Government of **Western Australia**
Department of **Housing and Works**

Department of Housing and Works

Design and Construct Specification

NATSPEC | Prefabricated Housing

Effective 1 July 2025

This reference specification has been developed by NATSPEC in conjunction with the Western Australia Housing Authority through the Department of Housing and Works. The requirements in this specification are generic and are to be read in conjunction with project specific documents from the Design consultant, including drawings, schedules and appendices. It does not cover the requirements for every project situation.

The Design consultants' documents take precedence over this reference specification. Check the consultants' documents for any variations to the requirements of this specification.

DOCUMENT REVIEW

Revision date	Comments
23/02/2017	2017 Alignment with the updated brief documents.
07/04/2017	2017 Annual update - NATSPEC update, Preliminaries, Smoke alarms. Demolition worksection separated into a stand-alone specification.
20/07/2017	2 July 2017 - Residual Current Device (RCD) trip time requirement.
04/12/2017	NATSPEC October 2017 Update incorporated, document title changed, E. PRELIMINARY SITE PREPARATION – DEMOLITION amended. F CONSTRUCTION SPECIFICATION – MISCELLANEOUS FIXTURES AND APPLIANCES clause amended, Water meter subclause amended, NBN installation subclause added. H FINISHING - Water Corporation approved sub meter subclause amended.
03/05/2018	NATSPEC April 2018 Update incorporated.
19/12/2019	2019 Annual update - NATSPEC October 2018, April 2019 and October 2019 Updates incorporated.
09/02/2021	2020 Annual update - NATSPEC April 2020 and October 2020 Updates incorporated.
14/02/2022	2021 Annual update - NATSPEC April 2021 and October 2021 Updates incorporated.
15/06/2023	2022 Annual update - NATSPEC April 2022 and October 2022 Updates incorporated.
01/07/2025	2025 Update - NATSPEC April 2023, October 2023, April 2024, October 2024 and April 2025 Updates incorporated. Information from landscape specification and demolition specification added. Updated branding to Department of Housing and Works.

TABLE OF CONTENTS

A. GENERAL

1 PROPOSAL REQUIREMENTS AND CONDITIONS

1.1 GENERAL DESCRIPTION

Proposal

Requirement: Provide a proposal for the design, fabrication, transportation, handling and installation of modular housing and associated site works. Include in the proposal all works required to fulfil the project program and the following:

- Conditions of contract.
- The National Construction Code (NCC).
- Design brief.
- Schedule of inclusions.
- This specification.
- Supplements.

Work components: Include all site investigation and design work, labour, material, tools, transportation, equipment, plant, excavation, site modification, shoring, testing, inspection, commissioning and all other general conditions required to satisfy the scope of works.

Definitions

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

- Approval: If approval is required, this is required from the principal before works can proceed further.
- Documented: Documented, as documented and similar terms mean contained in the contract documents.
- Hot-dip galvanized: Zinc coated to AS/NZS 4680 (2006) after fabrication with coating thickness and mass to AS/NZS 4680 (2006) Table 1.
- Metallic-coated: Steel coated with zinc or aluminium-zinc alloy as follows:
  - . Metallic-coated steel sheet: To AS 1397 (2021). Metal thicknesses specified are base metal thicknesses.
  - . Ferrous open sections zinc coated by an in-line process: To AS/NZS 4791 (2006).
  - . Ferrous hollow sections zinc coated by a continuous or specialised process: To AS/NZS 4792 (2006).
- GROH: Government Regional Officers' Housing.
- Northern areas: Project sites located north of 27° latitude.
- Prefabricated/modular housing: A dwelling consisting of module units fabricated off-site (in separate box-like modules) in factory conditions, and transported to and assembled (secured) at the project building site.
- Professional engineer: To NCC (2022) Schedule 1.
- Proprietary: Identifiable by naming the manufacturer, supplier, installer, trade name, brand name, catalogue or reference number.
- Prototype: An original, sample or first model of a product/building fabricated, from which other products/buildings will be copied or developed.
- Provide: Provide and similar expressions mean supply and install and include development of the design beyond that documented.
- Required: Required by the contract documents, the local or statutory authorities.
  - . If required: A conditional specification term for work that may be shown in the documents or is a legislative requirement.
- Supply: Supply, furnish and similar expressions mean supply only.

2 SCOPE OF WORKS

2.1 DESCRIPTION OF WORKS

General description

Requirement: Design, fabricate, transport and install modular housing including the connection of electrical, mechanical, communication, security, reticulation and plumbing services.

Project components: The complete project comprises the following components:

- Site works: Modifications to the site, site improvements, and utilities.
- Substructure: Elements below grade and in contact with the ground.
- Building fabric: The exterior enclosure and roofing.
- Interiors: Interior construction, finishes, and fixtures, except fixtures associated with services.
- Services: Mechanical, hydraulic and electrical services and associated fixtures, including communication and security.
- Equipment and furnishings: Fixed and movable elements.

Responsibilities

Requirement: The contractor is responsible for all unknowns and/or varying site conditions, including utilities, subsoil conditions and regulatory authority permits.

Regulatory approvals: Obtain permits or approvals from the regulatory authority as required for the completion of the project.

- Building permits: Obtain from the Permit Authority.

Site installation works: Perform all works required to verify existing site conditions, including site location and dimension, utility capacities, clearances/restrictions and connection options of external utilities. Carry out works, including compile maps, surveys, traffic and geotechnical data, so that installation meets the requirements of this specification, conditions of contract, other design documents and the construction program.

Errors or omissions in the contract documents: The contractor is responsible for all errors and

omissions discovered. Notify the principal of errors and omissions and submit resolution proposals for approval.

2.2 PERMITS, FEES AND CONTRIBUTIONS

Applications and approvals
Written confirmation of authority approvals: Provide to the principal before installing, including all relevant drawings.

Headworks/infrastructure contribution
Requirement: Cover all contribution fees and services connection/reconnection fees required for the project by the utility authority or service provider. Retain proof of payment for reimbursement by the Department of Housing and Works.

2.3 DESIGN REQUIREMENTS

Standards, codes and regulations
Requirement: Design the project in compliance with the applicable federal and state codes, rules, regulations, ordinances, and standards.

Design development
Requirement: Develop and document modular housing design for review and approval before fabrication. Conform to **B. DESIGN DEVELOPMENT**.

2.4 FABRICATION, ASSEMBLY AND TRANSPORTATION

Fabrication and assembly
Prototype: Fabricate, test, modify and if required, retest building prototype for approval.

Production program: Submit for approval, a program for the review and approval of prototype, and production roll out.

Production: After acceptance of the prototype, fabricate and roll out module unit production to meet the proposed program.

Transportation
Requirement: Perform all tasks required for the safe transportation of module units from the fabrication site to the project site, including:

- Mapping transportation route for each installation.
- Obtaining authority approvals and permits.
- Conformance with conditions of contract.
- Traffic management.

2.5 SITE WORKS AND INSTALLATION OF MODULE UNITS

General description of works
Site preparation: Include site establishment and preliminary preparation works ready for the delivery and positioning of housing module units at the project site, including the following:

- Clearing, relocation or transplantation of vegetation.
- Site modification.
- Foundations and footings.
- Driveways and paths.
- Site drainage.
- Septic system or connection to stormwater/wastewater services.
- Connection to water supply.

Installation/button-up work: Include works required to finish the modular house after it is set on the foundation/footing, including the following:

- Construction of additional structures, including porches, decking and carports.
- Connection to the plumbing, gas, electrical and communication systems.
- Installation of the HVAC system.
- Completion of exterior fittings, including screens, locks and grilles.
- Completion of interior fittings, including non-fixed items.
- Installation of cyclone debris screens if required by the principal.
- Installation of solar collector panels if required by the principal.

Site built structures: Include works additional to the modular house, including the following:

- Detached storeroom.
- Letterboxes.
- Clothes hoist.
- Exterior lighting structure.
- Fencing and walls.

B. DESIGN DEVELOPMENT

1 DESIGN REQUIREMENTS

1.1 DESIGN CRITERIA

Bushfire attack level (BAL)
Design level: Prepare a Bushfire Attack Level assessment report with details of the design attack level required for the project and the design and installation requirements based on the assessed BAL.

Structural design actions
Requirement: To AS/NZS 1170.2 (2021) or AS 4055 (2021), as appropriate, including for external fixtures and fencing.

Designated design Wind Region: D.

Designated design Terrain Category: TC1.

Future module unit relocation
Future dismantling: Design modular housing so that it may be easily disassembled into the original individual module units for transportation to another site if required.

Site installation works
Foundations and footings: Design foundations and footings for modular housing as required for the site conditions and classification, and to the recommendations of the geotechnical report.

Additional requirements
Sustainability: Conform to the following:

- Building performance: To the *Prefabricated Housing – Part A: Qualitative Brief* from the Western Australia Department of Housing and Works.
- Material finishes VOC limits: To the **Maximum TVOC limits table**.

Maintenance: Minimise and facilitate maintenance required by providing the following:

- Elements and finishes designed to minimise maintenance.
- Easy access to elements, with the required working clearances for maintenance, and access doors and panels.

Cyclone debris screens: Design prototype to allow screens to be fitted/attached if required by the principal. Assume screens are only required for some site locations/conditions.

Stormwater drainage: Liaise with the local government authority for the preferred method of drainage and other design requirements.

Driveways and pathways: Liaise with the local government authority for the driveways, pathways and crossover requirements to and within the site. Allow for this in the project design.

Maximum TVOC limits table

Product category	Max TVOC content (g/L)
General purpose adhesives and sealants	50
Interior wall and ceiling paint, all sheen levels	16
Trim, varnishes and wood stains	75
Primers, sealers and preparation coats	65
1 and 2 pack coatings for floors	140
Acoustic sealants, architectural sealants, waterproofing membranes, fire retarding sealants and adhesives	250
Timber flooring, laminate adhesives and sealants	100

1.2 AIR CONDITIONING DESIGN

Design, application and calculations
Standards: Conform to the recommendations of one or more of the following:

- AIRAH Design Application Manuals.
- ASHRAE Handbooks.
- CIBSE Guides.

Methods of calculation: Manual or software that employs the data and methods in the above standards.

Air conditioning system design
Requirement: Provide engineering design that:

- Maximises the functionality, performance, safety, flexibility and reliability of the mechanical services.
- Is technically sound.
- Can be constructed using methods that are good practice and in common use.
- Provides the lowest combined owning and operating cost over the design life of the systems.

Energy efficiency: To BCA (2022) H6D2(2).

Outdoor design conditions: Use outdoor design conditions listed in AIRAH DA09 (2022) or ASHRAE Handbook - Fundamentals (2021) for the following:

- The design conditions location selected to the recommendations of AIRAH DA09 (2022) clause 3.4.2.
- Cooling design: Annual cooling, dehumidification and enthalpy design conditions, 1% DB (dry bulb) and MCWB (mean coincident wet bulb) for the selected location.
- Heating design: Annual heating and humidification design conditions, 99% Heating DB (dry bulb) for the selected location.

Indoor design conditions:

- Summer: 24°C dry bulb, 50% relative humidity.
- Winter: 21°C dry bulb.

Cooling performance: Maintain the air conditioned spaces, as measured at the points of control, within the documented cooling indoor design conditions at the highest cooling load due to the combination of the following:

- Cooling loads imposed by the outdoor design conditions.
- Other cooling loads when they are at their maximum.
- Full solar load.
- Loads due to system and other losses.

Heating performance: Maintain the air conditioned spaces, as measured at the points of control, within the documented heating indoor design conditions at the highest heating load due to the combination of the following:

- Heating loads imposed by the outdoor design conditions.
- Other documented cooling loads are zero.
- Solar cooling load is zero.
- Loads due to system and other losses.

Temperature variation: Limit the temperature difference in air conditioned spaces served by the same zone or system to 2°C as follows:

- Between any 2 points in the space from floor level to 1500 mm above floor level.
- More than 2000 mm from cooking equipment and more than 1000 mm from any other appliance.
- When outside design conditions are not exceeded.
- After the plant has been operating for one hour.
- With the temperatures measured in the same 5 minute period.

Zoning: Divide the systems into temperature controlled zones to meet the specified permissible limits in temperature variation and the system divisions documented.

Fresh air: Supply fresh air to spaces with air conditioning systems via the air handling system.

Heating: Reverse cycle.

Building fabric loads: Allow for loads from the construction documented.

Ambient noise emitted: Provide room air conditioning systems conforming to the following, whichever is the lower noise level:

- Lower than the level that can be heard within a habitable room in any neighbouring residential premises, regardless of whether any door or window to that room is open.
- Maximum noise levels in occupied spaces: NR 30.
- Maximum noise level at site boundary: To the *Environmental Protection (Noise) Regulations 1997 (WA)*.

System requirements

Paint finish: Paint ductwork, pipework and equipment exposed to view and weather.

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

2 DESIGN DOCUMENTATION

2.1 GENERAL

Prototype development documentation and approval process

Schematic design drawings: Submit drawings and materials boards for approval before producing detailed design drawings. Submit five coloured sets of drawings with the following for review and approval:

- Floor plans.
- Building elevations.
- Building sections.
- Building perspective.
- Building model.
- Exterior and interior colour schemes.

Detailed design drawings: Submit drawings that adequately describe the main design detailing intent for approval including interior and exterior fixtures detailing, e.g. external cladding profiles and fixing, kitchen, bathrooms and lighting.

Construction documentation: Upon approval of the detailed design drawings for the proposed prototype module units, submit construction documentation for approval before fabrication.

General drawing requirements

Requirement: Include the following information on all drawings:

- Date, north point, scale bar.
- Project description and location.
- The principal’s name and details.
- The contractor/designer’s details.
- Locality plan.
- Issuance details.

2.2 ARCHITECTURAL REQUIREMENTS

Prototype detailed design and construction documentation

Floor/roof plans: Submit drawings of minimum 1:200 scale when printed at A3, showing the following:

- Room layout, room/space names, floor finishes, overall room dimensions and sizes (in m^2) for all programmed spaces including entrances and corridors.
- Connections to adjoining module unit(s) and provisions for unit transportation method.
- Locations and sizes of all doors, showing door swings, and windows.
- Overall dimensions, including height and levels, of the major elements of each building.
- Locations and fire ratings of all fire-resisting elements.
- Location of all plumbing fixtures including floor drains.
- Built-in fittings including shelves, benches, and stairs and balustrading for the two-storey dwelling prototype.

- Roof plan showing associated equipment, slopes, ridges, drains, and other items.
- Cross references to elevations and sections.

Elevations and sections: Submit drawings of minimum 1:200 scale when printed at A3, showing the following:

- All building elements including entrances, windows, doors, louvres, vents, exhaust and similar items.
- Overall building, floor-to-floor and roof heights.
- Longitudinal and transverse sections for each major area, indicating floor elevations, ceiling heights and roof lines.
- Provisions for HVAC distribution and hood venting.
- Connections to adjoining module unit(s) and provisions for unit transportation method.

Interior details: As appropriate, submit plans, sections and elevations of minimum 1:100 scale when printed at A3, showing the following:

- Kitchens and related service areas.
- Toilet and bathrooms.
- Laundry.
- Other joinery or areas of special design.

Schedules: Submit the following:

- Door schedule indicating door type, size, material and hardware.
- Interior and exterior finishes schedule showing the material, texture, colour and the proposed supplier/manufacturer of each finish material proposed.

Materials boards: Submit samples of all finish materials listed in the materials/colour schedule mounted on presentation boards for review and approval.

Site installation drawings

Detailed site survey: Submit a detailed topographical survey of minimum 1:200 scale when printed at A3, showing the following:

- Date, north point, scale bar.
- Project description and location.
- The principal's name and details.
- Street name, lot number.
- Location of existing services and easements.
- All existing site features, including streams, creeks, buildings, retaining wall, structures, adjoining buildings/outdoor living areas and below ground levels.
- Position of existing building(s) and openings.
- Location of individual trees, group of trees and other vegetation, including trees over 3 m high.
- Existing site dimensions, 0.5 m contours, spot levels and tree heights, including levels at boundaries and the base of trees for evaluating changes in soil levels.
- Street verge, including footpaths, street trees, crossovers and power poles.

Site and landscape drawings: Submit drawings of minimum 1:200 scale when printed at A3, showing the following:

- Contextual information, including street name, lot numbers and adjacent building locations.
- Overall dimensions of the proposed building. Show benchmark, baseline levels and distances from:
  - Each proposed new building to existing buildings.
  - Property lines, setbacks and any easements, including proposed site area boundaries of any strata lots.
  - Roadways.
- Existing structures and streets.
- Exterior elements including parking areas, paved areas, walkways, steps, ramps, retaining walls, fences, clothes hoist, letterboxes and other equipment.
- Existing and proposed contours, levels, grades and site drainage method.
- Sections through the site, as appropriate, showing floor levels and proposed excavation and fill areas.
- Elevations with existing and natural ground levels, relative wall heights and roof heights.
- Ramps and other provisions for disabled access to the NCC cited AS 1428.1 (2009) and AS 1428.2 (1992).
- Site demolition plan indicating existing structures, trees and vegetation to be removed.
- Landscaping plans with following details:
  - Finished grading.
  - Irrigation.
  - Planting.
  - Paving, including vehicular and pedestrian access, and parking spaces.
  - Area included as Private Open Space.
  - Water management requirements, e.g. permeable pavers.
  - Landscape buffer between car parking and dwellings.
- For two-storey buildings, shadows cast by the building onto adjoining properties at 12 noon on 21st June.

2.3 STRUCTURAL REQUIREMENTS

Prototype construction documentation

Requirement: Submit construction documentation including the following:

- Structural plans (at the same scale as that used for the architectural plans) and detail drawings of structural elements as appropriate, including columns, loadbearing walls, shear walls and footings.
- Structural performance calculations.
- Cast concrete details including the following:
  - Concrete mix and type of cement if special-class concrete.

  - . Concrete cover to reinforcement.
  - . Location, size, details, materials, ductility and stress grades of reinforcement.
  - . Cores, fixing and embedded items.
  - . Surface finish class and surface treatment, if applicable.
  - . Curing and protection methods.
- Precast concrete drawings/documentation of non-proprietary architectural and structural precast concrete elements showing design, manufacturing, assembly, transport and installation details, including the following:
  - . Manufacturer's details: Name, contact details and credentials of proposed manufacturer of precast elements.
  - . Safe work method statement: A safe work method statement specific to the project for the precast erection.
  - . Protective coating: Details of coatings to exposed metallic components to AS 2312.1 (2014) or AS/NZS 2312.2 (2014) for the site-specific corrosivity zoning.
  - . Colour: Details of method for the proposed colour, including details of the type and colour of the cement, sand and aggregates, and colouring oxide pigments or stain.
  - . Proprietary inserts: For lifting, bracing or fixing inserts. Include make, type and working load limit.
  - . Non-proprietary inserts: Certificate from a professional engineer certifying the working load limit.
- Samples of surface finish: Showing texture and colour.

Transportation and handling: Include in the structural drawings, lifting points and temporary bracing elements for handling the modules.

Construction documentation: Submit documentation certified by a professional engineer.

Shop drawings: Submit certification by a professional engineer that drawings conform to **B. DESIGN DEVELOPMENT**, DESIGN REQUIREMENTS, **DESIGN CRITERIA** and **F. CONSTRUCTION SPECIFICATION**.

Site installation drawings

Requirement: Submit structural drawings as required for the installation of the housing module units, including module connection points and exterior fixtures for each site.

2.4 PLUMBING REQUIREMENTS

Prototype construction documentation

Floor plans: Submit drawings of minimum 1:100 scale when printed at A3, showing the following:

- Locations of piping.
- Locations of main waste lines, stacks and vents, including for water, air and gas.
- Stormwater drainage.
- All equipment including water heater, pumps, tanks, generators and pressure-reducing valves. Show their locations and required piping connections.
- Access requirements for maintenance.

Site installation drawings

Floor plans: Submit drawings of minimum 1:100 scale when printed at A3, showing the following:

- Proposed services routing from each building to the point of connection to the network provider's system. Show all service lines that are to be capped off, removed or rerouted.

2.5 HVAC REQUIREMENTS

Prototype construction documentation

Floor plans: Submit drawings of minimum 1:100 scale when printed at A3, showing the following:

- Location of all equipment including air handling units, evaporative coolers and other equipment.
- Location of piping and ducts.
- Supply and return air zones.
- Exhaust air duct for each type of application, including rangehoods, toilets, laundries and other rooms as required.

Detail drawings: Submit large scale drawings showing equipment layout, how the proposed equipment will fit in the designated space and access requirements for maintenance.

2.6 ELECTRICAL REQUIREMENTS

Prototype construction documentation

System layouts: Show the power, signal and communications layouts on one set of drawings, and the lighting layout on a different set of drawings.

Floor plans: Submit drawings of minimum 1:100 scale when printed at A3, showing the following:

- Suggested furnishing layout.
- Location and mounting heights of switchboard, power outlets, telephone, television and communication/computer data points.
- Types and locations of lighting fixtures and controls.
- Ceiling fans.
- Fire and smoke alarms.

Site installation drawings

Floor plans: Submit drawings of minimum 1:100 scale when printed at A3, showing the following:

- Single-line electrical distribution diagram showing primary service to substations and secondary service to distribution switchboards and panel boards for power and lighting. Include the permanent and temporary points of connection to external utilities such as external lighting, telephone, and all signal systems.

3 DESIGN VERIFICATION

3.1 SUBMISSIONS

Construction documentation review

Requirement: Submit construction documentation for review and approval upon 50% and 100%

completion of documentation. Submit documentation as required to verify that the design conforms to **B. DESIGN DEVELOPMENT**, DESIGN REQUIREMENTS, **DESIGN CRITERIA**, **F. CONSTRUCTION SPECIFICATION** and other conditions of contract, including drawings, certification and calculations for the structural, HVAC, electrical, plumbing and communications services.

100% complete documentation: Incorporate all agreed changes from the 50% complete review.

As-constructed drawings

Electronic copies/format: Submit at minimum files in pdf, dxf and dwg format.

Hard copies: Submit drawings in the same size, format and scale to those approved for construction.

Drawing content: Show drawings of the completed installed dwelling, including site installed features, future disassembling instructions, drawings of structural components, and plumbing, electrical and HVAC services.

C. FABRICATION AND ASSEMBLY

1 PROTOTYPE

1.1 BUILDING AND TESTING THE PROTOTYPE

Fabrication of the prototype

Requirement: Upon approval of the construction documentation, build prototype for inspection and testing.

Number of prototypes: Allow for one single storey dwelling prototype and one two storey dwelling prototype.

Building prototype: Construct prototype module units to the approved 100% complete construction documentation and **F. CONSTRUCTION SPECIFICATION**.

Inspection of prototype: Before building prototype, propose inspection points for approval. At minimum, include the following inspection points:

- Completion of framing.
- Before covering up or concealing with lining, cladding and roofing.
- Completion of prototype.

Testing and verification: Submit test results and/or certification records, as appropriate, verifying that the prototype conforms to **B. DESIGN DEVELOPMENT**, DESIGN REQUIREMENTS, **DESIGN CRITERIA** and **F. CONSTRUCTION SPECIFICATION**.

Prototype approval

Auditing and review: Jointly review with the principal, the completed work or a portion thereof, to evaluate prototype compliance.

Non-compliance and corrective action: Compile and submit a report of non-compliance, including the following details:

- Identifying the non-complying items with details of non-conformity.
- Detailed corrective action plan with planned correction date and milestones.
- Method of rectifying the non-compliance.
- Plans to prevent reoccurrence of the non-compliance.

Refining prototype: If variations are required, implement change and verify compliance with the NCC.

Precast concrete elements

Manufacturing prototype of element: Cast the elements using the formwork, concrete, reinforcement, compaction equipment, form release agents, curing and formwork removal methods which are to be used in the final work.

Element prototype storage: Maintain on fabrication site, undamaged and protected from discolouration for comparison with manufactured precast elements.

1.2 RECORD DOCUMENTS

As-constructed documentation of prototype
Requirement: Upon approval of the completed prototype, prepare/update prototype documentation, include all changes required in the approval process, and submit with testing and verification documents, including those required in **F. CONSTRUCTION SPECIFICATION**.

Materials board: Submit updated materials board to match the materials/finishes installed in the prototype.

Calculations: Update calculations if affected by any variations to the prototype.

2 FABRICATION OF MODULE UNITS

2.1 FABRICATION

General
Requirement: Fabricate module units to match the approved prototype.

D. TRANSPORTATION

1 TRANSPORTATION ROUTE

1.1 ROUTE CLEARANCE

General
Requirement: Before transporting module units, map out the transportation route. Liaise with Main Roads Western Australia, the local authorities, the police and interstate road authorities, as required for clearances and approval of transportation.

Noise restrictions: Conform to the local authorities' requirements.

Traffic management: Plan, implement and manage traffic to facilitate safe transportation of module units to the project site. Provide work zone traffic control throughout the project site for the duration of the construction/ installation period (for both active and inactive work zones). Make sure there is safe and efficient movement of all traffic, whilst minimising construction impact on the public, cyclists, pedestrians and residents.

2 TRANSPORTATION AND HANDLING

2.1 HANDLING EQUIPMENT

General
Requirement: Provide transportation and handling equipment as required to complete the picking up from the fabrication site, loading, transporting and setting down of module units in their final position at the project site.

Clearances: Make sure handling equipment used is approved by Main Roads Western Australia, the local authorities and interstate road authorities, as appropriate.

2.2 HANDLING

General
Requirement: Load from the fabrication site, transport and position module units into their final position at the project site without damage to the units.

After loading module units onto transportation vehicle: Before leaving the fabrication site, rectify any damage caused to the units during loading which is likely to worsen during transportation.

Protection of module units: Protect the module units so that damage to units is minimised in the transportation and handling process, including securing components, fixtures and fittings such as windows, glazing, doors, heaters, fans and lighting.

Unloading and placement of module units
Requirement: Off-load module unit and provide temporary supports to the unit in its final location, as required. Connect to other units and carry out works to secure building and ensure watertightness of the building, including installation of flashing and joining up of roof/wall cladding.

E. PRELIMINARY SITE PREPARATION

1 GENERAL

1.1 BEFORE MODULE UNIT DELIVERY

Project site preparation
Requirement: Before delivery of module units to site, prepare the site area ready for the final positioning of modules and provide associated facilities, including the following works:

- Pathways.
- Retaining walls.
- Clearing.
- Demolition of redundant works.
- Levelling, filling and cutting.
- Marking out of set-out points of storeroom and attached installations such as carports, verandahs and decking.
- Protection of vegetation/trees to be retained for the project to SITE PREPARATION, **TREE PROTECTION**.

Access routes: Carry out works, as appropriate, to provide access route(s) for the transportation vehicle and handling equipment from the existing roadway, including trimming/clearing vegetation, providing temporary road base and temporary removal of fences.

Site security
Temporary fencing: Adjust existing fencing or provide fencing as required to securely restrict site access. Make sure vehicle access gates allow sufficient clearances for the module unit transportation vehicle and handling equipment.

1.2 PROTECTION OF PEOPLE AND PROPERTY

General
Temporary works: Provide and maintain required hoardings, barricades, guards, fencing, shoring, temporary roadways, footpaths, signs, lighting and traffic management until practical completion. Provide all measures required to guard against vandalism of works and materials on site.

Vandalism
Requirement: Provide all measures required to guard against vandalism, including graffiti, of works, materials, plant and equipment on site. Do not claim for costs or loss from vandalism of works, materials, plant or equipment on site.

Removal of graffiti: Remove any graffiti applied to buildings, plant and equipment. If graffiti is not removed within the time nominated by the principal, the Department of Housing and Works will remove the graffiti and recover the cost from the contract.

Natural vegetation and neighbouring properties
Protection of existing vegetation and properties: Retain existing vegetation and landscaping, as documented. Minimise wheel ruts to turfed/landscaped areas being retained. Do not cause damage to the neighbouring properties. Where damage occurs, reinstate to its original condition. If a dilapidation report prepared to **THE SITE**, **Adjoining properties** is available, refer to this before reinstatement. Obtain written acceptance from the owner of the affected property after completing reinstatement.

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

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

Certification: Required.

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

1.3 THE SITE

Project signboards
General: Within 10 working days of commencement of work, provide project specific signboards and as follows:

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

Other signboards: Obtain approval from the principal before display of advertisements or provision of other signboards.

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

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

Existing services
Requirement: Disconnect and cap off existing services, ready for reconnection where required.

Services location: Before starting site works, locate existing, including contact BEFORE YOU DIG AUSTRALIA to identify locations of underground utility services pipes and cables.

Services to be continued: Repair, divert or relocate service as required for the project.

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

Redundant services: Remove redundant parts and make safe.

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

Easements: Confirm easement required with the relevant utility authority.

Changes to existing services: Submit proposals.

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

Damaged services: Rectify or replace services damaged during construction. If required, obtain permits from the appropriate authority to do so.

