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Roberts Pizzarotti
2 Rhodes St,
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15th October 2020
Prism Reference: 20018-FA-LT-001(0)

Dear Onneile,

Re: Condition B4 – Statement Regarding NCC Compliance of External Walls and Cladding

Prism Façades have been engaged by Roberts Pizzarotti to provide façade consultancy services for the windows, lightweight brick cladding, metal screens and sunshades on the Meadowbank Schools Project. These services include preparation of a facade performance specification and design intent for tendering purposes.

The façade performance design prepared by Prism Facades (drawings and façade performance specification) provide an indicative solution for the façade works. We confirm that this indicative solution has been prepared in accordance with all Australian Standards and to satisfy the requirements of the NCC/BCA 2019.

The façade subcontractor is responsible for the final design of the facade, including material selection, fabrication, installation and certification of the façade works on a “Design and Construct” basis. The Subcontractor may choose to develop the indicative solution prepared by Prism Facades or produce their own design which must fully comply with the project requirements.

It is a requirement of the contract documents (i.e. the façade performance specification) that the façade subcontractor prepare the final façade design so that it complies with the requirement of the Australian Standards and NCC/BCA 2019.

We note that Prism Facades have been engaged to act as a peer reviewer during the construction stage of the project and therefore we will review the subcontractor’s submissions that relate to their final design (i.e. samples, shop drawings, calculations, thermal modelling reports, waterproofing test reports, certificates, etc).

The Subcontractor is also responsible for submitting statements of design, engineering and installation certification on practical completion of the project, confirming that compliance with the Australian Standards and NCC has been achieved.

We trust the above is clear, however, please do not hesitate to contact us should you have any questions.

Yours sincerely,

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PRISM

Meadowbank Education & Employment Precinct Schools Project

Facade Performance Specification

Prism Facades
MSP-PF-FA-0002
Revision D, Contract Documentation
17th September 2020

Meadowbank Schools Project, Meadowbank

Facade Performance Specification

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1 General

1.1 Performance Specification

This document is written in the directive style. Where an obligation is given and it is not stated who is to undertake these obligations, they are to be undertaken by the Contractor.

Where a submission, request, proposal is required and it is not stated who the recipient should be, it is to be provided to the Principal for approval.

This is a performance specification. The architectural drawings and façade drawings, together with this specification, define the;

- Scope of works;
- Mandatory geometry of visible surfaces;
- Performance requirements;
- Minimum acceptable standards;
- Verification requirements for design, fabrication & installation.

The drawings and this specification provide an indicative solution for the works. The Contractor may choose to develop the indicative solution shown in the drawings or produce their own design which will fully comply with the project requirements.

The Contractor shall complete the design, procure, fabricate, verify and install the glazed and non-glazed façade elements. It shall be the Contractor's responsibility to warrant the above to the Principal and to ensure that all the requirements of the contract documents are met.

The Contractor shall ensure that the Works (including documentation) are fit, complete and suitable for their intended purpose as set out in or reasonably ascertainable from this specification and any other information provided by the Principal.

The drawings and this specification do not necessarily indicate or describe in detail all work required for the full performance and completion of the works. Provide all items required for proper completion of the contracted works without adjustment to the contract price.

Where two or more requirements, codes or standards in this specification pertain to the same item or conflicts arise between clauses, standards or any other requirements, the more stringent shall apply. If in doubt, request clarification from the Principal.

1.2 Related Documents

Read in conjunction with all other contract documents, and in particular:

- Head Contract Documents;
- Project Approval Conditions;
- Safety in Design (SiD) Register;
- Architectural drawings and specifications by Woods Bagot
- Mechanical Services drawings and specification by Steenson Varming

- ESD reports prepared by Stantec
- Acoustic reports prepared by Acoustic Logic
- Fire Engineering reports by Performance Based Consulting
- Structural Engineer's drawings and specification by Enstruct Group;

The Head Contract shall take precedence over this specification, which in turn shall take precedence over the referenced specifications and the drawings.

Original / fully editable files of the contract documents (e.g. .docx, .dwg, .xls files etc.) will not be provided by the Principal.

1.3 Definitions & Abbreviations

Each word imparting the plural shall be construed as if the said word were preceded by the word "all".

Each word implying persons shall, where appropriate, also be construed as including corporations.

'Principal' shall mean the Client, or the person appointed by the Client as its representative for the purposes of the contract. This may include members of the client's design team e.g. Architect or relevant consultants.

'Contractor' shall mean the party bound to carry out and complete the Works including supervision of all Subcontractor activities.

'Subcontractor' shall mean the party or parties engaged by the Contractor to complete the Works.

"Authorised", "approval", "approved", "selected", "directed" and similar words shall be construed as referring to the authorisation, approval, selection or direction of the Principal in writing.

"Allow" shall mean that the cost of the item referred to is the responsibility of the Contractor.

"Provide" shall mean "supply and install".

"TBC" shall mean "to be confirmed by the Principal" unless otherwise specified. The Contractor shall seek written confirmation and approval from the Principal for all items designated "TBC" prior to completing the design and/or ordering materials.

Submissions, requests, proposals are to be provided seven working days prior to work commencing or material ordering (unless noted otherwise).

Common industry abbreviations may be used in this document. These include, but are not necessarily confined to, the following:

- AS: Australian Standard (issued by The Standards Association of Australia)
- BS: British Standard
- BCA: National Construction Code / Building Code of Australia
- NATA: National Association of Testing Authorities
- ASTM: American Society for Testing and Materials
- IGU: Insulating Glass Unit

1.4 Contractor Experience & Façade Packaging

Procurement Separation:

A single subcontractor shall be engaged to provide the design, fabrication, installation, certification and warranty of each façade system.

Packages relating to design, supply and installation of the façade systems shall not be separated or procured directly by the main contractor without the prior approval of the Principal.

This requirement does not apply to trade packaging between discreet façade systems.

Façade Subcontractor Experience:

The façade subcontractor (including their fabrication facility and glass supplier) shall have a minimum of 5 years' successful experience in the design, engineering, fabrication and installation of equivalent sized projects and façade systems within the Australian market.

Submit details of similar projects undertaken by the façade subcontractor in Australia, including details of project size (i.e. area of façade system supplied), façade contract value, references/referees, and technical system descriptions (with example drawings where necessary).

The subcontractor must demonstrate that they have ample production facilities to produce, furnish and supply the system as required for installation without delay to the work.

1.5 Key Contractor Responsibilities

Responsibilities relating to the financial terms and conditions and site issues are covered in the Head Contract documents.

Responsibilities relating to the trade aspects of the works are covered in the technical sections of this specification.

In addition to the above, the Contractor shall take full responsibility for identifying and undertaking all tasks required to take the works from award of contract to the end of the Defects Liability Period, other than those responsibilities allocated to others in the Contract documents. The review, acceptance or approval of any submissions shall not relieve the contractor of this responsibility. The contract sum is taken to allow fully for the discharge of this responsibility.

The Contractor shall manage the project delivery programme so as to allow for sequential review of all samples, shop drawings, calculations and reports, including a minimum of 5 working days for the architect, plus a further 5 working days for the façade consultant (i.e. a minimum of 10 working days of review time for all submission).

Specific Contractor responsibilities are noted below, but they do not necessarily describe all the activities required for the Works.

1.5.1 Engagement of Façade Engineer

Unless the Contractor can demonstrate that he has an experienced and competent cladding design capability (to the Principal's satisfaction), then he is to engage a

professional façade engineer to undertake responsibility for the design aspects of the facade (including all interfaces between facade systems and building elements), including structural, weatherproofing, and overall performance of the system.

The façade engineer shall provide certification of the structural design of the facade package components (certification to be signed by a Chartered Professional Engineer in the Structural Division of Engineers Australia (who shall be a Registered Building Practitioner with the VBA/BPEQ), and include a written confirmation that the overall weatherproofing design meets the requirements of the contract documents).

The engineer shall have a minimum of 10 years' experience in light weight cladding and façade design and provide verification of a minimum five projects of similar complexity.

1.5.2 Trade Coordination/Installation Workshops

- Coordination and management of the sequencing of this and allied trades, and any required sequencing of the application of protective measures, and removal thereof.
- Documentation of method statements resulting from installation workshops.
- Conduct programme workshops to allow full coordination with allied trades.

1.5.3 Survey of Structures

The Contractor is to allow to fully survey the line and level of the structure at the interfaces with all new facades so that a complete understanding of the maximum and minimum tolerances of the existing structure becomes known. This is to occur before the design of the façade systems are complete, so that the system design can be manufactured to incorporate the existing tolerances.

The Contractor maintains the responsibility to coordinate the facade design with the structure and to advise the Principal of any potential clash with the structure or boundary prior to commencement of the facade manufacture.

The Contractor is to allow this sequence in his programming so as to avoid delay.

1.5.4 Programming/Coordination Workshops

Update and confirm the detailed programme for the façade works, on a fortnightly basis. All submission and review requirements are to be incorporated into the Contractor's Programme.

Any work commenced prior to obtaining approval of the proposed work will be at the sole risk of the Contractor.

Undertake workshops in which the façade programme is coordinated with allied trades.

1.5.5 Quality Assurance

The Contractor is to undertake verification and record keeping in accordance with the requirements of ISO 9001. Take all necessary steps to monitor, and correct, where necessary, the design, materials, processes, and installation practices required for the Works. As a minimum, undertake the checks and prepare the documentary records specified herein.

Record keeping and verification steps should be undertaken to ensure that each step of the facade

fabrication and installation is carried out in accordance with the design.

Completed quality checklists shall accompany the components at all stages of production and installation and be available for inspection at any stage. Submit full records of all quality management documents at Practical Completion and keep for a period not less than twelve years from Practical Completion.

2 General Scope of Works

2.1 General

This trade package covers the design, fabrication and installation of the cladding contract works including the relevant interfaces as shown in the drawings. The works include but are not necessarily limited to the following:

2.1.1 Facade Works

Including all:

- Glazing;
- Framing;
- Sealants;
- Gaskets and beads;
- Fixings and fastenings;
- General flashings;
- Finishes, coatings and surface treatments;
- Metal panels (infill panels, column covers, spandrels, external framing and trims) including all finish coatings;
- Fire safing and smoke flashings (where applicable);
- Structural steel framing necessary to support facade elements and associated fireproofing (i.e. necessary support framing which has not been detailed on the Structural Engineer's drawings);
- All reinforcing (stiffeners, brackets etc.) required to strengthen or reinforce members of the facade system;
- All operational hardware as needed and identified in the architectural hardware schedules;
- All cleats necessary to support external signage;
- All sealants, joint fillers, gaskets etc. necessary to produce a watertight installation;
- Penetrations for services, external features or other fixtures (where required);
- Weeps, baffles, thermal breaks, acoustic insulation, flashings etc. necessary to meet the performance requirements;
- Waterproofing and other membranes, insulation and vapour barriers within the external portions of the facade;
- Installation, including all anchors, embedding devices, fixings and brackets to support the exterior wall system;
- Coordination with all acoustic performance of the facade and acoustic interfaces;
- Lightning protection connection points;
- Supply of cast-in inserts (to be installed by Main Contractor);
- Nominated safety systems;
- Construction of all full-scale visual mock-ups and mock-up specimens for performance testing.

2.1.2 Miscellaneous Works

- Coordination with other trade contractors that have components of their work installed on or within the exterior wall system;
- Protection of all works during construction;
- Cleaning of all works during construction;
- Facade Prototype Testing to AS/NZS 4284 (off-site) if no acceptable test results available for proposed systems;
- Window & Door Suite Testing to AS/NZS 2047 (off-site) if no acceptable test results available for proposed suites;
- Protective design testing, including forced-entry testing;
- Testing of samples of materials and forms of construction at independent testing laboratory including all coordination of testing and testing procedures with the selected laboratory and payment of all laboratory fees;
- Field testing of assemblies for water penetration;
- On site water hose testing to AAMA 501.2;
- Spare material of glass, aluminium and other cladding components;
- Preparation of Maintenance Manuals.

2.2 Interfacing Between Trade Packages

The Contractor shall ensure that Contract Works carried out under this specification are fully interfaced and coordinated with the other specification sections for interfacing trades, namely:

- Building structure: allow to coordinate with structural tolerances and building movements;
- Mechanical services: interface with plant enclosures in-ceiling services, louvres, grilles and gas chimney exhaust flues;
- Internal fit out: ceiling, sill, internal partitions;
- Base building fire safety systems: such as sprinklers;
- External cladding and other façade trades;
- Security systems and barriers;
- External finishes and paving;
- Lighting and associated electrical;
- Awnings, gutters and drainage;
- Electrical services;
- Building management systems;
- Building maintenance / access systems. The Contractor is to ensure the facade design has capacity to accommodate the loads induced by the proposed system.

2.3 Submissions

Provide all submissions noted in the table below. Provide all re-submissions as required due to prior rejection:

Submission	Programme
All documentation, samples, certificates and other information required for tender (see Section 2.3.1)	With tender
Programme for design / procurement	Within 2 weeks of award
Programme for site works	Within 4 weeks of award
Work Method Statements	Within 4 weeks of award
Performance prototype test schedule	Within 4 weeks of award
Glass Mock-up shop drawings	Within 4 weeks of award
Visual Mock-up shop drawings	Within 4 weeks of award
Protective design test schedule & drawings	Within 6 weeks of award
Shop drawing schedule	Within 2 weeks of award
Facade Thermal Performance Section J Report	Within 4 weeks of award
Glass Replacement Methodology Report	Within 4 weeks of award
All Authority submittals, approvals, permits, and payments of fees and charges as required	Progressive
Material samples and manufacturer's statements	Progressive
Material combustibility compliance report	Before placing any material orders
Shop drawings – full set	Allow sufficient time to allow review / resubmission process
Calculations – full set	Submit with shop drawings
Natural Frequency Assessment Report	Submit with shop drawings
Materials certification	Ongoing
Sealant compatibility test results	6 weeks prior to installation on site
Draft Quality Assurance Manual	Within 4 weeks of award
ITP for manufacturing	Within 4 weeks of award

Submission	Programme
ITP for installation	6 weeks prior to start of installation
As-Built drawings	Within 4 weeks of installation completion
Maintenance Manual	Within 4 weeks of installation completion
Warranties	Within 4 weeks of installation completion
Certification	Final certification within 4 weeks of installation completion

2.3.1 Tender Submissions

Tenders must satisfy the following requirements to be considered valid:

- Submit a list of any inadequacies, deficiencies or omissions in the Tender Documents that could affect the performance, appearance or cost of the Works;
- Clearly describe any work necessary for the full completion of the Works which has not been included for in this Tender, which will involve works to be carried out and costs to be incurred by others. Any such work not specifically described in the Tender return, shall be deemed to have been included for in the Tender;
- Identify any design requirements which will not satisfy the performance requirements as set out in this Specification, and submit proposals which will provide the required performance;
- Provide a full set of sketch details or mark-ups indicating any / all proposed deviations from the design intent shown in the Tender Documents. Any such deviations not specifically described in the Tender return, shall be deemed to have been included for in the Tender and will be subject to review and written approval by the Principal;

Submit the information outlined below with the tender submission:

- A complete list of products, manufacturers and fabricators of all façade components;
- Three (3) 300mm x 300mm samples from the proposed glass and cladding supplier of each type and finish of glass and cladding specified;
- Confirmation of sizes of structural components including mullions and transoms and glass thicknesses required to withstand imposed loadings as determined by analysis of the relevant codes;
- Details of any scaffolding to be provided by the Contractor and necessary for the erection of the façade;
- Outline program showing times for lead-up, shop drawings, tests, supply of metal sections, glass delivery etc., fabrication and installation;
- Examples of similar projects completed during the previous 5 years by the facade subcontractor;
- Name of Chartered Facade Engineer (NPER registered or approved equivalent) including Professional Indemnity Insurance details and CV to demonstrate experience;

- Proposed Installer and CV to demonstrate experience;
- Name of Façade Designer responsible for overall façade system design (including interfaces) and CV to demonstrate experience;
- Confirmation of acceptance and allowance of all requirements of the specification, in particular warranties, spares and all testing including visual mock-up;

2.3.2 Structural Calculations

Retain the services of an approved Façade Engineer, for the purpose of preparing full and detailed calculations.

Calculations shall be submitted for all members and fixings including prototype, glazed aluminium panels and all associated features and elements, and other works. Calculations shall include as a minimum:

- Table of contents;
- Design inputs;
- Narrative on structural principles, philosophy and assumptions;
- Summary of deflections and stresses;
- Summary of joint movements;
- Summary of fixing loads and loading pattern on building edge beams;
- Summary of fixing analysis;
- Summary of structural silicone bite.

Approval of Shop Drawings and Calculations submitted shall in no way relieve the Contractor of the necessity of compliance with the requirements of the Contract Documents.

Test reports from a recognised laboratory may be acceptable in lieu of calculations for some components e.g. concrete inserts, castings, earthquake deflections, screw capacities and deflections.

2.3.3 Drawings

Submit shop drawings, and specifications conveying the following information:

Concept Drawings

Prepare Concept Drawings to demonstrate the typical systems and interfaces prior to the preparation of Shop Drawings.

Shop Drawings

Prepare clear and complete details of each assembly, component and connection together with all information relative to their fabrication, material, surface treatment and erection.

Prepare Shop Drawings in a professional manner by a person experienced in this type of drafting. 'Mark ups' and 'over-notes' on the Contract Drawings will not be accepted as Shop Drawings. Hand drawn sketches will not be accepted as Shop Drawings.

The shop details shall include but not be limited to:

- Marking plans, elevations and sections showing the location of and marking proposed for each member, including any secondary support system;

- Sectional details of all typical and non-typical elements and associated elements including interfaces and flashings with adjacent panels, structure and/or other cladding or roof elements;
- Material type, grade, temper etc.;
- Identification of type and extent of protective coating/finish to be applied;
- Method of draining the assembly, including details showing:
 - Pressure equalised (p.e.) drained joints;
 - Location, number and size of weepholes;
 - Location and size of drain holes into mullions.
- The type, size and spacing of welds;
- Provision for differential vertical or horizontal movements, including:
 - Thermal expansion and contraction;
 - Frame deflections.
- Type and location of anchors and other attachments to be cast or otherwise built into the building structure. Show max allowable shim dimension at fixings;
- Glazing details including:
 - Rebate depth;
 - Edge restraint;
 - Clearances and tolerances;
 - Glazing gaskets and sealant beads.
- Hardware, fittings and accessories including visible heads of fasteners;
- Set out plans for locating cast-in anchors and inserts;
- Attachments for handling, transportation and erection;
- Dimensions for fabricating individual components;
- Assembly for each facade type including assembly tolerances and isometric or axonometric and exploded views of typical junctions;

Do not submit drawings that have not been checked and approved. Clearly note on each drawing the names of the checker and approver. Use revision clouds to highlight drawings changes in revised drawings.

