame:	FRM1 - 1.6mm thick, pressed metal fire rated jamb. Paint finish
Door panel:	48FR2M - 48mm flush panel, - / 120 / 60 FRL door with mild steel cladding. Paint finish
Size:	Refer to Door Type Schedule 4A
Opening:	Refer to Door Type Schedule 4A
Kickplate:	1.2mm thick Grade 304 stainless steel, satin finish high to match skirting wall x width of door
Vision panel:	VP1 - 600 x 100mm with 13mm Pyrodur glass
Grilles:	Refer <i>Mechanical Consultant's</i> drawings
Hinges:	H1 – 4 x 100mm x 100mm Novas 304 Grade Ball bearing hinges. Satin stainless steel
Lock / Latch:	L4 - Novas 6115 Storeroom Lock with 60mm backset. Satin stainless steel finish.
Operation:	Outside handle always inoperative. Key retracts bolt / Inside handle always operative. Single action escape function. Interlock system required.
Lock / Latch:	L6 - Novas 6150 Exit Latch with 60mm backset. Satin stainless steel and Lockwood Padde Series ES2100 Monitored Electric Strike. Refer to Security Consultant's documents. Provide proximity card reader to the lobby to allow restricted access to stair
Operation:	Stair side handle is always inoperative. Electric strike is unlocked by proximity card rear. Outside handle always operative. Single action escape function. Electric strike to disengage on power failure or activation of the fire alarm. Provide proximity card reader to inside face of each stair landing to allow restricted access
Furniture:	F1 - Novas Designer B series 79 handle on round rose. Satin stainless steel
Closer:	C3 - Novas 1500VTRBSIL Series door closer. Slide arm closer/over door mounted. Silver
Closer:	C2 - Novas 1500BCSIL Series Standard Arm Closer / Parallel Arm Closer. Silver.
Seals:	S1 - Raven RP70Si rebated into base S3 - PyroPanel intumescent perimeter hot smoke seal S4 - Raven RP150 to perimeter. Colour - Black
Stop:	DS3 - Novas 550 cylindrical door stop. 75 x 19mm.Satin chrome. Provide spacer where required
Signage:	Install signage in accordance with the BCA and statutory requirements

SCHEDULE 04 –DOORS AND DOOR HARDWARE

Extent: Doors opening off smoke lobbies

CSC1 CORRIDOR SERVICE CUPBOARDS – SOLID SINGLE SWING

Frame: PM2 - 100mm x 38mm x 1.2mm thick pressed metal frame with single rebate. Paint finish
Door panel: 38SCP - 38mm thick flush panel solid blockboard core doors. Laminate finish. Provide with sheet steel backing to rear face of doors to comply with BCA requirements for fire resistant construction.
Size: Refer to Door Type Schedule 4A
Hinge type: H9 - Heavy Duty SOSS hinge concealed on metal frame to builder's specifications.
Lock / latch: L30 - Lockwood 507 Fire Rated Nightlatch Satin stainless steel
Furniture: F19 - Novas Ring Pull, RP60. Satin stainless steel.
Closer: C2A - Novas 1500BCSIL Series Standard Arm Closer / Parallel Arm Closer with hold open. Silver
Seals: Not required
Signage: Install signage in accordance with the BCA and statutory requirements
Extent: Services cupboards

CSC3 CORRIDOR ELECTRICAL SERVICES CUPBOARDS – SOLID SINGLE SWING

Frame: PM2 - 100mm x 38mm x 1.2mm thick pressed metal frame with single rebate. Paint finish
Door panel: 38SCP - 38mm thick flush panel solid blockboard core doors. . Laminate finish. Provide with sheet steel backing to rear face of doors to comply with BCA requirements for fire resistant construction.
Size: Refer to Door Type Schedule 4A
Hinge type: H9 - Heavy Duty SOSS hinge concealed on metal frame to builder's specifications.
Lock: L30 - Lockwood 507 Fire Rated Nightlatch Satin stainless steel
Furniture: F19 - Novas Ring Pull, RP60SSS. Satin stainless steel. Mount on same panel as lock cylinder.
Closer: C2A - Novas 1500BCSIL Series Standard Arm Closer / Parallel Arm Closer with hold open. Silver
Seals: S8 - Raven Rp78Si to jambs and head
Threshold: TBC.
Signage: Install signage in accordance with the BCA and statutory requirements
Extent: To Electrical Meters, Comms and LV Risers