Use of existing services

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

Adjoining properties

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

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

Dilapidation report: For each adjoining property to be recorded:

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

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

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

1.4 BUILDING THE WORKS

Survey marks

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

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

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

2 DEMOLITION

2.1 STANDARDS

Demolition

Standard: To AS 2601 (2001).

2.2 SUBMISSIONS

Notice of Completion Certificate

Submission: Within 5 days of completing the demolition works, submit a Notice of Completion Certificate (BA7) to the Permit Authority with other required documentation.

2.3 DEMOLISHED MATERIALS

General

Removal: Except for items to be recovered for re-use in the works or delivery to the owner and materials to be recycled in the works, take possession of demolished materials, remove them from the site and dispose at an authorised waste collection facility. Do not burn or bury demolished materials on site. Prevent spillage of demolished materials in transit.

Recycling: If possible, dismantle building components for off-site recycling.

2.4 PROCEDURAL

Work, health and safety

Requirement: To the *Work Health and Safety Act 2020 (WA)*.

Unexpected finds

Requirement: Give notice and close off affected site area with barrier tapes and warning signs to prevent access. Unexpected finds include asbestos and other hazardous or volatile contaminants, archaeological finds and items of heritage value.

Cultural and Aboriginal heritage items

Requirement: Conform to the *Aboriginal Heritage Act 1972 (WA)*. Protect and prevent damage or loss of items of cultural heritage or Aboriginal sites and artefacts.

Notice: If any item is suspected to be an artefact of heritage value, relic or material that is Aboriginal or belonging to early settlement, give notice.

Action: Stop construction work that might affect the item and protect the item from damage or disturbance.

2.5 HAZARDOUS SUBSTANCES

Removal of hazardous substances

Standard: To AS 2601 (2001) clause 1.6.2.

Asbestos removal: To AS 2601 (2001) clause 3.3.2 and *How to safely remove asbestos Code of Practice (2020)* by Safe Work Australia.

2.6 ASBESTOS REMOVAL

Discovery of asbestos

Identification: If suspected asbestos containing material has been identified, conform to the following:

- Isolate the contaminated area and prevent access.

- Do not disturb the material.
- Cease work on site until safe removal can be arranged.

Water supply: Maintain water supply to the contaminated area until all asbestos products have been removed.

Materials containing asbestos

Transport and disposal cost: Pay for all costs of removing the asbestos waste.

Verification: Where asbestos products are found and removal required, submit written evidence of asbestos waste disposal at a waste facility licensed to accept asbestos.

Asbestos disposal facilities

Metropolitan areas: Use facilities listed by the Waste Authority at: www.wasteauthority.wa.gov.au.

Non-metropolitan areas: For facilities outside the Perth metropolitan areas, use facilities recommended by the local authority.

State regulations

Disposal: To the *Environmental Protection (Controlled Waste) Regulations 2004 (WA)*.

Form submission: Provide copies of submitted WorkSafe (WA) Notification of Asbestos Removal forms and evidence that all fees have been paid. Forms are available at: wise.commerce.wa.gov.au/wise-online/nar.

2.7 PROTECTION

Encroachment

General: Prevent the encroachment of demolished materials onto adjoining property, including public spaces.

2.8 DEMOLITION

Existing septic tanks

Requirement: Conform to the *Environmental Protection (Unauthorised Discharges) Regulations 2004 (WA)*.

Redundant/disused tanks: Decommission tanks as follows:

- Completely empty tanks, leach drains and soak wells using a licensed liquid waste contractor.
- After emptying septic tanks, leach drains and soak wells, and fully remove from the project site.
- Hose down and disinfect tanks, drains and wells as required.
- Fill up excavations, tank, drains and soak wells.

Backfilling to excavation: Place fill in near-horizontal layers of uniform thickness no greater than 150 mm after compaction, deposited systematically across the fill area to achieve minimum relative compaction to AS 3798 (2007) Table 5.1.

Local authority approval: After decommissioning, submit certification and documentation to the local government authority health officer's requirements.

2.9 COMPLETION

Notice of completion

General: Give at least 5 working days' notice of completion of demolition so that adjoining or adjacent structures may be inspected following completion of demolition.

Reinstatement

Assessment of damage: Use the dilapidation record to assess the damage and rectification work arising from the demolition work.

Rectification: Repair damage arising from the demolition work. Obtain written acceptance from the owner of each adjoining or adjacent property of the completeness and standard of the rectification work.

Temporary support

General: Remove at completion of demolition.

3 SITE PREPARATION

3.1 CONTROL AND PROTECTION

Erosion control

General: Plan and carry out the work to protect natural and stormwater drainage systems from sedimentation by minimising soil erosion and sediment transportation.

Dewatering

Requirement: Keep earthworks free of water. Provide and maintain slopes, crowns and drains for excavations and embankments to make sure there is free drainage. Do not commence construction activities, including placing fill, before removing free water from groundwater seepage or excavation has been removed. Prevent water flow over freshly laid work.

Water quality

Washout: Prevent washout from entering waterways and stormwater drains.

Cross connection: Prevent cross connections between stormwater and the public sewerage system.

Backflow prevention: To AS/NZS 3500.1 (2021) and the requirements of the network utility operator.

3.2 TREE PROTECTION

Trees to remain

Extent: Trees not marked for removal.

Tree protection

Tree protection zone (TPZ): To AS 4970 (2009) Section 3.

Tree protection measures: To AS 4970 (2009) Section 4.

Work near trees

Material placement: Keep the area within the dripline free of sheds and paths, construction material and debris.

Work under trees: Do not remove topsoil from or add topsoil to the area within the dripline of the trees.

Hand methods: If excavation is required within the dripline, use hand methods so that root systems remain intact and undamaged.

3.3 SITE CLEARING

Extent
Requirement: Clear only areas occupied by works such as structures, paving, excavation, regrading and landscaping or other areas documented for clearing.

Clearing and grubbing
Clearing: Remove everything on or above the site surface, including rubbish, scrap, grass, vegetable matter and organic debris, scrub, timber, stumps, boulders and rubble.

Soil: Turn up soil to a minimum depth of 700 mm.

Turf: Remove turf to a depth just sufficient to include the root zone.

Grubbing: Grub out stumps and roots over 75 mm diameter to a minimum depth as follows:

- Below subgrade under buildings, embankments or paving: 500 mm.
- Below finished surface in unpaved areas: 300 mm.

Backfilling: Fill holes remaining after grubbing with sand material to prevent ponding of water. Compact the material to the relative density of the existing adjacent ground material.

Disposal
Spoil: Remove cleared and grubbed material from the site and dispose of legally.

4 EARTHWORK

4.1 STANDARDS

General
Earthworks: Conform to BCA (2022) H1D3 and the recommendations of AS 3798 (2007).

4.2 SUBMISSIONS

Certification
Requirement: Submit engineer's signed compaction certificate before commencing construction.

Products and materials
Pesticides and herbicides: Submit manufacturer’s product data before application.

Binders and wetting agents: Submit manufacturer’s product data before use.

4.3 PRODUCTS

Unsuitable materials
Requirement: Do not use fill or imported topsoil containing the following:

- Clay material.
- Refuse or materials toxic to humans, animals or plants.
- Stumps, roots or stones more than 50 mm.

Topsoil
Requirement: Topsoil conforming to the following:

- With an organic content not less than 3% by mass.
- With a pH between 5.5 and 7.5.
- With a soluble salt extent not more than 0.06% by mass.

4.4 FILL MATERIALS

General
Suitable material: To AS 3798 (2007) clause 4.4 including inorganic, non-perishable material suitably graded and capable of compaction to the documented density.

Unsuitable materials: Do not use fill defined as unsuitable by AS 3798 (2007) clause 4.3.

4.5 GEOTECHNICAL

As found site conditions
General: If the following are encountered, give notice and obtain instructions before carrying out any further work in the affected area:

- Bad ground.
- Rock.

4.6 REMOVAL OF TOPSOIL

General
Extent: Areas of cut or fill and areas to be occupied by structures, pavements and embankments.

Maximum depth: 200 mm.

Topsoil stockpiles
General: Stockpile site topsoil intended for re-use.

Stockpile maximum height: 1.5 m.

Protection: Protect the topsoil stockpiles from contamination by other excavated material, weeds and building debris.

4.7 EXCAVATION

Extent
Clearing and excavation: Clear and excavate 1500 mm clear of the building or to the allotment boundaries, whichever is less.

Site surface: Excavate the site to the levels and profiles required for the documented structures, pavements, filling and landscaping. Make allowance for compaction, settlement or heaving.

Footings: Excavate to the required sizes and depths. Confirm the foundation conditions meet the design bearing capacity.

Crawl space: Provide 400 mm minimum clearance under timber and steel bearers.

4.8 PREPARATION FOR FILLING

Preparation
Stripping: Prepare the ground surface before placing fill (including topsoil fill), ground slabs or load bearing elements to AS 3798 (2007) clause 6.1.5. Remove loose material, debris, organic matter and material that inhibits or prevents satisfactory placement of fill layers.

Compaction: Compact the ground exposed after stripping or excavation, to a minimum depth of 150 mm, to the minimum relative compaction in AS 3798 (2007) Table 5.1.

Embankments
Requirement: Grade embankments to an even slope.

Maximum gradient: 1:4.

4.9 PLACING FILL

General

Fill: Conform to BCA (2022) H1D4 and the following requirements:

- Sand fill: Not containing gravel sized particles.
- Achieving a blow count of greater than 7/300 mm to the AS 1289 series.

Extent: Extend fill 1000 mm past the building perimeter to a maximum slope of 1(V):2(H) to the natural ground.

Placement: To BCA (2022) H1D4.

Layers: Place fill in near-horizontal layers of uniform thickness no greater than 150 mm after compaction, deposited systematically across the fill area.

Placing at structures: Place and compact fill in layers simultaneously on both sides of structures, culverts and pipelines to avoid differential loading.

Moisture content: Determine in conformance with AS 1289.5.1.1 (2017) or AS 1289.5.2.1 (2017), as appropriate. Adjust the moisture content of fill to ±2% of the optimum moisture content during compaction as required to achieve the documented density.

Compaction

General: Compact the subgrade and each layer of fill to the required depth and density, as a systematic construction operation. Shape surfaces to provide drainage and prevent ponding.

Fill: Compact fill as follows:

- Controlled fill (up to 800 mm deep): In layers not more than 300 mm deep using a vibrating plate or roller.
- Rolled fill: (up to 800 mm deep): In layers not more than 300 mm deep using an excavator or similar machine.

Minimum relative compaction: To AS 3798 (2007) Table 5.1.

4.10 PLACING TOPSOIL

Stockpiled topsoil

Cultivation: Rip subgrade to a depth of 100 mm or to the depth of rippable subgrade if less. Cultivate around services and tree roots by hand. Trim to allow for the required topsoil depth.

Herbicide: Apply before placing topsoil. Use environmentally acceptable methods conforming to the *Health (Pesticides) Regulations 2011 (WA)*, such as a non-residual glyphosate herbicide, at the recommended maximum rate. Leave herbicide undisturbed for a minimum of 2 weeks unless cleared by the principal.

Binders and wetting agents: Apply to manufacturer's recommendations.

Placing: Spread and grade evenly to provide an average compacted thickness of 50 mm and a minimum compacted thickness of 30 mm at any location.

Compaction: Lightly compact topsoil so that the finished surface is smooth, free from lumps of soil, at the required level, ready for cultivation and planting.

Edges: Finish topsoil flush with abutting kerbs, mowing strips and paved surfaces. Feather edges into adjoining undisturbed ground.

Finish level: Conform to the following:

- 30 mm below paths, kerbs or slabs.
- Minimum one brick course below the damp-proof course of buildings.
- Levelled with bitumen or concrete driveways.
- Free of undulations, irregularities and wheel ruts.

Disposal of excess topsoil

On-site: Dispose of surplus topsoil remaining on site by spreading evenly over the areas already placed.

5 TERMITE MANAGEMENT

5.1 TERMITE MANAGEMENT SYSTEMS

System requirements

Standard: To AS 3660.1 (2014).

Termite management: To BCA (2022) H1D3(3).

Termite reticulation systems

System assessment: To AS 3660.3 (2014) Section 5.

Termite management system notice

Signage: Permanently fix a durable notice in a prominent location to BCA (2022) H1D3(3) and as follows:

- Single dwellings: One notice in the main electrical switchboard.
- Grouped and multiple dwellings: One notice to each dwelling, in the electrical meter box.

6 SERVICE TRENCHING

6.1 FILL MATERIALS

General

Backfill material: To EARTHWORKS, **FILL MATERIALS** and as follows:

- Sulfur content: Do not provide fill with sulfur content exceeding 0.5% within 500 mm of concrete and cement bound elements (for example masonry) unless such elements are protected by impermeable membranes or equivalent means.
- In reactive clay: In sites classified M, M-D, H1, H1-D, H2, H2-D, E or E-D to AS 2870 (2011), re-use excavated site material at a moisture content within ±1% of that of the adjoining in situ clay.

6.2 EXISTING SURFACES

Concrete and asphalt pavements

Method: Sawcut trench set-out lines for the full depths of the bound pavement layers except where the set-out line is located along expansion joints.

6.3 EXCAVATION

General
Requirement: Excavate for underground services in conformance with the following:

- To required lines and levels, with uniform grades.
- Straight between access chambers, inspection points and junctions.
- With stable sides.

Trench widths
General: Keep trench widths to the minimum, consistent with the laying and bedding of the relevant service and construction of access chambers and pits.

6.4 TRENCH BACKFILL

General
Place fill: To EARTHWORKS, **PLACING FILL**.

Timing: Backfill service trenches as soon as possible after laying and bedding the service, if possible on the same working day.

6.5 SURFACE RESTORATION

General
Reinstatement: Reinstate existing surfaces removed or disturbed by trench excavation to match existing and adjacent work.

F. CONSTRUCTION SPECIFICATION

1 GENERAL REQUIREMENTS

1.1 SUBMISSIONS

Products and materials
Safety data sheets (SDS): Submit SDS for products and materials conforming to the *Globally Harmonized System of Classification and Labelling of Chemicals (GHS) (2023)*.

1.2 PRODUCTS AND MATERIALS

Prohibited materials
General: Do not provide the following:

- Materials, exceeding the limits of those listed, in the Safe Work Australia *Hazardous Chemical Information System* (HCIS) Workplace exposure standards.
- Blowing agents:
  - Materials that use chlorofluorocarbon (CFC) or hydrochlorofluorocarbon (HCFC) in the manufacturing process.
  - A blowing agent with a global warming potential (GWP) ≥ 700.

1.3 PROPRIETARY ITEMS

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

Proprietary items/systems/assemblies: Deliver, handle, store, assemble, install or fix to substrate to the manufacturer's or supplier's recommendations.

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

1.4 SUBSTITUTIONS

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

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

Non-approved alternatives
Removal: If an alternative material, product or method has been installed/used without the principal's approval and replacement is required, cover all the costs associated with the removal, replacement and rectification of damage resulting from the substitution.

1.5 TIMBER

Timber source certification
Requirement: Use timber products originating from sustainably managed forests to the

recommendations of the Forest Products Commission's *Wood Encouragement Policy for Western Australia*.

Certification: Forest management and chain of custody to any of the following:

- Responsible Wood (Australian Forestry Standard (AFS)).
- FSC (Forestry Stewardship Council).

Engineered timber product certification and identification

Certification: To EWPAA Product Certification Scheme for the following:

- Plywood.
- Preservative-treated timber and engineered wood products.
- Solid structural timber.
- Wet process fibreboard, dry process fibreboard and particleboard.
- Wood-plastic composite products.

Branding: Brand timber products under the authority of a certification scheme applicable to the product. Locate the brand on faces or edges that will be concealed in the works.

Moisture content

Protection: Protect timber and timber products stored on site from moisture and weather. For milled, prefinished, prefabricated and similar elements that are to be protected in the final structure, provide temporary weather protection until the permanent covering is in place.

Unseasoned timber

General: If unseasoned timber is provided, or variation in moisture content is likely, make allowance for shrinkage, swelling and differential movement.

Recycled timber

Grit blasted or re-machined: Remove all nails and screws.

Classification: Visually graded.

Durability

General: Provide timbers with natural durability appropriate to the conditions of use, or preservative-treated timber of equivalent durability.

Natural durability class of heartwood: To AS 5604 (2022).

Preservative treatment: To the AS/NZS 1604 series.

Termite resistance: Provide timbers that are naturally termite-resistant or preservative treated, or protect using physical barriers or coatings, as appropriate.

Minimum requirement: To the **Natural and treated timber durability table**.

Natural and treated timber durability table

Exposure	Natural durability class to AS 5604 (2022)	Preservative-treated hazard class to the AS/NZS 1604 series
Inside, above ground:		H1
Completely protected from the weather, well ventilated, and protected from termites		
Inside, above ground: Protected from wetting with nil leaching		H2
Outside, above ground: Subject to periodic moderate wetting	Class 2	H3
In-ground	Class 1	H4 (Severe wetting and leaching)
		H5 (Extreme wetting and leaching and/or critical uses)

1.6 CORROSION RESISTANCE

General

Atmospheric corrosivity category: To AS 4312 (2019) and as documented.

Requirement: Conform to the following:

- Built-in products below damp-proof course: Stainless steel Type 316 or engineered polymer.
- Steel lintels: To the ABCB Housing Provisions (2022) Table 5.6.7b.
- Structural steel (other than lintels): To the ABCB Housing Provisions (2022) Tables 6.3.9a, 6.3.9b and 6.3.9c.
- Steel cladding, lining, trims and flashings: To the ABCB Housing Provisions (2022) Table 7.2.2a.

Galvanizing

Requirement: Galvanize mild steel components (including fasteners) to AS/NZS 1214 (2016), AS 1397 (2021) or AS/NZS 4680 (2006) as appropriate, if:

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

1.7 FASTENERS

General

Fasteners in CCA treated timber: Epoxy coated or stainless steel.

Self-drilling screws

Standard: To AS 3566.1 (2002).

2 CONCRETE

2.1 REQUIREMENTS

Performance
Requirement: Provide cast concrete as follows:
- Conforming to the performance criteria.
- Satisfying quality requirements.
- Compatible with finishes.

Design
Structural design: To AS 2870 (2011) and AS 3600 (2018).

2.2 STANDARDS

General
Formwork design and construction: To AS 3610.1 (2018) and AS 3610.2 (Int) (2023).

Plywood formwork: To AS 6669 (2016).

Reinforced concrete construction: To AS 3600 (2018).

Specification and supply of concrete: To AS 1379 (2007).

Residential ground slabs and footings: To AS 2870 (2011).

2.3 INTERPRETATION

Definitions
General: The following definitions apply:
- Ambient temperature: The air temperature at the time of mixing and placing of concrete.
- Average ambient temperature: Average value of the daily maximum and minimum ambient temperatures over the defined period at a site.
- Weather – cold: Ambient shade temperature less than 10°C.
- Weather – hot: Ambient shade temperature greater than 30°C.

2.4 TOLERANCES

Position
Requirement: To AS 3600 (2018) clause 17.5.

Formed surfaces
Form face deflections: To AS 3610.1 (2018) Table 3.3.4.1.

Straight elements: To AS 3610.1 (2018) Table 3.3.5.1.

Unformed surfaces
Flatness: To the **Flatness tolerance class table**, using a straightedge placed anywhere on the surface in any direction, for the documented class of finish.

Flatness tolerance class table

Class	Measurement	Maximum deviation (mm)
A	2 m straightedge	4
B	3 m straightedge	6
C	600 mm straightedge	6

2.5 SUBMISSIONS

Certification
Conformance: Submit independent certification by a professional engineer verifying conformance of both the design and the completed works to the project criteria.

2.6 MATERIALS

Polymeric film underlay
Vapour barriers and damp-proofing membranes: To AS 2870 (2011) clause 5.3.3.

Minimum thickness: 0.2 mm.

Reinforcement
Standard: To AS/NZS 4671 (2019).

Surface condition: Free of loose mill scale, rust, oil, grease, mud or other material which may reduce the bond between the reinforcement and concrete.

Corrosion: Protect from corrosion in conformance with AS 3600 (2018) clause 17.2.1.2.

Cement
Standard: To AS 3972 (2010).

Age: Less than 6 months old.

Pre-mixed concrete supply
Standard: To AS 1379 (2007) by the batch production process.

Maximum slump: 100 mm.

Curing compounds
Liquid membrane-forming compounds: To AS 3799 (1998).

Fixings and embedded items
Compatibility: Provide inserts, fixings and embedded items that are compatible with each other, with the reinforcement and with the required concrete finish.

Corrosion: In external or exposed locations, galvanize anchor bolts and embedded fixings, as follows:
- All threaded products: To AS/NZS 1214 (2016).
- All non-threaded products: To AS/NZS 4680 (2006).

2.7 POLYMERIC FILM UNDERLAY

Location
Vapour barrier: Under slabs on ground, including integral ground beams and footings.

Damp-proofing membrane: Areas prone to rising damp or salt attack.

2.8 REINFORCEMENT

Supports
Concrete, metal or plastic supports: Provide as follows:
- Able to withstand construction and traffic loads.
- With a protective coating if they are ferrous metal, located within the concrete cover zone, or are used with galvanized or zinc-coated reinforcement.

Spacing:
- Bars: ≤ 60 diameters.

- Mesh: ≤ 600 mm.

Supports over membranes: Prevent damage to waterproofing membranes or vapour barriers. If appropriate, place a metal or plastic plate under each support.

Projecting reinforcement
Protection: If starter or other bars extend beyond reinforcement mats or cages, through formwork or from cast concrete, provide a plastic protective cap to each bar until it is cast into later work.

Bending
Restriction: Use only bars with bends as documented.

Site bending: If required to bend or straighten bars on site, conform to AS 3600 (2018) clause 17.2.3.2. Do not use heat, and only use methods that will not damage the steel and its structural properties.

Tying
Requirement: Secure the reinforcement against displacement at intersections with wire ties or clips. Bend the ends of wire ties to prevent the ties projecting into the concrete cover.

Bar lapping
Requirement: Minimum lap as follows:

- Square and rectangular mesh: Overlap the two outermost transverse wires of one sheet with the two outermost transverse wires of the other sheet.
- Trench mesh: 500 mm.
- Bars:
  . Bar diameter ≤ 12 mm: 500 mm.
  . 12 mm < Bar diameter ≤ 16 mm: 700 mm.
- Strip footing intersections and corners:
  . Trench mesh: Full width across the intersection.
  . Bars: Typically full width across the intersection. At corners ('L' intersections), bend and continue the outer bar 500 mm minimum around the corner.

2.9 CONCRETE

Placing
Methods: Avoid segregation and loss of concrete, and minimise plastic settlement. Maintain a nominally vertical and plastic concrete edge during placement.

Horizontal elements: Place concrete in layers not more than 300 mm thick. Compact the following layer into previous layer before previous layer has taken initial set.

Vertical elements: Limit the free fall of concrete to maximum of 2 m.

Reinforcement: Maintain the documented concrete cover to reinforcement.

Compaction
Methods: Use immersion and screed vibrators accompanied by hand methods as appropriate to remove entrapped air and to fully compact the mix.

Vibrators: Do not allow vibrators to contact set concrete, reinforcement or items embedded in concrete including pipes and conduits. Do not use vibrators to move concrete along the formwork. Avoid causing segregation by over-vibration.

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

Placing in cold weather
Temperature limits: Maintain the following:

- Freshly mixed concrete: ≥ 5°C.
- Forms and reinforcement before and during placing: ≥ 5°C.
- Water: Maximum 60°C when placed in the mixer.

Placing in hot weather
Temperature control: Make sure the temperature of the concrete mix does not exceed 35°C.

2.10 JOINTS

Construction joints
Location: Do not relocate or eliminate construction joints, or form undocumented construction joints. If emergency construction joints are made necessary by unforeseen interruptions to the concrete pour, prepare a report on the action taken.

Joint preparation: Scabble hardened concrete joint surface to a minimum 3 mm amplitude. Do not damage projecting reinforcing steel. Remove loose or soft material, foreign matter and laitance. Dampen the surface just before placing the fresh concrete and coat with a neat cement slurry.

Slip joints
Requirement: If concrete slabs are supported on masonry, provide proprietary slip joints.

Slab-on-grade control joints
General: Provide control joints, as documented.

Tooled and sawn joints: Form joints within the concrete surface with either a grooving tool or a mechanical circular saw.

Timing: Form joints as early as possible after placement of concrete. Make sure the concrete has hardened sufficiently to prevent dislodging aggregate.

Joint width: 3 to 5 mm wide.

Joint depth: A minimum of (0.25 - 0.33) x depth of the concrete.

2.11 FORMED SURFACES

General
Formed surface finish quality: To AS 3610.1 (2018) Table 3.3.3.1 and the following:

- Visible: Class 3.
- Not visible: Class 5.

Damage: Do not strip formwork prematurely if damage to the concrete may be caused.

Surface repairs
Method: If surface repairs are required, submit proposals.

2.12 UNFORMED SURFACES

Surface repairs
Method: If surface repairs are required, submit proposals.

2.13 CURING

General

Requirements: Take into account the average ambient temperature at site over the relevant period affecting the curing and adopt procedures to make sure of the following:

- Curing: Cure continuously from completion of finishing, when the concrete has set sufficiently not to be damaged by the curing process.
- Minimum curing period: Total cumulative number of days or fractions of days, during which the air temperature in contact with the concrete is above 10°C, conforms to AS 3600 (2018) clause 17.1.5 and the following:
  - . Fully enclosed internal surfaces: 3 days.
  - . Other concrete surfaces: 7 days.
- End of curing period: Prevent rapid drying out at the end of the curing period.

Curing compounds

Liquid membrane-forming compounds: Provide a uniform continuous flexible coating without visible breaks or pinholes, which remains unbroken for at least the required curing period after application.

Substrates: Do not use wax-based or chlorinated rubber-based curing compounds on surfaces forming substrates to applied finishes, concrete toppings and cement-based render.

Water curing

Method: Select a method of ponding or continuous sprinkling that does not damage the concrete surface during the required curing period.

Cold weather curing

Temperature: Maintain concrete surface temperature above 5°C for the duration of the curing period.

Hot weather curing

Requirement: If the concrete temperature exceeds 25°C, or the ambient shade temperature exceeds 30°C, protect from drying winds and sun by using an evaporative retarder until curing has commenced.

2.14 COMPLETION

Compliance

Tolerances: Check element compliance with AS 3610.1 (2018) Section 3.

3 PRECAST CONCRETE

3.1 REQUIREMENTS

Performance

Requirement: Provide precast concrete as follows:

- Designed and certified by a professional engineer.
- Designed for handling, transport and erection.
- Undamaged by handling and installation.
- Certified by a professional engineer after erection.

Design

Structural design: To AS 3600 (2018) and BCA (2022) B1D2.

3.2 STANDARDS

General

Precast elements: Conform to AS 3600 (2018) and NP PCH (2009) (Precast concrete handbook).

Materials, components and equipment for manufacture: To AS 3850.1 (2024).

Planning, design, construction, casting, transportation, erection and installation: To AS 3850.2 (2024).

Precast flooring systems: To AS 3600 (2018).

Installation and testing of post-installed and cast-in fastenings: To AS 5216 (2021).

3.3 INTERPRETATION

Definitions

General: The definitions given in AS 3850.1 (2024) and the following apply:

- Precast concrete: Concrete building elements, cast in moulds and cured away from the final structural position, and then transported, lifted and fixed into position.

3.4 TOLERANCES

General

Reinforcement and tendon position: To AS 3600 (2018) clause 17.5.3.

Manufacturing, installation, fixings and embedded items tolerance for precast elements: To AS 3610.1 (2018) Table 3.3.6.2 and AS 3850.2 (2024) clause 2.11.

Formed surfaces finish quality: To AS 3610.1 (2018) Table 3.3.3.1.

3.5 SUBMISSIONS

Certification

Conformance: Submit independent certification by a professional engineer verifying conformance of both the design and the completed works to the project criteria.

Manufacture: Submit certification from the precast manufacturer of conformance to the documented design.

3.6 CONCRETE

General

Standard: To AS 3600 (2018) and AS 1379 (2007).

Concrete cover: To AS 3600 (2018) clause 4.10.

Aggregates

Standard: To AS 2758.1 (2014).

Cement

Standard: To AS 3972 (2010).

Age: Less than 6 months old.

Supplementary cementitious materials:

- Fly ash: To AS/NZS 3582.1 (2016).
- Slag: To AS 3582.2 (2016).
- Amorphous silica: To AS/NZS 3582.3 (2016).
- Manufactured pozzolans: To AS 3582.4 (2022).

Water

Standard: To AS 1379 (2007) clause 2.4.

Requirement: Clean, free from oil, acid, alkali, organic or vegetable matter and not more than 500 mg/L of chloride ions.

Chemical admixtures

Standard: To AS 1478.1 (2000), used to manufacturer's recommendations and free from chlorides, and other substances detrimental to concrete or reinforcing steel.