2.3.4 Method Statements, Specifications and Data Sheets

- Draft method statements of installation/erection including sequence of construction and access methodology;
- Method statements of how to produce distortion-free components and assemblies;
- Method statements of assembly, jointing, sealing and fixing of trim panels and other facing panels, particularly where joined edge to edge;
- Specifications/data sheets etc, demonstrating how performance criteria (thermal insulation, fire resistance, smoke barrier, etc) are to be met.

2.3.5 Material Samples

Confirm proposed material selections and associated details in the attached Materials Schedule.

Material types and properties already noted in the Schedule are minimum requirements for this project. Where alternatives are proposed, submit for approval.

Submit samples in accordance with this Specification for approval, including fire performance and all other relevant test certificates to demonstrate compliance with NCC as part of the submission.

2.3.6 Maintenance Manual

Provide four bound copies and a digital copy of the maintenance manual containing the information outlined in Appendix D.

2.3.7 Tests for Fixings

Provide all the necessary test data, calculations and technical information to demonstrate that the proposed fixings are adequate. Submit the Manufacturers written certification that the proposed fixings and details are appropriate for their intended use. Where this information is not available, calculate the characteristic force for each set of tests in line with AS1170.0 Appendix B.

Testing Authority shall retain test specimens for inspection by the Principal.

Cast-in Inserts for Fixing Brackets

Provide manufacturers statement or calculations certifying that the cast in inserts supporting the bracket fixings for the facade elements will resist the types of loading required and will satisfy the following criteria:

- All testing as outlined in AS 5216:2018 to be carried out for all cast-in and post fixed anchors.

2.4 Thermal Modelling

The Contractor is required to undertake AFRC (NFRC) compliant 'Glass + Frame' glass thermal performance software modelling (in LBNL 'Window' and 'Therm' or approved equivalent) in accordance with the requirements of the BCA for the proposed glass, spandrel and facade framing elements at tender and during design and verification prior to fabrication.

The project's Section J and ESD requirements are strict, and it is essential that this modelling is undertaken promptly to ensure that the design does not progress without meeting these performance parameters.

This analysis should be performed for both the transparent vision areas and solid spandrel areas, and should also include an average for the over-all performance of the façade including both the contribution from the vision and spandrel areas.

The Contractor should provide a report and thermal calculations prepared by an approved and experienced Professional Engineer summarising the methods and findings of this modelling and confirming that the system meets with the various requirements of this specification for approval prior to fabrication.

The Contractor should allow to meet with the 'glass + frame' and spandrel performance requirements detailed in this specification.

2.5 Substitutions

Where an alternative design, fabrication / installation method, system, material, component or finish is

proposed, submit details (technical information, samples and cost differential) and reasons for the proposed substitution for approval by the Principal. Advise if the proposed alternative will necessitate alteration to other parts of the Works, together with any consequent time and/or costs.

Unless noted otherwise, all substitutions must have a proven track record of at least 10 years for their proposed application in Australia. Alternative materials that do not have this track record may be proposed but any testing regime to assess their suitability must be agreed with the Principal and the reasonable costs associated with testing and consulting fees for witnessing and assessing these tests will be borne by the Contractor.

2.6 Warranties

The warranty shall comply with the requirements of that noted in the Head Contract and referred to in the Works Contract, as well as the requirements of this Specification. The following is a guide to the minimum requirements:

The Contractor shall agree to warrant their works, against any defects in the design, workmanship, quality of materials, weather-tightness and performance of the Contract Works, including all glazing, steelwork, aluminium and cladding works, and all supporting framing and fixings.

The Contractor shall repair or replace defective design, workmanship or materials of the Contract Works during the warranty period. Defective materials and /or workmanship includes abnormal deterioration, ageing or weathering of the Works, leakage of water or air, structural failure (including excessive deflection) of components resulting from exposure to pressures and forces within reasonably expected limits, failure of parts to function normally, deterioration, ageing, glass breakage and failure of the Works to meet any other specified performance requirements.

The warranty period is from the date of practical completion of the Head Contract Works, and continues for at least the period shown in the table below (unless noted otherwise in the Head Contract):

Component	Warranty Period
External Façade (General)	15 years
Glazing and Coatings	15 years
Framing System	15 years
External Metal Louvres, Grilles and Screens	15 years
Sunshading Devices (Aluminium)	15 years
Powdercoating	15 years
Sealants (including structural)	10 years
Brick/Blockwork	25 years
Metal Finishes	15 years
Fc Sheeting Cladding Systems and Eaves Systems	15 years
Vitra Panel	15 years

Component	Warranty Period
External Window Systems	15 years
Roof lights	15 years
Canopies	10 years

All warranties to be project specific and without limitations and/or qualifications, and inclusive of all costs for replacement including (but not limited to) access, hoists, chainage, permits, materials and labour (including after hours) as and where applicable.

Ensure any supporting warranties obtained from material suppliers and applicators are made out in a form that is assignable to the Principal.

The warranty and its enforcement shall not deprive the Principal of other action, right or remedy available to them.

2.6.1 Material-Specific Warranties

Warranties shall include the following material-specific failures:

Warranty Conditions for Envelope / Cladding

- Failure of the system to meet performance requirements;
- Structural integrity, including dislodgement due to wind within the design load range;
- Failure of system to exclude water and weather or deliver water to drainage system;
- Damage, deterioration, perforation or staining due to contact or close proximity with dissimilar metals or chemical products in the substrates, adjacent materials or the environment generally;
- Noise or vibration caused by thermal and / or air movements;
- Disengagement of gaskets, seals and or weather-strips;
- Formation of condensation which is visible, or is not managed by system drainage;
- Collapse of thermal insulation or fire safing insulation;
- Water leakage into electrical system for exterior building lighting, blind operation or any other effects on the electrical system.

Warranty Conditions for Applied Coatings

- Failure of protective coatings to prevent corrosion and staining due to corrosion;
- Suitability of coating system, including preparation and base-coats, for substrate types;
- De-lamination, peeling, flaking, chipping, drumminess, loss of bond to substrate;
- Cracking, blistering, perforations or similar defects;
- Chalking or other deterioration due to ultra-violet light, atmospheric pollution or weathering;
- Staining and discoloration;
- Fading or colour change (greater than 2 Rating Scale points measured in accordance with AS 1580.481.1.2,

Table 1) or colour variation in adjacent sections greater than the variation of the approved control sample range.

Warranty Conditions for Glass

- Breakdown of body tints or performance coatings;
- Any de-lamination which occurs in the first 12 months after Practical Completion.
- Delamination which extends further than 10mm from any edge after the first 12 months;
- Failure of IGU hermetic seals;
- Creep or change of colour of laminated glass and interlayer;
- Spontaneous breakage of toughened glass;
- Thermal breakage.

Warranty Conditions for Sealants

- Cohesive and adhesive failures;
- Staining or bleeding to adjacent surfaces;
- Change in hardness greater than +/- 5 points on the Shore A durometer scale;
- Cracking of sealants;
- Fading or colour change (greater than 2 Rating Scale points measured in accordance with AS 1580.481.1.2, Table 1) or colour variation in adjacent sections greater than the variation of the approved control sample range.

2.7 Certification

The contractor is responsible for providing certification (in a form acceptable to the Building Certifier) by a Chartered Professional Engineer (who shall be a Registered Building Practitioner with the VBA/BPEQ), for the design and installation of all aspects of the façade works, and its compliance with the contract documentation, including:

- Structural performance (Part B1 of the NCC);
- Weatherproofing performance (clause FP1.4 of the NCC);
- Fire/smoke performance (Section C of the NCC);
- Thermal performance (Section J of the NCC);
- Acoustic performance (Acoustic Report).

3 Project Specific Scope of Works

3.1 Façade Types & Requirements

3.1.1 Summary of Façade Types

Façade Type	General Description
CU:01	Unitised window wall DGU vision glass and awning sash windows, translucent DGU glass, and opaque DGU spandrel, horizontal louvre and vertical expanded aluminium mesh fins and thin brick projection.
CU:02	Thin Brick System on Curtain Wall System
CU:03	Expanded Aluminium Mesh Screen
CU:04	Gym/Communal Hall Glazing
CU:05	Glass Screen
WD:01	Unitised window wall DGU vision glass and awning sash windows, translucent DGU glass, and opaque DGU spandrel, horizontal louvre and vertical expanded aluminium mesh fins
CU:06	Library unitised curtain wall DGU vision glass and awning sash window, CFC cladding with circular and rectangular mechanical louvres.

3.1.2 Façade Type CU:01: Typical Curtain Wall

CU:01

General Description	Unitised window wall DGU vision glass and awning sash windows, translucent DGU glass, and opaque DGU spandrel, horizontal louvre and vertical expanded aluminium mesh fins
Key Features	<ul style="list-style-type: none"> – Typical floor-to-floor height: 3900mm; – Typical curtain wall module widths: 1500mm; – Vision height nominally: 1450mm (nominal); – Mullion depth: To be confirmed by Contractor. Nominally 150mm minimum (from rear of glazing pocket); – Top of stack sill: Nominally 100mm above SFL; – Curtain wall bracketry in pockets recessed into slab; – Exterior shading fins formed with expanded anodised aluminium mesh and internal extruded aluminium posts; – Pressure equalised and drained joint curtain wall system; – Glass to be 4-side structurally glazed
Location	<p>Ref to Architectural drawings for extent and location Typically:</p> <p>Northern Elevation of North Wing – Ground to Level 5</p> <p>Southern Elevation of South Wing – Ground to Level 5</p>
Glass	<ul style="list-style-type: none"> – GL-01 Vision Glazing Grade A Safety – GL-01/S Vision Glazing Grade A Safety – GL-02 Translucent Glazing Grade A Safety – GL-02/S Translucent Glazing Grade A Safety – GL-03 Opaque Glazing Grade A Safety – GL-03/S Translucent Glazing Grade A Safety
Finishes	<p>At a minimum, aluminium curtain wall components and framing to be powder coated to Dulux Duratec / Interpon D2015 or equivalent.</p> <ul style="list-style-type: none"> – Colour and finish as selected by Architect. – Aluminium cladding to be colour anodised (AA25 thickness). Colour and finish as selected by Architect; – Folded aluminium cladding nom.4mm with v-groove folds, machined weep holes and slotted connections to accommodate thermal expansion; – Brick type: Extruded - Colour and finish as selected by Architect
Detailing Requirements	<p>General Requirements:</p> <ul style="list-style-type: none"> – Include folded expanded aluminium mesh fin, nom. 2.5mm thick with approx. 25% opening (TBC) – Abseil restraints points to be low-profile, highly discreet grade 316L pins; – All beads, trims and cladding panels are to be mechanically fixed; – All bolts, fittings and fixings are to be concealed unless noted otherwise on drawings; – All fixings outside of air seal to be stainless steel (grade 316 where visible, grade 304 where concealed). <p>Spandrels:</p> <ul style="list-style-type: none"> – Spandrel areas feature glazed 100% ceramic frit IGU – Spandrel transom to be structurally glazed to inner surface of IGU – Provide insulated steel or aluminium backpan at spandrel areas; – Provide foam baffles to all glazed spandrels vents and drains, and include temporary removable covers to mitigate potential for water and dust to collect in cavity prior to installation; <p>Brick and Aluminium Projections</p> <ul style="list-style-type: none"> – Thin skin brick system, equivalent to: Brickclad / Empire Brick; – Fabricated brick slips over free draining / ventilated cavity, brick and mortar colour to Architect's selection;

- Provide additional extruded aluminium box sections to facilitate the installation of the brick slip system;

Shading Fins

- Vertical sunshades at every mullion;
- Exterior shading fins Nom.4mm thick aluminium expanded mesh [Italmesh Siena 150 or equivalent](#);
- Expanded aluminium mesh anodised to Architect's Selection, Coordinate weld alloy with anodiser to ensure compatibility and colour consistency;
- Internal extruded aluminium post bracketed back to mullion;
- Fabricate welded tab on reverse face of mesh to provide fixing point for all fasteners;
- Separate mesh from [steel](#) framing with isolation washers;
- Provide Nom.4mm thick aluminium fabricated end caps to vertical and horizontal sunshades;
- Horizontal sunshades at transom (2400mm FFL) using same construction;
- Connections of sunshade to allow vertical deflection via slotted connection, etc;
- Exposed fixings to be grade 316 architectural hex head low-profile socket or countersunk, with maximum spacing between fixings.

Roof-Level & Parapets

- Provide 3mm folded aluminium parapet capping over corrugated aluminium or FC backing at roof level. Capping to be designed for maintenance load.

Internal Components:

- Sill: Where sills are indicated in the drawings, provide profiled extruded aluminium internal sill to form integral part of façade design.
- Smoke Flashing: Provide continuous galvanised steel smoke flashing to top of slab edge.
- Fire Safing: Additional fire layers necessary to satisfy the provisions of the BCA 2019 or later;
- Acoustic Flashing & Insulation: Allow for additional acoustic flashings and acoustic insulation at underside of slab edge;
- Partition Closures: Façade contractor to provide steel plate or CFC sheet to sides of mullion with aluminium covers, with extruded and gasketed aluminium closure at all partitions (by others) to achieve acoustic seal while accommodating mullion deflections.
- Interior lining to spandrel panels, folded aluminium cladding nom.3mm with v-groove folds, machined slotted connections to accommodate thermal expansion, powder coated to [Dulux Duratec / Interpon D2015 or equivalent](#);

Operable Windows:

- Window Automation – Refer to Mechanical Consultant's and Electrical Consultant's documentation for louvre power, control and BMS requirements;
- Allow to integrate and fully seal window actuator power and control cabling into window framing, to terminate near sill at one end of each gable. Coordinate cabling requirements and locations with Electrical Consultant and Electrical Contractor
- Provide restrictor stay hardware to limit operation of windows.
- Coordinate distribution of power and data through framing;

Mechanical Louvres:

- Louvres to be single or double stage aluminium louvres, with profile to be coordinated with Architect and Mechanical Engineer.
- Louvre blades are to be oriented to eliminate any internal lighting being visible through the blades when viewed from exterior.
- All louvres blades to be mechanically fixed.
- Provide stainless steel vermin mesh to all operable areas.
- Provide powder coated aluminium blank-off panels and insulation to all non-operable areas.

3.1.3 Façade Type CU:02: Brick Cladding on Curtain Wall System

CU:02

General Description	Unitised curtain wall with brick slips
Key Features	<ul style="list-style-type: none"> – Typical floor-to-floor height: 3900mm; – Typical curtain wall module widths: 1445mm (to suit brick module); – Mullion depth: To be confirmed by Contractor. Nominally 150mm minimum (from rear of glazing pocket); – Pressure equalised and drained joint curtain wall system; – Thin skin brick system, equivalent to: Brickclad / Empire Brick.
Location	Ref to Architectural drawings for extent and location Typically: Eastern and western elevations.
CW Finishes	As per CU:01
Detailing Requirements	As per main CU:01 Curtain Wall:

3.1.4 Façade Type CU:03: Expanded Aluminium Mesh Screens

CU:03

General Description	Anodised expanded aluminium mesh fixed to steel sub-framing
Key Features	<ul style="list-style-type: none"> – Typical screen module widths: 1200mm; – Framing depth: To be confirmed by Contractor. Nominally 150mm minimum (from rear of aluminium mesh); – Fabricate welded tab on reverse face of mesh to provide fixing point for all fasteners;
Location	Ref to Architectural drawings for extent and location Typically: All elevations.
Mesh Type	– Nom.4mm thick expanded aluminium mesh Italmesh Siena 150 or equivalent;
Mesh Finish	Anodised – Colour to architect’s selection
Framing Finishes	<p>Painted External Steel Framing PUR5:</p> <ul style="list-style-type: none"> – Primer: 75 µm DFT Inorganic zinc silicate; – Second Coat: 200 µm DFT High build epoxy; – Third Coat: 50 µm DFT poly-urethane gloss; <p>Expanded Mesh:</p> <ul style="list-style-type: none"> – Aluminium cladding to be colour anodised (AA25 thickness). Colour and finish as selected by Architect;
Detailing Requirements	<p>General Requirements:</p> <ul style="list-style-type: none"> – Nom.4mm thick aluminium expanded mesh; – Expanded aluminium mesh anodised to Architect’s Selection, Coordinate weld alloy with anodiser to ensure compatibility and colour consistency; – Fabricate welded tab on reverse face of mesh to provide fixing point for all fasteners; – Separate mesh from steel framing with isolation washers; – Exposed fixings to be grade 316 architectural hex head low-profile socket or countersunk, with maximum spacing between fixings.