CSC4 CORRIDOR ELECTRICAL SERVICES CUPBOARDS – SOLID DOUBLE SWING

Frame: PM2 - 100mm x 38mm x 1.2mm thick pressed metal frame with single rebate. Paint finish
Door panel: 38SCP - 38mm thick flush panel solid blockboard core doors with paint quality plywood facings. Paint finish. Provide with sheet steel backing to rear face of doors to comply with BCA requirements for fire resistant construction.
Door panel: 38SCP - 38mm thick flush panel solid blockboard core doors. . Laminate finish. Provide with sheet steel backing to rear face of doors to comply with BCA requirements for fire resistant construction.
Size: Refer drawings
Hinge type: H9 - Heavy Duty SOSS hinge concealed on metal frame to builder's specifications.
Lock: L30 - Lockwood 507 Fire Rated Nightlatch Satin stainless steel
Furniture: F12 - Novas Ring Pull, RP60SSS. Satin stainless steel. Mount on same panel as lock cylinder.
Bolts: B1 - Novas 1781/1791 panic bolts with visible fixings. 300mm to base and 600mm to head
Closer: C2A - Novas 1500BCSIL Series Standard Arm Closer / Parallel Arm Closer with hold open. Silver
Seals: S8 - Raven Rp78Si to jambs and head -
S10 - Raven Rp71Si to meeting stiles. Finish TBC.
Thresholds: TBC.
Signage: Install signage in accordance with the BCA and statutory requirements
Extent: To Electrical Meters, Comms and LV Risers to corridors

SCHEDULE 04 –DOORS AND DOOR HARDWARE

3 ENCLOSURE DOORS

EGS1 DOORS WITH PERIMETER FRAME – GLAZED SINGLE SWING

Frame:	ALF1 - Aluminium frame as part of the facade system.
Door panel:	ALG2 - Aluminium framed hinged glass door to suit façade system
Size:	Refer external elevations
Hinges:	H5 - 4 x 100mm x 71mm Novas Fastfix ball bearing hinges. Satin stainless steel.
Lock / Latch:	L25 - Novas 4245 Exterior Lock. Satin Stainless Steel.
Operation:	Outside – Opened by handle except when handle is made inoperative by turnknob inside. Confirm requirements.
Furniture:	F2 - Novas 79 lever on Aust. narrow stile plates P series. Satin stainless steel
Closer:	C1 - Novas 1300VTRBSIL series slide arm, surface mounted closer. Silver
Seals:	S20 - Standard bulb and brush seals by facade contractor to achieve air and weather tightness
Stop:	TBC.
Signage:	Nominate
Extent:	Refer Façade drawings

EGB1 BALCONY/TERRACE – GLAZED MULTIPLE BI-FOLDING

Frame:	ALF1 - Aluminium frame as part of the facade system. Capral Artisan Aluminium folding door system – top hung
Door panel:	ALG1 - Aluminium framed, sliding glass door to suit façade system
Size:	3000mm high(max.) x 1000mm wide(max.) x 100kg(max.) per panel. Refer external elevations
Lock / Latch:	TBC
Furniture:	TBC
Bolts:	TBC
Seals:	DS20 - Standard bulb and brush seals by facade contractor to achieve applicable air and weather tightness
Extent:	Refer Façade drawings

ESS1 EXTERNAL ACCESS TO SERVICES/PLANT ROOMS – SOLID SINGLE SWING

Frame:	PM1 - 1.2mm thick pressed metal frame with single rebate. Paint finish
Door panel:	48SCM - 48mm thick, weatherproof, flush panel solid core door with galvanised steel / mild steel cladding. Paint finish
Size:	Refer to Door Type Schedule 4A
Opening:	Refer to Door Type Schedule 4A
Grille:	Refer <i>Mechanical Services</i> Drawings
Kickplate:	1.2mm thick Grade 304 stainless steel, satin finish high to match skirting wall x width of door
Hinges:	H1 – 4 x 100mm x 100mm Novas 304 Grade Ball bearing hinges. Satin stainless steel
Lock / Latch:	L9 - Novas 6120 Single action lock, with 60mm backset. Satin stainless steel and L31 Novas NH096 Strike Shield lock protector plate. Satin stainless steel
Operation:	Key retracts bolt. No outside handle / Inside handle always operative. Single action escape function
Furniture:	F1 - Novas Designer B series 79 handle on round rose. Satin stainless steel and;
Closer:	C2 - Novas 1500BCSIL Series Standard Arm Closer / Parallel Arm Closer. Silver. Mount on push side of door
Seals:	S1 - Raven RP70Si rebated into base S4 - Novas NHBWS perimeter seal to jamb and head.
Stop:	DS2 - Novas 280 mushroom door stop. Satin chrome
Signage:	Install signage in accordance with the BCA and statutory requirements
Extent:	Plant Rooms