Concrete colour

Standard: To AS 3610.1 (2018).

Pigments (oxides): As follows:

- Chemically inert.
- Alkaline resistant.
- Insoluble.
- Light-fast.

3.7 REINFORCEMENT

Steel reinforcement

Standard: To AS/NZS 4671 (2019).

Fabrication tolerances: To AS 3600 (2018) clause 17.2.2.

Surface condition: Provide surfaces conforming to the following:

- Free of loose or flaking mill scale and rust.
- Clean from oil, grease, mud or other material that would reduce the bond between the reinforcement and concrete.

Corrosion protection: To AS 3600 (2018) clause 17.2.1.2.

Prestressing steel

Standard: To AS 4672.1 (2007).

Strand type: 7 wire, stress relieved, high tensile steel.

Quality: Make sure strands are not galvanized, have no nicks, pitting, indents, damage or foreign matter such as mud and dirt. Inspect at delivery and store the prestressing steel on supports clear of the ground.

Construction requirements: To AS 3600 (2018) Section 17.

Welding: Do not weld prestressing strands.

Tie wire

General: Annealed steel 1.25 mm diameter (minimum).

External and corrosive applications: Galvanized.

Supports

Standard: To AS/NZS 2425 (2015).

Tests

Prestressing steel: To AS/NZS 4672.2 (2007).

3.8 CAST-IN ITEMS

Lifting, bracing and fixing inserts

Requirement: Conform to the following:

- Fixing inserts: To AS 3850.1 (2024) clause 2.5.
- Lifting and bracing inserts: To AS 3850.1 (2024) clause 2.5 and AS 3850.2 (2024).

Compatibility: Provide cast-in items that are compatible with each other, the reinforcement and the documented concrete finish.

Corrosion protection: In external or exposed locations, provide hot-dipped galvanized anchor bolts and embedded fixings, as follows:

- Minimum coating mass of 600 g/m^2.
- Threaded products: To AS/NZS 1214 (2016).
- Non-threaded products: To AS/NZS 4680 (2006).

Ferrules: Provide ferrules anchored behind the reinforcing, as documented.

Dowel bars: Provide dowel bars loose, cast in or screwed into a ferrule or coupler and projecting from the precast element. Alternatively, where dowels are cast into and project from in situ concrete, provide a mating sleeve with grout tube.

Grout tube: Provide grout tubes as documented, cast into either in situ concrete or the precast element into which a dowel bar will be grouted.

Cast-in plates and bolts: Provide purpose-made steel brackets with bars, bolts or studs welded to them, as documented. If proprietary inserts are welded, conform to manufacturer's written permission.

Welding of connections: To AS/NZS 1554.1 (2014).

Restraint brackets: Provide all restraint brackets for the precast elements, as documented or as required.

Lifting and bracing inserts: Conform to the following:

- Cast in.
- Provide proprietary lifting devices with published load data designed specifically for lifting concrete elements.
- Provide bracing inserts or strongbacks designed by a professional engineer.
- Do not use deformed bars or stressing tendons as lifting loops.
- Do not place lifting attachments, holes and other temporary fixings for handling purposes on faces visible upon completion.
- Clearly mark all lifting points and the positions for temporary bearing for storage and transport.

Sealing: Recess lifting attachments such as bracing ferrules, or other types of cast-in fixings, and provide plugs for sealing

Tests

Lift, bracing and fixing inserts: To AS 3850.1 (2024) Appendix A.

3.9 MISCELLANEOUS

Curing compounds and release agents

Liquid membrane-forming compounds: To AS 3799 (1998).

Release agent: Compatible with the curing compound.

Bearing pads

Selections and testing: To AS 5100.4 (2017).

Levelling pads and shims

Requirements: To AS 3850.1 (2024) clause 2.8.

Flashings

Standard: To AS/NZS 2904 (1995).

3.10 INSTALLATION

Proprietary precast elements
Requirement: Install to the manufacturer's recommendations.

Lifting and handling
Requirement: To AS 3850.2 (2024).

Precautions: Use handling methods that do not overstress, warp or damage the elements.

Lifting: Only lift or support members at specified points. Do not use the fixing devices for lifting or hoisting unless they have also been designed for this purpose and confirmed as such by a professional engineer.

Proprietary systems: Use in conformance with manufacturer's specifications and recommendations.

Temporary bracing and propping: To AS 3850.2 (2024) Section 5.

Flooring systems
Shear keys: Grout with mix proportion (sand:cement) 3:1.

Preparation: Immediately before in situ topping, wet surface of plank without pooling.

Waterproofing: Provide waterproofing to exposed precast floors.

Topping minimum grade: N32 to AS 1379 (2007).

3.11 COMPLETION

Conformance
Tolerances: To AS 3850.2 (2024) Table 2.11(D).

4 LIGHT STEEL FRAMING

4.1 STANDARDS

General
Design, materials and protection: To AS/NZS 4600 (2018).

Residential and low-rise steel framing: To NASH-1 (2005) (National Association of Steel Housing) and NASH-2 (2014) Standard.

4.2 TOLERANCES

General
Manufacturing, assembly and installation tolerances: To NASH-1 (2005) Appendix D and NASH-2 (2014) Appendix A.

4.3 COMPONENTS

Damp-proof course
Membrane: To the membrane requirements of AS 2870 (2011) or AS/NZS 2904 (1995).

Cold-formed steel framing
General: Cold-formed sections from steel, metallic-coated to AS 1397 (2021).

Corrosion protection: To NASH-2 (2014) Section 8.

Framing members
Cold-formed steel framing for proprietary systems: To NASH-1 (2005) or NASH-2 (2014).

4.4 INSTALLATION

Frame fabrication
Length: Cut members accurately to length so that they fit firmly against abutting members.

Service holes: If not pre-punched, form holes by drilling or punching, conforming to the requirements of NASH-2 (2014).

Swarf: Immediately remove swarf and other debris from cold-formed steel framing.

Connections
Prefabricated framing: Fix framing elements to the fabricator's requirements.

Framing built in situ: Fix framing elements, as documented.

Fasteners: Compatible with steel frame to prevent galvanic corrosion of dissimilar metals.

Welding
Burning: Avoid procedures that result in greater than localised burning of the sheets or framing members.

Prefabricated frames
General: Protect frames from damage or distortion during erection.

Unseasoned or CCA treated timber
General: Do not fix in contact with framing without fully painting the timber and/or the steel.

Earthing
Requirement: To AS/NZS 3000 (2018). Provide temporary earthing during erection until the permanent earthing is installed.

Protection
General: Restore coatings that have been damaged by welding or other causes. Thoroughly clean affected areas back to base metal and coat with a zinc rich organic primer.

Metal separation: Install lagging to separate non-ferrous service pipes and accessories from the framing.

Grommets: Provide grommets to isolate piping and wiring from cold-formed steel framing.

Site cut holes: Provide plastic bushes or grommets to site cut holes.

Cyclone debris screens
Noggings: Provide as required to support screen fixings.

Roof battens: Provide as required to support screens under verandahs and eaves when in the fully open position.

4.5 FLOOR FRAMING

Decks and balconies
Attachment to external walls: To BCA (2022) H1D11.

4.6 WALL FRAMING

Additional support
Grabrails: Provide additional support by fixing 18 mm plywood sheets, flush with the face of studs, to noggings at 450 mm centres.

Damp-proof course
Requirement: Provide damp-proof courses under the bottom plate of stud walls built off slabs or masonry dwarf walls as follows:

- External walls (not masonry veneer): Turn up a minimum of 75 mm on the inside and tack to stud. Project 10 mm beyond the external slab edge or dwarf wall and turn down at 45°.
- Walls of bathrooms, shower rooms and laundries: Turn up a minimum of 150 mm on the wet side and tack to studs.

Installation: Lay in long lengths. Lap full width at angles and intersections and at least 150 mm at joints.

Junctions: Preserve continuity of damp-proofing at junctions of sarking, damp-proof courses and waterproof membranes.

Flashings
Location: Provide flashings to external openings sufficient to prevent the entry of moisture. Form trays at the ends of sill flashings.

Masonry veneer construction: Extend across cavities and build into brickwork.

4.7 ROOF AND CEILING FRAMING

Additional support
Requirement: Provide additional frame members at the following locations:

- Hanging light fittings.
- Ceiling fans.
- Access panels.
- Any other hanging services or fixtures and fittings.

Water tank or heater in roof space: Provide a support platform to AS/NZS 3500.4 (2021) clause 5.5.1.

Battens
Requirement: Supply and fix battens suitable for span, spacing and proposed roofing material.

Anti-ponding boards
Standard: To AS 4200.2 (2017).

4.8 TRUSSES

Fabrication
Assembly: Factory assemble trusses.

Supports for in roof services
General: If walkways, mechanical plant or other services are to be supported within the roof space, provide support and make sure trusses have been designed to carry the loads.

Water tank and heater: If a water tank or heater is located in the roof space, provide a support platform to AS/NZS 3500.4 (2021) clause 5.5.1 and make sure trusses have been designed to carry the loads.

Marking
General: Permanently mark each truss to show:

- Project identification.
- Manufacturer.
- Tag or number.
- Location.
- Support points.

Installation
Support: Support and fix trusses to the truss fabricator's recommendations.

Vertical movement: Over internal walls not providing support to trusses, provide at least 10 mm vertical clearance and use wall bracing methods that allow for vertical movements, to the truss fabricator's recommendations.

4.9 ROOF TRIM

Fascia, valley and barge boards
Requirement: Fix fascia, valley gutter boards and barge boards in conformance with the manufacturer's recommendations.

4.10 COMPLETION

Cleaning
General: On completion of framing remove debris from any gaps between members and make sure void between bottom chord of roof trusses and top of any non-supporting internal wall is clear.

5 WATERPROOFING - EXTERNAL AND TANKING

5.1 STANDARDS

External waterproofing
Membrane materials: To AS 4654.1 (2012).

Membrane design and installation: To AS 4654.2 (2012).

6 ROOFING

6.1 COMPONENTS

Fasteners
Requirement: Starter clips, fixing clips and fastenings to the roofing system supplier's recommendations.

Prefinished exposed fasteners: Finish with an oven baked polymer coating to match the roofing material.

Insulation spacers
Description: Proprietary spacer system to prevent excessive compression of insulation between roof sheeting and framing.

Sealants
Requirement: 100% neutral cure non-acid based silicone rubber to match roofing.

6.2 MATERIALS

Profiled sheet metal roofing
Material: Prefinished/coated steel sheeting.

Standard: To AS 1562.1 (2018).

Corrosion protection: To BCA (2022) H1D7(2).

Prepainted and organic film/metal laminate finish: To AS/NZS 2728 (2013).

Glazed roofing
Plastic sheet materials:

- Unplasticised polyvinyl chloride (PVC-U) sheet: To AS 4256.2 (2006).
- Glass fibre reinforced polyester (GRP) sheet: To AS 4256.3 (2006).
- Polycarbonate: To AS 4256.5 (2006).

6.3 ROOF PLUMBING

General
Description: Flashings, cappings, gutters, rainheads, outlets, external downpipes and accessories necessary to complete the roofing system.

Flashing and capping: Notched to match profile of roofing.

Gutters and fascias: Prefinished/coated steel sheeting.

Downpipes: Prefinished or painted zincalume.

Standards
Roof drainage: To AS/NZS 3500.3 (2021).

Metal rainwater goods: To AS/NZS 2179.1 (2014).

Flashings and cappings: To AS/NZS 2904 (1995).

Gutters
Fastening: Fix gutters with galvanized straps to rafters or fascia.

Minimum slope of eaves gutters: 1:200.

Minimum width overall of valley gutters: 400 mm.

Eaves gutter overflow measures: To BCA (2022) H2D6.

Downpipes
General: Prefabricate downpipes to the required section and shape where possible. Connect heads to gutter outlets and, if applicable, connect feet to rainwater drains.

Downpipe support: Provide supports and fixings for downpipes.

Strapping: Secure downpipes to walls with not less than two metal straps.

- Strap material and finish: Prefinished/coated steel.

6.4 PROFILED SHEET METAL ROOFING

Installation
Requirement: Provide galvanized steel cyclonic fasteners and EPDM bonded cyclonic washers to the manufacturer's recommendations for the appropriate substrate.

Standard: To AS 1562.1 (2018).

Swarf: Remove swarf and other debris as soon as it is deposited.

Accessories: Provide accessories with the same finish as roofing sheets to complete the roofing installation.

6.5 GLAZED ROOFING

Plastic sheet roofing
Standard: To AS 1562.3 (2006).

7 CLADDING

7.1 MATERIALS

Debris protection
Impact resistance: Provide cladding with improved debris resistance for cyclonic conditions, such as incorporating plywood and/or sheet metal in the walls and ceiling linings to designated rooms to strengthen them for impact, uplift and racking.

Fibre cement (FC) planks
Requirement: Proprietary single faced fibre cement building planks.

Standard: To AS/NZS 2908.2 (2000). Type A Category 3.

Plank thickness: 7.5 mm.

Joints and edges: PVC-U extrusion.

Corners: Preformed metal joining pieces.

Fibre cement (FC) sheets
Standard: To AS/NZS 2908.2 (2000).

Cladding, eaves and soffit linings: Type A Category 3.

Compressed cladding: Type A Category 5.

Sheet cladding: A proprietary system of single faced fibre cement sheets:

- Arrangement: Set out in even panels with joints coinciding with framing.
- Sheet thickness: 6 mm.
- Joints, corners and edges: PVC-U extrusion.

Eaves lining: Single faced fibre cement:

- Material and fixing: To BCA (2022) H1D7(7).
- Minimum sheet thickness: 6 mm.
- Joints: PVC-U extrusion.

Profiled sheet metal
Standard: To AS 1562.1 (2018).

7.2 COMPONENTS

Fasteners
General: Type, size, corrosion resistance class and spacing to the cladding manufacturer's recommendations.

Flashings
Standard: To AS/NZS 2904 (1995).

7.3 CONSTRUCTION GENERALLY

Fixing
Method: Fix sheeting firmly against framing to the manufacturer's recommendations.

Corner flashing
Requirement: Finish off corners with purpose-made folded flashing strips.

Metal separation
Requirement: Prevent direct contact between incompatible metals, and between green hardwood or chemically treated timber and aluminium or coated steel, by either of the following methods:

- Applying an anti-corrosion, low moisture transmission coating to contact surfaces.
- Inserting a separation layer.

Incompatible metal fixings: Do not use.

Fixing for cyclonic conditions
Requirement: Provide galvanized steel cyclonic fasteners and EPDM bonded cyclonic washers to the manufacturer's recommendations for the appropriate substrate.

7.4 PROFILED SHEET METAL

General
Accessories: Provide material with the same finish as cladding sheets.

Swarf: Remove swarf and other debris as soon as it is deposited.

Installation
Standard: To AS 1562.1 (2018).

8 WINDOWS AND GLAZED DOORS

8.1 WINDOW SIZES

General
Requirement: Use the manufacturer's standard sizes.

8.2 STANDARDS

General
Selection and installation: To AS 2047 (2014) for the following:

- Serviceability design wind pressure: To AS 2047 (2014) Table 2.1 in conformance with **B. DESIGN DEVELOPMENT**, DESIGN REQUIREMENTS, **DESIGN CRITERIA**, **Structural design actions**.
- Ultimate strength test pressure: To AS 2047 (2014) Table 2.5 in conformance with **B. DESIGN DEVELOPMENT**, DESIGN REQUIREMENTS, **DESIGN CRITERIA**, **Structural design actions**.

Glazing: To BCA (2022) H1D8.

External glazing: To BCA (2022) H6D2(1)(b)(ii).

Glazing
Glass type and thickness: To AS 1288 (2021), if no glass type or thickness is nominated.

Quality requirements for cut-to-size and processed glass: To AS/NZS 4667 (2000).

8.3 SUBMISSIONS

Products and materials
Type tests: Submit test results for the following:

- Wind-borne debris impact for windows, doors and screens to AS/NZS 1170.2 (2021) clause 2.5.8.

8.4 PRODUCTS AND MATERIALS

Safety glazing materials
Standard: To AS 2208 (2023).

Aluminium frames
Standard: To AS 2047 (2014) clause 3.1.

Powder coating: To AS 3715 (2025).

Anodising: To AS 1231 (2000):

- Thickness:
  . Internal: 15 µm.
  . External: 20 µm.

Construction: Assembled from aluminium sections, including accessories such as pile strips, fixing ties or brackets and cavity flashings, with provision for fixing documented hardware and seals.

Timber frames
Standard: To AS 2047 (2014) clause 3.2.

Hardwood: To AS 2796.1 (1999):

- Grade: Select.

Softwood: To AS 4785.1 (2002):

- Grade: Select.

Construction: Assembled from timber sections, with provision for fixing documented hardware including rebates for seals.

PVC-U frames
Standard: To AS 2047 (2014) clause 3.3.

Flashings
Standard: To AS/NZS 2904 (1995).

Window labelling and certification
Requirement: To AS 2047 (2014) Section 8.

Protection of openable windows
Fall prevention: To BCA (2022) H5D3.

Testing: To AS 5203 (2016).

8.5 COMPONENTS

Louvre window assemblies
Requirement: Louvre blades, mounted in a frame or subframe, able to withstand the ultimate limit state wind pressures for that location, without failure or permanent distortion of members, and without louvre blade flutter.

Adjustable louvres: Louvre blades, clipped into blade holders pivoted to stiles or coupling mullions, linked together in banks, with each bank operated by an operating handle incorporating a latching device or by a locking bar.

Insect screens
Requirement: Provide insect mesh screens to all operable windows that cannot be accessed without the use of a ladder.

Fixed screens: Fixed screens fitted to the window frames with a clipping device that allows removal for cleaning.

Hinged screens: Screens hinged at the top to give access to opening sash.

Retractable screens: Proprietary retractable screens, comprising aluminium frames and fibreglass mesh, fitted between guide channels incorporated in the frames, and a retraction system including tension spring, bearings, positive self-locking device and elastomeric sealing strip at sill.

Sliding screens:

- Screens that are part of the window frame, with matching aluminium head guide, sill runner, and frame stile sections.
- Hardware: Nylon slide runners and finger pull handle. Provide pile strip closers against sash if necessary to close gaps.

Aluminium framed screens:

- Aluminium extruded or folded box frame sections with mesh fixing channel, mitred, staked and screwed at corners. If necessary to adapt to window opening gear, provide an extended frame section.
- Mesh: Bead the mesh into the frame channel with a continuous resilient gasket, so that the mesh is taut and free of distortion.

Bushfire screens and seals
Protection: Protect glazed windows and doors from the ingress of embers.

Standard: To AS 3959 (2018).

Security screens
Requirement: Provide security barrier screens to sliding doors, and operable and accessible windows.

Standard: To AS 5039.1 (2023).

Screen infill material: Type 3 to AS 5039.1 (2023).

Cyclone debris screens
Location: If required for the project, provide to all windows.

Screens and fixing to frame: Powder coat finished stainless steel screw clamped 0.9 mm strand Type 304 stainless steel wire mesh screens.

8.6 HARDWARE

Requirement
General: Provide hardware of sufficient strength and quality to perform its function, appropriate to the intended conditions of use, compatible with associated hardware, and fabricated with fixed parts firmly joined.

Window restrictors
Requirement: Provide window restrictors that limit the window opening.

- Opening limit: < 110 mm and > 125 mm.

8.7 INSTALLATION

General
Requirement: Install windows and glazed doors as follows:

- Plumb, level, straight and true within building tolerances.
- Fixed or anchored to the building structure in conformance with the wind action loading requirements.
- Isolated from any building loads, including loads caused by structural deflection or shortening.
- Allow for thermal movement.

Weatherproofing
Flashings and weatherings: Install flashings, weather bars, threshold plates, drips, storm moulds, joint sealant and pointing to prevent water penetrating the building between the window frame and the building structure under the prevailing service conditions, including normal structural movement of the building.

Trim
General: Provide mouldings, architraves, reveal linings, and other internal trim using materials and finishes matching the window frames. Install to make neat and clean junctions between frames and the adjoining building surfaces.

Security screens
Installation: To AS 5039.2 (2024) by a Police Licensed security installer.

Cyclone debris screens
Mounting: Top hung, fully framed, mitred and staked to protect from side impact and insects.

- Hinge: Minimum three 70 mm fixed pin hinges for each screen.
- Hinge position: 170 to 180 mm from outer edge of screen at 500 mm centres.

Screen (surround) frame: 70 x 20 mm.

Base frame:

- Fixing: Screw fixed to the building structure, through cladding into wall framing, with 10 g tamper resistant screws at 100 mm from the corners and 300 mm centres.
- Drainage points: Minimum two 20 x 5 mm (elongated) holes to prevent water pooling.
- Wire surface clearance: Provide projection so that wire clearance from glazing is not less than the rate of instantaneous deflection measured during testing, 105 mm optimum.

Screen configuration: Align with window configuration.

- Maximum panel dimension: 1200 x 1500 mm.

Gravity self-centring hook: Provide hook to hang screen from rafter or eaves when in the fully open position.

- Hook material: 6 mm galvanized steel rod.

Screen finish:

- Mesh: Black powder coat.
- Frame: Powder coat.

Marking: Provide the manufacturer’s name in 3 mm high letters on the internal face of the frame, using one of the following methods:

- Embossing the frame.
- Adhesive, transparent acrylic, untearable polyester film label.

9 DOORS AND ACCESS PANELS

9.1 STANDARDS

General
Timber and composite doors: To AS 2688 (2017).

9.2 FRAMES

External doors
Requirement: Double rebated with weather gaskets and seals.

Aluminium frames
Construction: Assembled from aluminium sections, including accessories such as buffers, pile strips, strike plates, fixing ties or brackets and cavity flashing, with provision for fixing documented hardware and seals.

9.3 DOORS

General
Doors: Proprietary products manufactured for interior or exterior applications and for the finish required.

Flush panel doors
General: Provide flush panel doors of balanced construction.

Construction
General: To AS 2688 (2017).

Door thickness:

- General: 35 mm.
- External doors and doors over 900 mm wide: 40 mm.

Door width: Minimum 870 mm.

Edge strips: Minimum thickness 10 mm. Increase overall thickness to greater than 15 mm to accommodate the full depth of the rebate in rebated doors. Apply to the external edges of door after the facings are bonded to the door framing/core and finish flush with outside surface of the facings.

Door facing:

- Internal doors: Standard Redicote finish.
- External doors: Solid core, Duracote finish.
- Doors to wet areas (internal): Duracote finish.

Door edges: Painted, including top and bottom edges.

Security screen doorsets
Standard: To AS 5039.1 (2023).

Screen infill material: Type 3 to AS 5039.1 (2023).

Mesh type: Type 304 stainless steel mesh with minimum 0.9 mm diameter wires.

Screen construction: Provide screens conforming to the following:

- Framing: Extruded aluminium frame.
- Mesh attachment: Fix mesh to frame with screw-clamps and anti-tamper screws. Provide screw-clamps which transfers forces around the frame so that the mesh remains intact after heavy impact.
- Finish: Powder coated. Colour of screen frame to match adjoining door frame colour.

Screen arrangement: Hinged or sliding conforming to the following:

- Allow cleaning of any fixed lights from the outside.
- Allow egress from the inside.
- Held open position: Allow for mechanisms for holding in position.
- Make sure screens are compatible with door/window system and do not interfere with its operation.

Operation and latching: From the inside with a keyless one touch locking system.

Bushfire screens and seals
Protection: Protect glazed windows and doors from the ingress of embers.

Standard: To AS 3959 (2018).

9.4 SLIDING INTERNAL DOORS

Face mounted
General: Provide overhead track supports and head and jamb linings appropriate to the arrangement of the door, and removable pelmets at the head to allow access to the wheel carriages for adjustment.

Wheel carriages: Fully adjustable precision ball race type providing smooth, quiet operation.

Cavity sliding
Door assemblies: Proprietary product comprising steel and timber frame construction with rigid steel top, base and rear supporting members and incorporating the overhead door track, ball race type wheel carriages, guides, stops, split jamb linings and removable pelmet.

9.5 ANCILLARY MATERIALS

Extruded gaskets and seals
General: Provide weather seals and gaskets to all external doors.

Materials: Non-cellular (solid) elastomeric seals as follows:

- Rubber products: Neoprene, ethylene propylene diene monomer (EPDM) or silicone rubber.
- Flexible polyvinyl chloride (PVC): E type compounds, colour fastness grade B.

9.6 INSTALLATION

Security screen doorsets
Installation: To AS 5039.2 (2024) by a Police Licensed security installer.

Door type and location: Provide hinged and sliding security screen doors to the external face of entry door to each dwelling as follows:

- Hinged security screen doors: To the external face of each entry door to the dwelling, excluding store room.
- Sliding security screen: To glazed sliding doors.

9.7 FRAMES

General
Frames: Install the frames as follows:

- Plumb, level, straight and true.
- Fixed or anchored to the building structure.
- Isolated from any building loads, including loads caused by structural deflection or shortening.

Finishing
Trim: Provide mouldings, architraves, reveal linings, and other internal trim using materials and finishes matching the door frames to make neat and clean junctions between the frame and the adjoining building surfaces.

Weatherproofing
Flashings and weatherings: Install flashings, weather bars, threshold plates, drips, storm moulds, caulking and pointing to prevent water from penetrating the building between the door frame and the building structure under the prevailing service conditions, including normal structural movement of the building.

10 OVERHEAD DOORS

10.1 STANDARDS

General
Garage doors: To AS/NZS 4505 (2012).

10.2 SUBMISSIONS

Products and materials
Manufacturer's data: Submit the manufacturer's product data sheets.

Type tests: Submit test results for the following:

- Wind-borne debris impact: Verification from an Accredited Testing Laboratory of wind-borne debris impact rating.

10.3 OVERHEAD DOORS

Marking and labelling
Garage doors and other large access doors: To AS/NZS 4505 (2012) Section 8.

10.4 INSTALLATION

Frames, guides and tracks
Requirement: Install as follows:

- Plumb, level, straight, true, and within tolerances and clearances recommended by the manufacturer.
- Fixed or anchored to the building structure using mechanical fixings suitable for the substrate and the imposed loads.
- Isolated from any building loads, including loads caused by structural deflection or shortening.

11 DOOR HARDWARE

11.1 COMPONENTS

Hinges
Number of hinges: Conform to the **Hinges table**.

Minimum size: 100 x 75 x 2.5 mm.

Hinges table

Nominal door leaf size (H x W x T) (mm)	Minimum number of hinges (per door leaf)
2040 x 600 x 35	2
2040 x 720 x 40	3
2040 x 820 x 40	3
2040 x 920 x 40	3
2040 x 1020 x 40	4
2400 x 1020 x 40	4

Locksets
Standard: To AS 4145.2 (2008).

External hinged doors: Provide single cylinder with release snib deadlocks.

External sliding doors: Provide standard secure door lock.

Internal doors:

- Generally: Passage sets.
- Bathrooms, showers and toilets: Privacy sets.

Keying
Requirement: Key doors (excluding garage doors) alike and key windows alike.

Door buffers
Internal doors: Satin chrome finished.

External doors: Satin chrome finished, with 3 fixing points.

Security doors
Hinges: 3 hinges with anti-tamper or steel fixed pin hinges.

- Fixing to door frame: Welded to the frame or provide hinges concealed when the door is closed.

Keying: Locks keyed alike where multiple doors are fitted.

11.2 INSTALLATION

Mounting height
Door lockset mounting heights: 1000 mm above finished floor to centreline of spindle.

Locks
Cylinders: Fix vertically and with consistent key alignment.

Door buffers
Fixing: Screw fix door buffers to the floor or skirting, as appropriate, to prevent the door or door furniture striking the wall or other surfaces.

12 GLASS COMPONENTS

12.1 STANDARDS

General
Materials and installation: To AS 1288 (2021).

Safety glass: To AS 2208 (2023).

12.2 MIRRORS

Reflective surface
Type: Silver layer deposited on the glass or glazing plastic.

Protective coatings: Copper free coating, at least 5 µm thick, and 2 coats of mirror backing and edge sealing paint having a total dry film thickness of at least 50 µm.

Safety glass mirrors
Standard: To AS 2208 (2023).

Type: Grade A safety glass.

Solid backed annealed glass mirrors
Type: Annealed glass mirror with backing.

Backing: 9 mm waterproof plywood.

Adhesive fixing: Clean surfaces to be bonded. Apply non-acidic silicone adhesive to the manufacturer's recommendations. Secure the mirror to the substrate with double sided adhesive tape until the adhesive cures.

Edge processing: If exposed, polished pencil edge.

12.3 GLASS SHOWER SCREENS

General
Type: Proprietary system comprising either frameless Grade A safety glass, or frames of

extruded aluminium, stainless steel, or PVC-U, assembled around Grade A safety glass to form fixed panels and sliding, hinged or pivoted doors.