3.1.5 Façade Type CU:04: Gym/Communal Hall Glazing

CU:04	
General Description	Full height steel mullions with unitised curtain wall single glazed vision glass, automated awning sash windows and swing doors.
Key Features	Unitised façade panels: <ul style="list-style-type: none"> – Typical floor-to-floor height: 7200mm – 11500mm – Curtain wall suite fixed to full height steel mullion – Typical module 3600mm wide – 1200mm high
Location	Ref to Architectural drawings for extent and location Typically: North, East, and Southern Elevation of South Wing – Lower Ground to Level 2
Finishes	At a minimum, aluminium curtain wall components and framing to be powder coated to Dulux Duratec / Interpon D2015 or equivalent. <ul style="list-style-type: none"> – Colour and finish as selected by Architect. – Aluminium cladding to be colour anodised (AA25 thickness). Colour and finish as selected by Architect; – Folded aluminium cladding nom.4mm with v-groove folds, machined weep holes and slotted connections to accommodate thermal expansion; Painted External Steel Framing PUR5: <ul style="list-style-type: none"> – Primer: 75 µm DFT Inorganic zinc silicate; – Second Coat: 200 µm DFT High build epoxy; – Third Coat: 50 µm DFT poly-urethane gloss;
Glass	– GL-04 Laminated Grade A Safety Glass
Detailing Requirements	General Requirements: <ul style="list-style-type: none"> – Provide sub head concealed behind façade interface cladding – Refer to architectural specification for door type, operation and specification of hardware and security requirements; – Sill: Where sills are indicated in the drawings, provide profiled extruded aluminium internal sill to form integral part of façade design. – Smoke Flashing: Provide continuous galvanised steel smoke flashing to top of slab edge. – Acoustic Flashing & Insulation: Allow for additional acoustic flashings and acoustic insulation at underside of slab edge; – Fire Safing: Additional fire layers necessary to satisfy the provisions of the BCA 2019 or later; – Partition Closures: Façade contractor to provide steel plate or CFC sheet to sides of mullion with aluminium covers, with extruded and gasketed aluminium closure at all partitions (by others) to achieve acoustic seal while accommodating mullion deflections. – Interior lining to spandrel panels, folded aluminium cladding nom.3mm with v-groove folds, machined slotted connections to accommodate thermal expansion, powder coated to Dulux Duratec / Interpon D2015 or equivalent; Operable Windows: <ul style="list-style-type: none"> – Window Automation – Refer to Mechanical Consultant’s and Electrical Consultant’s documentation for louvre power, control and BMS requirements; – Allow to integrate and fully seal window actuator power and control cabling into window framing, to terminate near sill at one end of each gable. Coordinate cabling requirements and locations with Electrical Consultant and Electrical Contractor. – Provide restrictor stay hardware to limit operation of windows. – Coordinate distribution of power and data through framing;

3.1.6 Façade Type CU:05: Glass Screen

CU:05	
General Description	Steel framed glass screen with dichroic glass structurally glazed to aluminium glazing channel.
Key Features	<ul style="list-style-type: none"> – Typical floor-to-floor height: 3900mm; – Typical module widths: 1750mm.
Location	Ref to Architectural drawings for extent and location Typically: East Elevation of Library building
Glass	– GL-05 Laminated Grade A Safety Glass
Finishes	Painted External Steel Framing PUR5: <ul style="list-style-type: none"> – Primer: 75 µm DFT Inorganic zinc silicate; – Second Coat: 200 µm DFT High build epoxy; – Third Coat: 50 µm DFT poly-urethane gloss; – Handrail: Grade 316L stainless steel Aluminium Glazing Suite: <ul style="list-style-type: none"> – Powder coated to Dulux Duratec / Interpon D2015 or equivalent. Colour and finish to architect's selection.
Detailing Requirements	General Requirements: –

3.1.7 Façade Type WD:01: Typical Window Wall

WD:01	
General Description	Unitised window wall DGU vision glass or awning sash window, translucent DGU glass, and opaque DGU spandrel.
Key Features	As per CU:01 mullion profile installed as window wall, with the following modifications: <ul style="list-style-type: none"> – Typical floor-to-floor height: 3900mm; – Pressure equalised and drained joint window wall system; – Sub-sill spliced and mitred at corners with end dam at door jambs; – Raised sill height to match adjacent CU:01 curtain wall + hob interface; – Horizontal recess at sub-head; – Glass to be 4-side structurally glazed;
Location	Ref to Architectural drawings for extent and location Typically: Southern Elevation of North Wing – Ground to Level 5 Northern Elevation of South Wing – Ground to Level 5
Glass	<ul style="list-style-type: none"> – GL-01 Vision Glazing Grade A Safety – GL-01/S Vision Glazing Grade A Safety – GL-02 Translucent Glazing Grade A Safety – GL-02/S Translucent Glazing Grade A Safety – GL-03 Opaque Glazing Grade A Safety – GL-03/S Translucent Glazing Grade A Safety
Finishes	At a minimum, aluminium curtain wall components and framing to be powder coated to Dulux Duratec / Interpon D2015 or equivalent. <ul style="list-style-type: none"> – Colour and finish as selected by Architect. – Aluminium cladding to be colour anodised (AA25 thickness). Colour and finish as selected by Architect; – Folded aluminium cladding nom.4mm with v-groove folds, machined weep holes and slotted connections to accommodate thermal expansion; – Brick type: Extruded - Colour and finish as selected by Architect

Detailing Requirements**General Requirements:**

- Fabricated brick slips over free draining / ventilated cavity, brick and mortar colour to Architect's selection;
- Refer to architectural specification for door type, operation and specification of hardware and security requirements;
- Folded aluminium cladding nom.4mm with v-groove folds, machined weep holes and slotted connections to accommodate thermal expansion;
- All fixings outside of air seal sheet to be stainless steel (grade 316 where visible, grade 304 where not visible);
- Provide sub head / jamb where system terminates at column and beam interfaces;
- Refer to architectural specification for door type, operation and specification of hardware and security requirements;

Internal Components:

- Fire Safing: Additional fire layers necessary to satisfy the provisions of the BCA 2019 or later;
- Partition Closures: Façade contractor to provide steel plate or CFC sheet to sides of mullion with aluminium covers, with extruded and gasketed aluminium closure at all partitions (by others) to achieve acoustic seal while accommodating mullion deflections.
- Interior lining to spandrel panels, folded aluminium cladding nom.3mm with v-groove folds, machined slotted connections to accommodate thermal expansion, powder coated to Dulux Duratec / Interpon D2015 or equivalent;

Operable Windows:

- Window Automation – Refer to Mechanical Consultant's and Electrical Consultant's documentation for louvre power, control and BMS requirements;
 - Allow to integrate and fully seal window actuator power and control cabling into window framing, to terminate near sill at one end of each gable. Coordinate cabling requirements and locations with Electrical Consultant and Electrical Contractor.
 - Provide restrictor stay hardware to limit operation of windows.
 - Coordinate distribution of power and data through framing;
-

3.1.8 Façade Type CU:06: Library Glazing

CU:06

General Description	Unitised curtain wall clad with CFC with painted artwork, areas of DGU vision glass, awning sash window, and swing doors.
Key Features	As per Tower CU:01 Curtain Wall, with the following modifications: <ul style="list-style-type: none"> – Typical floor-to-floor height: 3900mm; – CFC Cladding with painted mural artwork
Location	Ref to Architectural drawings for extent and location Typically: Library Building – Level 1 to Level 5
Glass Appearance	<ul style="list-style-type: none"> – GL-01 Vision Glazing Grade A Safety GL-01/S Vision Glazing Grade A Safety – GL-02 Translucent Glazing Grade A Safety GL-02/S Translucent Glazing Grade A Safety – GL-03 Opaque Glazing Grade A Safety GL-03/S Translucent Glazing Grade A Safety
Finishes	At a minimum, aluminium curtain wall components and framing to be powder coated to Dulux Duratec / Interpon D2015 or equivalent. <ul style="list-style-type: none"> – Colour and finish as selected by Architect. – Aluminium cladding to be colour anodised (AA25 thickness). Colour and finish as selected by Architect; – Folded aluminium cladding nom.4mm with v-groove folds, machined weep holes and slotted connections to accommodate thermal expansion;
Detailing Requirements	<p>General Requirements:</p> <p>As per main CU:01 Curtain Wall, with the following modifications:</p> <ul style="list-style-type: none"> – CFC Cladding nom.12mm James Hardie ExoTech with associated system panel support products, gaskets, accessories and tools to maintain product warranties and accommodation of panel and cladding thermal and building movement; – Cladding finish, sealing, treatment to be coordinated with RP + Mural Artist – CFC Cladding System, product, edge preparation and finish to Architect’s selection and specification; – CFC Cladding detailing to accommodate curved corner panel; – Support cladding on extruded adjustable batten; – Fixings oversized to accommodate movement and thermal expansion in all directions between systems; – All fixings outside of air seal sheet to be stainless steel (grade 316 where visible, grade 304 where not visible); <p>Aluminium Cladding Below Windows</p> <ul style="list-style-type: none"> – Folded aluminium cladding nom.4mm with v-groove folds, machined weep holes and slotted connections to accommodate thermal expansion; – Aluminium cladding to be colour anodised (AA25 thickness). Colour and finish as selected by Architect; <p>Mechanical Louvres:</p> <ul style="list-style-type: none"> – As per CU-01 with the following modifications – Mechanical intake / exhaust areas not covered with mechanical louvres to have stainless steel bird mesh with free area greater than 90% – Fabricated into circular portholes where indicated on the Architectural elevations, otherwise rectangular panels are required;

3.2 Glass Types & Requirements

3.2.1 Summary of Glass Types

Glass Ref	Colour / Appearance	Nom. Thickness	Heat Treatment	Centre of Glass U-Value (W/m ² .K)	Centre of Glass SHGC	Special Requirements
GL-01 Vision Glass	Low Iron Clear	IGU: 6mm laminated / 12mm Argon / 6mm laminated	Heat Strengthened	1.4	0.60	Grade A safety glass
GL-01/S Vision Glass	Low Iron Clear	IGU: 9.52mm / 12mm Argon / 9.52mm	Heat Strengthened	1.4	0.23	Performance coating to surface #2, Grade A safety glass where required
GL-02 Translucent Glass	Low Iron Clear	IGU: 6mm laminated / 12mm Argon / 6mm laminated	Heat Strengthened	1.4	0.60	Ceramic frit pattern and colour as selected by architect Grade A safety glass
GL-02/S Translucent Glass	Low Iron Clear	IGU: 9.52mm / 12mm Argon / 9.52mm	Heat Strengthened	1.4	0.23	Ceramic frit pattern and colour as selected by architect, Grade A safety glass where required
GL-03 Opaque Glass	Low Iron Clear	IGU: 6mm laminated / 12mm Argon / 6mm	Heat Strengthened	1.4	0.60	100% ceramic frit to surface #4, colour as selected by Architect Grade A safety glass
GL-03/S Opaque Glass	Low Iron Clear	IGU: 9.52mm / 12mm Argon / 9.52mm	Heat Strengthened	1.4	0.23	Ceramic frit pattern and colour as selected by architect, Grade A safety glass where required
GL-04 Gym Vision Glass	Low Iron Clear	Laminated: 13.52mm	Heat Strengthened	5.4	0.80	Grade A safety glass
GL-05 Glass Screen	Low Iron Dichroic Glass	Laminated: 13.52mm	Heat Strengthened	N/A	N/A	Dichoric interlayer, colour as selected by Architect, Grade A safety glass

3.2.2 Glass Type GL-01

GL-01	
General Description	Insulating Glass Unit (IGU)
Glass Thickness	<p>The Contractor is to calculate the glass thickness to comply with this specification, all relevant standards and codes, and the other associated specifications and reports for this project.</p> <p>The glass is to have consistent thickness throughout each façade type for a consistent appearance.</p> <p>Alternative glass make-ups / thicknesses to those nominated will be considered where they meet all nominated performance requirements.</p>
Appearance	<p>To be approved by Architect and Principal following assessment of samples and visual prototypes. Visual benchmarks:</p> <ul style="list-style-type: none"> – Taiwan Glass: PTGY6 on low iron
Performance Requirements	<ul style="list-style-type: none"> – Visible Light Transmittance: 60% min – Visible Light Reflectance (out): 20% max – Visible Light Reflectance (in): 15% max – Centre-of-Glass SHGC: 0.60 max – Centre-of-Glass U-Value: 1.4 W/m².K max – SHGC (Glass + Frame): 0.60 max – U-Value (Glass + Frame): 4.1 W/m².K max <p>It is the Contractor's responsibility to undertake thermal modelling as required and select a glass that meets all NFRC 'Glass + Frame' performance parameters.</p>
Outer Lite:	<p>Min. 6mm laminate (9.52mm GL-01/S)</p> <p>Heat treatment: Heat Strengthened</p> <p>Body Tint: Low Iron</p> <p>Where laminated glass cannot be sourced at 6mm thickness, then greater thicknesses will be accepted (i.e. 9.52mm)</p>
Air Gap:	<p>Nominal 12mm</p> <p>Argon fill</p> <p>Spacer colour: Black</p>
Inner Lite:	<p>Min. 6mm laminate (9.52mm GL-01/S)</p> <p>Heat treatment: Heat Strengthened</p> <p>Body Tint: Low Iron</p> <p>Where laminated glass cannot be sourced at 6mm thickness, then greater thicknesses will be accepted (i.e. 9.52mm)</p>
Samples	<p>Provide preliminary samples of minimum 300mm x 300mm of nominated products for review by the design team.</p> <p>Provide final samples of minimum 600mm x 600mm of final selected options for review by the design team, with correct heat treatments.</p> <p>Refer to Section 3.3.1 for large glass sample requirements</p>
Spares	Provide minimum 0.5% spares for all panel sizes of over 100 units

3.2.3 Glass Type GL-02

GL-02 Translucent Frit	
General Description	Insulating Glass Unit (IGU)
Glass Thickness	<p>The Contractor is to calculate the glass thickness to comply with this specification, all relevant standards and codes, and the other associated specifications and reports for this project.</p> <p>The glass is to have consistent thickness throughout each façade type for a consistent appearance.</p> <p>Alternative glass make-ups / thicknesses to those nominated will be considered where they meet all nominated performance requirements.</p>
Appearance	<p>To be approved by Architect and Principal following assessment of samples and visual prototypes. Visual benchmarks:</p> <ul style="list-style-type: none"> – Taiwan Glass: PTGY6 on low iron
Performance Requirements	<ul style="list-style-type: none"> – Visible Light Transmittance: 30% max – Visible Light Reflectance (out): 20% max – Visible Light Reflectance (in): 15% max – Centre-of-Glass SHGC: 0.60 max – Centre-of-Glass U-Value: 1.4 W/m².K max – SHGC (Glass + Frame): 0.60 max – U-Value (Glass + Frame): 4.1 W/m².K max <p>It is the Contractor's responsibility to undertake thermal modelling as required and select a glass that meets all NFRC 'Glass + Frame' performance parameters.</p>
Outer Lite:	<p>Min. 6mm laminate (9.52mm GL-02/S)</p> <p>Heat treatment: Heat Strengthened</p> <p>Body Tint: Low Iron</p> <p>Interlayer: Translucent, colour to architects selection</p> <p>Where laminated glass cannot be sourced at 6mm thickness, then greater thicknesses will be accepted (i.e. 9.52mm)</p>
Air Gap:	<p>Nominal 12mm</p> <p>Argon fill</p> <p>Spacer colour: Black</p>
Inner Lite:	<p>Min. 6mm laminate (9.52mm GL-02/S)</p> <p>Heat treatment: Heat Strengthened</p> <p>Body Tint: Low Iron</p> <p>Ceramic Frit pattern and colour to architect's selection</p> <p>Refer to architectural panel types as GL-02 and GL-03 can be combined into one panel in many instances</p> <p>Where laminated glass cannot be sourced at 6mm thickness, then greater thicknesses will be accepted (i.e. 9.52mm)</p>
Samples	<p>Provide preliminary samples of minimum 300mm x 300mm of nominated products for review by the design team.</p> <p>Provide final samples of minimum 600mm x 600mm of final selected options for review by the design team, with correct heat treatments.</p> <p>Refer to Section 3.3.1 for large glass sample requirements</p>
Spares	Provide minimum 0.5% spares for all panel sizes of over 100 units

3.2.4 Glass Type GL-03

GL-03 Opaque Frit	
General Description	Insulating Glass Unit (IGU)
Glass Thickness	<p>The Contractor is to calculate the glass thickness to comply with this specification, all relevant standards and codes, and the other associated specifications and reports for this project.</p> <p>The glass is to have consistent thickness throughout each façade type for a consistent appearance.</p> <p>Alternative glass make-ups / thicknesses to those nominated will be considered where they meet all nominated performance requirements.</p>
Appearance	<p>To be approved by Architect and Principal following assessment of samples and visual prototypes. Visual benchmarks:</p> <ul style="list-style-type: none"> – Taiwan Glass: PTGY6 on low iron
Performance Requirements	<ul style="list-style-type: none"> – Visible Light Reflectance (out): 20% max – Visible Light Reflectance (in): 15% max – Centre-of-Glass SHGC: 0.35 max (Indicative) – Centre-of-Glass SHGC: 0.60 max – Centre-of-Glass U-Value: 1.4 W/m².K max – SHGC (Glass + Frame): 0.60 max – U-Value (Glass + Frame): 4.1 W/m².K max <p>It is the Contractor's responsibility to undertake thermal modelling as required and select a glass that meets all NFRC 'Glass + Frame' performance parameters.</p>
Outer Lite:	<p>Min. 6.0mm laminate (9.52mm GL-03/S)</p> <p>Heat treatment: Heat Strengthened</p> <p>Body Tint: Low Iron</p> <p>Where laminated glass cannot be sourced at 6mm thickness, then greater thicknesses will be accepted (i.e. 9.52mm)</p>
Air Gap:	<p>Nominal 12mm</p> <p>Argon fill</p> <p>Spacer colour: Black</p>
Inner Lite:	<p>Min. 6mm monolithic opaque laminate (9.52mm GL-03/S)</p> <p>Heat treatment: Heat Strengthened</p> <p>Body Tint: Low Iron</p> <p>100% Ceramic Frit colour to architect's selection</p> <p>Refer to architectural panel types as GL-02 and GL-03 can be combined into one panel in many instances</p>
Samples	<p>Provide preliminary samples of minimum 300mm x 300mm of nominated products for review by the design team.</p> <p>Provide final samples of minimum 600mm x 600mm of final selected options for review by the design team, with correct heat treatments.</p> <p>Refer to Section 3.3.1 for large glass sample requirements</p>
Spares	Provide minimum 0.5% spares for all panel sizes of over 100 units

3.2.5 Glass Type GL-04

GL-04	
General Description	Single glazed laminate
Glass Thickness	<p>The Contractor is to calculate the glass thickness to comply with this specification, all relevant standards and codes, and the other associated specifications and reports for this project.</p> <p>The glass is to have consistent thickness throughout each façade type for a consistent appearance.</p> <p>Alternative glass make-ups / thicknesses to those nominated will be considered where they meet all nominated performance requirements.</p>
Appearance	<p>To be approved by Architect and Principal following assessment of samples and visual prototypes. Visual benchmarks:</p> <ul style="list-style-type: none"> – China Southern Glass: Clear on low iron
Performance Requirements	<ul style="list-style-type: none"> – Visible Light Transmittance: 80% min – Visible Light Reflectance (out): 20% max – Visible Light Reflectance (in): 15% max – Centre-of-Glass SHGC: 0.80 max – Centre-of-Glass U-Value: 5.40 W/m².K max – SHGC (Glass + Frame): N/A – U-Value (Glass + Frame): N/A <p>It is the Contractor's responsibility to undertake thermal modelling as required and select a glass that meets all NFRC 'Glass + Frame' performance parameters.</p>
Build-up:	<p>Min. 13.52mm Laminate</p> <p>Heat treatment: Heat Strengthened</p> <p>Body Tint: Low Iron</p>
Samples	<p>Provide preliminary samples of minimum 300mm x 300mm of nominated products for review by the design team.</p> <p>Provide final samples of minimum 600mm x 600mm of final selected options for review by the design team, with correct heat treatments.</p> <p>Refer to Section 3.3.1 for large glass sample requirements</p>
Spares	Provide minimum 0.5% spares for all panel sizes of over 100 units

3.2.6 Glass Type GL-05

GL-05	
General Description	Single glazed laminate
Glass Thickness	<p>The Contractor is to calculate the glass thickness to comply with this specification, all relevant standards and codes, and the other associated specifications and reports for this project.</p> <p>The glass is to have consistent thickness throughout each façade type for a consistent appearance.</p> <p>Alternative glass make-ups / thicknesses to those nominated will be considered where they meet all nominated performance requirements.</p>
Appearance	<p>To be approved by Architect and Principal following assessment of samples and visual prototypes. Visual benchmarks:</p> <ul style="list-style-type: none"> – China Southern Glass: Clear on low iron with Dichoric interlayer
Performance Requirements	<ul style="list-style-type: none"> – Visible Light Transmittance: 80% min – Visible Light Reflectance (out): 20% max – Visible Light Reflectance (in): 15% max – Centre-of-Glass SHGC: N/A max – Centre-of-Glass U-Value: N/A max <p>It is the Contractor's responsibility to undertake thermal modelling as required and select a glass that meets all NFRC 'Glass + Frame' performance parameters.</p>
Build-up:	<p>Min. 13.52mm Laminate</p> <p>Heat treatment: Heat Strengthened</p> <p>Body Tint: Low Iron</p>
Samples	<p>Provide preliminary samples of minimum 300mm x 300mm of nominated products for review by the design team.</p> <p>Provide final samples of minimum 600mm x 600mm of final selected options for review by the design team, with correct heat treatments.</p> <p>Refer to Section 3.3.1 for large glass sample requirements</p>
Spares	Provide minimum 0.5% spares for all panel sizes of over 100 units

3.3 Prototyping & Testing

3.3.1 Glass Sample Mock-Up

Prior to carrying out a full-scale visual mock-up, there is a requirement to review the primary glass options at large scale.