SCHEDULE 04 –DOORS AND DOOR HARDWARE

ESS10 FIRE BOOSTER CUPBOARD – SOLID DOUBLE SWING

Frame:	Custom frame to suit 48mm thick door panel. Refer details
Door panel:	48SCP - 48mm thick, weatherproof, flush panel solid core door with selected cladding (TBC)
Size:	Refer to Door Type Schedule 4A
Hinges:	H7 – 4 x 100mm x 125mm / 150mm / 175mm / 200mm x 3.2mm, Novas fixed pin, satin stainless steel broad butt hinges
Lock / Latch:	L10 - Novas 6305 Nightlatch: Cylinder latch. Satin stainless steel. Keying to conform with fire brigade requirements
Operation:	Single cylinder opened by key.
Furniture:	F13 - Novas S61002150 'D' Handle. Satin stainless steel
Bolts:	B2 - Novas 1781/1791 series panic bolts to each door, 600mm at base to enable door to be held in an open position to suit fire brigade requirements.
Seals:	Not applicable
Stop:	Not applicable
Signage:	Install signage in accordance with the <i>Fire Brigade</i> requirements
Extent:	Fire Booster Cupboard

EGF3 BALCONY/TERRACE – GLAZED MULTIPLE SLIDING

Frame:	ALF1 - Aluminium frame as part of the facade system.
Door panels:	ALG1 - Aluminium framed, sliding glass doors to suit façade system
Size:	Refer to Door Type Schedule 4A
Lock / Latch:	L22 - Novas NH591 hook bolt short backset mortice lock with cylinder escape turn to inside. Powdercoat finish
Furniture:	F15 - Novas back to back entry door handle 61027 (325mm long) Powdercoat finish.
Seals:	DS20 - Standard bulb and brush seals by facade contractor to achieve applicable air and weather tightness
Stop:	DS5 - Proprietary track mounted stop to sliding door track
Operation:	Automated (T.B.C)
Extent:	Refer Façade drawings

EGF2 BALCONY/TERRACE – GLAZED DOUBLE SLIDING

Frame:	ALF1 - Aluminium frame as part of the facade system.
Door panels:	ALG1 - Aluminium framed, sliding glass doors to suit façade system
Size:	Refer external elevations
Lock / Latch:	L22 - Novas NH591 hook bolt short backset mortice lock with cylinder escape turn to inside. Powdercoat finish
Furniture:	F15 - Novas back to back entry door handle 61027 (325mm long) Powdercoat finish.
Seals:	DS20 - Standard bulb and brush seals by facade contractor to achieve applicable air and weather tightness
Stop:	DS5 - Proprietary track mounted stop to sliding door track
Extent:	Refer Façade drawings

SCHEDULE 04 –DOORS AND DOOR HARDWARE

4 FACILITIES DOORS

FSS1 ACCESSIBLE AMENITIES – SOLID SINGLE SWING

Frame:	PM1 - 1.2mm thick fire rated pressed metal, frame with single rebate. Paint finish
Door panel:	48SCP - 48mm thick, flush panel solid blockboard core doors with paint quality exterior grade plywood facings. Paint finish
Size:	Refer to Door Type Schedule 4A
Kickplate:	1.2mm thick Grade 304 stainless steel, satin finish high to match skirting wall x width of door
Hinges:	H6 - Novas 100mm x 75mm lift-off hinges. Satin stainless steel.
Lock / Latch:	L7 - Novas 6235 Privacy Latch with anti-lockout function. Satin stainless steel
Operation:	Outside handle operative except when handle is made inoperative by turn knob inside. Handle may be unlocked from outside by coin or screwdriver by operating the slotted emergency button. Inside handle operative except when handle is made inoperative by turn knob inside. Turn knob locks or unlocks both handles
Furniture:	F1 - Novas Designer B series 79 handle on round rose. Satin stainless steel
Closer:	C4 - Geze TS2000SNVBCSIL door closer with slide arm. Silver
Stop:	Novas 280 mushroom door stop. Satin chrome
Signage:	Install signage in accordance with the BCA and statutory requirements
Extent:	Accessible toilet and shower doors