Glass: To AS 1288 (2021) clause 5.8 and Appendix D.

Water shedding
Requirement: Provide an assembly that sheds water to the inside without retaining it on the frame surfaces. Seal the edge of the frame to adjoining surfaces with a resilient strip.

Fixing
Proprietary shower screens: To the manufacturer's recommendations.

13 INSULATION AND PLIABLE MEMBRANES

13.1 MATERIALS

Acoustic insulation
Bulk insulation:

- Mineral fibre blankets and batts: Glass wool or rock wool bonded with thermosetting resin.
- Polyester blankets and batts: Thermally bonded polyester fibres.

Board insulation:

- Mineral fibre panels: High density glass wool or rock wool bonded with thermosetting resin.

Thermal insulation
Standard: To AS/NZS 4859.1 (2018).

Pliable building membrane
Standard: To AS 4200.1 (2017) and BCA (2022) H6D2(1)(b)(i).

13.2 INSTALLATION

Bulk insulation
General: Firmly butt together with no gaps except as follows:

- Access openings and vents: Do not obstruct.
- Light fittings: To AS/NZS 3000 (2018) clause 4.5.
- Electrical cables: To AS 3999 (2015) clause 2.6.

Thermal insulation
Standard: To AS 3999 (2015) and BCA (2022) H6D2(1)(b)(i).

Installation: Firmly butt together, with no gaps except as follows:

- Access openings and vents: Do not obstruct.
- Light fittings: To AS/NZS 3000 (2018) clause 4.5.
- Electrical cables: To AS 3999 (2015) clause 2.6.

Pliable building membrane
Standard: To AS 4200.2 (2017) and BCA (2022) H6D2(1)(b)(i).

14 LININGS

14.1 MATERIALS AND COMPONENTS

Plasterboard
Standard: To AS/NZS 2588 (2018).

Minimum thickness: Conform to the following:

- Generally: 10 mm.
- Improved impact resistance, where required by the principal: 13 mm.

Cornices: 75 mm.

Fibre cement
Standard: To AS/NZS 2908.2 (2000).

Wall and ceiling linings: Type B, Category 2.

Minimum thickness: Conform to the following:

- Wall:
  - . Generally: 9 mm.
  - . Improved impact resistance, where required by the principal: 12 mm.
- Ceiling: 6 mm.

Access panels
Internal ceilings, except garages: Provide insulated access panels.

Finish: Match the access panels to the ceiling in appearance and performance.

Minimum size: 600 x 400 mm.

14.2 CONSTRUCTION GENERALLY

Ceiling linings
General: Do not install until the timber roof structure has been fully loaded for at least 14 days.

14.3 PLASTERBOARD

Installation
Gypsum plasterboard: To AS/NZS 2589 (2017).

Plasterboard cornices
Fixing: Mitre at corners and adhesive fix with cornice cement. Pin in place at cornice edges until adhesive sets, remove pins and fill holes.

14.4 FIBRE CEMENT

Installation
Joints and layout: Run sheets perpendicular to the framing members. In flush jointed applications, stagger end joints in a brick pattern and locate them on framing members, away from the corners of large openings. Provide supports at edges and joints.

Fixing
Timber framed construction: Nail only or combined with adhesive to manufacturer's recommendations.

Steel framed construction: Screw only or combined with adhesive to manufacturer's recommendations.

Wall framing: Conform to the following:

- Do not fix to top and bottom plates or noggings.
- In tiled areas: Provide an extra row of noggings immediately above wall-to-floor flashings. Fix sheet at 150 mm centres to each stud and around the perimeter of the sheet.

Ceilings: Fix using screws and/or adhesive to ceiling furring members. Do not fix sheets directly to the bottom chords of trusses.

Wet areas: Do not use adhesive fixing alone.

15 JOINERY

15.1 JOINERY MATERIALS AND COMPONENTS

Certification
Timber based products: Label panels under the authority of a recognised certification scheme applicable to the product. Locate the brand on faces or edges that will be concealed in the works.

Joinery timber
Hardwood for trim: To AS 2796.1 (1999).

Hardwood for furniture: To AS 2796.3 (1999).

Seasoned cypress pine: To AS 1810 (1995).

Softwood for trim: To AS 4785.1 (2002).

Softwood for furniture: To AS 4785.3 (2002).

Finished sizes for milled timber: Not less than the documented dimension unless qualified by a term such as nominal, out of or ex, to which industry standards for finished sizes apply.

Plywood
Interior use generally: To AS/NZS 2270 (2006).

Interior use, exposed to moisture: To AS/NZS 2271 (2004).

Formaldehyde emission class to AS/NZS 2270 (2006) and AS/NZS 2271 (2004): E_1.

Wet process fibreboard (including hardboard)
Standard: To AS/NZS 1859.4 (2018).

Particleboard
Standard: To AS 1859.1 (2017).

Formaldehyde emission class to AS 1859.1 (2017): E1.

Dry process fibreboard (including medium density fibreboard)
Standard: To AS/NZS 1859.2 (2017).

Formaldehyde emission class to AS/NZS 1859.2 (2017): E1.

Decorative overlaid wood panels
Standard: To AS/NZS 1859.3 (2017).

High pressure decorative laminate (HPDL)
Standard: To AS/NZS 2924.1 (2024).

Minimum thickness: Conform to the following:

- Horizontal surfaces fixed to a continuous substrate: 1.2 mm.
- Vertical surfaces fixed to a continuous substrate: 0.8 mm.
- Post formed laminate fixed to a continuous substrate: 0.8 mm.
- Vertical surfaces fixed intermittently, including to studs: 3.0 mm.
- Edge strips: 0.4 mm.

Splashbacks
Ceramic tiles: Glazed ceramic tiles to AS 13006 (2020).

Edging
Cupboards and drawers: 2 mm ABS.

15.2 JOINERY ASSEMBLIES

General
Standard: To AS 4386 (2018).

15.3 WARDROBE, CUPBOARD AND DRAWER UNITS

Plinths, carcasses, drawer fronts, shelves and doors
Material: Select from the following:

- Overlaid high moisture resistant particleboard.
- Overlaid high moisture resistant medium density fibreboard.

Thickness: 16 mm.

Doors and frames: Provide aluminium framed, anodised, powder coated, sliding or hinged.

Door panels: Provide mirrors, paint, melamine surfaced, vinyl or stain clear.

Adjustable shelves: Support on proprietary pins in holes bored at equal 32 mm centres vertically.

Fasteners: Conceal with finish.

Drawer fronts: Rout for drawer bottoms.

Drawer backs and sides:

- Material: PVC film wrapped particleboard.
- Thickness: 12 mm.
- Installation: Mitre corners leaving outer skin of foil intact, finish with butt joints, glue to form carcass and screw to drawer front. Rout for drawer bottoms.

Drawer bottoms:

- Material: PVC film laminated hardboard.
- Thickness: 3 mm.

Drawer and door hardware
Hinge types: Concealed metal hinges with the following features:

- Nickel-plated.
- Adjustable for height, side and depth location of door.
- Integrated soft and self-closing action.
- Hold open function.

Number of hinges for each door:

- Doors ≤ 1200 mm high: Minimum 2 hinges.
- Doors > 1200 mm high: Minimum 3 hinges.

Slides: Metal runners and plastic rollers with the following features:

- 30 kg loading capacity.
- Integrated soft and self-closing action.
- Closure retention.
- White thermoset powder coating or nickel-plated.

15.4 WORKING SURFACES

Laminated benchtops
Material: High moisture resistant particleboard or medium density fibreboard.

Finish: High pressure decorative laminate.

Minimum thickness: 32 mm.

Balance underside: Extend laminate to the undersides of benchtops if subject to excessive moisture from equipment such as dishwashers.

Porcelain or stone benchtops
General: Provide benchtops within the visual range of the approved samples.

Minimum thickness: 20 mm.

15.5 TIMBER STAIRS AND BALUSTRADING

Configuration and installation
Requirement: Provide timber stairs, balustrading, nosings and mouldings (including at landings). Conform to the following:

- Stairs: To BCA (2022) H5D2.
- Barriers and handrails: To BCA (2022) H5D3.

15.6 TRIM

General
Requirement: Provide trim, such as architraves, beads, mouldings, stops and skirtings, to make neat junctions to openings and between lining components, finishes and adjacent surfaces. Provide paint finish to skirtings.

Skirting: Satin finished pre-primed high moisture resistant medium density fibreboard.

- Dimensions: Minimum 67 x 18 mm.

Proprietary items: Provide complete with installation accessories.

Fixing
Masonry walls: Screw with wall plugs at 600 mm centres maximum.

Stud walls: Nail to plate or framing at 600 mm centres maximum.

16 MISCELLANEOUS FIXTURES AND APPLIANCES

16.1 GENERAL

Waste bins
Type: Prefinished proprietary products manufactured from metals or plastics in standard sizes and colours.

16.2 APPLIANCES

Cooking appliances
Oven: Stainless steel, electric, fan-forced, under bench or wall oven, as documented.

- Dimension: Minimum 600 mm wide.

Cooktop: Minimum 4 zone electric cooktop.

Rangehoods: Fixed or retractable rangehood, flued to the outside, and with removable filters.

- GROH projects: Stainless steel 900 mm wide with dual fan.

Exhaust fans
Kitchen, bathroom and laundry: 250 mm diameter.

16.3 EXTERNAL FIXTURES

Clothes drying facilities
Single dwellings: Provide individual clothesline for each dwelling.

- Type: Height adjustable fold down wall mounted clothes hoist.

Grouped and multiple dwellings: Provide a wall or post mounted fold down framed clothesline or wall mounted extendable clothesline to private external areas.

Letterboxes
Requirement: Where Australia Post provides a postal service, provide letterboxes conforming to the requirements of Australia Post, and as follows:

- Dwellings with street frontage: One numbered and lockable letterbox each.
- Other dwellings: Banks of letterboxes.

16.4 INSTALLATION

Rangehood and exhaust fan
Requirement: Provide as follows:

- Habitable rooms: Fit with self-closing damper or filter to BCA (2022) H6D2(1)(b)(iii).
- Exhaust fans: Operated by a separate wall switch.
- Ducting to outside: Conform to the following:
  - Northern areas: Side exhaust with PVC-U cover painted to match exterior colour scheme. Ducting not permitted through roof.
  - Southern areas: Steel ducting projecting through the roof. Provide roof cowl to pipe as documented.

Installation: To the manufacturer's recommendations.

17 FIRE BLANKETS

17.1 BLANKETS

Fire blankets
General: To AS/NZS 3504 (2006).

Selection and location: To AS 2444 (2001).

17.2 INSTALLATION

Firefighting equipment
Standard: To AS 2444 (2001).

17.3 MAINTENANCE

Routine service
Fire blankets: To AS 1851 (2012) Section 11.

18 WINDOW COVERINGS

18.1 MATERIALS

Fire hazard properties
Windows coverings: Tested to AS/NZS 1530.3 (1999).

Fabrics
Uncoated woven and knitted fabrics:

- Standard: To AS 2663.1 (1997).
- Performance classification (minimum): 2.

Coated woven and knitted fabrics:

- Standard: To AS 2663.2 (1999).
- Performance classification (minimum): 2.

Holland blind fabrics: To AS 2663.3 (1999).

18.2 COVERING TYPES

Holland blinds
Requirement: Vertical blinds provided as complete proprietary systems fabricated by one manufacturer. Do not provide horizontal blinds.

18.3 INSTALLATION

General
Safety: Install child safety devices on all control cords. Install all control cords in conformance with *Competition and Consumer (Corded Internal Window Coverings) Safety Standard (2014)*.

Clearance
General: Provide 5 mm horizontal clearance at each side of blinds for recessed applications.

19 RENDERING AND PLASTERING

19.1 MATERIALS AND COMPONENTS

Gypsum plaster
General: Provide a proprietary product containing calcium sulfate hemihydrate with additives to modify setting.

Lath
General: Provide a proprietary product for use with plaster.

Internal: Expanded metal to AS 1397 (2021) coating class Z350, minimum.

External: Stainless steel or PVC-U.

Beads
General: Provide a proprietary product for use with plaster.

Internal: Metallic-coated sheet AZ 150, minimum.

External: Stainless steel or PVC-U.

Mixes
General: Select a mix proportion to suit the conditions of application**.**

Measurement: Measure binders and sand by volume using buckets or boxes. Do not allow sand to bulk by absorption of water.

Mixing: Machine mix for 3 to 6 minutes.

Strength of successive coats: Make sure successive coats are no richer in binder than the coat to which they are applied.

Mix proportion table - Gypsum finish coat

Mix type		Substrate	Upper and lower limits of proportions by volume			
			Gypsum	Cement	Lime putty	Sand
Gypsum finish coats	GPF	Cement render base coats	1 1	- -	1.5 2	- -

Water
General: Clean and free from any deleterious matter.

19.2 APPLICATION

Tolerances
General: Finish plane surfaces within a tolerance of 6 mm in 2400 mm, determined using a 2400 mm straightedge placed anywhere in any direction. Finish corners, angles, edges and curved surfaces within equivalent tolerances.

20 CEMENTITIOUS TOPPINGS

20.1 MATERIALS

Admixtures
Standard: To AS 1478.1 (2000).

Aggregates
Standard: To AS 2758.1 (2014).

Coarse aggregate: Nominal single size not more than 1/3 topping thickness.

Fine aggregate: Fine, sharp, well-graded sand with a low clay content and free from efflorescing salts. Nominal single size not more than 1/4 topping thickness for toppings less than 40 mm thick.

Bonding products
General: Proprietary products manufactured for bonding cement-based toppings to concrete substrates.

Cement
Standard: To AS 3972 (2010).

Type: GP.

Reinforcement
Standard: To AS/NZS 4671 (2019).

Mesh: SL 62.

Maximum joint spacing: 6 m internal, 4 m external.

Water
General: Clean and free from any deleterious matter.

21 WATERPROOFING - WET AREAS

21.1 STANDARDS

Waterproofing wet areas
Standard: To AS 3740 (2021).

NCC compliance: To BCA (2022) H4D2.

21.2 MEMBRANES

General
Standard: To AS/NZS 4858 (2004).

Membrane system
Requirement: Proprietary membrane system suitable for the intended internal wet area waterproofing.

21.3 ACCESSORIES

Waterstop angles
Material: Rigid, corrosion-resistant angles compatible with the waterproof membrane system.

Bond breakers
Requirement: Compatible with the extensibility class of the membrane to be used.

Material: Purpose-made bond breakers tapes or fillets of sealant.

Sealants
Requirement: Waterproof or water resistant, flexible, mould-resistant and compatible with the waterproofing system and to the manufacturer's recommendations.

21.4 PREPARATION

Substrates
General: Prepare substrates as follows:

- Clean and remove any deposit or finish that may impair adhesion of membranes.
- If walls are plastered, remove loose sand.
- If walls or floors are framed or discontinuous, make sure support members in full lengths without splicing.
- If floors are solid or continuous:
  - . Remove excessive projections.
  - . Fill voids and hollows greater than 10 mm with abrupt edges with a cement:sand mix not stronger than the substrate nor weaker than the bedding.
  - . Fill depressions less than 10 mm with a latex modified cementitious product with feathering eliminated by scabbling the edges.
  - . Fill cracks in substrates wider than 1.5 mm with a filler compatible with the membrane system.

Concrete substrates: Cure for more than 28 days.

External corners: Round or arris edges.

Moisture content
Requirement: Verify that the moisture content of the substrate is compatible with the water vapour transmission rate of the membrane system by testing to the recommendations of AS 3740 (2021) Appendix F.

Falls
Membrane applied to substrate: Make sure the fall in the substrate conforms to the fall documented for the finish.

Waterstop angles
Requirement: Provide waterstop angles at door thresholds and shower enclosures to support the waterproof membrane at junctions between waterproofed and non-waterproofed areas.

Sizing: Size the vertical leg of the waterstop angle to conform to the requirements of AS 3740 (2021).

Corners: Cut the horizontal leg and bend the vertical leg at corners instead of forming vertical joints between separate lengths of angle.

Fixing: Fix waterstop angles to the substrate with compatible sealant or adhesive and corrosion-resistant countersunk or wafer head screws.

Bond breakers
Requirement: After the priming of surfaces, provide bond breakers at wall/floor junctions and at control joints where the membrane is bonded to the substrate.

Sealant fillet bond breakers:

- Application: Form a triangular fillet or cove of sealant to internal corners within the period recommended by the membrane manufacturer after the application of the primer.
- Width: Conform to AS 3740 (2021) Table 4.10.

21.5 INSTALLATION

Ambient conditions
Requirement: Do not install in conditions outside the manufacturer's recommendations.

Protection
Damage: Protect membrane from damage during installation and for the period after installation until the membrane achieves its service characteristics that resist damage and an overlaying finish is installed.

Extent of waterproofing
Requirement: Conform to AS 3740 (2021) and BCA (2022) H4D2. Provide waterproofing, including to the following areas:

- Floors in bathrooms and other wet areas: To full extent of floor area.
- Walls in bathrooms:
  - . All tiled wall surfaces.
  - . Minimum 150 mm above finished floor level.
- Walls in shower areas: Minimum 1800 mm above finished floor level.
- Wall/floor and wall/wall junctions and joints.
- Penetrations.

Drainage connections
Floor wastes: Turn membrane down 50 mm minimum into the floor waste leak control flanges and adhere to form a waterproof connection.

Vertical membrane terminations
Upstands: Minimum 150 mm above the highest finished tile level of the floor within the shower area.

Anchoring: Secure sheet membranes along the top edge.

Edge protection: Protect edges of the membrane.

Unenclosed showers
Requirement: Extend membrane at least 1500 mm into the room from the shower rose outlet on the walls and floor.

Curing of liquid membrane systems
General: To the manufacturer's recommendations.

Curing: Allow membrane to fully cure before tiling.

Overlaying finishes on membranes
Requirement: Protect waterproof membranes with compatible water resistant surface materials that do not cause damage to the membrane.

Bonded or partially bonded membranes: If the topping or bedding mortar is to be bonded to the membrane, provide sufficient control joints in the topping or bedding mortar to reduce the movement over the membrane.

21.6 COMPLETION

Reinstatement
Extent: Repair or replace faulty or damaged work. If the work cannot be repaired satisfactorily, replace the whole area affected.

Warranties
Requirement: Cover materials and workmanship in the terms of the warranty in the form of interlocking warranties from the supplier and the applicator.

- Form: Against failure of materials and execution under normal environment and use conditions.
- Period: As offered by the supplier and the applicator.

22 CERAMIC TILING

22.1 STANDARDS

Tiling
General: Conform to the recommendations of AS 3958 (2023).

22.2 TILES

Ceramic tiles
Standard: To AS 13006 (2020).

Coves, nosings and skirtings: Provide matching stop-end, and internal and external angle tiles moulded for that purpose.

Exposed edges: Provide purpose-made border tiles with the exposed edge (whether round, square or cushion) glazed to match the tile face. If such tiles are not available, mitre tiles on external corners or use proprietary trim.

Slip resistance
Stair treads, ramps and landings: Classification to AS 4586 (2013).

22.3 MATERIALS

Adhesives
Standard: To AS ISO 13007.1 (2020).

PVA (polyvinyl acetate) based adhesives: Do not use in wet areas or externally.

Mortar materials
Cement type to AS 3972 (2010): GP.

Sand: Fine aggregate with a low clay content selected for grading, sharp and free from efflorescing salts.

22.4 ACCESSORIES

General
Requirement: Provide tile accessories that match the composition, colour and finish of the surrounding tiles, as documented.

Tile trim: Provide proprietary trim for wall tiles and floor tiles, as documented.

22.5 SETTING OUT

Falls and levels
Requirement: Grade floor tiling to even and correct falls to floor wastes and elsewhere as required. Make level junctions with walls. If falls are not required, lay level.

Fall: Conform to falls as documented and the following:

- Falls to floor wastes: 1:80 minimum.
- Continuous fall of floor plane to floor waste: 1:50 maximum.

Change of finish: Maintain finished floor level across changes of floor finish including carpet.

22.6 SEALANT JOINTS

General
Cupboards and fixtures: Seal gap between wall surface and top of cupboards of sanitary fixtures with silicone sealant. Make sure fixture is watertight before commencing wall tiling.

- Interfaces: Use a colour matched flexible filler in lieu of grout at cabinet/tile interfaces and bath/tile interfaces.

23 RESILIENT FINISHES

23.1 STANDARDS

General
Installation: To AS 1884 (2021).

23.2 MATERIALS

Vinyl planks
Type: Loose laid wood design vinyl planks.

Total thickness: Minimum 2 mm.

Wear layer thickness: Minimum 0.55 mm.

Surface treatment: PUR treatment.

Warranty: Minimum 15 years.

Slip resistance
Classification: To AS 4586 (2013).

23.3 PREPARATION

Substrates
General: To AS 1884 (2021) Section 3.

23.4 INSTALLATION

General
Requirement: Install to the manufacturer’s recommendations.

Vinyl planks
Installation: Install using pressure sensitive adhesive to the manufacturer’s recommendations. Set out planks from centre of room. Align patterns, texture and grain in one direction.

Joints
Non-welded: Butt edges together to form tight neat joints showing no visible open seams.

Chemical welding: Apply seaming compound 100 mm wide to the substrate centrally under the seam. Roll the seam until the compound is forced up into the joint. Clean off flush using a damp cloth.

23.5 COMPLETION

Reinstatement
Extent: Repair or replace faulty or damaged work. If the work cannot be repaired satisfactorily, replace the whole area affected.

Cleaning
General: Clean the finished surface. Buff and polish. Before the date for practical completion, mop and leave the finished surface clean and undamaged on completion.

24 CARPETS

24.1 MATERIALS

Carpet
Minimum grade: Residential Medium Duty under the Australian Carpet Classification Scheme.

Total VOC emission tested to ISO 10580 (2010): < 0.5 mg/m^2/h.

Slip resistance
Classification: To AS 4586 (2013).

24.2 INSTALLATION

Standard
General: To AS 2455.1 (2019) Section 3 and the manufacturer's recommendations.

Setting out
Joints in underlay: Make sure joints in underlay do not coincide with carpet joints. Do not carry underlay over carpet grippers or edge strips.

Seaming methods
Woven carpet: Machine or hand sew.

Tufted carpet: Seam with hot-melt adhesive tape.

25 PAINTING

25.1 STANDARDS

Painting
General: To the recommendations of AS/NZS 2311 (2017).

25.2 PAINTING MATERIALS

Low VOC emitting paints
VOC limits for low odour/low environmental impact paint types:

- Primers, sealers and undercoats: < 65 g/L.
- Interior wall and ceiling paint, all sheen levels: < 16 g/L.
- Varnishes and wood stains: < 75 g/L.

25.3 PREPARATION

Exposed steelwork
Requirement: Before painting, including before applying primers and sealers, clean exposed steel surfaces to the recommendations of AS 2312.1 (2014) Section 4.

25.4 APPLICATION

General
Standard: To AS/NZS 2311 (2017) Section 6.

Timing: Apply the first coat immediately after substrate preparation and before contamination of the substrate can occur. Apply subsequent coats after the manufacturer's recommended drying period has elapsed.

Exposed steelwork
Paint application: To the recommendations of AS 2312.1 (2014) Section 5 and the paint manufacturer.

Paint coating systems: To the recommendations of AS 2312.1 (2014) Section 6.

25.5 PAINT SYSTEMS

Paint system description
Generally: The paint system is referred to by its final coat.

Primers and undercoats: Provide primers and undercoats recommended by the manufacturer of the selected final coat as suitable for the substrate and the final coat.

Number of coats: Unless specified as one or two coat systems, each paint system consists of at least 3 coats.

Selection: Provide paint systems that conform to the **Paint final coat table**.

Paint systems for interior surfaces: Provide paint system conforming to AS/NZS 2311 (2017) Tables 4.2 and 5.1, the manufacturer's recommendations and the following:

- Ceilings: Two coats of white paint.
- Walls: Two coats of low-gloss latex paint.
- Wet areas: Two coats of semi-gloss (anti-mould) latex paint.

Paint final coat table

Final coat	Applicable Australian Standard
Interior	
Flat latex	AS 3730.1 (2006)
Floor varnish - moisture cured	AS 3730.27 (2006)
Floor varnish - two pack isocyanate cured	AS 3730.27 (2006)
Low gloss latex	AS 3730.3 (2006)
Semi-gloss latex	AS 3730.2 (2006)
Gloss latex	AS 3730.12 (2006)
Exterior	
Full gloss solvent-borne	AS 3730.6 (2006)
Flat latex	AS 3730.7 (2006)
Low gloss latex	AS 3730.8 (2006)
Semi-gloss latex	AS 3730.9 (2006)
Gloss latex	AS 3730.10 (2006)
Stain, lightly pigmented	AS 3730.28 (2006)
Latex stain, opaque	AS 3730.16 (2006)
Paving	
Paving paint, semi-gloss	AS 3730.29 (2006)
Paving paint, gloss	AS 3730.29 (2006)

26 MECHANICAL SERVICES

26.1 STANDARDS

General
Mechanical ventilation and air conditioning: To AS 1668.1 (2015) and the NCC cited AS 1668.2 (2012), as required by the NCC.

Refrigeration systems: To AS/NZS 5149.1 (2016), AS/NZS 5149.2 (2016), AS/NZS 5149.3 (2016) and AS/NZS 5149.4 (2016).

Heating and cooling systems: To AS/NZS 5141 (2018) and the recommendations of HB 276 (2004).

26.2 AIR CONDITIONING SYSTEMS

General

Requirement: If air conditioning systems are required, conform to the following:

- System type: Inverter.
- Air conditioning equipment: Before supply, verify that all system equipment and components will operate together to meet the equipment manufacturer's documented performance and component requirements. Install as documented to meet the documented performance.

Standards

Ducted air conditioners: To AS/NZS 3823.1.2 (2012).

Non-ducted air conditioners: To AS/NZS ISO 5151 (2023).

Concrete work

Requirement: Provide concrete plinths to suit the equipment.

Plumbing

Requirement: Provide external floor wastes and drain points to suit the equipment.

Equipment

Performance: Supply equipment as follows:

- Made by a manufacturer with a demonstrated ability to provide spare parts and service promptly to the site.
- Labelled to AS/NZS 3823.2 (2013): Minimum 5 star energy rating.

Refrigerant: Provide refrigerant listed as Safety Group A1 or A2L in AS/NZS ISO 817 (2016) and having an Ozone Depletion Potential of 0 and a maximum Global Warming Potential of 700.

Reverse cycle units: Provide refrigerant reversing valve and an effective outdoor coil defrost facility that prevents room temperature dropping more than 2 K during defrost.

Split systems: Supply indoor and outdoor condensing units designed and rated by the manufacturer to operate together.

- Capacity: Minimum 3.5 kW.

Equipment enclosures: Provide enclosures, materials and finishes that are corrosion-resistant, assembled and reinforced to prevent flexing and drumming.

External equipment enclosures: Weatherproof.

Equipment enclosure insulation: Insulate enclosures to prevent external surface condensation under all operating conditions. Fix insulation to panels with adhesive applied to at least 50% of the panel area.

Supply fan: Centrifugal with multi-speed or variable speed motor, or single speed motor with belt drive and adjustable pulley.

Condenser fans: Low speed propeller or axial.

Filter performance: Provide dry media filters with performance to one of the following:

- AS 1324.1 (2001): ≥ G4.
- AS 16890.1 (2024): ≥ Coarse 90%.
- ASHRAE 52.2 (2017): ≥ MERV 6.

Drain trays: Aluminium, stainless steel or plastic trays to collect all moisture generated inside unit.

Coils: Copper tube, aluminium plate fin type with no moisture carry over.

Wall and ceiling mounted split system units - for GROH projects

Requirement: Provide units conforming to the following:

- Refrigerant:
  - . Factory assembled, pre-piped, pre-wired and tested ready for installation on site.
  - . Providing not less than the required capacities.
  - . AS/NZS ISO 5151 (2023).
- Listed as Safety Group A1 or A2L in AS/NZS ISO 817 (2016).
- Ozone Depletion Potential: 0.
- Global Warming Potential: ≤ 700.

Cabinets: Aluminium, powder coated steel or moulded ABS plastic with metallic-coated steel or stainless steel fasteners. Insulate and vapour seal cabinet and drain trays to prevent external condensation under all operating conditions. Provide drain holes to prevent moisture accumulation within the unit.

Discharge air grilles: Plastic grilles and side panels or moulded PVC-U/fibreglass/plastic fascia with multi-directional grilles.

Coils: Copper tube, aluminium plate fin type with no moisture carry over.

Outdoor coils within 5 km of marine environment: Provide proprietary coil corrosion protection coating.

Reverse cycle units: Provide effective outdoor coil defrost facility that prevents room temperature dropping more than 2°C during defrost.

Refrigeration system: Provide compressor overload or over current relays, high pressure safety switches, discharge gas thermostat, crankcase heater and built-in thermostat.