These large-scale samples are intended to provide a full understanding of the transmitted and reflected colours in the glass, and the transparency:

Glass Types GL-01, GL-02, GL-03, GL-04 and GL-05 are to be reviewed as follows:

- Each glass sample should be nominally 1.0m wide x 1.0m high;
- Allow to provide the nominated glass products, plus at least one alternative glass product from an alternative glass manufacturer, for all glass types.
- The samples should be located outside, in the Sydney metropolitan area, so that the effects of sunlight and shade can be assessed. The final location of the visual prototypes will require the Principals' approval.
- It is important that the samples are viewed in the project city, as sky conditions can vary from location to location. Assessing reflected and transmitted colours in glass is highly dependent on the sunlight and sky conditions.
- The samples should be supported in a vertical position on a temporary frame, facing east or west;
- Glass samples should be of the correct thicknesses, make-up and heat treatment, and must be produced by the proposed manufacturers. IGU spacers and primary and secondary seals should be provided in the nominated project colours.
- The sampling frame should be arranged to eliminate direct external daylight in the chamber behind the glass, with corflute or similar used to form side panels and a ceiling.
- The sampling frame should allow for swapping of the rear backing material in order to fully understand the various characteristics of the glass. The backing materials should be as follows:
 - o No backing (i.e. open to sky at rear);
 - o White backing (corflute or similar), nominally 1.5m behind glass;
 - o Black backing (corflute or similar), nominally 1.5m behind glass;
- Samples should be viewed at early morning, midday, and late afternoon, preferably under both cloudy and sunny sky conditions.

3.3.2 Visual Mock-up (Visual Prototype)

There is a requirement for a full-scale visual mock-up (visual prototype) for the external facade. The purpose of this prototype is for confirmation of aesthetics and material choice by the Principal and Architect, as well as review of glass selection and quality.

Extent of Visual Prototype:

The extent of the visual prototype shall include the following façade types:

The extent of the visual prototype for shall be as follows:

CU:01:

- 1.5 storeys high and 4 panels wide, and include at least 1 external corner with brick feature panel.
- 1 operable window

CU:02:

- 1 storey high and 2 panels wide, and include at least 1 return

WD:01:

- 1 storey high and 2 panels wide, and include at least 1 external corner
- 1 operable window

The Contractor is to make all monetary and time allowances for the procurement, erection fabrication, dismantle and storage / rental costs associated with the visual prototypes.

As soon as is practicable after award of Contract and before placing any material order the contractor shall begin construction of the visual prototypes.

Prepare shop drawings of visual prototype details and submit for approval. Clearly highlight where non-production material, extrusions, or components are proposed to enable the prototype to be completed.

The following elements should be included in the visual mock-up:

- An accessible viewing platform behind the glass to mimic the internal finished floor level;
- The sampling frame should allow for swapping of the rear backing material in order to fully understand the various characteristics of the glass. The backing materials should be as follows:
 - o No backing (i.e. open to sky at rear);
 - o White backing (corflute or similar), nominally 1.5m behind glass;
 - o Black backing (corflute or similar), nominally 1.5m behind glass;
- Glass samples should be of the correct thicknesses, make-up and heat treatment, and must be produced by the proposed manufacturers. IGU spacers and primary and secondary seals should be provided in the nominated project colours. Any permanent safety glass markings proposed for the project should be included on the glass.
- Include any projections, fins, sunshades or other external features and attachments in the visual mock-up;
- Include all correct weather and structural sealant colours, gaskets, and joints at proposed widths;
- Include representation of consequences of fabrication on visible features and finishes such as folds, cut / punched edges, welds etc;
- Incorporate any non-typical façade elements such as BMU or abseil restraint pins, and drenchers;
- Aluminium framing may be simulated where all exposed visible surfaces are representative of the

final arrangement, with proposed paint finishes provided.

- Visual prototypes shall be approved by the Principal prior to placing material orders;

Should review of the visual prototypes be required outside of the Sydney metropolitan area then the contractor is to allow for business class travel, meals, transfers and approved accommodation for 2 Principals and 2 representatives of the design team to view the prototypes.

Should further viewing of the prototypes be required after the initial inspection the contractor shall allow the same monetary allowances for the Principal and design team members to attend re-inspection of the visual prototypes.

3.3.3 Performance Prototype Testing

It is anticipated the various facade types for this project will be based on existing, pre-tested systems. However, where these systems are bespoke, weather and structural performance testing will have to be undertaken. The Contractor should allow to:

- Conduct performance testing of curtain wall facade prototypes in accordance with AS/NZS 4284 for structural adequacy, weatherproofness and air infiltration requirements;
- Conduct performance testing all window system prototypes in accordance with AS 2047 for structural adequacy, weatherproofness, air infiltration requirements and door loads.

The prototype test samples shall consist of the following:

Curtain Wall Systems

Extent of Prototype:

- Final extent and arrangement to be proposed by the Contractor and the certifying engineer;
- To be sufficient to test all key details of the project façade;
- A minimum of two and a half storeys in height x 3 bay widths plus 2 bay external corner; to incorporate spandrel, vision glazing areas, and brick.
- To be representative of both podium and tower façade types;
- To include at least one horizontal sunshade element;
- To include sunshade connections to represent each sunshade bracket type on the building;

Other requirements:

- Submit proposed testing regime with tender;
- Test regime shall be in accordance with AS/NZS 4284;
- Should a test be unsuccessful, the Contractor shall determine the cause of failure, rectify the cause and re-test. All costs of re-testing including attendance by the consultant team shall be borne by the Contractor. Any modifications made to the test sample as a result of failure shall be fully documented in the final test report;
- Test failure shall be fully documented in the final test report;
- Should review of the prototype testing be required outside of the Sydney Metropolitan area the contractor is to allow for business class travel, meals, transfers and accommodation for 4 representatives

of the design team to view the prototypes. Should further review of the prototype testing be required after the initial testing due to a test failure or the like the contractor shall allow the same monetary allowances for the Principal's representative and design team members to attend re-testing of the prototypes.

Window Systems

All window and door suites shall be proof tested to AS2047 and to meet all project requirements unless previous test certificates are submitted.

- Full scale prototype samples, representative both in size and shape of each type of each window and door cladding shall be prepared and tested separately in accordance with AS2047;
- Should a test be unsuccessful, the Contractor shall determine the cause of failure, rectify the cause and re-test. All costs of re-testing including attendance by the consultant team shall be borne by the Contractor. Any modifications made to the test sample as a result of failure shall be fully documented in the final test report;
- Test failure shall be fully documented in the final test report;
- Should review of the prototype testing be required outside of the Sydney Metropolitan area the contractor is to allow for business class travel, meals, transfers and accommodation for 4 representatives of the design team to view the prototypes. Should further review of the prototype testing be required after the initial testing due to a test failure or the like the contractor shall allow the same monetary allowances for the Principal's representative and design team members to attend re testing of the prototypes.

3.3.4 Other Performance Prototype Testing

Where previous type tests are to be relied upon, submit copies of test reports. Where proposed systems differ from the tested samples (they are larger, have higher wind pressures, extrusions differ slightly etc.), submit a project specific report prepared by a suitably qualified and experienced person stating how the previous type tests can be relied upon to demonstrate the required performance of the system as proposed.

If previous type tests cannot be relied upon to demonstrate a suitable system performance, before commencing cladding production arrange and pay for a project specific prototype test to be performed by a suitably qualified independent testing authority with NATA and provide the authority's test report showing compliance with the test criteria. The proposed testing authority shall be submitted for approval. Provide the test prototype, erect it where required by the authority, attend upon the authority as necessary, and remove the prototype on completion.

Should the location of the approved test facility not be located in the Sydney Metropolitan area, make provision and allow to pay all travel, accommodation and meal costs associated with attendance of one (1) representative of the consultant team to view the test as well as any re-testing required.

Prototype test drawings shall be provided and include the following:

- The Prototypes shall be representative of the different elements of each cladding type;

- The boundary conditions of the prototype shall mirror the actual conditions of the facade.

Submit drawings detailing the proposed prototype configurations prior to erection.

3.3.5 Quality Control Mock-Ups on Site

The Contractor shall provide all necessary materials, labour and equipment required to install, finish and clean the facade for a partial floor area for all facade types to a full level of completeness, at which point the Principal shall inspect for approval of materials, finish, workmanship and general compliance with the Contract documents.

Each quality benchmarks shall be 4 typical modules wide by 2 floors high. The Principal will nominate the areas to be constructed as quality benchmarks for the project in conjunction with the contractor.

Quality benchmarks shall consist of each facade type nominated in this document.

These quality control mock-ups shall be fully protected for the duration of the project. The approved works are to be used as a quality benchmark for all other exterior

cladding works and will be referenced during the course of the works.

The quality mock-ups shall be completed substantially earlier than other scheduled works at a time designated by the Principal and to create a quality reference point for all facade works installed to this project.

3.3.6 Additional On-Site Water Tests

Hose testing shall be carried out to AAMA 501.2 on at least six (6) locations for each facade type, during the course of installation.

Locations are to be nominated by the facade subcontractor and submitted to the Principal for approval.

In the event of leaks being detected as a result of hose testing, the suspect leak is to be repaired and a re-test carried out. For each leak detected during testing, a further 2 locations in addition to the original test program are to be tested.

Test reports to be submitted to the Principal for approval.

4 Performance Requirements & Design

4.1 General

In the following sections the performance intent of the Works is stated, along with the minimum acceptable requirements. The suitability of design selections nominated by the Contractor to meet these requirements is the sole responsibility of the Contractor. The Principal's Façade Consultant's role is to verify that the Contractor's design and submissions are in accordance with the intent of the specified requirements. Notwithstanding that verification role, and any approvals given, the responsibility for the performance of the following sections remains with the Contractor.

Where designs and material selections are not specified or detailed they are to be of a standard appropriate for the Works and suitable for the functions stated or reasonably inferred from the Contract Documents and in accordance with the relevant International Standards.

4.2 Standards, Codes & Statutory Requirements

Acts, Statutes, Local Regulations, Codes, Standards and Manufacturers Recommendations referred to in this document shall mean the latest edition and amendments current at the time of signing of the Contract for these works, unless a specific edition is referred to.

Refer to Appendix C for a list of relevant Standards and Codes.

All work and labour practices under this contract shall be in accordance with all applicable building codes and standards.

Obtain all required installation and/or operating permits and pay all fees required by relevant Statutory Authorities. Submit evidence of application and copies of permits.

4.3 Structural Design

4.3.1 General

The building has a design life of 50 years for the determination of structural loads.

The works will be designed so that the specified design loads and any temporary loading that may arise from construction of the cladding is transmitted back to the building structure with an adequate margin of safety appropriate to each material and product.

4.3.2 Building Importance Level

The building shall be designed for an Importance Level of 3 in accordance with NCC (BCA) 2019.

4.3.3 Loads

Load Type	Requirement
Dead loads	Design to AS1170.1
Live loads	Design to AS1170.1 and AS1288

Load Type	Requirement
Wind loads	Design to AS1170.2 and AWES-HB-001-2012
Snow and ice loads	Design to AS1170.3
Earthquake loads	Design to AS1170.4
Maintenance loads	Design to AS1170.1 As a minimum, accommodate the following (subject to confirmation by access contractor): Vertical uniformly distributed load of 1.0 kN/m ² , and a concentrated load of 1.1 kN acting separately on a 100mm diameter contact area applied to any gutters, copings of flat or near flat surfaces. 0.5 kN applied horizontally through a square of 100mm side on any vertical or near vertical framing or metal panelling. Where abseiling ropes are to be draped over elements of the Works, design those elements to support both maintenance traffic loads and rope loading. Note that the cladding elements must not be permanently deformed under normal rope load, while for emergency loading (fall arrest) there may be local deformation but no failure or disengagement of cladding elements.

4.3.4 Deflection Limits

Component	Serviceability Deflection Limit
Glass - IGU	Span/60 or 20mm, whichever is the lesser
Glass - Single glazed	Span/60 or 20mm, whichever is the lesser
Metal panelling / sheet	Span/90 or 20mm, whichever is the lesser
Aluminium framing - General	Span/250
Aluminium framing - Vertical deflection from dead loading	Span/500 or 3mm, whichever is the lesser
Aluminium framing - Supporting a brittle material (e.g. masonry)	Span/500
Steel framing - General	Span/250
Steel framing - Vertical deflection from dead loading	Span/500 or 3mm, whichever is the lesser
Steel framing - Supporting a brittle material (e.g. masonry)	Span/500

4.3.5 Impact

Shall be determined to achieve the requirements of AS 4040 soft body test.

4.3.6 Construction Tolerances

The facade design shall, as a minimum, accommodate the following:

Component	Construction Tolerance
Concrete	Plan position +/- 25 mm
	Surface level +/- 10 mm
	Surface flatness +/- 3 mm (in 3m length)
Steel erection	Plan position +/- 10 mm
	Surface level +/- 10 mm
	Surface flatness +/- 3 mm (in 3m length)

4.3.7 Building Movements

The facade design shall as a minimum, accommodate the movements nominated by the Structural Engineer.

4.3.8 Thermal Movements

Design to accommodate the following temperature variations:

- Ambient Temperature: 0°C to 50°C
- Surface Temperature: 0°C to 80°C

4.3.9 Very High Bond Tapes

Very high bond tapes are not be relied upon as the sole means of support for cladding elements. However, they may be used for deflection control.

4.3.10 Attachments to the Building

Structural fixings shall be designed to resist dead loads, live loads, wind loads, earthquake loads and all building movements, individually and in combination. All fixings are to accommodate the worst combination of tolerances as listed previously.

4.3.11 Cast-in Inserts and Post Fixed Anchors

All cast-in inserts and post fixed anchors are to be designed to meet all requirements of AS 5216.

Design to resist worst load combinations. For proprietary inserts, design to manufacturer's requirements and submit relevant documentation to validate design.

Detailed set-out of all cast-in inserts are to provide to the main contractor for coordination and installation in conjunction with reinforced concrete structure design and construction.

4.3.12 Fixings of Beads and Trims

Each significant glazing trim or feature shall be attached to the facade by mechanical means in addition to any reliance upon wedge gaskets or VHB Tape.

4.3.13 Vibration, Natural Frequency and Fatigue

Ensure that elements do not vibrate under expected weather conditions.

Where façade elements such as frames, sunshades, cables, protruding plates and flaps etc. are considered to be at risk of in-service oscillations, prepare a natural frequency analysis of the members.

This analysis should consider all materials included in each assembly, as well as the manner of fixing and effects of dampening.

Where assemblies are found to have a natural frequency of less than 10 Hz, undertake wind tunnel testing of a full-scale prototype to demonstrate that the assembly will meet the requirements of this specification.

Prepare a report summarising the findings of the testing, including recorded displacements and frequency of vibration. Where assemblies are found to resonate, deflect excessively, or defect sufficiently to cause alarm or discomfort, then reinforce and stiffen the assembly to achieve compliance.

Design for fatigue should follow the requirements of AS/NZS 1664.1 and AS/NZS 1664.2. In any fatigue assessment undertaken the design fatigue factor assumed shall be 2. Whether or not a specific fatigue assessment is undertaken, the design should incorporate good design practice to minimise the possibility of fatigue failure.

4.4 Weatherproofing Design

The weatherproofing design will be undertaken in accordance with the design criteria noted below. Allow for any changes to standard extrusions and assembly/installation procedures as required to meet these criteria.

4.4.1 Pressure Equalisation

Unless noted otherwise design the weatherproofing of all systems and joints to be pressure equalised thus incorporating the following features:

- A rain-screen: This prevents the majority of water entering joints.
- A cavity between the rain-screen and air seal. This cavity shall be:
 - Sufficiently ventilated and bounded by baffles, seals etc. so that there is minimal air pressure difference across the rainscreen.
 - Drained so that any water entering the cavity flows harmlessly to the outside.
- An air seal: Design for the full wind load. This is due to the effective pressure equalisation of the cavity. Design the system so that water penetrating the cavity does not reach the air seal.