FSS4 TYPICAL - SOLID SINGLE SWING

Frame:	ALF2 - 100mm x 45mm aluminium frame. Powdercoat finish
Door panel:	48SCP - 48mm thick, flush panel solid blockboard core doors with paint quality exterior grade plywood facings. Paint finish
Size:	Refer to Door Type Schedule 4A
Kickplate:	N/A
Vision panel:	N/A
Grilles:	N/A
Hinges:	H2 – Novas 100mm x 75mm ball bearing hinges. Satin stainless steel.
Lock / Latch:	N/A
Furniture:	F16 - Novas 30mm x 25mm x 1500mm long stainless steel handles and standoff supports fixed as back to back handles. Satin finish
Closer:	C1 - Novas 1300VTRBSIL series slide arm, surface mounted closer. Silver <i>*Hinged Doors</i>
Seals:	S1 - Raven RP70Si rebated into base S4 - Novas NHBWS perimeter seal to jamb and head.
Stop:	DS3 - Novas 550 cylindrical door stop. 75 x 19mm. Satin chrome. Provide spacer where required
Signage:	TBC
Extent:	Amenities

FGC5 AMENITIES – GLAZED SINGLE CAVITY SLIDING

Frame/Track:	CS3 - CS Frameless glass cavity sliding system cavity sliding system with squarestop jambs / no closing jamb, to suit 13mm plasterboard. Paint finish.
System:	Dorma HD 200 Series Automatic door operator / Motion Sensor
Door panel:	FG2 Frameless glass automatic sliding door
Size:	Refer to Door Type Schedule 4A
Lock / Latch:	N/A
Furniture:	Custom
Extent:	Refer to Door Type Schedule 4A

SCHEDULE 04 –DOORS AND DOOR HARDWARE

5 SERVICES AREA / PLANT ROOM DOORS

PSS1 PLANT ROOM – SOLID SINGLE SWING

Frame:	FRM1 - 1.6mm thick, pressed metal fire rated jamb. Paint finish
Door panel:	48FR2 - 48mm thick, 2 hour fire rated, flush panel door with paint quality exterior grade plywood facings. Paint finish
Size:	Refer to Door Type Schedule 4A
Opening:	Refer to Door Type Schedule 4A
Kickplate:	1.2mm thick Grade 304 stainless steel, satin finish high to match skirting wall x width of door
Vision panel:	TBC.
Grilles:	TBC.
Hinges:	H1 – 4 x 100mm x 100mm Novas 304 Grade Ball bearing hinges. Satin stainless steel
Lock / Latch:	L4 - Novas 6115 Series Storeroom Locking Latch with satin stainless steel finish. 60mm backset
Operation:	Outside handle locked / unlocked by key. Inside handle always operates lock/latch. Single action escape function
Furniture:	F1 - Novas Designer B series 79 handle on round rose. Satin stainless steel
Closer:	C2 - Novas 1500BCSIL Series Standard Arm Closer / Parallel Arm Closer. Silver. Mount on push side of door
Seals:	S1 - Raven RP70Si rebated into base S3 - PyroPanel PFS2003 hot smoke seals to perimeter. S4 - Raven RP150 to perimeter. Colour black
Stop:	DS1 - Novas 290 half-moon door stop. Satin chrome finish. Provide spacer where required
Signage:	Install signage in accordance with the BCA and statutory requirements
Extent:	Plant Rooms generally

SSS1 SERVICES AREA - SOLID SINGLE SWING

Frame:	PM1 - 1.2mm thick, pressed metal jamb. Paint finish
Door panel:	48SCP - 48mm thick, flush panel solid blockboard core doors with paint quality exterior grade plywood facings. Paint finish
Size:	Refer to Door Type Schedule 4A
Kickplate:	1.2mm thick Grade 304 stainless steel, satin finish high to match skirting wall x width of door
Vision panel:	N/A
Grilles:	N/A
Hinges:	H1 – 4 x 100mm x 100mm Novas 304 Grade Ball bearing hinges. Satin stainless steel
Lock / Latch:	L4 - Novas 6115 Series Storeroom Lock. Satin stainless steel finish.
Operation:	Outside handle locked / unlocked by key. Inside handle always operates lock/latch. Single action escape function.
Furniture:	F1 - Novas Designer B series 79 handle on round rose. Satin stainless steel
Closer:	C2 - Novas 1500BCSIL series standard arm closer / parallel arm closer. Silver.
Seals:	S1 - Raven RP70Si rebated into base S4 - Raven RP150 to perimeter. Colour black
Stop:	DS1 - Novas 290 half-moon door stop. Satin finish. Provide spacer where required
Signage:	TBC
Extent:	Refer to Door Type Schedule 4A

SSS5 SUBSTATION PERSONNEL DOORS

(Refer to Energex and PE Consulting Engineers drawings for specifications)

Frame:	FRS - Double rebated mitred and welded 150 x 70 x 8mm steel angle 3 sided frame with 50 x 25mm RHS stops and a 70 x 6mm steel threshold plate. Hot dip galvanised and paint finish
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SCHEDULE 04 –DOORS AND DOOR HARDWARE