Condenser fan: Plastic or aluminium, propeller or axial flow, dynamically balanced, with a direct drive IP55 rated electric motor.

Service access panels: Provide easily accessed panels for servicing of all electrical components, compressor, outdoor fans and condenser coil.

Electrical - for GROH projects

Power supply: Provide power supply, complete with individual circuit breakers for each unit, terminating in coiled cables adjacent to each indoor unit. Make sure there is sufficient power for testing and commissioning of equipment.

Conduits and cabling: Provide cabling in conduits or cable ducts between refrigeration and associated

equipment, including thermostats and control switches.

Supply source: All electrical equipment, wiring and fittings to be from the same manufacturer throughout the installation.

Electromagnetic compatibility: Prevent electromagnetic interference. Conform to the AS/NZS 61000 series.

Controls

General: Provide the following functions:

- Temperature control for each zone located to accurately sense zone temperature.
- Fan speed selection for multi and variable speed fans.
- Day/night zone changeover if scheduled.
- Time switch for each system with at least 6 temperature programs per day, separate programs for each day of the week, manual set point override and vacation temperature set back.

Warranties

Requirement: Cover warranties for replacement of equipment and components, including electrical items, for a period of 12 months after practical completion.

26.3 UNIT INSTALLATION

General

Requirement: Supply all necessary components, including the following:

- Means of attachment to the structure.
- Anti-vibration mounting.
- Appropriate flexible connections.
- Trim and weather sealing around openings.
- Electrical connections.
- Drainage connections.
- Field connection of refrigerant lines in split systems.

Alignment: Install units level, plumb and to manufacturer’s recommendations.

Fixing: Bolt units in place with minimum 4 anchors or suspension rods.

GROH projects

Outdoor units: Provide 50 mm hot-dip galvanized steel support frames, securely fixed to the wall.

Support

Wall mounted equipment: Fix to manufacturer's recommendations. Make sure the wall structure is able to support the mechanical equipment when operating. Strengthen walls if necessary.

Rack mounted equipment: Provide 50 mm angle hot-dip galvanized support racks supported off a plinth and braced to the wall.

Safety trays

General: If leaks or condensation from equipment could cause nuisance or damage to the building or its contents, provide a galvanized steel safety tray under the equipment.

26.4 DUCTWORK

Standards

Flexible ductwork: To AS 4254.1 (2021).

Rigid ductwork: To AS 4254.2 (2012).

Materials

Ductwork fittings: Provide fittings, including fittings between flexible duct, fabricated from sheet metal.

Insulation fire hazard properties: To AS 4254.1 (2021) and AS 4254.2 (2012).

Flexible duct

Layout: Install flexible duct as straight as possible with minimum number of bends. Maximise bend radius but not less than required by AS 4254.1 (2021).

Cutting to length: Make sure the inner core is fully extended before cutting. Cut to this length. Do not leave excess lengths of flexible duct for possible future relocation of air terminal devices.

Joints: Securely fix flexible duct to rigid spigots and sleeves using draw bands. Provide spigots with a bead.

Draw bands: Stainless steel or non-metallic with a tensile strength of ≥ 670 N.

Sealing: Seal the joint between the flexible duct and rigid duct using one of the following methods:

- Duct tape as detailed in AS 4254.1 (2021).
- Mastic sealant placed between the flexible duct core and rigid duct. Do not apply mastic sealant as a fillet.

Support: To AS 4254.1 (2021). Limit sag to less than 120 mm between supports.

Maximum length of flexible duct sections: 6 m including the length of any rigid duct or sleeves used to join lengths of flexible duct.

Substitution: If rigid duct is shown on the drawings do not substitute flexible duct.

Constriction: If flexible duct is compressed or deformed by a building element or other component, conform to the following:

- Extent of constriction: Smallest dimension perpendicular to air flow not less than 80% of the original duct diameter.
- Length of constriction: Less than 300 mm.
- Number:
  - Not more than 2 in an individual run of flexible duct.
  - Not more than 20% of all flexible duct runs with constrictions.

Cleaning

General: Clean interior of ductwork progressively during installation.

26.5 AIR GRILLES

General

Supply air: Provide supply air grilles, diffusers, registers or unducted room air conditioners to evenly distribute supply air within the space. Provide at least one air grille, diffuser, register or unducted room air conditioner in each room or space served.

Return air: Provide air grilles that return air to the air conditioning plant in an energy efficient manner.

Air grilles: Provide proprietary air grilles:

- Free from distortion, bends, surface defects and irregular joints.
- With flange corners neatly mitred, butted and buffed, with no joint gaps.
- Free from vibration or rattling in operation.
- Material: Steel or aluminium.
- Finish to exposed surfaces: Powder coated to the nominated colour.

Installation

Mounting: Provide a matching escutcheon to close gaps between the air grille and its surrounds. Provide air grilles with flanges to cover penetrations and irregularities in surrounds.

Appearance: Install square.

Fixing accessibility: Provide fastenings that allow removal of the air grille without damage to surrounds or air grille.

Gaskets: Provide foam type gaskets under air grille flanges or flanged supports.

Plenum and cushion head boxes: Provide side entry plenum or cushion head boxes to air grilles connected to flexible ductwork.

26.6 REFRIGERATION PIPEWORK

General

Copper pipe: To AS 1571 (2020).

Deemed-to-Satisfy: Split system manufacturer's standard pre-charged piping kit.

26.7 CONDENSATE DRAINS

General

Requirement: Provide trapped, at least DN 20 condensate drains to AS/NZS 3666.1 (2011) from each indoor coil and safety tray. Provide drains from each reverse cycle outdoor coil unless casing freely drains to a roof or other location where condensate will not cause damage or pond.

26.8 COMPLETION

Commissioning

Requirement: Commission mechanical services when:

- The respective systems or parts of systems are at a stage of static completion.
- The building work on which commissioning depends is complete.

Adjustments: Make the adjustments necessary to achieve the documented performance under continuous operating service conditions, including balancing, setting the controls, checking the operation of overload and safety devices, and correcting malfunctions.

Automatic controls: Test controls hardware and software for correct operation.

Sensors for automatic controls:

- Calibration: Calibrate sensors to within the documented accuracy of the sensor.
- Set points: Adjust sensors to documented values.

Safety controls: Test each safety control and facility by simulating the unsafe condition that the control is intended to protect against. Make sure that monitoring and safety measures are in place for the test to protect personnel from injury and the building and equipment from damage.

Cleaning

General: Clean filters, outdoor coils, grilles and diffusers before the date for practical completion.

Operation and maintenance instructions

Requirement: Provide written operation and maintenance instructions containing the following:

- Contractor's contact details for service calls.
- Manufacturers' operation and maintenance literature.
- Manufacturers' warranty certificates if the manufacturers' warranty period is greater than the defects liability period.
- Description of day to day operation.
- Setting of time switches.
- Schedule of recommended maintenance.

Record drawing: Provide a drawing of the system as installed.

26.9 MAINTENANCE

General

Requirement: Provide all labour and material necessary to maintain the mechanical installation including filter media, belts, refrigerants, lubricants and all items commonly referred to as consumable.

Maintenance period: The greater of 12 months from the date of completion of commissioning of the systems and the duration of the Defects Liability Period.

Corrective maintenance: Attend site and undertake corrective maintenance within 24 hours of receipt of verbal or written advice.

Preventive maintenance: Provide preventive maintenance recommended by the equipment manufacturer.

Minimum level: Carry out maintenance at no lower frequency than the intervals recommended in AIRAH DA19 (2019) for Maintenance Level A and the operation and maintenance manual.

Service records: Record maintenance undertaken in the schedules in the operation and maintenance manuals.

27 HYDRAULIC SERVICES

27.1 STANDARDS

General

Plumbing and drainage: To the AS/NZS 3500 series and the PCA (2022).

27.2 SUBMISSIONS

Records

Certificate of compliance: Within 5 working days of completing the plumbing works, including gas,

lodge a Certificate of compliance with the Department of Energy, Mines, Industry Regulation and Safety or Plumbers Licensing Board. Include all required documentation.

27.3 PRODUCTS

Authorised products
Requirement: Listed in the WaterMark Product Database, unless otherwise required by the Network Utility Operator.

Labelling
Water efficiency labelling: Provide products conforming to and labelled to the Water Efficiency Labelling Scheme (WELS) or the Waterwise Products Program.

Bushfire-prone areas
Site with Bushfire Attack Level (BAL) 12.5, 19, 29, 40 or FZ to AS 3959 (2018): If external and above ground, provide metal pipes and fittings to AS 3959 (2018).

27.4 FIXTURES

Toilet suites
Rating: Minimum 4 stars WELS rated dual flush.

Shower heads
Rating: Minimum 3 stars WELS rated.

Baths
Type: Bath with soap holder, waste outlet, bar grate and plug.

- Dwellings with 3 or more bedrooms: Minimum 1675 mm length.
- Other dwellings: Minimum 1500 mm length.

Basins
Type: White, vitreous china vanity basin with overflow.

Properties: Size, configuration and tap hole configuration, as documented.

Towel rails
Type: Chromium-plated brass or stainless steel rail, as documented.

Hanging space: Minimum 1200 mm.

Robe hooks
Type: Chromium-plated brass or stainless steel hook, as documented.

Toilet roll holders
Type: Chromium-plated brass or stainless steel single roll holder, as documented.

Soap dish
Type: Chromium-plated brass or stainless steel dish, as documented.

Laundry tub and cabinet
Standard: To AS/NZS 1229 (2002) Section 5.

Type: Provide one of the following:

- 42 L tub and prefinished steel cabinet with side entry for concealed washing machine taps.
- Tub integrated into joinery.

Material: Type 304 stainless steel.

Bowl capacity: Minimum 42 litres.

Internal tap fittings
Rating: Minimum 4 stars WELS rated.

Type: Chromium-plated lever handled mixer tap (hot and cold) with 150 mm swivel arm with aerator outlet.

Kitchen sink
Type: Sink with drainer on each side and single tap hole. Bowl type as documented.

Size: As documented.

27.5 WATER HEATERS

General
Requirement: Provide water heaters compatible with low flow fixtures and fittings.

Types
Electric water heaters: To the NCC cited AS 1056.1 (1991).

- Energy performance: To AS/NZS 4692.2 (2005).

Solar water heaters: To AS/NZS 2712 (2007).

- Star rating: ≥ 5 stars to the NCC cited AS 4552 (2005).

Heat pump water heaters: To AS/NZS 2712 (2007).

Heaters installed in Northern areas
Installations with hard water source: Provide heaters with bobbin elements to the manufacturer's recommendations.

27.6 INSTALLATION

Connections to mains
General: Excavate to locate and expose the connection points and connect to the Network Utility Operator and gas Network Operator mains. On completion, backfill and compact the excavation and reinstate surfaces and elements that have been disturbed, such as roads, pavements, kerbs, footpaths and nature strips to **E. PRELIMINARY SITE PREPARATION**, SERVICE TRENCHING.

Metering: Provide metering, valves and fittings to Network Utility Operator requirements.

Water meters
Sub-meters: Provide Water Corporation approved meters for multi-unit residential developments of three (3) or more units.

Installation: In conformance with the *Sub-meter Application Form* and *Guide to Sub-meter Options for Multi-residential Developments*. (See www.watercorporation.com.au/Developing-and-building/Subdividing/Strata-and-green-title-subdivisions/Strata-subdivisions/Metering-options-for-stratas.)

Accessories
General: Provide the accessories and fittings necessary for the proper functioning of the systems, including taps, valves, outlets, pressure and temperature control devices, strainers, gauges and pumps.

Piping
Requirement: Install piping in straight lines and to uniform grades. Arrange and support the piping so that it remains free from vibration and water hammer, while permitting thermal movement. Keep

the number of joints to a minimum. Prevent direct contact between incompatible metals.

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

Concealment: If practicable, conceal piping and fittings requiring maintenance or servicing so that they are accessible within non-habitable enclosed spaces such as roof spaces, subfloor spaces and ducts. Keep pipelines in subfloor spaces at least 150 mm above ground and make sure access can be provided throughout for inspection. Provide at least 25 mm clearance between adjacent pipelines (measured from the piping insulation where applicable).

Building penetrations: If piping or conduit penetrates building elements, provide metal or PVC-U sleeves formed from oversized pipe sections.

Cover plates: If exposed piping emerges from wall, floor or ceiling finishes, provide cover plates of non-ferrous metal, finished to match the piping, or of stainless steel.

Pipe support materials: The same as the piping, or galvanized or non-ferrous metals, with bonded PVC-U or glass fibre woven tape sleeves where needed to separate dissimilar metals.

27.7 FINISHES

General

Exposed piping: Finish exposed piping, including fittings and supports as follows:

- Internal locations such as toilet and kitchen areas: Chromium-plated copper piping to AS 1192 (2004) service condition 2, bright. Stainless steel braided hose for flexible applications.
- External locations: Paint.
- Concealed but accessible spaces including cupboards and non-habitable enclosed spaces: Unpainted and with identification marking.

Valves: Finish valves to match connected piping.

27.8 COLD AND HEATED WATER

Standards

General: To AS/NZS 3500.1 (2021) and AS/NZS 3500.4 (2021).

Copper pipe: To AS 1432 (2004) and AS 4809 (2017).

Piping

Pipe materials:

- Between water main and the building: Copper.
- Other locations: To the PCA (2022).

Pipe joints:

- Copper pipes: Silver brazed capillary joints or screwed brass unions silver brazed to pipe.
- Other materials: Proprietary crimped fittings supplied by the pipe manufacturer and crimped, using tools and methods recommended by the manufacturer.

Backflow prevention

Standard: To AS/NZS 3500.1 (2021) and the requirements of the network utility operator.

Tap positions

Requirement: Locate hot tap to the left of, or above, the cold tap.

Fittings and accessories

General: Provide the fittings required for the proper functioning of the water supply system, including taps, valves, backflow prevention devices, pressure and temperature control devices, strainers, gauges and automatic controls and alarms.

Water heaters

Location: Locate water heaters in an easily accessible area where they can be maintained or replaced without damaging adjacent structures, fixtures or finishes.

Tariff: Install so that the heating system qualifies for the tariff concession or subsidy offered by the electricity distributor.

Isolating valves: Provide isolation valves to water heaters.

Labelling for GROH projects: Engrave 'GOVERNMENT REGIONAL OFFICERS' HOUSING' in 12 mm high lettering, at the top right hand side of the rear panel.

Heated water temperature

Standard: To AS/NZS 3500.4 (2021).

Maximum temperature at ablution outlets: 50°C.

Maximum recommended temperature at kitchen sinks and laundry tubs: 60°C.

Solar and heat pump systems

General: Provide a proprietary automatic water heater comprising solar collector and storage container, with or without supplementary heating unit and including connections, controls and necessary fittings.

Standard: To AS/NZS 2712 (2007).

Solar and heat pump systems for GROH projects

Solar water heater booster switch, electrical booster element: Single phase with thermostatic and manual control, one shot booster switch as recommended by the water heater manufacturer.

- Switch location: Adjacent to the load centre. Provide flush plate permanently marked 'WATER HEATER'.

Stand pipes

Requirement: Provide two external stand pipes (one at front and one at rear) to each dwelling fixed against the building, complete with 12 mm brass hose cocks.

Hose tap connection: Provide threaded connection (not welded) to cold water service.

- Fix hose tap to wall 600 mm above the finished ground level with backflow prevention devices to AS/NZS 3500.1 (2021).

Cleaning

General: On completion, flush the pipelines using water and leave pipelines clean.

27.9 STORMWATER

Standards

General: To AS/NZS 3500.3 (2021).

Cleaning
General: During construction, use temporary covers to openings and keep the system free of debris. On completion, clean and flush the system.

Laying
Installation: Lay in straight lines between changes in direction or grade. If other pipes are adjacent, set each pipe true to line and complete each joint before laying the next pipe. If work is not continuous, cap open ends to prevent entry of foreign matter.

Downpipe connections
Termination: Select from the following:

- Termination over pit: Stop downpipe 100 mm above the ground level and discharged into grated pit. Do not connect directly into stormwater pipes.
- Turn up branch pipelines with bends to meet the downpipes, finishing horizontally 50 mm (nominal) above finished ground or pavement level.

Subsoil drains
Requirement: Provide subsoil drains to intercept groundwater seepage and prevent water build-up behind walls and under pavements. Connect subsoil drains to surface drains or to the stormwater drainage system as applicable.

Trench width: Minimum 450 mm.

Piping: Provide proprietary perforated plastic pipe.

Geotextiles: UV stabilised, permeable, polymeric, woven or non-woven textile material used in contact with soil/rock material.

Filter sock: Provide a permeable polyester sock capable of retaining particles of 0.25 mm and greater. Securely fit or join the sock at each joint.

Pits
Metal access covers and grates: To AS 3996 (2019).

Cover levels: Locate the top of covers or gratings, including frames as follows:

- In paved areas: Flush with the paving surface.
- In landscaped areas: 25 mm above finished surface.
- Gratings taking surface water runoff: Locate to receive the runoff without ponding.

27.10 WASTEWATER

Standards
General: To AS/NZS 3500.2 (2021).

Waterless composting toilets: To AS/NZS 1546.2 (2008).

On-site domestic wastewater treatment units: To AS 1546.3 (2017).

Cleaning
General: During construction, use temporary covers to openings and keep the system free of debris. On completion, clean and flush the system.

Septic tanks
Requirement: Provide septic tanks and associated fittings to AS/NZS 1546.1 (2008) and the *Code of Practice for Product Approval of Onsite Wastewater Systems (2013)*.

Effluent disposal: To AS/NZS 1547 (2012).

Tank requirements and size: 1 x 1200 mm diameter and 1 x 1500 mm diameter concrete septic tanks.

Installation of apparatus for sewage treatment: To the *Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974 (WA)*.

Compliance and approval: To the Health Department and local government authority's requirements.

Vent pipes
Requirement: Provide upstream and downstream vents to AS/NZS 3500.2 (2021).

Staying to roof: If fixings for stays penetrate the roof covering, seal the penetrations and make watertight.

Terminations: Provide vent cowls of the same material as the vent pipe.

Leach drains
Length and type: To *Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974 (WA)* and local government authority's requirements.

Installation: Construct with brickwork, concrete segments, or lightweight polypropylene modular tank system (for underground water storage).

27.11 RAINWATER STORAGE SYSTEMS

Standards
Metal tanks and rainwater goods: To AS/NZS 2179.1 (2014).

Design and installation: To the recommendations of HB 230 (2008) except if they conflict with the requirements of AS/NZS 3500.1 (2021) and AS/NZS 3500.3 (2021).

Products in contact with drinking water: Tested to AS/NZS 4020 (2018).

Rotationally moulded tanks: To AS/NZS 4766 (2020).

Coated steel tanks: Metallic-coated steel with polymer film to AS/NZS 4020 (2018) on the inside and prepainted on the outside.

Bladder tanks: Proprietary plastic bladder type constructed from reinforced polymer conforming to AS/NZS 4020 (2018), resistant to puncture and microbial attack.

Rainwater tanks
Accessories: Provide accessories needed to complete the installation and constructed from corrosion-resistant material compatible with the tank material. Include the following:

- Inlet and outlet connections.
- Floating outlet to draw water from the upper part of the tank.
- Tight fitting lids or screens with maximum 1 mm mesh at all openings.
- Flap valves at every opening to the tank.
- Calmed inlet to the tank to prevent stirring sediment.
- Overflow siphon to skim surface contaminants.
- Vermin-proof, childproof access opening.

- Easily cleanable filter before the entry to the tank with maximum 1 mm mesh size.

First flush diverter

General: Provide dry systems with a first flush diverter. Arrange to drain completely.

Sizing: Select for at least 20 L/100 m^2 rainwater catchment area.

Construction: Corrosion-resistant and compatible with the rainwater plumbing and tank.

Discharge: Discharge wastewater from the first flush diverter either:

- If permitted by the local authority, onto grassed areas away from tank and building footings.
- To the stormwater installation.

Tank installation

Requirement: Provide structural support to withstand the mass of the tank when full without deformation or excessive settling. Support connecting piping independently of the tank. Provide a 300 mm long section of reinforced flexible hose to prevent piping exerting a load on the tank. Pipe overflow to discharge away from the tank. Prevent the entry of sunlight to the interior of the tank.

Above ground tanks: Restrain the tank to prevent movement caused by wind and other loads when empty. Provide a level base with gaps not exceeding 10 mm, free of sharp projections and extending beyond the edge of the tank at all points.

Interior access: Arrange tanks so the interior is accessible for inspection and cleaning. Arrange internal features to permit effective cleaning.

Rotationally moulded tanks: Trim and compact the ground and place a level bed of sand at least 50 mm thick.

Coated steel tanks: Fully support the tank on a self-draining timber or concrete base. Prevent contact with dissimilar metals. Arrange so that no part of the tank is below ground level and so that adjacent ground surfaces fall away from the tank. Do not use sharp objects inside the tank. After drilling or cutting ferrous metal, remove swarf with a magnet. Recoat or seal new openings to restore original corrosion resistance.

Bladder tanks: Locate on a level base free from sharp objects. Install with manufacturer's supporting frame. Provide over-pressurising relief and air vent.

Cleaning: Flush the rainwater system. Wash and flush tanks to remove manufacturing and other contaminants.

27.12 GREYWATER SYSTEMS

Standards

Design and installation: To AS 1546.4 (2016).

Greywater diversion devices

WaterMark: Required.

Access: Locate to facilitate access for inspection and maintenance.

Tanks

General: Provide an appropriately sized surge tanks.

Overflow: Pipe to sewer.

Arrangement: Prevent the entry of sunlight to the interior of the tank.

Backflow prevention

Standard: To PCA (2022), AS/NZS 3500.1 (2021) and the requirements of the Network Utility Operator.

27.13 FUEL GAS

Standard

Reticulated gas systems: To AS/NZS 5601.1 (2022).

Metering

Requirement: Provide separate meters for individual dwellings, to the utility service provider's requirements.

Buried pipes

Requirement: During backfilling, lay plastic warning tape 300 mm above buried piping, for the full length of the piping.

Warning tape: Minimum 100 mm wide, with GAS PIPE UNDER marked continuously.

Commissioning

General: On completion of installation and testing, turn on isolating and control valves, and purge and charge the system.

Gas room heater and outlet - GROH projects

Heater connection: Flexible hose connection to a gas bayonet fitting. Locate gas outlet to suit reticulation and wall and ceiling vent requirements.

Convection room heater capacity: Minimum 21 MJ.

Labelling: Engrave ‘GOVERNMENT REGIONAL OFFICERS’ HOUSING’ in 12 mm high lettering, at the top right hand side of the rear panel.

Controls: Top mounted with piezo or electronic ignition.

Gas outlets: Provide as follows:

- Type: Recessed, flush fitting, wall mounted, and chromium plated bayonet outlets.
- Gas flued heater: Where required, provide a gas point inside a No. 1 valve box, in the ground, outside the building, adjacent to the heater.
- Valve: Quarter turn valve capped to the network utility operator’s requirement at the outlet for future connection.

Valve box lid: To AS/NZS 5601.1 (2022), finished flush with ground level or the top of concrete or paving.

Above ground gas points: Locate 130 mm above floor level and 100 mm (centreline) to the right of flued heater.

Recessing of gas points: Install in an electrical plaster wall box with a blank plate. Blanket off, back plate and elbow fix gas supply in the recess.

Gas lines chased into walls: Vertical and within 1 m from the floor.

Bottle LP gas

Type: Provide spring-loaded safety relief valve where bottled LP gas is documented.

Installer: WA licensing board approved plumber.

Installation: To the AS/NZS 3500 series.

Location: Locate bottles as documented or as directed by the principal. Point relief valve away from building.

Cylinder storage and handling: Conform to AS/NZS 1596 (2014).

Labour and material: Supply labour and material required to complete the gas supply system, including manual changeover gas regulator and metal hood.

28 ELECTRICAL SERVICES

28.1 STANDARDS

General

Electrical installation: To AS/NZS 3000 (2018).

Selection of cables: To AS/NZS 3008.1.1 (2017).

Communications cable systems: To AS/CA S008 (2020), AS/CA S009 (2020) and AS 11801.1 (2019).

Grid connected photovoltaic systems: To AS/NZS 4509.1 (2009), AS/NZS 4509.2 (2010), AS/NZS 4777.1 (2024) and AS/NZS 4777.2 (2020).

28.2 POWER SUPPLY

General

Connection to network supply: To the private pole or as documented, to the WAER (2023).

Power supply to be underground: 415/240 V, single-phase, 50 Hertz a.c., unless required otherwise.

Electrical services installation: Concealed.

28.3 PRODUCTS

Earth electrodes and earth conductors

Earthing system: A Multiple Earth Neutral (MEN) system conforming to AS/NZS 3000 (2018), and the requirements of the supply authority and the Australian Communications Authority (ACA).

Labelling: Main earth electrode, earth bar provided with an engraved label and red filled letter inscribed: MAIN EARTH – DO NOT DETACH.

Authorised products - fire detection and alarms

Evidence of suitability: Submit evidence of suitability for use, to NCC (2022) A5G1, for all fire protection products.

Smoke detection

Standard: To the NCC cited AS 3786 (2014).

Smoke alarms: Photoelectric smoke alarms that are mains powered with a non-removable rechargeable battery, and that have an anti-tamper device requiring a tool to remove from the ceiling. Select from the following:

- Brooks EIB3016.
- PSA LIF6000RL.

Interconnection devices: Wireless smoke alarms. Select from the following:

- Brooks EIB3016: EIB100MRF.
- PSA LIF6000RL: LIF6000WB.

Alternatives: If alternatives are proposed, conform to **F. CONSTRUCTION SPECIFICATION**, GENERAL REQUIREMENTS, **SUBSTITUTIONS**.

28.4 CEILING FANS

General

Controls: Hardwired adjustable speed control switch. Do not provide remotes.

Internal ceiling sweep fans - Northern areas

Type: White fans with 1400 mm diameter metal blades and sealed bearings.

Mounting: Flush.

Controls: Supplied by the manufacturer with variable speed, summer/winter switch and off control.

- Mounting height: 1500 mm above finished floor level.

External ceiling sweep fans - Northern areas

Type: Brown or black fans with 1400 mm diameter metal blades and sealed bearings.

Design and installation: To AS/NZS 3000 (2018) clause 1.5.14.

Mounting: Flush.

Switches and socket outlets: With an Ingress Protection (IP) Rating, to AS/NZS 3000 (2018), if installed in a location where water ingress is possible, including where exposed to cyclonic conditions.

Controls: Supplied by the manufacturer with variable speed, summer/winter switch and off control.

- Mounting height: 1500 mm above finished floor level.

28.5 INSTALLATION

Applications and compliance

General: Submit all necessary applications for electricity supply. Liaise with the electricity distributor and conform to the WAER (2023).

Consumers mains and metering

General: Provide consumers mains and automatic meter reading in conformance with the WAER (2023).

Electrical mains: Provide in underground conduits from the private pole or service pillar to meter panels.

Electrical/gas meter box: Standard metal single or combined cabinet.

Meter installation: Install to the electricity distributor’s requirements, including for meter type.

Earth electrodes and earth conductors

Multiple or distributed master metering: Where documented, install earth electrode in cable pit near switchboard and connect earth electrode to switchboard with earth conductor.

Earth cable pit: Provide concrete lid marked MAIN EARTH and install with lid flush with surrounding finished surface.

Earth electrodes: Install so they cannot be removed from ground by hand. Do not use star pickets or galvanized iron water pipe electrodes.

28.6 LOW VOLTAGE POWER SYSTEMS

Switchboards

Standard: To AS/NZS 61439.1 (2016) and AS/NZS 61439.3 (2016).

Construction: Enclosed type with a hinged lid.

Protective devices: Provide circuit breakers and residual current devices.

Enclosure material: Metallic-coated sheet steel.

Location: Verify the location conforms to AS/NZS 3000 (2018), the electricity distributor's standards and the WAER (2023) before proceeding.

Power circuit breakers: Conform to the following:

- Provide RCD/MCBs on every circuit.
- Individually protect lighting circuits and power (GPOs) circuits by combined Residual Current Device compliant with Department of Housing and Works < 40 ms trip time and Miniature Circuit Breakers (RCD/MCBs).
- Where 15 A socket outlets are required, install on a separate RCD/MCB circuit.
- Where ceiling sweep fans are required, install on a separate RCD/MCB circuit.
- Where external lighting circuits are documented, install on separate RCBO circuits.
- Label circuits with permanently marked labels.

Maximum demand and spare capacity

Maximum demand: Calculation method to AS/NZS 3000 (2018) Appendix C. Submit a copy of the calculations.

Spare capacity: Provide the following:

- > 10% spare capacity in mains and submains.
- > 25% spare capacity in final subcircuits.

Load balancing: Spread electrical load equally across circuits to prevent overloading and inadvertent circuit breaker operation.

Spare spaces: Provide switchboards with ≥ 25% spare positions for future single phase circuit breakers.