4.4.2 Air Infiltration

- Facade suites: Less than 1.6L/m²/sec at 300 Pa;
- Operable Windows/Doors: Design to AS2047 & AS4420

4.4.3 Weather Performance Rating

- Facade suites: Design to AS4284
- Operable Windows/Doors: Design to AS2047 & AS4420
- Site installed cladding systems: AAMA 501.2

4.5 Appearance

Achieve the mandatory geometry, colours, gloss levels and the like as presented in the Contract Documents.

4.6 Durability & Corrosion

Service life is defined as the period of time during which no excessive expenditure is required on operation, maintenance, or repair of components.

Design to meet the following Service Life requirements:

Component	Service Life
Structural components and fixings (those that support or reinforce other elements)	50 years
Glass	30 years
Cladding & external features	30 years
External finishes	20 years
Internal finishes	20 years
Gaskets	15 years
External sealants	10 years
Internal sealants	20 years
Hardware (operational integrity)	15 years

4.6.1 Corrosion

Determine corrosion rates in accordance with AS 4312.

Select each material to be compatible with the other materials around it or within its range of influence.

Incorporate separators to prevent bimetallic corrosion.

Isolate all aluminium components in direct contact with cementitious surfaces with thin, dense PVC or EPDM isolation packs. Do not use bituminous paint.

4.7 Thermal Performance

To meet the requirements of the JV3 assessment report and Mechanical Engineer's specification. Note that 'whole of system' (glass + frame) thermal performance must meet with the requirements stipulated in this specification and other documentation.

4.7.1 Thermal Insulation

Install thermal insulation to all opaque wall areas (spandrels, cladding areas, air-seal locations within suspended ceilings, blanked off louvres and the like) with a minimum R-value to achieve current BCA Section J compliance. Refer to JV3 Assessment Report for details.

Insulation to be bulk insulation (rockwool etc.) of typically 80mm to 120mm thickness unless noted otherwise or as necessary to meet thermal requirements.

Install insulation using welded or mechanically fixed impaling and/or retaining clips. Adhesive attachment of insulation is not permitted. Provide sufficient insulation support to prevent sagging.

Provide a positive vapour barrier using non-combustible materials. If it cannot be shown that a foil-faced

insulation complies with the combustibility requirements of the BCA then a metal sheet (aluminium or Zinalume® or similar) should be adopted as the vapour barrier.

Thermal insulation shall be installed so as to prevent the formation of condensation within the spandrel cavity and behind air seal sheeting.

4.8 Condensation

Condensation is not to form on either internal or external surfaces of framing members, glazing, solid panels, or internally within the construction of the components forming part of the works under normal operating conditions.

Normal operating conditions shall include all uses of internal and external spaces that may be reasonably expected of building occupants and assumes that activities contributing to excessive humidity such as cooking, showering, operation of clothes dryers etc. are exhausted externally in accordance with the NCC, Part F6.

If it cannot be proven that the system will not form condensation through submission of assessments (assessed by a suitability qualified and experienced consultant) of successful precedent projects, or if high risk conditions (i.e. thermal bridging) are identified in the proposed system design, the Contractor is to model the façade to determine whether the façade make-up is at risk of forming condensation under normal operating conditions.

Precedent projects shall be assessed based on:

- Same system type and arrangement;
- Similar glazing build-up;
- Project location, including micro-climate influences;
- Building type and use;
- Any other relevant factors

4.9 External Reflectivity

Specular reflectivity (visible light) of all building materials used on the facade should not exceed 20%.

4.10 Acoustic Performance

Design of all façade systems is to be in accordance with the performance requirements outlined in the Acoustic Consultant's report.

4.11 Fire

Design of all façade systems is to be in accordance with the performance requirements outlined by the Fire Safety Engineer.

All façade materials are to be non-combustible in accordance with AS 1530.1 as required by the NCC, unless determined otherwise by a specific risk assessment and explicitly approved by the project Fire Safety Engineer. The Contractor shall allow for all costs associated with assessment and approval, including testing.

All floors and walls (as per the fire engineering report) shall be separated in accordance with BCA requirements. This is to provide a continuous and complete smoke flashing at slab level to separate all adjacent floors and fire compartments.

4.12 Access & Maintenance

Access for cleaning and replacement of elements is envisaged to be via rope access.

Allow for the effective maintenance and replacement of these elements can be carried out utilising the methods noted or via an alternative method approved by the Principal and without damaging adjacent components.

4.12.1 Glass Replacement

Each glass panel is to be capable of replacement in isolation without damage to adjacent elements, and without removing adjacent unitised panels. External features such as sunshades, fins and / or cladding that may have to be removed for glass replacement must be identified and described in design submissions.

It is envisaged that removal & delivery of replacement glass will be undertaken via the external access systems. The Contractor shall coordinate and verify lowering and lifting of replacement glass to all locations, maximum glass sizes & loads, lifting equipment, ground level clearances etc to ensure the strategy is adequate and executed as part of the access & maintenance Works.

4.13 Infestation & Birds

Close off, or make vermin proof, openings in the cladding that permit entry of insects, reptiles, birds, bats, or rodents.

4.14 Movements & Noise

Design to accommodate the effects of movement caused by thermal changes and applied loads (wind loads and structural settlement).

Design movement joints, interfaces & components so that they do not creak, rattle, whistle or make any other noises that could cause complaint from tenants.

5 Materials

5.1 General

Specific minimum requirements for materials and their finishes are covered in the appended Materials Schedule. The schedule also covers the requirements for samples.

Requirements additional to those in the Materials Schedule are noted below.

5.1.1 Material Samples

Submit three off samples of all designated materials. All samples are to be labelled denoting (where applicable):

- Component name;
- Manufacturer;
- Manufacturer's code reference;
- Any other relevant reference data.

Submit digital copies of manufacturer's technical trade literature to identify material characteristics (where relevant).

5.2 Glass

All glass must comply with AS 1288, AS/NZS 2208 and AS/NZS 4667.

Glass shall be consistent in colour and quality and equivalent to the control samples approved by the Principal. Source the total quantity of each glass material from the same glass manufacturer. In the case of coated glass, or other processed glass products, ensure all raw materials are obtained from the same manufacturers.

The thicknesses and dimensions of glass indicated in the Contract Documents are not prescribed thicknesses or dimensions. Calculate the glass thicknesses to meet all performance criteria including manufacturer's recommendations, using the recommendations in the relevant standards or validated proprietary design methods.

Only use glass products that are included on the International Glass Database (IGDB).

All glass edges (including non-visible) shall be arrised (2mm maximum) then fine ground with dubbed corners and free from damage as a minimum. Visible and exposed glass edges shall be polished.

Inspect the edges of all panes and during processing and before and after installation in their frames. Any edges with defects likely to initiate cracks in service including feather (shark's teeth) or whisker (serrations) deeper than half the thickness of the pane, vents (flake chips) greater than 6 mm across, or impact damage shall not be incorporated in the cladding.

Clearly mark the glass to show its intended final position and orientation.

5.2.1 Visual Requirements

Faults & Defects

The glass shall be clean cut without significant edge faults (including feathered edges, shells or other imperfections) and free from scratches, bubbles, cracks, ripping, dimples or other defects.

The glass is to be free from inclusions of deleterious matter and other defects that interfere with the desirable appearance and performance. There shall be no linear or extended faults.

Defects shall be assessed from a position 1.5m from each side of the glass, between 0 degrees and 35 degrees from perpendicular.

Visual Distortion

Visual distortion shall be kept to a minimum and no defects producing irregular reflections are permitted. Visual distortions shall be assessed from a position 3.0m from each side of the glass, between 0 degrees and 35 degrees from perpendicular. A white foam core sheet with a thin black grid pattern (lines spaced at 200 mm in each direction, or similar) shall be placed 1.0 m behind the glass. Any glass with visual distortions when viewed in the installed condition or against the grid pattern shall be rejected.

5.2.2 Safety Manifestations

Safety marking shall comply with the National Construction Code and AS1288.

5.2.3 Heat Treated Glass

Do not use toughened glass without written approval by the Principal.

Approved toughened glass shall conform to AS/NZS 2208 Class A. Heat soak test all approved toughened glass in accordance with EN 14179-1 and EN 14179-2.

Each pane of heat soaked glass shall be traceable to individual heat soak test batches so that in the event of failure it shall be possible to locate all panels from that heat soak batch.

Toughen/heat strengthen glass on a roller hearth furnace. Tong marks are not permitted.

All glass that is required to be heat treated shall have the roller marks horizontally.

Grind out small shells and/or chips prior to heat treatment. Maximum chip/shell diameter shall not exceed 2 mm, and there shall not be more than four randomly placed chip/shells in any single pane of glass.

Demonstrate by non-destructive testing that the surface compressive stress is between 30 N/mm² and 50 N/mm² for heat strengthened glass.

All heat treated glass is to be permanently but discretely marked in a corner to identify processor and treatment type.

5.2.4 Laminated Glass

Laminated glass shall be in accordance with ASTM C1172, ISO 12543 and shall conform to AS/NZS 2208 Class A.

The interlayer shall be:

- Polyvinylbutyral (PVB) material as manufactured by Solutia, Saflex or Trosifol™ or approved equal; or
- SentryGlas®, as manufactured by Trosifol™ Structural products (Kuraray).

Apply interlayer in a single, consistent orientation so as to avoid any possibility of inconsistent visual effect.

Where the edge of laminated glass is to be exposed demonstrate that the interlayer material is resistant to the effects of moisture absorption, including clouding and delamination. Any delamination shall not extend further than 10mm from the edge of the glass.

Where Kuraray SentryGlas® is to be used, provide a certificate from Kuraray confirming glass laminator is on the Kuraray Qualified Network Laminators (QNL) list.

5.2.5 Insulated Glazed Units

Use hermetically sealed insulated glazed units that comply with AS/NZS 4666.

Use aluminium alloy spacers to separate panes of glass with a black anodised finish unless specifically noted and with adequate rigidity for their purpose. Design to accommodate the seal and contain desiccant, allowing both to operate at maximum efficiency. Secondary seals are to be silicone unless noted otherwise.

All bent edge spacers shall be limited to a maximum two joints in any one assembly. Spacer pieces should not be less than 200mm in length. Joints shall not be allowed within 50mm of any corner. Joints shall be located away from the central zone of all IGUs (i.e. eye level).

Apply low-e coat to surface 2 (i.e. inner surface of outer piece of glass) unless noted otherwise.

Where the design intent requires that the insulated glazed units are structurally glazed, they shall have the capacity to transfer the in-service wind loads to the facade via the insulated glazed unit sealant interfaces.

Where argon (or other gases other than air) filled units are proposed provide evidence that the units have undergone accelerated ageing tests in accordance with BS EN 1279-3.

IGU's to have a maximum theoretical deviation of span/500 across the shortest span at a temperature of 20 degrees centigrade and an atmospheric pressure of 1013hPa. Provide calculations to demonstrate the pressure and temperature ranges in which IGU's can be manufactured to comply with this requirement. The temperature and atmospheric pressure at time of assembly is to be noted in the quality control documentation. Breather tubes shall not be used for IGUs with electrostatically applied coatings.

To avoid ragged sight lines, ensure that the sealed face and the aluminium spacer bar are always concealed within the depth of the glazing gasket line.

The drainage of water along edge seals of insulated glazed units is not permitted unless written confirmation is provided by the unit manufacturer stating that the design life, required service life, and warranty of the unit are unaffected.

Locate manufacturers' logos in the bottom left hand corner of the insulated glazed units when viewed from the inside to the outside.

5.2.6 Low Iron Glass

Low iron glass appearance to be visually equivalent to Vitro (previously PPG) Starphire.

5.2.7 Coated Glass

Match coated glass to the colour of the reference products. Coated glass shall be uniform in tone, hue, colour, texture, pattern and transparency and shall provide a consistent appearance to the glazed units.

5.2.8 Opacified Glass

Opacified glass refers to glass with an opacified coating to selected colours to the rear of the glass.

Opacified coatings shall be uniform in thickness and colour and when viewed from the exterior not display any inconsistency in colour or appearance and shall be free from scratches, cracks, bubbles, blisters, streaks, lines or processing imperfections which might detract from the external appearance.

Opacified spandrel glass shall be heat treated to eliminate the potential for breakage due to thermal shock.

5.2.9 Ceramic Frits

Apply ceramic ink to areas of glass using the silk screen or printing process and fuse to the surface of the glass during the heat treatment process. It shall be permanent and durable and shall be resistant during the design life of the façade to:

- Attack from mechanical damage or abrasion, during normal use and maintenance;
- Weathering, fading, or discolouration due to attack from climatic conditions, UV or atmospheric pollutants.

5.2.10 Glass Defects & Tolerances

Item	Description	Requirement
1	Monolithic Glass	
1.1	Overall thickness	
1.1.1.a	Less or equal to 6.0mm	±0.2 mm
1.1.1.b	Greater than 6.0mm	±0.3 mm
1.2	Overall Bow & Warp	
1.2.1.a	Nominal 6.0mm	Max. 1 in 350 < 1500mm Max. 1 in 250 > 1500mm
1.2.1.b	Greater than 6.0mm	Max. 1 in 400 < 1500mm Max. 1 in 300 > 1500mm
1.3	Cut Dimensions	
1.3.1.a	Nominal 6.0mm	±1.6mm
1.3.1.b	Greater than 6.0mm	±2.0mm
1.3.2	Diagonal/Squareness	±5.0mm
1.4	Defects	
1.4.1	Viewing Area	
1.4.1.a	Bubbles, gaseous inclusions, dots, residues, knots, dirt and stones	As per AS/NZS 4667/2000
1.4.1.b	Scratches, rubs	As per AS/NZS 4667/2000
1.4.1.c	Surface scars	As per AS/NZS 4667/2000
1.4.1.d	Digs, strings	As per ASTM C1036, q3

Item	Description	Requirement
1.4.1.e	Reams, lines and other linear distortions	As per AS/NZS 4667/2000, ASTM C1036
1.4.1.f	Wave, distortions, process surface imperfections	As per AS/NZS 4667/2000, and ASTM C1036
1.4.1.g	Coating and glass colour consistency between all glass of the same type	Maximum 2.5 ΔE CIELAB variation
1.4.2 Edge Zones		
1.4.2.a	Bubbles, gaseous inclusions,	As per AS/NZS 4667/2000
	Dots, residues, knots, dirt and stones	As per ASTM C1036, q3
1.4.2.b	Scratches, rubs	As per AS/NZS 4667/2000
1.4.2.c	Surfaces scars	As per AS/NZS 4667/2000
1.4.2.e	Digs	As per ASTM C1036, q3
1.4.2.f	Ream, lines and other linear distortions	As per AS/NZS 4667/2000, ASTM C1036
1.4.2.g	Strings	As per ASTM C1036, q3
1.4.2.h	Wave, distortions, process surface blemishes	As per AS/NZS 4667/2000, ASTM C1036
1.5 Confirmation		
1.5.1.a	Subcontractor and supplier to agree to regular factory audits and review of QA records and stock control records.	
2 Heat Treated Glass		
2.1	Overall thickness	As per section 1.1
2.2	Surface Flatness (variation in surface / roller wave)	
2.2.1	Leading/trailing edge (Edge Dip)	Max. 0.150mm in 300mm
2.2.2	Main Body (All Thicknesses)	Max. 0.100mm in 300mm (peak to trough)
2.3	Overall Bow & Warp	As per section 1.2
2.4	Defects	As per section 1.4
2.4 Confirmation		
2.4.1.a	Roller wave to be parallel and horizontal in orientation when installed on building.	
2.4.1.b	Heat strengthening is to be undertaken such that no localised deformations will result from the heat strengthening process. No tong marks or localised kinks will be accepted.	
2.4.1.c	Permanent Identification marking shall be in the bottom right hand corner.	
2.4.1.d	Glass supplier is requested to provide record of surface stress.	
3 Laminated Glass		

Item	Description	Requirement
3.1	Overall thickness of laminate	
3.1.1.	Nominal thickness	AS/NZS4667:2000
3.1.2	Variation in thickness, locally	±0.100mm in 300mm length
3.1.2.a	Crests and troughs shall be aligned when laminating individual glass lights.	
3.1.2.b	Obvious visual deformation in glass are to be measured as rate of change, as per section 3.1.2, and to be no longer than 100mm.	
3.2	Surface Flatness	As per section 2.2
3.3	Overall Bow & Warp	As per section 2.3
3.4	Step in laminates	<1.6mm for 6.0mm <2.0mm for 8.0mm
3.4.1.a	Bottom edge of laminate to have 0.0mm slip/step	
3.5	Dimensions	As per section 1
3.6	Defects Inclusions and bubbles	As per AS/NZS 4667/2000
4 Double Glazed Units		
4.2	Surface Flatness	As per section 2.2
4.3	Overall Bow & Warp	0.10%
4.4 Dimensions		
4.4.1	Height and breadth	As per section 1
4.4.2	Diagonal	As per section 1
4.4.3	Mismatch/Step	2.0mm
4.4.4	Bottom edge of DGU to have 0.0mm step.	

5.3 Aluminium

Aluminium shall have the chemical composition and temper appropriate for its function, exposure and applied finish.

Extrusions shall have sufficient thickness in webs, walls, and flanges to eliminate visible distortion of the extrusion in the finished works (prior to the application of design live loads and wind loads).

Aluminium profiles shall be used to reinforce extrusions. Steel shall not be used as reinforcing for extrusions without written approval from the Principal.

Aluminium shall not be left in contact with cementitious materials in a potentially wet environment (i.e. outside air barrier).

Do not accept supply of aluminium components without written certification confirming correct grade, strength, size, finish and coating type and thickness. Submit certificates for approval and do not incorporate the shipment into the works until approval has been confirmed.

5.3.1 Aluminium Finishes

Application of finishes shall only be undertaken and warranted by licensed applicators under factory-controlled conditions.

Prior to the commencement of finishing operations, submit a range of samples, which define the colour variations, which may occur in that finish type. The approved samples will define the variance acceptable for the project. Production finishes that fall outside this range are liable to be rejected.

Shop finish all visible other surfaces of aluminium that will be exposed to the external environment, including drained and ventilated cavities and pressure equalisation chambers.

Prepare aluminium surfaces in accordance with the approved finish applicator's recommendation prior to the application of the finish.

PVF2

Use a wet applied, heat-cured polyvinylidene fluoropolymer coating (Kynar 500® or Hylar 5000® resin-based coating system) that conforms to AAMA 2605.