Door panel:	FR4 - Doors shall be non-combustible as well as blast, impact and moisture resistant, fabricated from composite panel of fibre reinforced cement mechanically bonded to punched steel sheets on both outer surfaces and J type meeting stiles. Paint finish
FRL:	- / 120 / 30
Product:	Blockade Durasub-D-EXT-01 from Blockade Barriers P: 0402-206-951 E: sales@blockadebarriers.com.au
Size:	Refer to Door Type Schedule 4A
Furniture:	F18 - Each leaf fitted with a panic bar 2 way shoot bolt mechanism. key and lock set, door selector and piano hinges, as part of the door system
Lock / Latch:	L36 - Lockwood Type 201 Series to Electrical Authority requirements
Closer:	C10 - Dorma TS83
Earthing:	Doors and doorframes to substation shall be earthed in accordance with the <i>Electrical Services</i> Drawings
Signage:	Install signage in accordance with the <i>Electrical Authority</i> requirements
Bund:	Provide a 90mm x 90mm x 6mm removable, hot dip galvanised angle door bund in accordance with Electrical Authority requirements
Extent:	Internal substation personnel doors

SSF2 SUBSTATION SOLID DOUBLE SLIDING

(Refer to Energex and PE Consulting Engineers drawings for specifications)

Frame:	Metal Custom
Door panel:	FR4 - Doors shall be non-combustible as well as blast, impact and moisture resistant, fabricated from composite panel of fibre reinforced cement mechanically bonded to punched steel sheets on both outer surfaces and J type meeting stiles. Paint finish
FRL:	- / 120 / 30
Product:	Blockade Durasub-D-EXT-01 from Blockade Barriers P: 0402-206-951 E: sales@blockadebarriers.com.au
Size:	Refer to Door Type Schedule 4A
Furniture:	TBC.
Lock / Latch:	TBC.
Closer:	TBC.
Earthing:	Doors and doorframes to substation shall be earthed in accordance with the <i>Electrical Services</i> Drawings
Signage:	Install signage in accordance with the <i>Electrical Authority</i> requirements
Bund:	TBC.
Extent:	Internal substation

6 TENANCY DOORS

OSS1 TENANCY SOLID SINGLE SWING

Frame:	ALF2 - 100mm x 45mm aluminium frame. Powdercoat finish
Door panel:	48SCP - 48mm thick, flush panel solid blockboard core doors with paint quality exterior grade plywood facings. Paint finish
Size:	Refer to Door Type Schedule 4A
Kickplate:	N/A
Vision panel:	N/A
Grilles:	N/A
Hinges:	H2 – Novas 100mm x 75mm ball bearing hinges. Satin stainless steel.
Lock / Latch:	N/A
Furniture:	F16 - Novas 30mm x 25mm x 1500mm long stainless steel handles and standoff supports fixed as back to back handles. Satin finish

SCHEDULE 04 –DOORS AND DOOR HARDWARE

Closer: C1 - Novas 1300VTRBSIL series slide arm, surface mounted closer. Silver
Seals: S1 - Raven RP70Si rebated into base
S4 - Novas NHBWS perimeter seal to jamb and head.
Stop: DS3 - Novas 550 cylindrical door stop. 75 x 19mm.Satin chrome. Provide spacer where required
Signage: TBC
Extent: Offices Tenancy

OGF1 TENANCY SOLID SINGLE SLIDING

Frame/Track: SS1 - Cowdroy Trojan sliding door track system, recessed in ceiling. Powdercoat finish
Door panel: FG2 Frameless glass
Size: Refer to Door Type Schedule 4A
Furniture: Custom
Lock / Latch: N/A
Stop: Proprietary track mounted stop to sliding door track
Extent: Offices Tenancy

7 CUSTOM DOORS

CES1 ACCESS PIVOT DOOR

(Refer to drawing A6003)

Frame: Custom Painted steel Frame
Door panel: Custom Hardwood battens fixed to steel frame
Size: Refer to Door Type Schedule 4A
Hinges: H11 - Pivot set for use with nominated floor spring
Lock / Latch: L13 - Lockwood Padde Series Z4 Single Monitored Electromagnetic Lock with push button to allow free exit in direction of escape if door is performing as an Exit door. Make provision for proximity card readers on outside of door
Furniture: Refer drawing A6003
Closer: C6 - Geze TS500NHO Heavy Duty Floor Spring (recessed into floor) with stainless steel cover plate. Provide suitable length spindle to suit floor finish or similar.
Stop: DS1 - Novas 290 half-moon door stop. Satin finish. Provide spacer where required
Extent: Childcare access door