Accessories

General: Provide accessories required for a complete installation including switches, dimmers, socket outlets, and telecommunications outlets. Provide accessories of the same style and from the same manufacturer.

Mounting: Flush mount accessories to the wall (or ceiling). Provide proprietary wall boxes in masonry and support brackets or wall boxes in stud walls.

Default mounting heights from finished floor level to centre of accessory plate:

- Outlets: Minimum 300 mm.
- Switches and controls: 900 to 1100 mm and horizontally aligned with the door handle.

Wet areas: In locations containing baths, showers or other fixed water containers, conform to AS/NZS 3000 (2018).

Ceiling mounted accessories: Fix luminaires, appliances and ceiling fans heavier than 2 kg to the ceiling structure or structurally adequate bridging.

Provisions for air conditioning: If air conditioning is required, provide for a wall mounted future split system to the areas required. Allow for an external waterproofed power isolator mounted 500 mm above the condenser plinth.

Power isolators: Install on a separate circuit, with a circuit breaker mounted in the load centre or meter box to AS/NZS 3000 (2018).

Power requirements: Provide as follows:

- Bedrooms: 15 A single phase.
- Kitchen/dining: 25 A single phase.
- Lounge: 25 A single phase.

Wiring

Concealed cables and conduits: Provide conduits as necessary to allow wiring replacement without structural work or the removal of cladding, lining, plaster or cement rendering.

Sequence of work: Install conduits and cables before the installation of wall and ceiling linings, and before any external landscaping works.

Installation: Do not penetrate damp-proof courses. Run wiring in cavity tied against inner brick surface.

Conduit sizes: Provide conduits of sufficient internal diameter and arranged so that cables are not subject to undue mechanical stress during installation.

Minimum conduit diameter: 20 mm.

Conduits for future use: Provide a non-metallic drawstring having a breaking strength greater than 100 kg.

Earthing systems

Protective earthing system with a multiple earth neutral (MEN) connection: To AS/NZS 3000 (2018) Section 5.

Appliances

General: Provide final subcircuits and terminate at fixed appliances, hot water units, packaged air conditioning and other plant and equipment.

Isolation switch: Provide isolating switch adjacent to equipment.

Electric vehicle charging systems

Installation: To AS/NZS 3000 (2018) Appendix P.

Photovoltaic systems

Location, orientation and tilt of photovoltaic array: As documented.

Installation: To AS/NZS 5033 (2021).

Battery system: To AS/NZS 5139 (2019).

Photovoltaic panels in Northern areas

Roof mounted collectors: Install using cyclone mounts or frame to the manufacturer's recommendations.

Photovoltaic panel mounting frame: Galvanized steel frame and fixings able to withstand wind classification as defined in AS/NZS 4505 (2012) appropriate to the project site.

Collector panel stone guards: Provide powder coat finished galvanized steel framed welded mesh (stone guard) enclosure, to all roof mounted collector panels, to the solar heater manufacturer's recommendations. Colour to match roof finish.

28.7 LIGHTING

Luminaires

Standard: To AS/NZS 60598.1 (2017).

Luminaire type: Provide the following, as documented:

- Oyster light fittings: 32W, 350 mm diameter (nominal) LED fittings and acrylic diffuser.
- LED recessed downlights: Insulation contact (IC) rated 15W fittings spaced at maximum 1.5 m spacing.
- LED tube fittings: Twin 18W T8 LED tube, battens and clear prismatic diffuser or vandal resistant cover.

Luminaire colour rendering: Cool white.

Communal areas: Provide LED lighting as follows:

- Type: One of the following:
  - . Wall mounted.
  - . Ceiling mounted.
  - . In-ground fixed bollard.
  - . Light pole style.
- Solar powered.
- Vandal resistant with tamper proof fixings.
- Minimum IP rating: IP68.
- 360 degree lighting output.
- Warranty: Minimum 10 years.

Non-specified luminaires: Provide a bayonet cap batten holder and lamp at each lighting point location where no luminaire is documented.

Lighting control systems

General: Locate grouped dimmers and control devices for future access. Provide ventilation and acoustic treatment to suit the device characteristics.

Motion sensor controls: Provide to external light fittings at the front and rear of dwelling.

28.8 TELECOMMUNICATIONS

Services and cabling

Requirement: Conform to the Australian Government's policy document *Telecommunications in new developments policy (2024)*.

Submissions: Submit required applications for telecommunications services to the telecommunications services carrier and liaise with the carrier.

Communication carrier: Liaise with the telecommunication services carrier and conform to the standards and requirements of the carrier.

Data cabling: Conform to the requirements of the utility service provider.

Installations requiring telephony only: To AS/CA S009 (2020).

Communications cable systems for small office/home office: Category 6_A, to AS/CA S009 (2020), the AS 11801 series and AS/NZS 14763.2 (2020).

Telecommunication/telephone outlets: Provide RJ45 8 modular jacks as documented.

- Location: Where the room in which the telephone outlet is to be installed does not have a roof space, provide a concealed conduit from the telephone outlet wall box to the internal wall, in an accessible location.
- Quantity: Provide minimum two telephone outlets per dwelling.
- Pinouts: T568A to AS 11801.1 (2019).

Telecommunications cables: Provide as follows:

- Type: Copper.
- Standard: To AS/CA S009 (2020) and AS 11801.4 (2019).
- Voice cabling: Multicore CAT 6 UTP cable as documented.

NBN installation: Conform to the *NBN Guideline 11 (2024)*, including the following:

- New buildings: To the *NBN Guideline 11 (2024)* Section 3.
- Location type: Open enclosures to the *NBN Guideline 11 (2024)* clause 7.2.

Television systems

General: Provide an analog and digital television distribution system to AS 1367 (2023) and conforming to the recommendations of Australian Communications and Media Authority (ACMA).

System requirements: Provide the following:

- Outlet assembly to each dwelling, including antenna, cable and television outlet.
- TV outlet and co-axial: Provide to living rooms, 500 mm above the finished floor level.
- An external TV aerial.
- MATV system: For developments with group dwellings serviced by a main electrical switchboard.

Antennas: Provide and locate antennas to receive all locally available free-to-air television stations.

Antenna system: To AS 1417 (2023).

External network: Liaise with each external communications carrier and determine the services and site access requirements for each network carrier's connection.

28.9 ELECTRONIC SECURITY AND ACCESS CONTROL

Intruder alarm system

General: Provide intruder alarm system to AS/NZS 2201.1 (2007).

Access control processors or panels

Capacity: Provide separate entry/exit control modules for each designated access point.

Users: Program the system to match the number of authorised users with unique access codes.

Door control devices

Requirement: Provide electric strikes, electric locks, drop bolts, or similar devices, as documented, to suit door construction and hardware.

Vehicle control

Vehicle access control: Provide vehicle access control system combining connection to vehicular

doors and boom gates, and interconnection to the main access control system.

Push-buttons and readers: Provide direct wall mounting for push-buttons or readers, or provide a robust mounting bollard and extension arm.

- Mounting height: 1000 mm from floor level.

Intercom

Base station: Provide intercom base station, interconnected with the individual local stations. Include speakers and microphones.

Entry station construction: Wall mounted flush stainless steel panel.

Weatherproofing: IP56.

Dial: Digital push-button type.

Schedule: Provide a weatherproof (IP56) schedule holder and card identifying individual local stations. Locate next to the base station intercom panel.

Local station: Provide wall mounted intercom local stations, interconnected with the base stations and external entry points.

Internal station type: Surface mounted, removable handset type.

Operation: Provide an audible tone device to indicate that the individual station is being called, and a press-to-talk switch so that the entry station can communicate with the internal station only when the switch is held down.

Door control: Provide integral momentary action door release switches to operate the door release or opening mechanisms at each external entry point.

28.10 FIRE DETECTION AND ALARMS

Smoke detection

General: Provide smoke detectors to BCA (2022) H3D6. Connect smoke alarms to mains power.

Smoke alarms: Install hardwired smoke alarms to BCA (2022) H3D6 and the manufacturer’s recommendations.

Marking: To the NCC cited AS 3786 (2014) clause 4.22.1.

28.11 CABLE LABELLING

Labelling

General: Provide labels including control and circuit equipment ratings, functional units, notices for operational and maintenance personnel, incoming and outgoing circuit rating, sizes and origin of supply.

Telecommunications cables: Label telecommunications cables, cross connects and outlets in conformance with the requirements of AS 11801.1 (2019).

Label colours: Black lettering on white background except as follows:

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

28.12 COMPLETION

Testing and certification

Electrical installations: Test and verify the installation to AS/NZS 3000 (2018) Section 8 using the methods outlined in AS/NZS 3017 (2022). Submit test results and certification of conformity to AS/NZS 3000 (2018).

Photovoltaic systems: Test to AS/NZS 4509.1 (2009), AS/NZS 5033 (2021) and the manufacturer's recommendations. Obtain test reports from manufacturers or suppliers verifying the performance of safety and control functions of each system.

Telecommunications cabling: Test the cable link performance to AS 11801.4 (2019) at the maximum frequency and data rate for the cable class, and the cable category. Submit a certificate showing test results and certifying compliance with AS 11801.4 (2019). Submit an ACMA Telecommunications Cabling Advice (TCA1) form.

Television and audio systems: Test the complete television and audio system to AS 1367 (2023). Submit certification of conformance of product installation to AS 1367 (2023).

G. LANDSCAPING

1 LANDSCAPE - FENCES AND BARRIERS

1.1 REQUIREMENTS

Performance
Requirements:
- Complete for their function.
- Conforming to the detail and location drawings.
- Firmly fixed in position.

1.2 TIMBER

Posts and rails
Hardwood: To AS 2082 (2007).

Softwood: To AS 2858 (2023).

Pickets and palings
Hardwood: To AS 2796.1 (1999) Section 8.

Hardwood grade to AS 2796.2 (2006): Select.

Softwood: To AS 4785.1 (2002) Section 7.

Seasoned cypress pine: To AS 1810 (1995) Section 5.

Preservative treatment
Timber type: Provide only timbers with preservative treatment to the documented hazard class.

Cut surfaces: Provide supplementary preservative treatment to all cut and damaged surfaces.

CCA or LOSP treated timber: If proposed, provide details.

1.3 STEEL

Steel tubes
Posts, rails, stays and pickets: To AS/NZS 1163 (2016).

Grade: C350L0.

Post and rail finish: Hot-dip galvanized.

Steel panels
Zinc-coated or aluminium/zinc alloy coated steel: To AS 1397 (2021).

Sheeting: Prepainted to AS/NZS 2728 (2013).

1.4 CONCRETE

General
Standard: To AS 1379 (2007).

Grade: N20 or proprietary packaged mix.

2 LANDSCAPE - SOILS

2.1 STANDARDS

Soils
Site and imported topsoil: To AS 4419 (2018).

2.2 INTERPRETATION

Definitions
General: For the purposes of this worksection, the definitions given in AS 4419 (2018) and the following apply:
- Bad ground: Ground unsuitable for the works, including fill liable to subsidence, ground containing cavities, faults or fissures, ground contaminated by harmful substances and ground that is or becomes soft, wet or unstable.
- Imported topsoil: Similar to local natural soil, suitable for the establishment and ongoing viability of the selected vegetation, free of weed propagules and of contaminants and classified by texture to AS 4419 (2018) Appendix K Table K1, as follows:
  . Fine: Clay loam, fine sandy clay loam, sandy clay loam, silty loam, loam.
  . Medium: Sandy loam, fine sandy loam.
  . Coarse: Sand, loamy sand.
- Site rock: Rocks selected for salvage.
- Site topsoil: Natural soil, excavated from the site, that contains organic matter, supports plant life, conforms generally to the fine-to-medium texture classification to AS 4419 (2018) and is free from the following:
  . Stones more than 25 mm diameter.
  . Clay lumps more than 50 mm diameter.
  . Weeds and tree roots.
  . Sticks and rubbish.
  . Material toxic to plants.
- Soil blend: A landscape soil derived from the blending of two or more of sand, natural soil material or organic materials and with a bulk density and organic matter content to meet site specific requirements.
- Top dressing: A soil that is suitable for surface application to turf and lawns.
- Topsoil: Includes landscape soil, low density soils and soils for turf and lawns.

2.3 SITE INVESTIGATION

Notice
Requirement: If the following are encountered, give notice immediately and obtain instructions before carrying out any further work in the affected area:
- Bad ground.
- Discrepancies.
- Rock.
- Springs, seepages.
- Topsoil less than 100 mm deep.

2.4 SUBMISSIONS

Certification
Compost: Submit certification as evidence of compost pH value.

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

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

Type tests: Submit test results for the following:

- Imported topsoil: To **TESTING**.

Samples
Requirement: Submit samples to **PRODUCTS**, **Samples**.

Subcontractors
General: Submit names and contact details of proposed suppliers and evidence of the following, if appropriate:

- Experience in the required type of work.
- Production capacity for material of the required type, sizes and quantity.
- Lead times for delivery of materials to the site.

Tests
Site tests: Submit test results for the following:

- Site topsoil: To **TESTING**.

2.5 INSPECTION

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

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

2.6 PRODUCTS

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

Bulk materials: At least 5 working days before bulk deliveries, provide a 1 kg sample of each type documented.

2.7 TOPSOIL

General
Properties: Conform to the following:

- Decompacted.
- Aerated.
- Free draining.
- Free of contamination from construction waste.

Deliveries: Documentation to AS 4419 (2018) clauses 6 and 7.

Additives: If using additives to ameliorate topsoil conform to the relevant criteria of AS 4419 (2018).

Compost: Well-rotted vegetative material or animal manure, free from harmful chemicals, grass and weed growth to AS 4454 (2012) and to the organic content by mass, as documented.

Source
General: If the topsoil of documented quality cannot be provided from material recovered from site, provide imported topsoil.

Mix proportion (loam:sand): 1:1.

Site topsoil
Requirement: Site topsoil, as documented.

Soil blend: If required, stripped natural soil with sand and/or organic matter and recommended ameliorant material.

Imported topsoil
Requirement: Imported topsoil to AS 4419 (2018) Tables 1, 2 and 3 and as documented.

Imported topsoil particle size table (% passing by mass)

Sieve size (mm)	Soil textures		
	Fine	Medium	Coarse
2.36	100	100	100
1.18	90 – 100	90 – 100	90 – 100
0.60	75 – 100	75 – 100	70 – 90
0.30	57 – 90	55 – 85	30 – 46
0.15	45 – 70	38 – 55	10 – 22
0.075	35 – 55	25 – 35	5 – 10
0.002		2 – 15	2 – 8

Imported topsoil nutrient level table

Nutrient	Sufficiency range (mg/kg)
Nitrate-N (NO_3)	> 25
Phosphate-P (PO_4) – P tolerant	43 to 63
Phosphate-P (PO_4) – P sensitive	< 28
Phosphate-P (PO_4) – P very sensitive	< 6
Potassium (K)	178 to 388
Sulfate-S (SO_4)	39 to 68
Calcium (Ca)	1200 to 2400
Magnesium (Mg)	134 to 289
Iron (Fe)	279 to 552
Manganese (Mn)	18 to 44
Zinc (Zn)	2.6 to 5.1
Copper (Cu)	4.5 to 6.3
Boron (B)	1.4 to 2.7

Method References
pH in H_2O (1:5), pH in $CaCl_2$ (1:5) and Electrical Conductivity (EC) by Rayment & Higginson (1992) method 4A2, 4B2, 3A1.
Soluble Nitrate-N by APHA 4500.
Extractable P by Mehlich 3 – ICP.
Exchangeable cations – Ca, Mg, K, Na by Mehlich 3 – ICP.
Extractable S by Mehlich 3 – ICP.
Extractable trace elements (Fe, Mn, Zn, Cu, B) by Mehlich 3 - ICP.

2.8 STRUCTURAL SUPPORT SOIL

General
Requirement: To AS 4419 (2018) Tables 4 and 5, and as documented.

2.9 TESTING

Topsoil tests
Sampling: To the recommendations of AS 4419 (2018) Appendix A.

Method: Test as follows:

- Landscape soils: To AS 4419 (2018) Table 1.
- Low density soils: To AS 4419 (2018) Table 2.

- Soils for turf and lawns: To AS 4419 (2018) Table 3.
- Structural support soils: To AS 4419 (2018) Table 4.

Test report
Requirement: Prepare a test report including the following:

- General:
  . Suitability of the soil for documented use.
  . Suitability for establishment and ongoing viability of the documented site vegetation.
  . Prescence of any weed propagules or contaminants.
- Site topsoil:
  . Contaminant removal.
  . Weed eradication: Species and eradication method.
  . Soil amelioration: If required, the source of ameliorant materials, rates and methods of incorporation and recommendations for use in bushland restoration areas, planting on grade and grass mixes.
- Imported topsoil:
  . Similarity to naturally occurring local soil.
  . Soil amelioration: If required, the source of ameliorant materials, rates and methods of incorporation.

2.10 PREPARATION

Vegetative spoil
Spoil suitable for bushland restoration: Spread freshly harvested native plant biomass, free of weed propagules.

Unsuitable material: Remove vegetative spoil from site. Do not burn.

Embankment stabilisation
Requirement: If necessary to prevent erosion or soil movement, stabilise embankments with matting.

Matting overlay material: Biodegradable fibre reinforced with lightweight polymer mesh, coir.

- High erosion zones: Flexible carbon black UV stabilised interwoven nylon mesh.

Matting overlay pegs: U-shape galvanized steel, at 1000 x 1000 mm intervals generally, 250 mm at overlaps.

Matting overlay installation:

- If seeding is required, sow before installing lightweight matting.
- If planting is required, plant after installing medium or heavy weight matting.
- Peg the matting into 300 x 300 mm anchor trenches at top and bottom, backfill the trenches with soil and compact.

2.11 ROCK WORK

New rock work
Erosion control: Protect the weathered faces from damage.

Site rock: Stockpile for future placement and accessibility for lifting. Dispose of other rock off site.

Imported rock: Provide rock that has been selected before delivery.

2.12 EARTH MOUNDS

Construction
Placing: Place clean fill in layers approximately 150 mm thick compacted to 85% of the dry density ratio of the surrounding soil tested to AS 1289.5.4.1 (2007). Minimise slumping and further compacting.

Edges: Construct changes in grade over a minimum width of 500 mm to smooth, gradual and rounded profiles with no distinct joint.

Existing trees: Maintain the natural ground level under the canopy.

Pipes, culverts and associated structures: Construct mounding to avoid unbalanced loading.

Drainage: Construct mounds to allow free drainage of surface water and to eliminate ponding.

2.13 PLACING SUBSOIL

Ripping
General: Rip parallel to the final contours. Do not rip if the subsoil is wet or plastic. Do not rip within the dripline of trees and shrubs to be retained.

Subsoil: Rip the subsoil to the following typical depths:

- Compacted subsoil: 300 mm.
- Heavily compacted clay subsoil: 450 mm.

Planting beds
Excavated: Excavate to reduce the subsoil level to at least 300 mm below finished design levels. Shape the subsoil to fall to subsoil drains, if required. Break up the subsoil to a further depth of 100 mm.

Unexcavated: Remove weeds, roots, rubbish and other debris. Reduce the planting bed level to 75 mm below finished design levels.

Cultivation
Requirement: As documented.

Minimum depth: 100 mm.

Services and roots: Do not disturb services or tree roots. If required, cultivate these areas by hand.

Cultivation: Cultivate manually within 300 mm of paths or structures. Remove stones exceeding 25 mm, clods of earth exceeding 50 mm and weeds, rubbish or other deleterious material brought to the surface during cultivation. Trim the surface to design levels after cultivation.

Additives
General: Apply additives after ripping or cultivation and incorporate into the upper 100 mm layer of the subsoil as documented.

Gypsum: Incorporate at the rate of 0.25 kg/m^2.

Herbicides
General: Before spreading topsoil apply a herbicide treatment.

2.14 PLACING TOPSOIL

Site topsoil preparation
Screening: By a power hydraulic screen capable of handling 100 tonne per hour, with sieves grading from 20 to 15 mm.

Additives: During the screening process add the following:

- 15% by weight coarse sand minimum particle size 0.2 mm.
- Ameliorants materials to the recommendations of the test report.
- Additives program: 8 weeks before stolonising or turfing.

Waste: Remove from site all clay lumps, balled compacted particles greater than 20 mm, stones and rubbish foreign to the normal composition of soil.

Contamination: If diesel oil, cement or other phytotoxic material has been spilt on the site topsoil, excavate the contaminated soil and dispose of the soil off-site.

Placing topsoil
Topsoil: Do not incorporate topsoil into the works until soil testing results have been approved. Remove unauthorised material from the site.

Spreading: Spread the topsoil on the prepared subsoil and grade evenly, making allowances, if appropriate, for the following:

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

Steep batters: If using a chain drag for spreading, make sure there is no danger of batter disturbance.

Finishing: Feather edges into adjoining undisturbed ground.

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

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

Topsoil depths
General: Spread topsoil to the following typical depths:

- Excavated planting areas:
  . Organic mulch: 225 mm.
- Irrigated grassed areas generally: 150 mm.
- Irrigated grassed areas, heavy use (e.g. playing fields, playgrounds and public parks): 200 mm.
- Non-irrigated grass areas: 100 mm.
- Earth mounds:
  . Mass planted surfaces: 300 mm.
  . Grassed surfaces: 100 mm.
- Top dressing: 10 mm.

Surplus topsoil
General: Spread surplus topsoil on designated areas on-site or dispose off-site.

2.15 PLACING STRUCTURAL SUPPORT SOIL

Preparation
Existing soil: Remove.

Subsoil: Break up the surface and shape to drains. Remove rock.

Construction
Spreading: Maintain a self-draining surface.

Compaction: To **E. PRELIMINARY SITE PREPARATION**, EARTHWORKS, **PLACING FILL**, **Compaction**.

Protection: Limit the size of compaction equipment or compact by hand to prevent damage.

Moisture content: Adjust the moisture content at the time of works to 12.5% of the optimum moisture content to AS 1289.5.4.1 (2007).

Contaminated structural soil: If contamination occurs after placing, excavate and dispose off-site.

Surplus structural soil: Remove.

3 LANDSCAPE - NATURAL GRASS SURFACES

3.1 SUBMISSIONS

Certification
Turf: Submit the supplier's certification as evidence that turf is free from diseases, pests and weeds at the time of delivery.

Execution details
Program: Submit a work program for the natural grass surfaces landscape works.

Maintenance program: Submit a proposed maintenance program.

Material storage on site: Submit proposal.

Products and materials
Supplier's data: Submit supplier's data including the following:

- Material source of supply.
- Evidence of experience in supply of the required material.
- Production capacity for material of the required type and quantity.
- Lead times for delivery of material to the site.

Samples
Requirement: Submit samples to **PRODUCTS**, **Samples**.

3.2 INSPECTION

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

- Clearing completed.
- Setting out completed.

- Grassing bed prepared before turfing.
- Grassing or turfing completed.

3.3 PRODUCTS

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

3.4 GRASS

Turf
Supplier: A specialist grower of cultivated turf.

Quality: Provide turf of even thickness, free from weeds, pests, disease and other foreign matter.

Turf properties: Provide turf with the following properties:

- Consisting of 25 mm deep, dense, well-rooted, vigorous grass growth in 25 mm deep topsoil.
- Drought tolerant.

Turf dimension:

- Roll width: Minimum 300 mm, in sound unbroken condition.
- Length: Minimum 1.5 m.

Stolons
Description: Well-established fibrous runners 50 to 100 mm in length, with minimum green leaf material.

Supplier: A specialist grower of cultivated turf.

3.5 FERTILISER

General
Description: Proprietary fertilisers, delivered to the site in the manufacturer's labelled and unopened bags or containers.

Labelling
General: To the applicable statutory requirements, including manufacturer or supplier, weight, fertiliser type, N:P:K ratio, recommended uses and application rates.

Label type: To withstand transit without erasure or misplacement.

3.6 ACCESSORIES

Grass reinforcement
Description: Lightweight interlocking plastic cellular paving system suitable for pedestrian and occasional vehicular traffic including emergency vehicles.

3.7 PREPARATION

Existing grass removal
Herbicide: Spray existing grass with a non-residual glyphosate herbicide in any registered formulae, at the recommended maximum rate.

Manual removal: Remove existing grass layer a minimum 2 weeks after application of herbicide.

Weed eradication
Herbicide: Conform to the following:

- Method: Eradicate weeds using environmentally acceptable methods conforming to the *Health (Pesticides) Regulations 2011 (WA)*, such as a non-residual glyphosate herbicide, at the recommended maximum application rate.
- Timing: With sufficient timing before establishment of turf and as recommended by the plant supplier.

Manual weeding: Remove weed growth throughout grassed areas.

Vegetative spoil
Disposal: Remove vegetative spoil from site. Do not burn.

Soil preparation
Subsoil: To LANDSCAPE - SOILS, **PLACING SUBSOIL**.

Site topsoil or imported topsoil: To LANDSCAPE - SOILS, **PLACING TOPSOIL**.

Levelling: Remove any debris. Level and shape the dry soil surface. Allow maximum 30 mm set-down to hard surfaces for turf and stolons.

Fertiliser
Soil improvement: Spread the fertiliser evenly over the cultivated bed a maximum 48 hours before placing grass as follows:

- Turfing and stolonising: Mix the fertiliser thoroughly into the topsoil before placing the turf or stolons.

3.8 TURFING

Preparation for turfing
Requirement: Prepare planting area for turfing as follows:

- Remove any rubbish, rubble, stones and roots.
- Rotary hoe: To a minimum depth of 150 mm. Provide runners with minimum 50 mm soil cover.
- Soil improver: Apply to manufacturer's recommendations.
- Wetting agent: Apply to manufacturer's recommendations.
- Watering: Keep moist to 100 mm deep before planting.
- Light rolling: Lightly roll to form an even, levelled surface without wheel ruts.
- Level: If turfing areas are adjacent to paving, make sure soil level is 50 mm below the top of paving.

Supply
Elapsed time: Deliver the turf and lay within 24 hours of cutting. Prevent turf from drying out between cutting and laying. If not laid within 24 hours of cutting, roll turf out on a flat surface with the grass up and water as required to maintain a healthy condition.

Fertilising
Requirement: Mix the fertiliser thoroughly into the topsoil before placing the turf with a slow release fertiliser applied to the manufacturer's recommendations.

Application
Requirement: Do not install turf on slopes steeper than 1:3.

Method: Lay the turf as follows:

- Stretcher bond pattern with the joints staggered and close butted.
- Parallel with the long sides of level areas and with contours on slopes.
- Finish flush, after tamping or rolling, with adjacent finished surfaces of ground, paving edging areas.

Laying: Close butt the end joints and space the turf strips 300 mm apart. Lay top dressing between the turf strips. Finish with an even surface.

Tamping or rolling: Lightly tamp or use a turf roller to provide to an even surface immediately after laying.

Stabilising on steep slopes: Peg the turf to prevent downslope movement. Remove the pegs when the turf is established.

Watering

General: Water immediately after laying until the topsoil is moistened to its full depth. Maintain moisture to this depth.

Initial establishment

General: Maintain turfed areas until there is a dense continuous sward of healthy grass over the whole turfed area, evenly green and of a consistent height.

Failed turf: Lift failed turf and replace with new turf.

Levels: If levels have deviated from the design levels after placing and watering, lift turf and regrade topsoil to achieve design levels.

Top dressing: Mow the established turf and remove cuttings. Lightly top dress to a depth of 10 mm. Rub the dressing into the joints and correct any unevenness in the turf surface.

3.9 STOLONISING

Preparation

General: Moisten topsoil to full depth.

Supply

Elapsed time: Deliver stolons to the site within 24 hours of harvesting and plant within 36 hours of arrival on site. Prevent stolons from drying out between harvesting and planting.

Application

General: As documented.

Method: Using a disk sprigger or row planter, mechanically sprig the stolons into the prepared soil to a minimum depth of half the stolon length, at maximum 150 mm centres in both transverse directions over the whole of the planting area and extending 1 m into adjacent grassed areas.

Stimulant: Three days after planting, spray with hormone root growth stimulant.

Erosion areas, slopes and swales: Immediately after planting, spray with binder at the rate of 250 L/ha.

Watering

General: Water thoroughly on completion of planting. Keep the topsoil moist to full depth.

Initial establishment

General: Replant areas that fail to grow.

3.10 TEMPORARY GRASSING

Preparation

General: If a prepared area becomes compacted before sowing begins, rework the ground surface before sowing.

Application

General: As documented.

Method: Evenly distribute the seed using purpose made sowing machinery. Lightly rake the surface to cover the seed.

Cover crop density: Sufficient to hold the soil and prevent erosion.

Minimum coverage: No bare areas greater than 50 mm in diameter to 90% of the documented area and no bare areas greater than 200 mm to 100% of the area.

Reseeding: Reseed areas where the seed fails to germinate within 3 weeks of the date of original sowing and within 3 months where required densities have not been met. Continue to reseed at minimum monthly intervals with an additional soil preparation as required, until required densities are met.