Fluoropolymer Powder Coats including PVF3

Use Interpon D3020 Fluoromax® or equal that conforms to AAMA 2605.

Polyester Powder Coat

Use a heavy duty external grade polyester powder coat (Interpon D2525 polyester or approved equal that conforms to AS 3715 and AAMA 2604). Unless noted otherwise apply this finish to all internal surfaces.

Anodising

Anodic oxidation of aluminium shall comply with AS 1231 with thickness grade AA25. All visible components shall be of the same grade and temper from the same supplier. Grain direction of components shall align with other adjacent components. Anodised components shall not be welded.

5.4 Mild Steel

Steel generally to be minimum Grade 250 mild steel.

Cold-formed steel sections to be roll formed from pre-galvanised, Zinc Hi-Ten G450/S with a minimum yield strength of 450 MPa.

Where mild steel stiffeners are used for reinforcement of aluminium sections, and there is a risk of bimetallic corrosion, steel is to be isolated from the aluminium or hot-dip galvanised.

5.4.1 Welding

Manual welding shall be in accordance with the relevant Standards. Semi-automatic welding shall be carried out in accordance with the relevant Standards. Evenly match butt edges and faces to be welded, brazed or soldered. Where joints made by these methods are visible, finish them by grinding buffing, or like methods appropriate to the class of work and before any further treatment such as painting or galvanising is carried out. All exposed continuous welds in structural members must be completely watertight.

Welders shall have passed the tests as specified in the relevant Standards. Welding supervisors shall have passed the tests specified (or under equivalent international standard) and possess the certificate specified therein.

All welding consumables and methods shall be strictly in accordance with the relevant Standards or any special requirements of the plate manufacturer. All work to be carried out by operators experienced in this type of work.

5.4.2 Protective Coatings

Internal Steelwork

Visible – coating system PUR2a to AS2312.1, Section 6.

Concealed – coating system IZS1 to AS2312, Section 6.

External Steelwork

Visible – coating system PUR5 to AS2312.1 Section 6. Micaceous iron oxide (MIO) pigment shall be used in the epoxy barrier (2nd coat).

Concealed – coating system EHB6 to AS2312.1 Section 6. Micaceous iron oxide (MIO) pigment shall be used in the epoxy barrier (2nd coat) / hot-dip galvanised in accordance with this specification.

Preparation

For exposed steelwork, visual appearance is of the highest importance. All exposed steel surfaces are to be finished smooth and true with a surface roughness such that it will not be visible after application of the corrosion protection and finish coats. All imperfections, which might be visible, are to be ground out if this can be achieved invisibly, or repaired by welding and grinding in accordance with the relevant Standards. All corners are to be smoothly rounded with a minimum radius of curvature 1mm. All visible welds are to be continuous fillet welds. All welds are to be ground flush and smooth, as required by the Principal.

All grinding shall maintain a consistent even surface finish so as to remove all signs of corrective work.

All elements pre-drilled, cut and welded prior to galvanising or painting.

Paint Coatings

All paint finishes to be prepared and applied in accordance with AS 2312.1.

Ensure that the following tests are carried out in relation to paint films:

- Abrasive Blast Cleaning: Australian Standard 1627.9 Pictorial Surface Preparation Standards will be used as a guide for assessing respective degrees of surface cleanliness.
- Film Thickness: Take Dry film thickness readings using Elcometer, Mikrotest or Positest Gauges to ensure the specified film thickness has been applied. Instruments shall be calibrated in accordance with the gauge manufacturer's requirements. A suitable comb type Wet Film Gauge is to be used during application to minimise the possibility of low dry film thickness. Submit test results for approval.
- Adhesion: Adhesion of the paint films is to be tested using relevant industry Standards.

Galvanised Coatings

Hot-dipped galvanised - minimum 100 micron thickness to all steelwork (visible and concealed); prepare material and galvanise in accordance with AS/NZS 4680 (post-fabrication coating); test coating thickness and submit results.

Cold formed galvanised – minimum coating mass 300g/m² unless noted otherwise. Cut ends to be painted with a zinc rich primer.

Bolts & fixings – minimum coating mass 300g/m², galvanised in accordance with AS 1214.

5.5 Stainless Steel

Provide specific type, alloy and finish as required to produce the work.

Unless otherwise specified, stainless steel shall be austenitic, non-magnetic using grade 304 or grade 316 to ASTM A480/480M for plate, sheet and strip and ASTM A276 for stainless steel bar. Specific grade designations shall be either as specified in the relevant sections of this Specification or, where not identified specifically, selected to meet the performance criteria specified for the particular element or component.

Use grade 316 or 316L (welded applications) at exterior locations and 304 or 304L (welded applications) at interior locations.

To prevent tea staining electro polish all exposed stainless steel components.

All welds and/or machined areas shall be re-passivated by an approved procedure. All visible welds are to be fully finished to match adjacent surfaces.

5.5.1 Stainless Steel Finishes

Where special finishes are noted, application of finishes shall only be undertaken by licensed applicators under factory-controlled conditions.

Prior to the commencement of finishing operations, submit a range of samples, which define the colour variations, which may occur in that finish type. The approved samples will define the variance acceptable for the project. Production finishes that fall outside this range are liable to be rejected.

Do not accept supply of stainless steel components without written certification confirming correct grade, strength, size, finish and coating type and thickness. Submit certificates for approval and do not incorporate the shipment into the works until approval has been confirmed.

Where no coating is specified then finish exposed stainless steel to finish number 4, 320 grit, surface roughness 0.5 microns maximum. The direction of texturing of any finished surfaces shall be as nominated on the Contract documents. Where direction is not nominated, seek confirmation prior to finishing.

All stainless steel surfaces are to be provided with a passive chromium oxide layer free of all surface free iron or surface pits created from subsequent finishing, welding or grinding operations. If the stainless steel is contaminated during fabrication by iron or other non-ferrous metal, clean and ensure the surface has adequate passivity. Test the surface passivity to ensure all contaminate has been removed.

During all fabrication procedures, protect the stainless steel finish surface with a protective film.

Unless otherwise specified, welds to visible areas of stainless steel to be ground smooth to achieve a seamless surface. Heat tints shall be removed using fine abrasives, pickling paste, wire brushing or similar to achieve continuity with the specified finish. Areas difficult to access shall be manually finished if necessary.

Do not allow the steel surface to be scratched or dented during fabrication. Dents and scratches which cannot be removed will be cause for rejection.

Use only compatible fasteners and clips to fix stainless steel fabrications in position.

After installation peel all protective films from the surface and wipe off all excess adhesive. Protect the stainless steel surface from other activities occurring around the metal which may cause contamination of the passive layer.

5.6 Sealants

5.6.1 Sealants - Non-Structural

Sealants shall be compatible and non-staining. Do not use acid curing sealants. Do not use acrylic sealants for frame seals or smoke flashings.

Only use backing rods which are compatible with the sealant and the substrate, and which do not adhere to the sealant.

Use primers and joint preparation materials as recommended by the sealant manufacturer.

5.6.2 Sealants - Structural

Primers shall be the same brand manufacture as the sealants used and shall be compatible with the substrate and all adjacent materials.

Determine structural silicone bite requirement from design wind pressure and panel size, using the sealant manufacturer's recommended procedure. Joint design must be in accordance with the sealant manufacturer's recommendation for glue-line and bite to glue-line ratio.

Provide documentation of the sealant manufacturer's requirements for the particular substrates of the project regarding joint size, limitations, backer rod, mixing, cleaning, surface preparations, priming and application, temperature and humidity of glazing conditions and any other criteria which may affect sealant performance.

Documentation, preparation, installation and testing of the structural silicone sealants shall include, but not be limited to:

- Silicone batch logging procedures to record all batches used including silicone batch manufacturing date, and arrival date of each batch at the Contractor's premises;
- Frame logging at time of assembly will include identifying every panel by a unique number. Glazing records will then provide information on each panel (by its number) including silicone type and batch, date of silicone installation, glazier's name, temperature and humidity measured inside the factory and at a nominated time each day;
- Deglazing to ensure quality of the silicone seals will be done periodically. Frames will be chosen at random as follows:
 - 1 out of the first 10 frames: (frames 1 to 10)
 - 1 out of the first 40 frames: (frames 11 to 50)
 - 1 out of the next 50 frames: (frames 51 to 100)
 - 1 out of each 100 frames for the remainder of the project.
- Establishment of an acceptance criteria for the periodic de-glazing;
- Establishment of a procedure in case a frame is rejected. This shall include de-glazing of frames glazed on the same day with the same silicone batch as the rejected frame. The procedure shall provide

for the identification of all frames of unacceptable quality and their re-glaze or rejection.

5.7 Gaskets & Weatherseals

Use EPDM, Silicone rubber, Santoprene, or approved equal. Do not use PVC. Gaskets shall be free from contact and migration stain and shall be compatible with all substrate, sealants and finishes with which they are likely to come into contact. The gaskets shall be free of mould flash.

Select gaskets to fully accommodate the range of dimensional tolerances and movements associated with fabrication and installation of the Works. Gaskets shall be capable of maintaining their elastic qualities, dimensions and resistance to physical and chemical attack sufficient to maintain the full performance during the design life.

5.8 Setting Blocks

Use dense heat cured silicone rubber with a Shore A hardness of 80-90 durometer.

Use dense heat cured silicone rubber with a Shore A hardness of 60-70 durometer for side blocks. Materials shall not leach out over time and cause staining.

Calculate setting block lengths to properly support the glass. Setting blocks to be sized to properly support both inner and outer panes of DGU's, including both sheets of laminated glass.

Provide a minimum of 2 blocks per glazed unit, at least 75 mm in length.

For annealed glass (or composite glass containing an annealed sheet), do not install setting blocks wider apart than the quarter points of the glass unless approved.

5.9 Isolating Materials

Isolating materials are to be non-conducting, non-compressible, non-water absorbing and compatible with any material with which they come into contact.

5.10 Aluminium Composite Panel & Bonded Laminates

Aluminium (or other metal) composite panel cladding is not to be incorporated into any part of the façade works,

irrespective of whether it incorporates a polyethylene core or 'FR' mineral core.

In these circumstances, adopt a finished solid aluminium cladding sheet (minimum 3mm thickness).

Where other forms of composite panel or any type of bonded laminated is proposed (including composite panels incorporating perforated aluminium substructures, or other bonded material laminates), then seek written approval from the Principal and supply product details including testing data which show that the product has successfully passed AS1530.1 combustibility testing.

The Principal is under no obligation to accept the use of these alternatives.

6 Fabrication

6.1 General

Fabricate and assemble the Works in strict accordance with approved Shop Drawings and with the requirements of this section.

Do not modify or adapt the agreed drawings and method statements without written approval. Record all changes on the master set of shop drawings.

Comply with the following:

- The current statutory requirements in place;
- Recognised Australian codes of practice and standards where these exist but are not specifically referred to in this Specification including but not limited to those set out in the attached Schedule;
- Other International codes of practice and standards including but not limited to those set out in the attached Schedule;
- Select methods of fabrication that will achieve the specified performance and minimum requirements;
- Where proposed fabrication methods differ from those in the standards above, submit details for approval prior to fabrication.

6.2 Fabrication of Cladding Assemblies

6.2.1 Tolerances

Achieve the following maximum allowable tolerances for all assemblies:

- +/- 1.5 mm on length on mullion
- +/- 1.0 mm on length on transoms
- +/- 1.5 mm on straightness of mullions
- +/- 1.0 mm on straightness of transoms
- +/- 2° accuracy on angles between mullions and transoms
- +/- 1.0 mm on sides and +/- 2 mm on diagonals on spandrel and vision panel opening positions

6.2.2 Markings

Clearly mark assemblies to:

- Identify strong points for lifting;
- Clarify assembly or installation sequence;
- Clarify required location and orientation;
- Clarify similar but different units.

Mark with removable material (which can be completely removed without affecting appearance of the marked area) or mark in areas which will be concealed when installation is complete.

6.2.3 Machinery

Use jigs and computer controlled tools wherever appropriate to achieve accuracy.

Use the correct and well maintained tools for each task. Do not use blunt or worn tools.

Carry out grinding, cutting, shaping and finishing operations using tools and techniques that will prevent contamination or damage of adjacent components with particles or substances that could disfigure, stain or corrode them.

6.2.4 Assembly

Undertake assembly of components under factory-controlled conditions. Clean all components to an appropriate standard prior to assembly.

Adequately reinforce and accurately cut, fit and seal all junctions to leave only sealed hairline joints. Do not impair drainage within sections. For weatherproofing joints use non-hardening small joint sealant.

Use similar fabrication techniques and detailing in all assemblies to prevent warping, twist and out-of-squareness and achieve consistent appearance of completed work.

Form joints accurately without lipping or offsets in visible surfaces unless designed otherwise. Joints shall be rigidly secured to prevent all but designed movement, unless shown otherwise.

6.2.5 Checking Material Deliveries

Check all materials provided by other suppliers for compliance with the project requirements. In particular, check for:

- Source, type, quality, grade, finishes and colour;
- Correct accessories and fixings;
- Correct sizes;
- Correct quantities (to ensure shortages do not delay the works);
- Correct coating thickness;
- Correct performance characteristics;
- Shelf life (i.e. that they are not out of date).

Record all checks, confirming satisfactory supply or corrective actions.

6.2.6 Protection

Store assemblies in a manner that will:

- Prevent overload, distress, or permanent deformation of the overall assembly or individual components;
- Prevent contamination by dust or substances which could be difficult to remove, or which could permanently etch or mark the finished surfaces;
- Avoid the entrapment of water (e.g. condensation) against materials which could be adversely affected by such contact.

Apply temporary protection films/measures to meet the contact requirements in a manner that will not affect the appearance of finishes when the protection is removed.

Package assemblies and accessories so as to prevent overload, distress or permanent deformation of overall

assembly or individual components either during transport or hoisting/lifting operations.

6.2.7 Installation

Provide all lifting equipment, scaffolding, temporary works required to install the cladding system and related works.

Include provision of all services required to operate plant and machinery.

Provide all necessary fencing and storage to adequately secure the site and stored materials.

6.2.8 Quality Assurance

Arrange all quality control procedures necessary to ensure that the fabrication of all elements and assemblies conforms with the Contract Documents.

The fabrication quality system requirements shall be in accordance with the relevant Standard.

Submit a Fabrication Quality Plan documenting all quality control systems, work procedures, check lists, and audit plans for the design and fabrication of the elements. Internal quality audits shall be scheduled within the Quality Plan. Submit the Quality Manual and Quality Plan for approval before commencement of work.

7 Installation

7.1 General

Carry out installation in accordance with approved Shop Drawings by personnel experienced in the handling and site installation of the Works.

Do not cut, drill, modify or otherwise alter any work or the agreed details without obtaining written approval. All such alteration work shall be carried out in accordance with the requirements of the Contract Documents and agreed submissions. All changes must be recorded on master documents held by the Contractor for inclusion on the 'as-built' drawings.

Employ only competent and experienced installers to carry out the cladding. Provide and maintain records to demonstrate their employees' experience and related training.

Comply with the following. Where conflicts arise between this specification and the Code or Standard listed below, the more stringent requirement shall apply:

- The current statutory requirements in place;
- Recognised Australian codes of practice and standards where these exist but are not specifically referred to in this Specification including but not limited to those set out in the attached Schedule;
- Other International codes of practice and standards including but not limited to those set out in the attached Schedule.

7.2 Management of Site Installers

Where the site installation works are undertaken by subcontract installers, nominate the preferred subcontractors for approval.

Engage the approved subcontract installers and provide a full-time Project Manager on site during the installation works to provide coordination and supervision of the site installers.

7.3 Shop Assembly

To the fullest extent practicable, fabrication and assembly shall be executed under factory conditions. Components or parts that are not required to be shop assembled shall be shop fitted and marked before disassembly to ensure proper assembly later at the building site.

Materials, components and systems incorporated in the work shall be in compliance with the standards and procedures of the appropriate manufacturers.

Reasonable timed visits may be arranged by the Design Team.

7.4 Transport/Materials Handling

Handle cladding materials and units by designed strong points only. Erection cleats to be located in non-visible locations. Submit details.

Handle and store materials by methods and appliances that will not over-stress or deform the members. Separate all materials on site from surface of ground or

walls. Members bent or buckled from handling or storing will be liable to rejection. Supply bolts, nuts and washers in grit-free containers and stored in watertight premises. Reject burred, damaged, corroded or otherwise unserviceable bolts. Damaged or defective components shall not be installed without prior repair and inspection in accordance with the requirements of this specification.

Handle coated elements with care to preserve the coating in the best practicable condition. Protect the cladding materials from mechanical damage and the harmful effects of heat and weather conditions. Supports and slings used in storing, handling and lifting of the steelwork shall be padded with rubber blocks or similar material to prevent damage to the coatings.

7.5 Installation Performance Requirements

7.5.1 Inspection/Signoff Points

The installation works are to be progressively submitted for inspection/signoff in accordance with the Principal's Requirements.

7.5.2 Protection of Adjacent Works/Finishes

Provide temporary protection to adjacent works and finishes as required in order to prevent damage during glazing installation works.

7.5.3 Tolerances

Install cladding to the following tolerances:

- Deviation from theoretical position in plan max +/- 3 mm;
- Deviation from theoretical position in elevation max +/- 1.5 mm;
- Change in deviation max 3 mm per 4,000 mm run in any direction;
- Offset between any two consecutive members max +/- 1.5 mm.

Construct joints between components to the following permitted deviations.

- Within the length of any joint (including in line continuations across transverse joints) the greatest width shall not exceed the least width by more than 10%. Any variation shall be evenly distributed with no sudden changes;
- The offset and elevation between nominally in-line edges across a transverse joint shall be not more than 10% of the width of the transverse joint;
- The offset in plan or section between flat faces of adjacent panels across any joint shall not be more than 10% of the width of the joint or 1.5 mm whichever is the lesser.

Install architectural steel mullions and framing to the following tolerances:

- Exposed and unclad architectural steel mullions and framing to be installed to one half the normal tolerances of structural steel specified in AS 4100: Steel Structures.

7.5.4 Fixings

Install fixings in accordance with their manufacturer's instructions and procedures. Use a torque spanner to achieve correct tightening of fixings to achieve correct tension load and avoid under/overstressing. Use lock-nuts to prevent loosening. At least one clear thread shall show above the nut.

Do not cut reinforcement to concrete/masonry when installing fixings.

Make good the integrity of the steel corrosion protection system where post drilled or site fixings are used for connections to the external steel work.

7.5.5 Site Glazing

Comply with the recommended guidelines set out in the relevant Standards.

Remove any protective tapes from the edges of insulating glazed units.

Install glazing units with at least 5 mm clearance at the sides and top from the framing, and 6 mm at the bottom with allowance for water to drain freely.

Install gaskets without incorrect distortion such as stretching or compression of length, or folding back of wiper seals.

Do not site cut or nip glazing.

Provide setting blocks in accordance with the 'Setting Blocks for Glazing' section within the fabrication section of this Specification.

Provide test certificates for each sealant type to confirm compatibility with all surrounding substrates, and adhesion to the relevant substrates.

7.5.6 Sealant Application – General

Clean and prepare joint surfaces before application and provide backer rods in accordance with the sealant manufacturers recommendations.

Mask all joints with non-staining tape prior to application of jointing materials to avoid staining, etching, or scratching of the adjacent materials.

Prevent three-sided adhesion.

Provide a sealant depth not greater than the joint width or less than half of the joint width or 6 mm, whichever is the greater.

Apply and cure sealants in accordance with their manufacturer's directions on minimum and maximum temperature and Relative humidity conditions.

Produce a smooth, slightly concave surface by tooling the silicone into the joint using a tool designed for the purpose. Wet tooling techniques will not be accepted.

Submit colour control samples of each sealant colour for approval.

7.5.7 Structural Glazing

Design and provide structural sealant glazing system where indicated on the drawings, or otherwise if approved in writing.

All glazing and sealants shall comply with manufacturer's recommendations, relevant codes and approved shop drawings.

Comply with minimum dimensional requirements for edge clearance, edge cover, front clearance, back clearance, and as required by sealant manufacturer.

Colour to be black or as directed.

Obtain manufacturers written endorsement of all proposed details and submit with shop drawings. Install in strict accordance with manufacturer's printed recommendations.

No structural glazing adhesive shall be applied to PVF2 painted or mill finished surfaces.

Experience of Glaziers

For structural glazing, employ only personnel trained and experienced in structural glazing installation. Each person shall be required to qualify by demonstrating experience, ability and knowledge of procedures. The names and details of qualified personnel shall be recorded in structural glazing log book. Submit details.

QA/QC Procedures

The Contractor shall establish and submit to the Principal, for endorsement, an acceptable quality control program to monitor quality of materials and workmanship. The QC program shall include, but not be limited to, the following tests:

- "butterfly"
- "snap time"
- "adhesion"
- "weather seal"
- "plug"

Structural Glazing Logbooks

In addition to the requirements for the glazing logbook, maintain on a daily basis and submit progressively structural glazing logbooks. As a minimum the logbook shall contain:

- Identification number of each structural glazed unit and its location in the building;
- The production lot numbers of the structural sealant used on each unit;
- The units subjected to site adhesion tests, and the test results;
- Site glazed or re-glazed units, if any;
- Adhesion test results at the base metal/coating interface;
- Adhesion test results at the coating/sealant interface;
- Quality of completed units on statistically valid basis.

Structural Glazing Workmanship

The dead load of the glass shall be fully supported by the setting blocks in the installed position, and fully engaged with the setting blocks prior to the application of structural adhesive.

The profile of structural adhesive and the methods of application shall enable the quality of adhesive to be inspected after application.

Site Glazing

Structural glazing shall be carried out in the factory except for approved on-site glass installation, replacement and vision panels left out for scaffold connectors, hoists,

cranes, loading platforms or otherwise directed by the Main Contractor.

Approval will not be given for structural site glazing unless:

- The design provides for independent support of the glass until the structural adhesive has fully cured;
- The manufacturer certifies in writing the suitability and experience of individual glaziers.

All site structural-glazing locations shall be recorded in the glazing logbook.

Certification

Submit certificate verifying:

- The assembled frame provides for the required glazing clearances and tolerances and maximum and minimum joint configurations, having regard to the bow, warp and kink characteristics of the required glass types, and is properly prepared for glazing. The adhesive bond of the structural adhesive has been satisfactorily tested on a contact surface of the actual framing system;
- The test values obtained;
- The requirement for primers (if any);
- Giving recommended procedures for factory and site glazing and site re-glazing, including maximum and minimum joint configurations, clearances, dimensions and the like;
- That the glaziers are qualified to apply the structural glazing adhesive and are experienced in its use;
- The structural glazing adhesive has been satisfactorily tested to ASTM C1087 for compatibility with the adjacent materials and components, is not detrimental to its long term structural performance, weathering and visual quality, is compatible with the edge seal of IGUs, and will not cause delamination or other impairment to laminated glass.

7.6 Inspection/Opening Up

If directed, open up complete work for inspection.

Where the inspection identifies that the works have been undertaken in accordance with the approved method statements, the time and cost of the opening up, inspection and closing up will be claimable.

Where the inspection identifies that the works have been undertaken in a manner which is different from the approved method statements and in the opinion of the Principal's Facade Consultant is likely to affect the performance of the works, then all costs associated with the inspection and subsequent rectification works will be borne by the Contractor.

7.6.1 Defect Rectification

Agreed Methods

Rectification methods for finished products will be trialled and submitted for approval prior to the commencement of work. Where rectification methods are rejected, replacement of the component and/or assembly will be required.

Allocation of Costs

Defects, which are clearly due to the actions of the Contractor and/or his agents, shall be rectified at the Contractors cost.

7.7 Completion

7.7.1 Progressive Cleaning

Clean the work progressively and daily by removing debris, waste, excess materials and the like from the work area.

Notify of the need to carry out interim cleaning of any sections of the Works contaminated by cement or slurry spillages or cement dust contamination that are at risk of causing permanent damage to the works.

7.7.2 Final Cleaning

At completion of installation, clean the work area thoroughly and clean the finished work to remove all marks, soiling and the like.

Finished work shall be free from defects and mechanical imperfections such as scratches, scrapes, dents, and abrasion.

The final clean shall remove all:

- Protection tapes, films, covers and the like, together with any residual adhesives left by the protection materials.
- Incidental construction dust, laitance, rubble and the like, to a level where the performance and appearance of the installation is not compromised, and any residual material will not etch the surface coatings/finishes and can be easily removed during the final clean.
- Visible installation stickers and temporary product markings and QA markings.

Conduct a trial clean at the commencement of cleaning operations, and seek approval that the level of cleaning is acceptable.

7.7.3 Protection

At completion of installation, cover and protect finished work as required to prevent soiling, damage, or wear and tear during subsequent construction activities. Otherwise, clean and maintain finished work as frequently as necessary until the hand-over of the facade. Protection shall be designed for removal without damage to finished surfaces. If requested, submit details of proposed protection materials and procedures.

7.7.4 Adjacent Work by Others

At the completion of adjacent work by others, including services work, attend the site, inspect finished work, and repair or replace damaged or dislodged work, and complete or make good finishing, trimming and sealing.

7.7.5 Responsibility

Be responsible for repair of all damage and breakage of finished work until hand-over.

7.7.6 Glass

Remove and replace glass that is broken, cracked, abraded, chipped or damaged before hand-over.

7.7.7 Structural Certification

Provide certification by a Chartered Professional Engineer, that the completed works meet the requirements of the Contractor's design.

Appendix A – General Façade Design Principles

A.1 Unitised Façade Systems

Unitised façade systems must be designed to be pressure equalised and feature the following:

- Be provided with split male / female mullions and stack joints, sub-heads, subsills and sub-jams;
- Eliminate standing water on or around the edge of glazed units, panes and panels;
- Incorporate isolation devices to minimise thermal bridging;
- Provide the following when all tolerances are accommodated and the most onerous combination of movements occur (including wind sway):
 - Sufficient edge cover on all glazed units, panes and panels to maintain weathering and structural performance around their perimeter;
 - Clearance to edges of all glass panes or panels everywhere around their perimeter.
- Be capable of being re-glazed from inside/outside the building;
- Incorporate bottom edge support to panes of single and both panes of insulated glazed units;
- If system is to be glazed on site utilising gaskets then provide site applied sealant bead to the inside of the vision glass.

A.2 Stick-Built Façade Systems

Stick built façade systems must be designed to be pressure equalised and feature the following:

- Be designed as dry/wet glazed;
- Eliminate standing water on or around the edge of glazed units, panes and panels;
- Incorporate isolation devices to minimise thermal bridging;
- Provide the following when all tolerances are accommodated and the most onerous combination of movements occur (including wind sway):
 - Sufficient edge cover on all glazed units, panes and panels to maintain weathering and structural performance around their perimeter;
 - Clearance to edges of all glass panes or panels everywhere around their perimeter.
- Be capable of being re-glazed from inside/outside of the building;
- Be sealed with gaskets/sealant at joints between mullions and transoms;
- Provide mechanical retention to transoms/mullions and decorative cover caps.

A.3 Structural Silicone Glazing

Structural silicone shall not be used to support dead loads.

Do not use site applied structural silicone except for re-glazing unless noted otherwise.

Bite dimension shall include tolerance and workmanship allowance. Make provision for future installation of bead on mullions, transoms and stack joints.

A.4 Glazing

Unless explicitly approved otherwise:

- Glazing more than 3 m above ground or floor level that is sloped (greater than to 15° from the vertical) shall be laminated;
- Where glass may be stood upon, it shall be 4-side supported laminated glass. The interlayer shall be a minimum of 1.52 mm thick PVB or Sentry Glass Plus;
- Glazing more than 3 m above ground or floor level that is vertical with unsupported edges shall be laminated glass;
- Do not use monolithic toughened glass, irrespective of the orientation, unless specifically noted in the contract documents or at the discretion of the Principal. Do not use in situations where breakage could result in glass falling more than 3 metres;
- Design glazing and system so that glazing cannot dislodge under any circumstance. Bolt fitted glass shall be laminated and, designed and installed to prevent dislodgement in the event of both plies of glass laminate breaking;
- Wherever glass performs the role of a barrier protecting a fall greater than 1m it shall be laminated Grade A Safety Glass. A barrier is defined as any element intended to prevent people from falling more than one metre or to stop people. For full height vision glazing in an office area with a transom or stack joint height lower than 500mm above finished floor level comply with the requirements of AS1288.

A.5 Vapour Barriers

Where a vapour barrier and separate weathering membrane are present in the same wall construction, the vapour barrier shall have a lower permeability than the outer membrane.

A.6 Gaskets

All gaskets with the exception of gaskets inside unitised framing members (mullion and stack joint) shall be accessible for inspection/replacement.

Gaskets are not to impede sight lines through vision glazing. Do not rely on compression gaskets as the sole means of restraining hook-on elements such as beads, fins, sunshades or similar.

A.7 Flashings and Smoke Seals

Flashings and smoke barriers visible externally or internally shall be aluminium sheet with finish to match the façade or as specified.

A.8 Spandrel Boxes

Provide a back pan to the rear of spandrel areas which consists of an aluminium sheet (minimum thickness 2.0 mm) or Zinalume® sheet (minimum thickness 1.2mm). The back pan shall provide a continuous vapour barrier and air barrier between the back pan and the adjacent framing members. No part of the spandrel box shall be in contact with the spandrel glass. Design or test the thickness and fixing of the back pan to accept full design loads.

If the spandrel glass is transparent (i.e. no opacifier applied to glass) provide a fully fritted (ceramic frit) glass or finished aluminium sheet (minimum thickness 3mm) spandrel panel in front of the insulation that is free to thermally expand and contract without resulting in visual distortion. Ensure that no volatile gasses are expelled from materials that may deposit on the glass.

Provide insulation to the back pan and a minimum 50 mm air space between the spandrel panel and the insulation or back pan. This space is to be drained and pressure equalised.

A.9 Fixings and Connections

Allow for the following within the fixings and brackets:

- Movements and dimensional changes that may occur in the building and within the facade itself;
- The worst combination of tolerances and constructional inaccuracies as specified;
- Adjustments by small increments in all directions;
- Any reduction in safe working loads in fixings due to their spacing, construction tolerances, location in areas of tension, near edges or proximity to cast in inserts/existing fixings, or thickness of shims.
- Use locking nuts, spring washers or application of an approved locking fluid to achieve this;
- The possibility of reinforcement being encountered and the fixing position being moved where post-drilled or site fixings are used into a concrete frame;
- All fixings outside or through the air barrier shall be stainless steel. All fixings inside the air seal to be a minimum of hot dip galvanised steel. All fixings in contact with Zinalume® products shall be galvanised and a minimum of Class 3 or Class 4 in accordance with AS 3566;

- All bracketry outside the air barrier shall be stainless steel or aluminium. All bracketry inside the air barrier to be a minimum of hot dip galvanised steel or structural aluminium;
- Chemical anchors must be a proprietary, mixed in cartridge and injectable type;
- Components being fixed shall permit movement only in the direction in which they are intended to move, i.e. thermal expansion connections;
- Movements which result from vibration under wind loads are not acceptable.

A.10 Operable Windows

All operable windows are to be designed to be pressure equalised and feature the following:

- Incorporate isolation devices to minimise thermal bridging;
- Eliminate standing water on/or around the edge of glazed units, panes and panels;
- Allow glazing replacement without the need to dismantle the primary framing members;
- Have stainless steel hinges, screws, stays, mechanisms and locks;
- Have stainless steel or brass keys;
- Limit openings in accordance to the BCA, local Authority and Health Infrastructure requirements. Provide a limiting device capable of being undone only by authorised personnel;
- Have an operating stay type mechanism with the following features:
 - The stay mechanism shall allow the opening light to be held open in incremental positions up to the maximum restricted open position;
 - The degree of friction required to enable the window to be held open in incremental positions shall be adjustable by means of a friction adjustment screw;
 - When the light is closed the mechanism shall not protrude into the room;
 - The stay mechanism shall be fastened to both the opening light and the frame and only be capable of being undone by deliberate action.
- Operable windows to close in the event of fire. Provide operating gear, motors, controls and wiring to allow connection to BMCS. Allow for fire rated cables and back-up power.

A.11 Doors

General

Provide doors integral to the window / facade system as shown on the Drawings and Door Schedule.

Doors shall have sufficient strength and robustness to withstand the static and dynamic loads that occur during use, and shall not disengage from frames under any of the relevant specified loads when open or closed.

Doors shall not be capable of removal from the surrounding areas of the cladding under any of the relevant specified loads, when closed.

Glass shall be Grade A Laminated Safety Glass.

All hardware shall be in accordance with Base Build Architects documentation.

Operability to be in accordance with Base Build Architects documentation.

Hinged doors

Shall be side hung, opening to 90° inwards/outwards. Limiting devices are required and shall be capable of being undone only by authorised personnel.

Double doors shall be provided with suitable multi-point vertical locking mechanisms.

Sliding doors

Sliding doors, side-light mullions and meeting stiles shall be fully interlocked to obtain maximum performance for wind loading, weatherproofing, acoustic control and other design criteria.

Sill tracks shall be provided with flush-fitting, purpose-designed, extruded aluminium infill elements to locations of door openings and sidelights where sliding doors are not required to operate.

Powered doors

- Powered doors shall include the following types:
 - Revolving doors;
 - Sliding doors;
 - Folding doors;
 - Swing doors.
- Powered door assemblies shall comply with AS5007;
- Security locking system shall comply with the following requirements:
 - All doors shall be capable of being instantly secured by switching from the security control room;
 - No doors shall fall into an unsecured condition as a result of a power drop;
 - For after hours security the door leaves shall be capable of electronic locking. Should a power failure occur during this time, the doors shall remain locked. Optional battery back-up shall allow release of locks and manual rotation of doors;
 - In the event of a power failure or emergency, the door system shall enable breaking-out to allow escape.
- All wiring to latching systems within the door framing shall be part of this Specification. Provide junction boxes at approved locations for the connection of this wiring to the building security system;
- Operability requirements e.g. under fire.

A.12 Jockey Sashes

Jockey sashes shall:

- Be mechanically or structurally glazed in accordance with AS/NZS 4666;
- Contain stainless steel hinges, screws, stays, mechanisms, locks and stainless steel or brass keys;

- Have cam-action locking handles, with heavy-duty stays including limiters to restrict extent of opening for:
 - Safety and performance;
 - Structural and weatherproof design requirements;
 - Elimination of potential wind-generated noise and vibration.
- When the sash is closed have a stay mechanism that does not protrude into the room;
- The transom member at the openable sash shall be shaped so as to ensure the surface is not suitable for use as a ledge or shelf;
- The degree of friction required to enable the window to be held open in incremental positions shall be adjustable by means of a friction adjustment screw. The limiting device shall be capable of being undone only by authorised personnel;
- Contain a continuous edge seal;
- Not sag more than 2 mm when opened;
- Provide riser blocks as required;
- Incorporate aluminium blinds with control knobs mounted to inside face of jockey sash. Refer to Base Build Architect's internal glazing specification for specific requirements.

A.13 Louvres – Fixed

- Provide aluminium in accordance with AS/NZS 4740 and AS 3715;
- Unless noted otherwise, all plantroom louvres are to achieve a minimum Louvre Effectiveness (Penetration Class) under AS/NZS 4740 of Class B or better.
- Provide single/double stage louvers as required;
- Fixed to supporting structure by aluminium clips or brackets and stainless steel fixings. Do not use plastic clips or fixings;
- Provide vertical and horizontal expansion joints so that to meet the requirements of this specification. Where exposed to weather fit louvres with internal gutters and means of draining water to outside /down pipes;
- Where connected to ductwork, provide collars with flanges to receive ductwork;
- Comprise bird mesh screens behind the aluminium louvers. The mesh shall be a minimum of Grade 304 stainless steel mesh where concealed and Grade 316 where visible, with opening dimensions not exceeding 10 mm;
- Where aluminium louvres are inactive, provide 3 mm minimum nominal thickness aluminium blank-off panels, finished to match the louvres unless otherwise noted;
- Louvres shall have a profile approved by the Architect and Mechanical Engineer.

A.14 Louvres – Operable

- Design to operate under all loads covered by this specification at all positions including the fully opened (horizontal), and fully closed (vertical) position;
- Be able to be stopped (and locate and lock) at any intermediate positions between open and closed;
- In the event of power failure louvers shall remain locked open/closed;
- Backlash – louvre blades will deflect no more than 1mm at the ends of the blades due to the summation of backlash in the connection of all pushrods, pushrod connectors and pushrod levers, etc.;
- Louvre blades shall not vibrate or oscillate while in any position;
- The actuator may be utilised to force the panel closed against gaskets, however, this force, in combination with the design wind speed, shall not exceed the strength capacity of the effected parts of the system.