Watering

General: Immediately after sowing, water to a depth of 100 mm. Continue watering until germination and establishment.

After establishment: Water as required to maintain seed material in a healthy condition.

Establishment

General: Maintain temporary grassing areas until no longer required.

Weeding: Remove weeds that emerge in newly established areas.

Reseeding: Reseed over the course of the contract to maintain required densities.

3.11 GRASS REINFORCING

Installation

General: Install to the manufacturer's recommendations and as documented.

Preparation: Excavate to required levels and compact subgrade.

Base course: Place and compact either of the following:

- Non-calcareous, free-draining washed sand, comprising 80% 0.1 to 1.0 mm grading.
- 1.0 to 5.0 mm gravel aggregate.

Base course depth:

- Pedestrian walkways: 100 mm.
- Passenger vehicles: 150 mm.
- Heavy vehicles: 250 mm.

Growing media: 80:20 (sand:organic sandy soil) mix.

Grass reinforcement: Place on base course and interlock. Spread growing media over grass reinforcement to heights as follows:

- Turfed areas: 5 mm.

Protection: Prevent traffic until the root system is established and anchored to the base course.

3.12 COMPLETION

Existing grass
General: Where existing grass is within the landscape contract area, maintain it as for the corresponding species of new grass.

Grassed areas
Maintenance: Start grass maintenance works at the completion of sowing and turfing. Maintain healthy weed-free growth.

Records
Logbook: Keep on site and make available for inspection a logbook, recording the following:

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

4 LANDSCAPE - PLANTING

4.1 SUBMISSIONS

Certification
Plant species: Submit the supplier's certification as evidence that plants are true to the required species and type, and free from diseases, pests and weeds at the time of delivery.

Compost: Submit a certification as evidence of compost pH value.

Execution details
Alternative materials for ground cover: If proposed, submit proposal.

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

Spraying: Submit proposal.

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

Material storage on site: Submit proposal.

Products and materials
Supplier's data: Submit supplier's data including the following:

- Material source of supply.

Samples
Requirement: Submit samples to **PRODUCTS**, **Samples**.

4.2 INSPECTION

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

- Plant holes excavated and prepared for planting.
- Plant material set out before planting.
- Planting, staking and tying completed.
- Completion of plant establishment work.

4.3 PRODUCTS

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

Bulk materials: At least 5 working days before bulk deliveries, provide a 1 kg sample of each type documented with required test results.

4.4 SOIL CONDITIONING COMPOST

Compost
Type: Mature soil conditioning compost free from harmful chemicals, grass and weed growth.

Application rate: Apply at an application rate that accounts for the immediate fertiliser equivalence of the compost as part of the overall fertiliser management schedule.

Particle size as a soil conditioner, pH, physical and chemical contaminants: To AS 4454 (2012) Table 3.1(A).

Mature compost: To AS 4454 (2012) Appendix N Table N3.2.

Soil conditioning properties
Chlorine content: Less than 1000 mg/kg to Rayment and Lyons 2011 test method.

Compost fertiliser equivalence properties values
Requirement: Establish the following values for each type of soil conditioning compost to Rayment and Lyons 2011 test methods:

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

4.5 FERTILISER

General
Description: Proprietary fertilisers, delivered to the site in the manufacturer's labelled and unopened bags or containers, as documented.

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

Labelling
General: To the applicable statutory requirements, including manufacturer or supplier, weight, fertiliser type, N:P:K ratio, recommended uses and application rates.

4.6 MULCH

General
Type: Composted or pasteurised mulch to AS 4454 (2012). Free of deleterious and extraneous matter including soil, weeds, plastic, metal, paint, rubber and sticks. Do not include fine mulch.

Particle size: ≤ 20 mm.

Physical and chemical contaminants: To AS 4454 (2012) Table 3.1(A).

Organic mulch types

General: Free of stones.

Brush chippings and leaf litter: Vegetative material processed through a chipper as follows:

- Material permitted: Leaf matter and tree loppings from *Eucalyptus, Tristania and Pinus species*.
- Material not permitted: Leaf matter and tree loppings from privet, camphor laurel, coral tree, poplar, willow, and declared (noxious) weeds.

Pine bark: From mature trees, free from wood slivers.

Pine flake: Pinus species sapwood slivers, including fragments of pine bark.

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

Inorganic mulch types

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

Decomposed granite gravel: Uniform size or graded material in the size range 5 to 20 mm, of uniform colour and low plasticity.

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

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

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

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

Scoria: Uniform size or graded material.

Binders

General: Materials suitable for cold spray application to stabilise mulched surfaces on banks or high erosion areas.

4.7 PREPARATION

Weed eradication

Herbicide: Eradicate weeds using environmentally acceptable methods conforming to the *Health (Pesticides) Regulations 2011 (WA)*, such as a non-residual glyphosate herbicide in any registered formulae, at the recommended maximum application rate.

Manual weeding: Regularly remove weed growth by hand throughout grassed, planted and mulched areas. Remove weed growth from an area of 750 mm diameter around the base of the trees in grassed areas. Continue weeding throughout the course of the works and during the plant establishment period.

Vegetative spoil

Disposal: Remove vegetative spoil from site. Do not burn.

Fertiliser

Requirement: Fertilise all new planting areas with an organic fertiliser and pelleted fowl manure.

Shrub planting areas

Requirement: Prepare planting areas as follows:

- Remove weeds, rubbish, rubble and other foreign materials.
- Rake the area clean and level, to the following levels:
  - . 100 mm below grassed area.
  - . 50 mm below mowing edges.
  - . Minimum one brick course below the damp-proof course of buildings.
  - . Levelled with bitumen or concrete driveways.

4.8 PLANTING

General

Requirement: Provide plants to LANDSCAPE - PLANT PROCUREMENT and as documented.

Plant location and spacing: Conform to the Water Corporation's requirements. If necessary to vary plant locations and spacings to avoid service lines, cover the area uniformly or for other reasons, give notice.

Planting conditions

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

Watering

Timing: Thoroughly water the plants at the following stages:

- Before planting.
- Immediately after planting.
- In the days leading up to the date of practical completion.
- As required to maintain growth rates free of stress.

Preparation

Individual plantings in grassed areas: Prepare for planting as follows:

- Shrubs and groundcover: Provide a hole with 75 to 100 mm clearance around the rootball.
- Trees: Provide a hole twice the diameter of the rootball.
- Break up the base of the hole to a further depth of 100 mm.
- Loosen compacted sides of the hole to prevent confinement of root growth.
- Ripline planting: Prepare for planting as follows:
- Rip the row and excavate a plant hole for each plant large enough to accept the rootball plus 0.1 m^3 of backfilling with topsoil.
- Clear weeds and other vegetative material within 300 mm radius of the plants.
- If planting holes are excavated by mechanical means, increase the hole size by 100 mm and loosen compacted sides to prevent confinement of root growth.

Placing

General: Place plants as follows:

- Remove the plant from the container with minimum disturbance to the rootball. Make sure that the rootball is moist.
- If required, root prune to make sure all circling roots have been either severed or aligned radially into the surrounding soil.
- Place the plant in its final position, in the centre of the hole and plumb, and with the topsoil level of the plant rootball 100 to 200 mm below the finished surface of the surrounding soil.

Fertilising
Requirement: Apply fertiliser for each plant at the time of planting.

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

Watering basins for plants in grassed areas
Location: To each individual plant not located in irrigated grassed areas or naturally moist areas.

Watering basin: Construct around the base of each individual plant, consisting of a raised ring of soil capable of holding at least 10 L.

4.9 MULCHING

Placing mulch
General: Place mulch to the required depth and clear of plant stems so that after settling it conforms to the following:

- Smooth and evenly graded between design surface levels.
- Flush with the surrounding finished levels.
- Sloped towards the base of plant stems in plantation bed.
- Gravel mulches: Not closer to the stem than 50 mm.

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

Depths:

- Organic mulch: 75 mm.
- Gravel mulch: 50 mm.

Maximum slopes:

- Leaf litter, pine flake and pine bark: 1:3. Provide stabilisation on steeper slopes.
- River pebbles and gravels: 1:6.

Installation:

- Ripline and grassed areas: Place mulch to 750 mm diameter around plants.
- Mass planted areas: Place after the preparation of the planting bed but before planting and other work.
- Smaller areas (e.g. planter boxes): Place after the preparation of the planting bed, planting and other work.

4.10 TREATMENT

General
Pest attack or disease: If evidence of pest attack or disease of plant material is discovered, immediately give notice.

Physical removal
General: Remove pest infestation and diseased plant material by hand if appropriate.

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

4.11 STAKES, TREE GUARDS AND TIES

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

Installation: Drive stakes into the ground at least one-third of their length, avoiding damage to the root system. Position on the prevailing wind side of each plant.

Stake sizes and quantities:

- 13 L trees: Two 35 x 35 x 1500 mm stakes per tree.
- 45 L trees: Three 50 x 50 x 1800 mm stakes per tree.

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

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

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

Location of marker stakes:

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

Protectors
Individual plantings in grassed areas: Fit with plastic stem protectors.

Trunk protection: Fit with collar guards made of 200 mm length of 100 mm diameter agricultural pipe split lengthways.

4.12 COMPLETION

Cleaning
Stakes, tree guards and ties: Remove those no longer required at the end of the plant establishment period.

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

Operation and maintenance manuals
Requirement: Prepare a manual that includes recommendations for maintenance of plants.

5 IRRIGATION

5.1 RESPONSIBILITIES

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

5.2 STANDARDS

Water supply
General: To AS/NZS 3500.1 (2021).

Backflow prevention and water efficiency: To PCA (2022).

Electrical
General: To AS/NZS 3000 (2018).

5.3 INTERPRETATION

Abbreviations
General: For the purposes of this worksection, the following abbreviations apply:
- HDPE: High-density polyethylene.
- LDPE: Low-density polyethylene.

Definitions
General: For the purposes of this worksection, the following definitions apply:
- Emitter: A device used to control the rate at which water is applied to a specific area.

5.4 SUBMISSIONS

Execution details
Irrigation plan: Before installation, submit an irrigation plan in pdf format.

Programmable tap timer: If a programmable tap timer is to be used as an alternative to irrigation controllers in small garden areas, submit proposal.

Shop drawings
General: Submit drawings and schedules showing the layout and details of the system, including the following:
- Micro-irrigation stake layout.
- Irrigation controller cabinets.

Tests
Site tests: Submit results to **TESTING**.

5.5 INSPECTION

Notice
Inspection: Give notice so that inspection may be made of the following:
- Excavated surfaces ready for installation.
- Concealed or underground services ready for backfilling.

5.6 AUTOMATIC CONTROL VALVES

General
Type: 24 V solenoid actuated hydraulic valves with flow control and a maximum operating pressure rating of at least 1 MPa and able to be serviced without removal from the line.

Valve size: Equal to the nominal pipe size, unless a smaller size is necessary for throttling purposes, providing that the water flow restriction does not affect the sprinkler operation.

Materials:
- ≤ DN 50: Dezincification resistant copper alloy body and bonnet, screwed ends. Stainless steel bonnet holding down bolts and internal metal parts.
- ≥ DN 65: Cast iron body and bonnet, flanged ends. Stainless steel bonnet holding down bolts and internal metal parts.

Isolating valve: Provide a ball or gate valve of the same size immediately upstream of each automatic control valve.

Housing: House both valves in the same valve box large enough to permit easy operation and servicing of the valves.

Valve boxes: To **VALVE BOXES**.

5.7 FIXED SPRINKLER SYSTEMS

General
Restrictions: Do not use microsprays.

Heads
Performance: Heads conforming to the following:
- Maintain a preset arc of throw.
- Adjustable for radius during watering operations.
- Vandal-resistant.
- Protected from damage in normal operation.

Pop-up type heads:
- Type: Designed to rise at least 50 mm out of the housing under supply pressure and return to flush position on removal of pressure.
- Components: Provide wiper seals, stainless steel return springs and removable internal filters.
- Playing fields: Covers designed and constructed to prevent injury.

Sprinkler heads:
- Type: Gear driven and spray sprinklers with matched precipitation rates for the various areas of throw.
- Flow rate: Adjustable down to zero.

Impact sprinkler heads: Bronze bodies in high impact plastic cases with drainage holes.

Drippers
Requirement: Conform to the following:
- Type: Pressure compensating type with the capacity to apply the required water volume to the shrubs/trees.
- Able to be installed directly online, buried or laid on the surface.
- With provisions for fitting the flexible riser tube to the online dripper and placed at the base of the shrubs/trees.

Valves
Check valves: If a rotating head is more than 300 mm below the highest head on the same automatic valve, fit an internal or external anti-drain check valve to prevent low head drainage.

Pressure regulating valves: Provide pressure regulating valves at off-take points as follows:

- Adjustable between 100 and 700 kPa.
- Complete with 800 µm filter sized to suit the flow and installed immediately upstream from the pressure regulating valve.
- Installed with isolating valves upstream from the filter and downstream from the pressure regulating valve.
- Mount the assembly in a readily accessible position in a valve box, access pit or adjacent building.

Valve boxes: To **VALVE BOXES**.

Soil moisture sensors

Type: Fixed ceramic moisture sensors.

Connection: Fit to the irrigation controller via moisture control units.

5.8 MICRO-IRRIGATION SYSTEMS

Tubing

Type: Polyethylene micro-irrigation pipe.

Fittings

Type: Barbed fittings rated for the pressure class of the pipe, fastened with ratchet type clamps.

Valve boxes

Requirement: To **VALVE BOXES**. Provide the following in each valve box:

- Automatic control valve.
- Isolating valve.
- Filter: 200 µm.
- Pressure-reducing valve with 170 kPa outlet pressure.

5.9 DRIP IRRIGATION SYSTEMS

Integrated drip line systems

Type: Tubing with integral drippers inserted into the tube during manufacture.

Discrete drip emitter systems

Tubing: Polyethylene micro-irrigation pipe.

Drippers: Turbulent flow types, easily dismantled for cleaning.

Emitters

Type: If the difference in elevation between the control box and all emitters is:

- Less than 1500 mm: Pressure compensated or non-pressure compensated type.
- Not less than 1500 mm: Pressure compensated type only.

Fittings

Type: Barbed fittings rated for the pressure class of the pipe, fastened with ratchet type clamps.

Valve boxes

Requirement: To **VALVE BOXES**. Provide the following in each valve box:

- Automatic control valve.
- Isolating valve.
- Filter: 100 µm.
- Pressure-reducing valve with 170 kPa outlet pressure.

5.10 SUBSURFACE DRIP IRRIGATION SYSTEMS

Tubing

Collector and distributor mains: LDPE, HDPE or PVC-U pipe.

Dripline: LDPE pipe.

Components

System requirements:

- Reduced pressure zone (RPZ) backflow prevention device.
- Electric or manual valve.
- Filter: 120 mesh screen or disc.
- Auto pressure regulator: 150 to 200 kPa.
- Air vacuum breaker.
- Automatic line flushing valve.
- Chemical injection system.

Fittings

Type: Barbed fittings rated for the pressure class of the pipe, fastened with ratchet type clamps.

Root-intrusion prevention

Requirement: To prevent root intrusion, provide one of the following:

- Herbicide impregnated emitters or filters.
- Root-intrusion chemical injection system.

Valve boxes

Requirement: Provide valve boxes for system components to **VALVE BOXES**.

Low density polyethylene pipes: Minimum 19 mm when used with drippers.

5.11 IRRIGATION CONTROLLERS

General

Type: Automatic controllers that are easily programmed and include the following:

- Solid state dual program.
- Number of stations provided in the controller more than the number required to operate the irrigation system.
- Manual cycle and individual control valve operation.
- Manual on/off operation of irrigation without loss of program.
- ≥ 4 on/off cycles per day.
- Day omit.
- 240 V input and 24 V output capable of operating 2 control valves simultaneously.
- Not less than 24 hour battery program back-up.
- Power surge protection.
- Mounted in a lockable cabinet of minimum IP54 to AS 60529 (2004) in external locations.
- Electrical connection: If connected to wall outlets, provide 3 core 10 A, 240 V flexible cord and plug. Provide an isolating switch at the controller.

Programming: Able to change watering times, start times or days.

Controller cabinet
Construction: Heavy gauge aluminium with lockable hinged doors.

Degree of protection: Minimum IP56 to AS 60529 (2004).

5.12 PIPE AND FITTINGS

Pipe
Materials: To AS/NZS 3500.1 (2021) clauses 2.4 and 2.5, and as documented.

Underground piping and PVC-U fittings
PVC-U pipes: To AS/NZS 1477 (2017).

PVC-U pipe system installation: To AS/NZS 2032 (2006).

Mainline piping: Minimum Class 12 PVC-U.

Lateral piping: Minimum Class 9 PVC-U.

PVC-U fittings: Minimum Class 18 PVC-U. Allow for changes in pipework direction using fittings. Do not install pipes with excessive bending.

Low density polyethylene pipes: Minimum 19 mm when used with drippers.

5.13 VALVE BOXES

General
Construction: UV-resistant high impact plastic with high impact snap lock plastic cover and adequately sized for clear access to components inside the box.

5.14 EXECUTION

Authority requirements
General: To the Water Corporation and local water restriction requirements.

Integrated Water Supply Scheme (IWSS): Connect the irrigation system to the existing water supply.

Performance
Performance and efficiency of the system: Conduct a flow and pressure test and rectify system if inadequate.

Reticulation
Extent: To all landscaped areas including common areas.

Type: Provide as follows:

- Lawn areas: Rotator sprinklers.
- Individual plants: Drippers.
- Reticulation sleeves: Provide as follows:
- 100 mm PVC-U sleeve 300 mm below driveways. Provide sleeve at the junction of driveway and carport floor.
- Provide a 90° elbow to each end, 300 mm out from the ground.
- Fit sleeves in one straight length under the driveway to allow draw wires to be easily drawn through the sleeve.

Solenoid conduit: Provide 15 mm diameter PVC conduit with draw wire from the garden reticulation cabinet, adjacent paths, hardstands and driveways to the nearest garden bed.

Reticulation cabinet
Requirement: Provide lockable aluminium reticulation cabinet next to the meter box. Conform to the following:

- Make sure solenoid wires can be routed from reticulation cabinet to the mains water supply water meter without being obstructed by concrete, paving or walls.
- Supply conduit and draw wire to the reticulation cabinet.
- Install a 10 amp 250 volt socket outlet in the cabinet. Position socket outlet at the bottom right hand corner of cabinet and connect to common services power circuit.
  . Provide label to socket outlet: SUPPLIED BY COMMON SERVICES POWER CIRCUIT.

Connection to services
Connection to main water supply: By a licensed plumber and as follows:

- Connection location: Supply from a separate cut within 2 m of the master mains water meter.
- Connection component: 25 mm tested gate valve fitted with an approved backflow prevention device.

Connection to main electrical supply: By a licensed electrician.

Metering: Provide meters to the utility service provider's requirements and as follows:

- Group dwelling sites with 2 dwellings: One meter for each dwelling. Provide reticulation to common areas from adjacent dwellings.
- Group and multiple dwelling sites with 3 dwellings or more: One meter for each dwelling. Provide common meter for common areas.

Backflow prevention
Requirement: To PCA (2022) and Network Utility Operator requirements.

Piping
Pipe bending: Bend radius not less than 300 times the pipe nominal diameter.

Bend and tee fittings: Provide sweep tees and long radius type bends with centreline radius of bend or tee branch at least 1.5 times the pipe nominal diameter.

5.15 SERVICE TRENCHING

General
Requirement: Excavate for underground services in conformance with the following:

- To required lines and levels, with uniform grades.
- Straight between access chambers, inspection points and junctions.
- With stable sides.
- Tree protection: To AS 4970 (2009).

Trench widths
General: Keep trench widths to the minimum, consistent with the laying and bedding of the relevant service and construction of access chambers and pits.

Trench depths
General: As required by the relevant service and its bedding method, and as follows:

- Minimum cover for mainline and PVC pipes in garden beds:
  . Front area of dwelling: 300 mm.
  . Rear area of dwelling: 200 mm.

Obstructions
General: Clear trenches of sharp projections. Cut back roots encountered in trenches to at least 600 mm clear of services. Remove other obstructions including stumps and boulders that may interfere with services or bedding.

Pipes and conduits
Pipes and conduits across pavement or paths: If installation across roadways, driveways or paths is required, install under the pavement/path 90° to the road/path alignment using dry trenchless methods. Do not cut sealed surface without the principal's approval.

Subsidence: If subsidence occurs, repair and reinstate pavement or paths.

5.16 AUTOMATIC CONTROL VALVES INSTALLATION

Installation
Location: Install in a valve box to **VALVE BOXES**.

Regional areas: Provide flow control valves to each station.

Valve protection: Do not use sand to cover the valves and wire junctions.

Wiring
Requirement: Provide low voltage solenoid wiring as follows:

- Solenoid wiring: Minimum 1 mm multi-strand cable.
  . Common wire: Black.
- Wiring and piping: Lay wiring in trenches under and attached to piping with insulation tape at maximum 3 m spacing.
- Wiring in areas with no piping: Install in conduits.
- Wiring run: Install in continuous unbroken lengths from the controller to the solenoid valves, with 1.5 m of spare cable coiled at the valve.

Wiring protection: Use multi-core wire protected with PVC sheaths. Protect with electrical conduits or strap beneath PVC piping.

5.17 FIXED SPRINKLER SYSTEMS INSTALLATION

Sprinkler application and location
Type: Use sprinkler types as follows:

- Grassed areas (large and small): Gear driven sprinklers.
- Turfed areas: Pop-up sprinklers with minimum rise of 150 mm.
- Garden beds:
  . Generally: Pop-up sprinklers. Provide 150 mm minimum clearance for rigid risers.
  . Adjacent to lawn areas, driveways and paths: Pop-up sprinklers with minimum rise of 150 mm. Do not use rigid risers.
  . Adjacent to driveways and paths, and less than 500 mm wide: Pop-up strip sprays.
- Trees: Bubblers or high flow drippers.

Sprinkler location restrictions: Conform to the following:

- Sprinklers along buildings: Position minimum 60 mm from the building.
- Sprinklers in verge areas: Do not install along kerbs facing back into the development site.

Prevention of overspray: Position sprinklers so that:

- Those in verge areas do not overspray onto roads.
- There is no overspraying onto buildings.
- Those in garden beds do not overspray onto driveways.

Sprinkler spacing: As recommended by the manufacturer for the pressure and water volume.

Control wiring
General: Connect the automatic control valves and soil moisture sensors to the controller as follows:

- Cable type: Double insulated.
- Cable runs: Run cables either in PVC-U conduit to AS/NZS 3000 (2018) laid in trenches or parallel to and under piping attached to the pipe using cable ties at 3 m maximum intervals.
- Connectors: Waterproof.
- Jointing: Loop cables and join only at valves, sensors and controllers.
- Movement provision: Provide expansion loops at changes of direction and at joints.
- Spare cable: Provide 1.5 m spare cable at the control valve. Neatly coil and tie spare cable and stow in the valve box.

Quick coupling valves
General: Provide DN 20 double lugged bronze quick coupling valves with neoprene seats mounted on DN 20 copper risers offset at least 150 mm from the supply pipe. Install in valve boxes.

Heads
Impact sprinkler heads: Provide granular fill for at least 75 mm around the base of the case.

Risers: Mount as follows:

- Above ground heads: Mount on fixed risers.
- Galvanized steel risers: Set in 300 x 300 x 200 mm deep concrete blocks.
- In-ground heads: Mount on reticulated risers.

Piping
Requirement: Provide piping for mainline up to the solenoid valves and the lawn areas.

Mainline and submains: Install 600 mm below the finished surface and lay marker tape along the top of the line.

Lateral piping for roof and planting areas: Install below the topsoil profile and anchor at 1500 mm maximum centres with U-shaped stakes.

Jointing: Join piping and associated fittings using solvent welded pressure type glue.

Sprinkler head protection

Requirement: Provide concrete surrounds for the following:

- Sprinklers along kerbs abutting roads, driveways or parking areas: Minimum 300 mm diameter, 90 mm thick.
- Sprinklers in lawn/grassed area: Minimum 200 mm diameter, 80 mm thick.

North West and Goldfields region

Requirement: Provide plastic surrounds to all sprinklers.

5.18 MICRO-IRRIGATION SYSTEMS INSTALLATION

Installation

General: Connect micro-tube laterals with proprietary push in or screw in fittings.

Drippers: Connect directly into piping or provide appropriately sized micro-tubes.

Microsprays: Mount microsprays 300 mm above ground on stakes and connect to the piping with appropriately sized micro-tubes.

Piping: Lay polyethylene micro-irrigation pipe on finished ground surface under planting bed mulch and anchor at 1500 mm maximum intervals with U-shaped stakes.

Air release valves: Provide at the highest point in each section to drain the system when flow stops.

5.19 DRIP IRRIGATION SYSTEMS INSTALLATION

Installation

Requirement: Conform to the Water Corporation's recommendations for waterwise garden irrigation.

Discrete drippers: Connect directly into piping or provide appropriately sized micro-tubes.

Piping: Lay polyethylene micro-irrigation pipe on finished ground surface under planting bed mulch and anchor at 1500 mm maximum intervals with U-shaped stakes.

Air release valves: Provide at the highest point in each section to drain the system when flow stops.

5.20 SUBSURFACE DRIP IRRIGATION SYSTEMS INSTALLATION

Installation

Piping: Install at least 150 mm below ground.

Automatic line flushing valve:

- Location: At the furthest point from the valve on the collector main.
- Discharge point: Locate in same plane as the pipe leading to it, so water can easily be flushed out.
- Gravel bed: Install a 0.3 m^3 minimum volume gravel bed in valve box. Maintain 50 mm clearance between gravel bed and the lowest discharge point of the valve.

Filter: Install in horizontal plane (or to prevent material entering mainline on cleaning) with 100 mm clearance from soil level.

5.21 UNDERGROUND PIPING AND PVC-U FITTINGS

Installation

PVC-U pipe system: To AS/NZS 2032 (2006).

PVC-U fittings: Allow for changes in pipework direction using fittings. Do not install pipes with excessive bending.

5.22 IRRIGATION CONTROLLERS INSTALLATION

General

Requirement: Provide irrigation controllers as follows:

- Individual dwellings: One controller for each dwelling.
- Common areas: One controller.

Location: Locate irrigation controllers and single socket outlet in a readily accessible location.

Power supply: For group or multiple dwelling sites, connect to the common power source.

Number of stations in the controller: ≥ number of stations in the reticulation systems.

Number of controllers: Do not use more than one controller without the approval of the principal.

Controller type/product: Do not install without approval from the principal.

5.23 VALVE BOXES INSTALLATION

Installation

Requirement: Install with top of box flush with the surface.

Clearance: Allow 100 mm minimum clearance from filters and 50 mm minimum clearance from valves.

Base: Concrete plinth or crushed rock.

5.24 TESTING

Site tests

Requirement: Test the flow and pressure from the metered supply. If flow and pressure are inadequate, rectify system.

5.25 COMPLETION

General

Requirement: On completion of the irrigation system, carry out the following:

- Flush system thoroughly. Check heads, sprays and drippers and clean if blocked.
- Clean strainers.
- Adjust for even distribution with no dry areas.

Irrigation controllers: Program the controls in conformance with the Water Corporation and the local water restriction requirements, including seasonal variation requirements.

Operation and maintenance manuals

Requirement: Prepare a manual that includes the manufacturer's recommendations for operation, care and maintenance of the irrigation system, including irrigation controllers.

6 LANDSCAPE - PLANT PROCUREMENT

6.1 RESPONSIBILITIES

Performance

Plants: Grown to a standard that allows rapid establishment and growth to maturity.

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

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

6.2 STANDARD

General

Tree stock supply: Conform to the recommendations of AS 2303 (2018).

6.3 INTERPRETATION

Definitions

General: For the purposes of this worksection, the definitions given in AS 2303 (2018) and the following below apply:

- Destructive inspection (of trees): The washing away of all soil from a rootball to allow inspection of rootball development.
- Investigative inspection: Any method of root inspection that involves the washing away of all or portions of the soil from the rootball to expose a section or all the roots.
- Known history: Supplier documentation, demonstrating and enabling verification that the product was grown by essentially the same processes and under essentially the same system of control.
- Locally sourced: Stock procured from district sources that is best suited to climatic, soil and environmental conditions in the immediate area of site.
- Partial inspection (of trees): A method of exposing a section of a root system to allow inspection of root development by washing the soil away in a wedge-shaped section from the stem to the extremity of the rootball. This soil can be gently replaced so the tree is not damaged.
- Shrub: A woody perennial plant smaller than a tree, usually having permanent stems branching from or near the ground.

6.4 SUBMISSIONS

Certification

Plant species: Submit the supplier’s certification as evidence that plants are true to the required species and type, and free from diseases, pests and weeds at the time of delivery.