A.15 Overhead Glazing

Overhead glazing / skylights will feature the following:

- Incorporate a secondary drainage system behind the weathering seals that drains to the outside. Secondary drainage channels to be at a higher level than the rafter drainage channels;
- Eliminate standing water on or around the edge of glazed units, panes and panels;
- Ensure water will not pond on glass;
- Allow reglazing from inside/outside;
- Capture the glass edges on 4 sides so that membrane action may be developed to support the specified loads in the event of glass breakage;
- Have breaks in external beads to allow water drainage.

A.16 Blinds

Blinds shall be capable of being tilted/turned/raised and lowered manually.

Appendix B – Materials Schedule

The Materials Schedule identifies the minimum requirements for the project.

Where proprietary products are nominated, they represent indicative examples of the minimum standard of quality and performance required for the project. The Materials Schedule is to be reviewed and modified to reflect the actual products proposed for the project and submitted for approval.

Item	Material Type	Grade	Manufacturer	Samples Required	Spares Required	Special Requirements
Glazing	Glass			Refer to Section 3.2 for all glass requirements		
Frame Extrusions (internal & external)	Aluminium	6063-T5 or better		300mm for each extrusion	-	-
Frame Extrusions (internal & external)	Steel (Stainless where applicable)			300mm for each extrusion	-	-
Backpans	Aluminium or Zinalume®			Yes	-	-
Smoke Flashing	Galvanised steel			Yes	-	-
Insulation/Solid Wall Cladding	Rockwool			Yes	-	Must achieve minimum R-value of 2.8 m ² K/W
Screws	Stainless steel	316-A4		Yes	-	-
Rivets	Stainless steel	316		Yes	-	-
Washers	Stainless steel	316		Yes	-	-
Non-Structural Sealant	Silicone or Polyurethane		Dow Corning or other reputable manufacturer	Yes	-	-
Structural Silicone	Black		Dow Corning or other reputable manufacturer	Yes	-	-
Fixing Brackets	Steel/Aluminium			Yes	-	-
Fixing Bolts	Stainless steel	304 min		Yes	-	-
Masonry Anchors	Stainless steel	304 min		Yes	-	-
Vibration Proofing	To be nominated by Contractor			Yes	-	-
Packers	Solid moulded polypropylene			Yes	-	-
Hinged Door Hardware						
Fixing Screws	Stainless steel	316	Refer to Architectural Schedule	Yes	-	-
Hinges	Stainless steel	316	Refer to Architectural Schedule	Yes	-	-
Limit Stays	Stainless steel	316	Refer to Architectural Schedule	Yes	10 off	-
Door Lock	Refer to Architectural Schedule			Yes	2 off	-

Appendix C – List of Relevant Standards and Codes

General

National Construction Code (NCC) / Building Code of Australia (BCA)

Design & Loading

Standard	Name
AS/NZS 1170.0	Structural design actions – General principles
AS/NZS 1170.1	Structural design actions – Permanent, imposed and other actions
AS/NZS 1170.2	Structural design actions – Wind actions
AS/NZS 1170.3	Structural design actions – Snow and ice actions
AS 1170.4	Structural design actions – Earthquake actions in Australia
AS 4488	Industrial rope access systems
AWES-HB-001-2012	Wind Loading Handbook for Australia & New Zealand Background To AS/NZS 1170.2 Wind Actions

Glass

Standard	Name
AS 1288	Glass in buildings – Selection and installation
AS/NZS 2208	Safety glazing materials in buildings
AS/NZS 4666	Insulating glass units
AS/NZS 4667	Quality requirements for cut-to-size and processed glass
ASTM C864	Standard specification for elastomeric cellular preformed gasket and sealing material
ASTM C1401	Specification for dense elastomeric compression seal gaskets, setting blocks and spacers
ASTM C1036	Standard specification for flat glass
BS 4255	Specification for structural sealant glazing
BS ISO 11485-2	Glass in building. Curved glass. Quality requirements.

Aluminium

Standard	Name
AS 1231	Aluminium and aluminium alloys – Anodized coatings for architectural applications
AS/NZS 1664.1	Aluminium structures: Limit state design
AS/NZS 1664.2	Aluminium structures: Allowable stress design
AS/NZS 1665	Welding of aluminium structures
AS 1734	Aluminium and aluminium alloys – flat sheet coiled sheet and plate
AS 1865	Aluminium and aluminium alloys – drawn wire, rod, bar and strip
AS 1866	Aluminium and aluminium alloys – extruded rod, bar, solid and hollow shapes
AS 1867	Aluminium and aluminium alloys – drawn tubes

Structural Steel

Standard	Name
AS 1163	Structural steel hollow sections
AS 1442	Carbon steels and carbon manganese steels – Hot rolled bars and semifinished products
AS 1553	Covered electrodes for welding
AS 1554.1	Structural steel welding: Welding of steel structures
AS 1554.2	Structural steel welding: Stud welding
AS 1554.3	Structural steel welding: Welding of reinforcing steel
AS/NZS 2312	Guide to the protection of iron and steel against exterior atmospheric corrosion
AS 3678	Structural steel – Hot rolled plates, floor plates and slabs
AS 3679	Hot rolled structural steel bars and sections
AS 4100	Steel structures

Standard	Name
AS 4600	Cold-formed steel structures
AS/NZS 4680	Hot-dip galvanised (zinc) coatings on fabricated ferrous articles

Stainless Steel

Standard	Name
AS 1449	Wrought alloy steels – stainless, and heat resisting steel plate, sheet and strip
AS/NZS 1554.6	Structural steel welding – Welding stainless steels for structural purposes
AS 2837	Wrought alloy steels – Stainless steel bars and semi-finished products
AS/NZS 4673	Cold-formed stainless steel structures
AS/NZS ISO 14343	Welding consumables – Wire electrodes, wires and rods for arc welding of stainless and heat resisting steels – Classification
ASTM A380	Standard practice for cleaning, Descaling and passivation of stainless steel parts, equipment, and systems
ASTM A967	Standard specification for chemical passivation treatments for stainless steel parts
ASTM B912	Standard specification for passivation of stainless steels using electropolishing
BS EN 10088-1	Stainless Steels. List of Stainless Steels
BS EN 10088-2	Stainless Steels. Technical delivery conditions for sheet/plate and strip of corrosion resisting steels for general purposes
BS EN 10088-3	Stainless Steels. Technical delivery conditions for semi-finished products, bars, rods, wire, sections and bright products of corrosion resisting steels for general purposes
BS EN 10088-4	Stainless Steels. Technical delivery conditions for sheet/plate and strip of corrosion resisting steels for construction purposes
BS EN 10088-5	Stainless Steels. Technical delivery conditions for bars, rods, wire, sections and bright products of corrosion resisting steels
BS EN ISO 3506	Mechanical properties of corrosion-resistance stainless steel fasteners.

Fibre Cement Sheet

Standard	Name
AS 2908.2	Cellulose-cement products - Flat sheet

Concrete

Standard	Name
AS 3600	Concrete Structures
AS 1302	Steel reinforcing bars for concrete
AS 1478	Chemical admixtures for concrete, mortar and grout
AS 1478.1	Admixtures for concrete

Paints & Protective Coatings

Standard	Name
AS 1627.6	Metal finishing – Preparation and pre-treatment of surfaces: Chemical conversion treatment of metals
AS 1650	Hot-dipped galvanised coatings on ferrous articles
AS 1789	Electroplated coatings – Zinc on iron or steel
AS /NZS 2312	Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings
AS 2331.3.1	Methods of test for metallic and related coatings: Corrosion and related property tests – Neutral salt spray test
AS 3715	Metal finishing – Thermoset powder coatings for architectural applications
AAMA 2603	Voluntary specification, performance requirements and test procedures for superior performing organic coatings on aluminium
AAMA 2604	Voluntary specification, performance requirements and test procedures for superior performing organic coatings on aluminium
AAMA 2605	Voluntary specification, performance requirements and test procedures for superior performing organic coatings on aluminium extrusions and panels.

Sealants and Fillers

Standard	Name
AS 1527	Two-part polysulphide-based sealing compounds for the building industry
ASTM C509	Standard specification for elastomeric cellular preformed gasket and sealing material
ASTM C510	Test method for staining and colour change of single- and multi-component joint sealants
ASTM C717	Terminology of building seals and sealants
ASTM C718	Test method for ultraviolet (UV) cold box exposure of one-part elastomeric solvent release sealants
ASTM C719	Test method for adhesion and cohesion of elastomeric joint sealants under cyclic movement
ASTM C793	Test method for effects of accelerated weathering on elastomeric joint sealants
ASTM C794	Standard test method for adhesion-in-peel of elastomeric joint sealants
ASTM C920	Specification for elastomeric joint sealants
ASTM C1184	Specification for structural silicone sealants
ASTM C1193	Guide for use of joint sealants
ASTM C1248	Test method for staining of porous substrates by joint sealants
ASTM C1401	Specification for structural sealant glazing
ASTM D2203	Test method for staining from sealants

Elastomeric Gaskets, Setting Blocks

Standard	Name
ASTM C864	Specification for dense elastomeric compression seal gaskets, setting blocks and spacers
ASTM D1149	Standard test method for rubber deterioration – Surface ozone cracking in a chamber (Flat Specimens)
ASTM D2240	Standard test method for rubber property – Durometer hardness
ASTM D297	Standard test method for rubber property – Chemical analysis
ASTM D395	Standard test method for rubber property – Compression set.

Standard	Name
ASTM D412	Standard test method for rubber properties in tension
ASTM D624	Standard test method for rubber property – Tear resistance
ASTM D746	Standard test method for brittleness temperature of plastics and elastomers by impact
ASTM D865	Standard test method for rubber – Deterioration by drying in air (test tube enclosure)
ASTM D1149	Standard test method for rubber deterioration – Surface ozone cracking chamber
ASTM D2287	Specification for non-rigid vinyl chloride polymer and copolymer moulding and extrusion compounds
ASTM D2203	Test method for staining from sealants

Fasteners

Standard	Name
AS 1110	Isometric Hexagon Precision Bolts and Screws
AS 1111	Isometric Hexagon Commercial Bolts and Screws
AS 1112	Isometric Hexagon Nuts
AS 1214	Hot Dip Galvanised Coatings on Metal Fasteners
AS 1252	High-Strength Steel Bolts for Structural Engineering
AS 3566.1	Self-drilling screws for the building and construction industries: General requirements and mechanical properties
AS 3566.2	Self-drilling screws for the building and construction industries: Corrosion resistance requirements
SA TS 101	Design of post-installed and cast-in fastenings for use in concrete

Fire Protection

Standard	Name
AS 1530	Methods for fire tests on building materials
AS 1530.4	Part 4. Fire resistance tests of elements of building construction

Windows & Sliding Doors

Standard	Name
AS 2047.1	Windows in buildings – selection and installation – Specification for materials and performance
AS 2047.2	Windows in buildings – selection and installation – Construction, installation and maintenance

Lightning Protection

Standard	Name
AS 1768	Lightning protection

Quality Assurance

Standard	Name
ISO 9000	Quality management systems – Fundamentals and vocabulary
ISO 9001	Quality management systems – Requirements

System Testing & Performance

Standard	Name
AS/NZS 4284	Testing of building facades
AS 4420.0	Windows – Methods of test – General introduction and list of methods
AS 4420.1	Windows – Methods of test – Test sample, preparation for tests and test sequence
AS 4420.2	Windows – Methods of test – Deflection test
AS 4420.3	Windows – Methods of test – Operating force test
AS 4420.4	Windows – Methods of test – Air infiltration test
AS 4420.5	Windows – Methods of test – Water penetration resistance test
AS 4420.6	Windows – Methods of test – Ultimate strength test
AAMA 501.2	Methods of test for exterior walls
AS 3555	Building Elements – Testing and rating for intruder resistance

Appendix D – Maintenance Manual Requirements

Develop and submit for approval a strategy in the form of a maintenance manual and log book to ensure that elements likely to deteriorate significantly can be replaced or rectified. Identify maintenance in terms of routine (e.g. cleaning) and in terms of component repair/replacement.

Provide the maintenance manual procedures for the satisfactory long-term care and regular maintenance of the various facade installations (and associated works), including:

- An outline description of the installation and a detailed description of specific items with product names, types, serial numbers etc.;
- The name, address and telephone number of each company and/or contractor involved in the supply or fabrication of materials, components, assemblies and finishes;
- Recommended maintenance periods and planned preventative maintenance procedures;
- A method statement showing the means of access to all parts of the facade with recommended safe loadings;
- Copies of manufacturer’s warranties or guarantees, service manuals, brochures, recommendations, etc.;
- Copies of test and approved certificates;
- One copy of each shop drawing, 'As Built' drawing, and the like relevant to the installation;
- Digital copy in PDF format, provided on USB stick, each shop drawing, 'As Built' drawing, and the like relevant to the installation;
- A list of replacement parts recommended to be held on site, with the names of suppliers;
- Realignment and adjustment instructions where relevant;
- Procedures for dismantling and reassembling;
- Finishes and their architectural description.

Include in the manual log book pages set up for recording the times of performance of the above procedures, sufficient in number to receive the entries for seven years. Show examples of typical entries by recording any maintenance procedures (such as cleaning) performed during the contract and defects liability periods.

The manual and log book to be as per the Principal’s specific requirements, but as a minimum shall be A4 size, printed or typed on durable printing paper each page consecutively numbered, neatly bound in durable vinyl or similar hard covers, and permanently labelled with the project name and date of issue. Supply any digital copies on USB stick.

Appendix E – Masonry Specification

This specification is for non-load bearing masonry, such as brick veneer applications.

The Contractor is responsible for the construction procedure and must ensure that no part of the structure is overstressed as a result of this procedure or as a result of the construction loads which are applied.

E.1 Masonry

General

Dry pressed solid kiln fired clay masonry units

Standards

AS/NZS4455.1 &.3, ASTM C126-14 and ASTM C-1405

Appearance

For size, colour and finishes refer to the architectural drawings and brick specification and as per approved samples and visual mock up.

If the colour of the face units is visible, evenly distribute the colour range of units and prevent colour concentrations and “banding”.

Physical Properties

Min compressive strength:

12MPa when tested in accordance with AS 3700 Appendix C

Cold Water Absorption:

<10 % by weight measured in accordance with AS/NZS 4456.14

Estimated 15 year Coefficient of Expansion (e factor):

<0.5 mm/m tested in accordance with AS/NZS 4456.11

Soluble salt content/ efflorescence:

Classified NIL measured in accordance with AS/NZS 4456.6

Durability (salt attack resistance):

Against sodium chloride attack: Achieve exposure grade of EXP and at least achieve General Purpose (GP) Rating for sodium sulphate resistance, when tested in accordance with AS/NZS 4456.10

Liability to lime pitting:

Classified NIL measured in accordance with AS/NZS 4456.13

Initial rate of absorption (gross):

3-6kg/m²min measured in accordance with AS/NZS 4456.17

Masonry Tolerance classification:

DW2 after AS/NZS 4455.1, measured according to AS/NZS 4456.3

E.2 Shelf Angles

Material

Shelf angles shall be of stainless steel Grade 316 or approved equivalent where visible and stainless steel Grade 304 where not visible.

E.3 Wall Ties

Wall tiles to be designed to accommodate and transfer the lateral force applied to the brick wall back to the substrate structure.

Wall tiles locations and spacing shall be selected in accordance with AS 3700 and AS2699.

Wall ties should be placed in the courses immediately above and below each soldier course.

Material

Stainless steel 304

Installation

Embedment: At least 50 mm into mortar and ensure mortar cover is 15 mm minimum to the outside face of the mortar.

Flexible types: If ties or anchors extend across control joints, use ties or anchors which do not impair the effectiveness of the joint.

Cavity wall ties shall also be located within 300mm adjacent to vertical lateral supports, control joints and around openings.

Horizontal spacing to be staggered in relationship to the course above and below.

Water Transmission

Install ties to prevent water passing across the cavity.

E.4 Mortar

Colour to be selected by the architect.

Mortar materials shall comply with AS 3700 clause 2.2;

Mortar mixing

Measure volumes using buckets or boxes. Machine mix for at least six minutes.

Mortar materials

Additives or admixtures:

- Air-entraining agents: To AS1478.1.
- Methyl-cellulose water thickeners: To be designed for use in brickwork.
- Plasticizers or workability agents: To be designed for use in brickwork or blockwork.

Lime: To AS 1672.1.

Masonry cement: To AS 1316.

Portland cement: To AS 3972.

Type: GP.

Proportions: Conform to the Mortar mix table.

Sand: To be fine aggregate with a low clay content and free from efflorescing salts, selected for colour and grading.

Water: To be clean and free from any deleterious matter.

White cement: To have iron salts content less than 1%.

E.5 Durability

All materials and components above the damp proof course are to comply with the following:

- Built-in products: Below damp proof course to be stainless steel 316 or engineered polymer.
- Bricks: Below damp-proof course, and in external walls corrosivity category to be 'high'.
- Mortar: Below damp-proof course use mortar grade M4 to the Mortar mixes table.

E.6 Joints

Filler Materials

Provide compatible sealant and bond breaking backing materials which are non-staining to masonry. Tests to be carried out by sealant manufacturer to verify adhesion and non-staining material. Do not use bituminous materials with absorbent masonry units.

- Bond breaking materials: To be non-adhesive to sealant, or faced with a non-adhering material.
- Foamed materials: To be closed cell or impregnated, not water-absorbing.

Fire Rated Control Joints

If a control joint occurs in an element of construction required to have a fire resistance rating, construct the control joint using fire stopping materials so that the fire resistance rating of the element is not reduced.

Fire stopping to AS 4072.1.

Joint Filling

Installation: Clean the joints thoroughly and insert an easily compressible backing material before sealing.

Sealant depth: Fill the joints with a gun applied flexible sealant for a depth of at least two-thirds the joint width.

E.7 Flashing and Damp Proof Courses

Design to AS/NZS 2904.

Alcor flashing to sit onto brick course below and cover with mortar.

E.8 Sills and Thresholds

Solidly bed sills and thresholds and lay them so that the top surfaces drain away from the building. Set out so that no unit is cut smaller than three quarters of the full width.