Source location: Submit the supplier's certification as evidence that plants have been grown from locally sourced stock. If this is not achievable, give notice.

Products and materials

Plants: If non-conforming plants are proposed, submit a proposal. Submit a copy of the written approval of substitution with any non-conforming plants.

Records

Photographic records: Within 14 days of the date of the contract, submit photographic records to **EXECUTION**, **Photographic records**.

Progress reports: Every 3 months, submit a detailed register of the quantities, growth, general health and geographic location of the complete inventory of plant material for the works.

Tests

Requirement: Submit test results to **TESTING**.

6.5 INSPECTION

Notice

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

- Representative samples of all stock scheduled to establish conformity immediately before the acceptance of tender.
- Plant material after 8 weeks of the growing on period.
- Plant material at 80% completion of stocking of species and numbers.
- Plant material at, as close as practicable, 100% completion of stocking of species and numbers.
- Plant material at the date of commencement of delivery.
- Plant material to assess potting on procedures, if necessary.

6.6 ASSESSMENT CRITERIA - GENERAL

General

Requirement: Supply plants with the following properties:

- Stress: Free from stress resulting from inadequate watering, excessive shade or excessive sunlight experienced at any time during their development.
- Site environment: Grown and hardened off to suit anticipated site conditions at the time of delivery and prevent dieback.
- Pests and disease: Free from attack by pests or disease, and resistant to polyphagous shot-hole borer (PSHB).
- Native species with a history of attack by native pests: Restrict plant supply to those with evidence of previous attack to less than 15% of the foliage and make sure actively feeding insects are absent.
- Waterwise: If possible, use plants identified as waterwise by Water Corporation for the particular region. (See www.watercorporation.com.au/Waterwise/Waterwise-plants).
- Root system: Not root bound.

Supply and delivery: Supply plants from a nursery with Nursery Industry Accreditation Scheme

Australia (NIASA) accreditation and deliver to site with a label displaying the botanical name.

Prohibited species: Do not supply species listed on the Western Australian Organism (WAOL) database declared as 'Pest, Prohibited (s12)' or 'Pest (s22)' under the *Biosecurity and Agriculture Management Act 2007 (WA)*.

Labelling

General: To the recommendations of the *National Plant Labelling Guidelines (2023)*.

Label type: To withstand transit without erasure or misplacement.

Label frequency: One for each plant.

Indication of north:

- Trees in containers greater than 100 L or of size index greater than 140: Label the northerly aspect during growth in the nursery and maintain during transit.

6.7 ABOVE-GROUND ASSESSMENT CRITERIA

Trees

Requirement: Supply trees to AS 2303 (2018) clause 4.2 and with the following properties:

- Minimum size: 45 L bag.
- Clean stem height: Less than 40% of total tree height.
- Trunk position: Less than 10% variation in distance from centre of the trunk to the extremity of the rootball.

6.8 BELOW-GROUND ASSESSMENT CRITERIA

Trees

Requirement: Supply trees to AS 2303 (2018) clause 4.3 and with the following properties:

- Rootball occupancy:
  - . Soil retention: On shaking or handling the unsupported rootball, at least 90% of the soil volume remains intact.
- Rootball diameter:
  - . Containers less than or equal to 45 L and ex-ground stock: Not less than rootball depth.
  - . Bare-rooted tree stock with size index less than or equal to 57: Not less than 10 x calliper.

Shrubs

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

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

Root inspection: If investigative inspection is required, sample as follows:

- Not more than 100 samples: Inspect 1 sample.
- More than 100 samples: Inspect 1%.

Sample plants: Replace plants used in investigative inspection.

6.9 ASSESSMENT CRITERIA - BALANCE

Shrubs

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

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

Small container-grown shrubs table

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

Trees

Size index range for trees grown in containers 18 L to 100 L and 100 L to 3000 L: To AS 2303 (2018) Appendix D Table D.1.

Minimum rootball diameter for ex-ground trees: To AS 2303 (2018) Appendix D Table D.2.

6.10 EXECUTION

Photographic records

Requirement: Make photographic records as follows:

- Rates:
  - . Not more than 100 plants: Submit 1 sample.
  - . More than 100 plants: Submit 1%.
- Plant species:
  - . All palm species.
  - . 100, 200, 400 L plant species.
  - . Specimen plant species.
- Identification:
  - . In colour.
  - . With a clearly identifiable scale reference located in the same plane as the plant stem or trunk.
  - . Labelled with plant species name and date.
  - . With sufficient clarity to be able to ascertain the species, size and quality of a single specimen of the subject plant.

6.11 TESTING

General

Requirement: To AS 2303 (2018).

Production tests

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

Above ground tree inspection:

- Frequency: Inspect trees at dispatch.

- Sampling strategy: To AS 2303 (2018) Appendix A Table A1.
- Inspector: Supplier.

Investigative tree inspection:

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

Non-conformance

Corrective action: Conform to corrective action procedures, as documented.

Rejection: If corrective actions are unsatisfactory, reject the entire batch.

Substitutions: Do not use non-conforming trees unless approved.

Investigative tree inspection sampling table

Number of trees per batch	Number of trees to sample
0 – 20	1
21 – 50	2
51 – 100	4
101 – 500	4 for the first 100 +2% of balance of order
501 – 2000	12 for first 500 +1% of balance of order
2001+	27 for the first 2000 +0.5% of balance of order

6.12 COMPLETION

Warranties

True-to-species: Provide at the time of each delivery as follows:

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

Maintenance:

- Parties: Supplier(s) to the principal.
- Form: Maintain all plant materials sourced and secured by the supplier throughout the procurement period.
- Period:
  . Commencement: The date of contract.
  . Completion: To cease in respect of any particular plant material upon issue of a delivery notice issued by the contractor upon delivery to site.

7 LANDSCAPE - ESTABLISHMENT

7.1 RESPONSIBILITIES

General

Requirement: Provide landscape establishment to common areas and common water metered areas.

7.2 SUBMISSIONS

Certification

Replacement plants species: Submit the supplier's certification as evidence that plants are true to the required species and type, and free from diseases, pests and weeds at the time of delivery.

Execution details

General: Give at least two days' notice of the following operations:

- Application of herbicide.
- Application of fertiliser.
- Watering.
- Each site maintenance visit.

Reporting: Submit monthly reports by the last Friday of each month.

Monitoring program

General: Submit a monitoring program developed by a specialist monitoring consultant and incorporating the following:

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

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

Records

Requirement: To **COMPLETION**, **Records**.

Tests

Requirement: Submit soil property test results to **PLANTING WORKS**, **Fertilising** for the following:

- Landscape soils.
- Low density soils.
- Soils for turf and lawns.

7.3 INSPECTION

Notice

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

- Date of practical completion.
- Three monthly intervals during the plant establishment period.
- End of defects liability period.

7.4 EXECUTION

Special instructions

Requirement: If directed, attend to identified areas and procedures as a priority. Obtain approval for additional costs before starting the works.

Reporting

Monthly report: Provide regular written reports each month on the following:

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

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

Disruption of works by others

Requirement: Make arrangements to work around the disturbance caused by other contractors.

Rubbish removal

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

Leaf litter: Remove from all path and lawn areas.

7.5 PLANTING WORKS

Planting

Requirement: Make sure the general appearance and presentation of the landscape and the quality of plant material at the date of practical completion is maintained for the plant establishment period.

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

Plant replacement: Replace failed, dead and/or damaged plants at maximum 3 weekly intervals as necessary throughout the plant establishment period. Provide replacement plants of similar size and quality, and of identical species and variety to the plants being replaced.

Plant pruning

Pruning: To AS 4373 (2007) and as documented.

Fertilising

Soil tests: Take samples from both planting beds and lawn areas and conduct tests, as follows:

- Landscape soils: To AS 4419 (2018) Table 1.
- Low density soils: To AS 4419 (2018) Table 2.
- Soils for turf and lawns: To AS 4419 (2018) Table 3.

Fertilising program: Base the program on soil testing results.

Application of fertiliser: Apply a 12 month slow release fertiliser, in two rows and cultivated into soil to a depth of 100 mm.

- Program: September and March according to seasonal growth requirement.

Sensitive native species: Apply appropriate dosage.

Insect and disease control

Period for treatment: Until the problem has been eliminated.

Chemical spray: Apply outside of normal working hours.

Stakes, tree guards and ties

Stakes: If stakes are damaged, replace stakes and re-stake the plants as follows:

- Stake sizes and quantities:
  - Plants more than 2500 mm high: Three 50 x 50 x 2400 mm stakes per plant.
  - Plants 1000 to 2500 mm high: Two 50 x 50 x 1800 mm stakes per plant.
  - Plants less than 1000 mm high: One 38 x 38 x 1200 mm stake per plant.
- Drive stakes into the ground at least one-third of their length, avoiding damage to the root system.

Tree guards and ties: Replace damaged or missing tree guards and ties.

Removal: If plants are robust with well-developed systems and no longer require support, remove stakes, tree guards and ties.

7.6 GRASS SURFACES

Mowing and trimming

Preparation: Remove litter and fallen branches before mowing.

Grass height: Consistent with the growth habit of the grass variety and maintained at 25 to 40 mm throughout the year. Do not remove more than one-third of the grass height at any one time.

Program: Weekly during the mowing season from November to March and at fortnightly intervals from April to October. Do not mow during wet conditions. Carry out last mowing not more than 7 days before end of plant establishment period.

Raking: Once every month before mowing from November to March, rake the grass with a flexible rake. On alternate mowings, adopt a north-south and east-west pattern.

Edge trimming: At the same time as mowing, trim lawn edges to plant beds, pathways, base of trees and other obstacles. Do not damage trees and shrubs.

Top dressing

Top dressing for established lawns: Weed-free imported sandy topsoil to a depth of 5 mm.

- Program: The spring following initial establishment.

Top dressing for remediation of depressions or irregularities: Apply coarse or medium texture soil to

AS 4419 (2018), suitable for application to turf areas.

Fertilising

Application of fertiliser: Apply a slow release lawn fertiliser at the completion of the first and last mowings of the plant establishment period and at other times as required to maintain healthy grass cover.

7.7 WEEDING

General

Requirement: Remove unwanted broad-leaf plants and grasses considered invasive to the locality.

Program:

- Lawns: Quarterly and as required to maintain the general lawn condition.
- Trees and shrubs: As required for planted, paved and mulched areas to be weed-free when observed at fortnightly intervals.

Vigorous ground covers: Keep 200 mm clear from the base of any shrub or tree. Remove as follows:

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

Herbicide application: Apply to the manufacturer's recommendations.

7.8 MULCHED SURFACES

General

Inspection: Fortnightly to determine mulch requirements.

Requirement: Maintain minimum depth as follows:

- 75 mm for organic mulch.
- 50 mm for gravel mulch.

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

Weed and grass growth in mulch areas: Control with a herbicide, approved by the principal, to the manufacturer's recommendations. Prevent herbicide contacting the new plants.

7.9 WATERING

Establishment

Water quality:

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

Watering program: Minimum 3 complete waterings, soaking to a depth of 150 mm at fortnightly intervals for the first 6 weeks of plant establishment irrespective of natural rainfall. Confirm soaked depth using a soil moisture probe and record in the log book.

Water restrictions: Coordinate the water supply and conform to legislation and restrictions applying at the time.

Hand watering

Requirement: Manually water all lawn and planting areas in absence of an irrigation system or until the proposed irrigation system is fully operational. Avoid frequent dampening of the surface. Allow the surface of the soil to partially dry out between waterings.

Irrigation

Irrigation system program: Adjust to suit the following:

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

Equipment maintenance:

- Check all components for proper operation.
- Repair or replace damaged components with parts from the same manufacturer.
- Flush any dirt or foreign matter from the system and clear all blockages.

7.10 CONTROL MEASURES

Weed mats

Generally: Maintain mats in a weed-free condition and reinstate missing or damaged mats to the documented standard, until completion of the plant establishment period.

Feral animal control

Generally: Implement feral animal control until the completion of the plant establishment period.

Feral animal guards: Maintain feral animal guards in a working upright and taut order with three stakes. Replace missing or damaged guards with materials as documented.

Removal: At the completion of the plant establishment period.

7.11 ROAD VERGES AND FIRE REDUCTION ZONES

Native grass

Generally: Allow native grasses planted within 2 m of road verges or 5 m of property boundaries to grow in a form consistent with the growth habit of the species.

Mowing

Native grasses: Maintain as follows:

- Do not damage regeneration areas, including tree saplings.
- Mow at a minimum of twice a year and at least once at the end of October, before bushfire season, as a fire reduction measure.
- Maintenance mowing: Use a single pass of a mower along medians and verges with maximum width of 1.7 m for a slasher and 1.2 m for a slope mower.
- Fire hazard reduction mowing: Use a double pass of a mower along medians and verges with maximum width of 3.4 m for a slasher and a single 1.2 m pass by a slope mower.

Other types of grass verges: Mow to maintain a maximum 250 mm height.

Pruning

General: Cut back tree and shrub growth to road verges, to on/off ramps and around emergency telephones and signs as required to achieve clear sight distances when viewed from a minimum of 100 m along roadway. Cut back tree and shrub growth within fire reduction zones to minimise risk to adjoining properties.

Pruning: As documented.

7.12 PAVING AND STRUCTURES

Furniture, signage and barriers

Maintenance guidelines:

- Furniture and pots: Keep in a good condition and move as required to carry out maintenance works.
- Directional and building signs: Keep in a good condition and maintain visibility.
- Boundary and car park barriers: Keep in a good condition and maintain visibility.

Drains

Maintenance: Inspect and clean all drainage structures and pit covers and maintain in working order. Remove all organic debris.

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

7.13 COMPLIANCE

Criteria

Generally: Plant establishment is complete, subject to the following:

- Repairs to plant material are complete.
- Ground surfaces are covered with the documented treatment to the documented depths.
- Pests, disease, or nutrient deficiencies or toxicities are not evident.
- Organic and gravel mulched surfaces are in a weed-free and tidy condition and to the documented depth.
- Vegetation is weed-free, established and well formed.
- Plants have healthy root systems that have penetrated into the surrounding, undisturbed ground and are not able to be lifted out of the planting holes.
- Vegetation is not restricting essential sight lines and signage.
- Only frangible species are growing within road side clear zones.
- Specified vegetation setbacks from services and road furniture are evident.
- All hard landscape works are installed and operating as documented.
- Litter collection and removal is complete.
- Mulch is removed from drainage and access areas.
- All non-conformance reports and defects notifications are complete.

Plant establishment compliance table

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

7.14 COMPLETION

Records

Logbook: Keep on site and make available for inspection a logbook, recording the following on a weekly basis:

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

8 LANDSCAPE - ROAD RESERVE AND STREET TREES

8.1 STANDARDS

General

Storage and handling of pesticides: To AS 2507 (1998).

Tree stock: To AS 2303 (2018).

8.2 INTERPRETATION

Definitions

General: For the purposes of this worksection the definitions given in AS 2303 (2018) and the following apply:

- Ameliorant material: Additives used to make or improve soil.
- Imported topsoil: Similar to local natural soil, suitable for the establishment and ongoing viability of the selected vegetation, free of weed propagules and of contaminants and classified by texture to AS 4419 (2018) Appendix K Table K1, as follows:
  - Fine: Clay loam, fine sandy clay loam, sandy clay loam, silty loam, loam.

. Medium: Sandy loam, fine sandy loam.

. Coarse: Sand, loamy sand.

- Top dressing: A soil that is suitable for surface application to turf and lawns.
- Topsoil: Includes landscape soil, low density soils and soils for turf and lawns.

8.3 SUBMISSIONS

Execution details

Soil amelioration recommendations: If required, the source of ameliorant material, rates and methods of incorporation.

Plant material: Submit details of proposed fertiliser to be used.

Soil conditioning: If other than gypsum is proposed, submit details.

Products and materials

Imported topsoil: Submit evidence verifying the following:

- Suitability of each soil type for its documented use.
- Similarity to naturally occurring local soil.
- Suitability for establishment and on-going viability of the site vegetation.
- Absence of any weed propagules or contaminants.

Plant species: Submit the supplier's certification as evidence that plants are true to the required species and type, and free from diseases, pests and weeds at the time of delivery.

Source location: Submit the supplier's certification as evidence that plants have been grown from locally sourced stock. If this is not achievable, give notice.

Trees: Submit evidence of conformity to AS 2303 (2018).

Samples

Requirement: Submit samples to **PRODUCTS**, **Samples**.

8.4 INSPECTIONS

Notice

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

- Plants on arrival at site.
- Landscape planting: Set out of plants, soil conditioner and fertiliser.

8.5 PRODUCTS

Samples

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

Bulk materials: Provide a 5 kg sample of each type documented with required test results.

Transportation

Requirement: Transport plants to the site without physical damage or drying out.

8.6 TOPSOIL

General

Requirement: To LANDSCAPE - SOILS.

8.7 FERTILISER AND MULCHES

General

Requirement: To LANDSCAPE - NATURAL GRASS SURFACES.

8.8 PLANT MATERIAL

Turf

Requirement: To LANDSCAPE - NATURAL GRASS SURFACES and as follows:

- Species: Use a species approved by the local authority for verge treatments.

Plant supply

Requirement: Supply plants to LANDSCAPE - PLANT PROCUREMENT and conforming to the following:

- Species: Use a species approved by the local authority for verge treatments.
- Maximum height: 750 mm.
- Not hazardous (poisonous or an irritant).
- Does not obstruct pedestrians.

8.9 OTHER MATERIALS

Inorganic ground cover

Stone/rock mulch treatments: Conform to the following particle size distribution:

- River washed rounded stone: $D_{50} < 40$ mm.
- Crushed rock: $D_{50} < 40$ mm.
- Crusher dust: $D_{50} < 10$ mm.

Stone aggregates, loose pea gravel or crushed brick: If proposed, obtain approval from the local authority.

Gravel treatments: Do not install if not allowed by the local authority. If allowed, install as follows:

- Depth: 100 mm.
- Edging: Make sure edging depth is sufficient to prevent loose gravel spreading onto roads, footpaths or neighbouring properties.

8.10 EXECUTION

Transport and storage

Requirement: Inspect all plants at the time of delivery and reject non-conforming plants.

Preparation

Existing services: Before landscaping the verge, locate existing and position new services in the verge, including contact BEFORE YOU DIG AUSTRALIA to identify locations of underground utility services pipes and cables.

Herbicide treatment: Spray herbicide as follows:

- Type: Glyphosphate.
- Rate: 9 litres/200 litres water/ha.
- Program: Maintain sprayed areas undisturbed for 2 weeks.

Pesticide treatment: In the following form, as documented:

- Liquid:
  . Application rate: 5 litres/hydromulch/ha.
  . Powder: 10 kg/ha.

Herbicides and pesticides: To the Australian Pesticides and Veterinary Medicines Authority (APVMA PubCRIS) register.

Soil conditioning: Provide as follows:

- Gypsum application rate: 400 g/m².
- Application: Conform to the following:
  . Spread evenly over the subsoil by a mechanical spreader and topsoil on the same day.
  . Thoroughly mix into the topsoil whilst the topsoil is being removed from stockpiles.
  . Apply conditioners other than gypsum to the supplier's recommendations.

Fertiliser treatment: Provide as follows:

- Application rate: 1000 kg/ha.

Watering

General: Conform to the following:

- Potable or sourced from areas without toxins, pollutants or any substance which may adversely affect plant growth.
- Initial watering: To a uniform moisture condition without run-off.
- After turfing: Re-water to a uniform moisture condition without run-off.
- After sowing: If required, re-water to a uniform moisture condition without causing rills in the surface, daily for 15 days.
- Excessive surface channelling through erosion: If watered areas result in excessive surface channelling rehabilitate by re-preparing and re-sowing the affected area.

8.11 PREPARATION

Dimension and level

Level and grade: Do not alter from existing levels.

Setback: Set verge 1.5 m from the road frontage, including for verges without footpaths.

Surface preparation

Cultivation: Before applying topsoil, tine to a depth of 200 mm to produce a loose surface and remove all large stones, rubbish and other materials that may delay germination.

Cultivation depth: 50 mm for a roughened surface with soil lumps not exceeding 50 mm.

Topsoil

Application: Apply uniformly to an average compacted thickness of 50 mm with a minimum compacted thickness of 30 mm at any location.

Pesticide application

Timing: Immediately before sowing.

Pesticide type: Powder form.

Grassing

Turfing:

- Laying: On the prepared topsoiled surface and perpendicular to the direction of water flow.
- Joints: Butt runs of turf hard against each other and top dress with topsoil.
- Slopes 5:1 to 3:1: Peg turf and remove pegs when established.
- Top dressing:
  . Timing: 4 to 6 weeks after laying turf.
  . Requirement: Correct any undulations or unevenness in the established turf.

Maximum slope for areas to be maintained by a ride-on mower with a 2 m wide deck: 4:1.

8.12 LANDSCAPE PLANTING

Conditions

General: Do not carry out landscape planting when temperature is below 10°C or above 35°C.

Preparation

Weed management: Conform to the following:

- Herbicide spray: Conform to **EXECUTION** and the following:
  . Program: Maintain sprayed areas undisturbed for 2 weeks.
  . Spray drift: Make sure there is no contact with planted material.
- Weed management by synthetic weed blocking fabric:
  . Extent: 800 mm surrounding each proposed planting.

Fertilising (N:P:K): Conform to the following:

- Ratio: 63:18:28.
- Application rate: 5 kg/m².

Mass planting in mulched bed

Surface preparation: Rip the surface at 500 mm centres to a depth of 300 mm and break up the top 200 mm of the planting bed by cultivation to a maximum size of 50 mm.

Mulch: Spread 75 mm thick.

Individual planting

Preparation: Loosen a planting area 600 mm diameter to a depth of 400 mm.

Mulch: Spread 75 mm thick to 600 mm radius around the plant.

Planting

Method: Remove the localised mulch. If required, root prune to make sure all circling roots have been either severed or aligned radially into the surrounding soil. Place the plant, backfill the planting hole with topsoil and compact lightly so as to minimise subsidence without compacting the backfill. Avoid mixing mulch with topsoil.

Stakes and ties: Advanced and super advanced stock:

- Drive stakes 300 mm deep and 200 mm clear of the plant.
- Ties: 50 mm wide hessian webbing strips, attached loosely.

Watering: 10 litres of water per hole before the mulch is respread over the disturbed area.

Mulching: Replace, and leave the plant stem clear.

Care of landscape planting

Watering: Water all plants, from the time of planting, every second day for the first twelve weeks at the following rates, per plant:

- Tube stock: 5 L.
- Advanced trees: 10 L.
- Super advanced (25 L): 30 L.
- Semi-mature (75 to 100 L): 50 L.

Replacement: Replace missing plants, dead plants and unhealthy plants with plants of similar size and quality and of identical species and variety to the plant being replaced.

Weed and grass growth in mulched areas: Control with herbicide, in conformance with the manufacturer's recommendations at monthly intervals during the construction period and contract maintenance period. Replace plants damaged by herbicide application.

8.13 STREET TREES

Unpaved areas

Excavation:

- Containers < 75 litre: Twice the diameter of the rootball.
- Containers ≥ 75 litre: Three times the diameter of the rootball.
- Depth: Rootball plus 100 mm. Loosen the compacted sides, and the bottom a further 100 mm.

Soil conditioning: If clay is present, add 1 kg of agricultural gypsum soil conditioning.

Accessories and drainage: Fit trunk collar guard, root barrier and subsoil drainage measures before backfilling.

Backfill: Topsoil.

Mulch: 75 mm thick and 50 mm clear of plant stem.

Initial watering: 50 litres per tree applied in stages during backfilling.

Watering basin: Construct around the base of each individual plant, consisting of a raised ring of soil capable of holding at least 10 L.

Paved areas

Excavation:

- Containers < 75 litre: Twice the diameter of the rootball.
- Containers ≥ 75 litre: Three times the diameter of the rootball.
- Depth: Rootball plus 100 mm. Loosen the compacted sides, and the bottom a further 100 mm.

Accessories and drainage: Fit trunk collar guard, root barrier and subsoil drainage measures before backfilling.

Mulch: 10 mm screenings 75 mm thick.

Initial watering: 50 litres per tree applied gradually.

Structural soil table

Type	Description	Fertiliser	Depth	Location
Structural soil 20 mm	75% 20 mm crushed river gravel 25% filler soil of 1 part screeded dolomite to 1 part screeded sandy loam	Trace element mix: 300 g/m^3 Potassium nitrate: 500 g/m^3 Ammonium nitrate: 500 g/m^3 Superphosphate: 500 g/m^3 Ion sulfate: 1.5 kg/m^3 8/9 month Controlled release: 2 kg/m^3 Gypsum: 500 g/m^3 Magnesium sulfate: 400 g/m^3 Magrilime: 600 g/m^3	100 mm	If pavements are installed around existing trees, replace 20 mm roadbase when the total soil depth available is 100 mm or less.
Structural soil 40 mm	80% 40 mm basalt aggregate 20% filler soil of 1 part screeded dolomite to 1 part screeded sandy loam	Trace element mix: 300 g/m^3 Potassium nitrate: 500 g/m^3 Ammonium nitrate: 500 g/m^3 Superphosphate: 500 g/m^3 Ion sulfate: 1.5 kg/m^3 8/9 month Controlled Release: 2 kg/m^3 Gypsum: 500 g/m^3 Magnesium sulfate: 400 g/m^3 Magrilime: 600 g/m^3	Varies	Tree plantings in pavements, courtyards, carparks and kerbsides.

Porous bonded gravel

Backfill: Allow for base aggregate and gravel.

Filter fabric: Lay over growing medium and pre-cut to size.

Base aggregate: 5 to 7 mm crushed blue metal, laid 70 mm deep and hand consolidated.

Porous paving: Mix and place to the manufacturer's recommendations.

8.14 LOCATION OF PLANTING

General

Requirement: Do not obstruct access to services or sightlines to signage. Do not obstruct pedestrian or vehicular traffic.

Street trees

Ground clearance:

- Clearance height at maturity: 2.4 m.
- Clearance height at time of planting: 1.5 m.

Setbacks: Locate trees to achieve mature canopy clearances from the following:

- Electricity or telecommunications poles or pillars: > 4 m.
- Streetlights: > 7.5 m.
- High voltage transmission lines: > 4 m radius.
- Stormwater drainage pits: > 2 m.
- Kerbs measured to the back of the kerb: 750 mm to 1000 mm.
- Driveways: > 3 m.
- Intersections measured from the face of the kerb of the adjoining street: > 10 m.
- Existing trees: The combined mature canopy width.

8.15 IRRIGATION

Installation

Requirement: Conform to IRRIGATION and as follows:

- Location: Make sure the sprinkler system is installed in a readily accessible location.
- Water source: Supply from a point beyond the water meter and inside the site boundary, passing through a backflow prevention device.
- Reticulation pipes: Provide piping installed at minimum 300 mm below the surface ground level and pop-up sprinkler system with conduits installed under footpaths.

9 PAVEMENT BASE AND SUBBASE

9.1 SUBGRADE PREPARATION

General

Requirement: Prepare the subgrade to **E. PRELIMINARY SITE PREPARATION**, EARTHWORKS.

Subbase: Install as required by the subgrade evaluation by a professional engineer.

9.2 PLACING BASE AND SUBBASE

General

Weak surfaces: Do not place material on a surface that is weakened by moisture and is unable to support, without damage, the construction plant required to perform the works.

Spreading: Spread material in uniform layers without segregation.

Moisture content: Maintain wet mixed materials at the required moisture content before and during spreading. Add water to dry mixed materials through fine sprays to the entire surface of the layer after spreading, to bring the material to the required moisture content.

Compacted layer thickness: 200 mm maximum and 100 mm minimum. Provide layers of equal thickness in multilayer courses.

9.3 TOLERANCES

Surface level

Subbase: +10 mm, -25 mm.

Base: +10 mm, -5 mm.

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

Surface deviation

Base: ≤ 5 mm from a 3 m straightedge laid on the surface.

9.4 BASE AND SUBBASE COMPACTION

Minimum relative compaction table

Item description	Minimum dry density ratio (modified compaction) to AS 1289.5.2.1 (2017)
Subbase	95%
Base	98%

10 CONCRETE PAVEMENT

10.1 STANDARDS

Concrete

Specification and supply: To AS 1379 (2007).

Materials and construction: To AS 3600 (2018).

Residential pavements: To AS 3727.1 (2016).

Vapour barrier

Requirement: To AS 2870 (2011) clause 5.3.3.

10.2 PAVEMENT

Grading

Requirement: Grade to fall away from buildings and towards drainage outlets without ponding, minimum 1:100.

Thickness

Minimum:

- Foot and bicycle traffic: 75 mm.
- Light vehicle traffic occasionally up to 3 tonne gross: 100 mm.

Condenser plinths

Requirement: If future split air conditioning systems are required for bedrooms and dining/living areas, provide 1200 x 1000 (wide) x 100 mm (thick) concrete plinths for air conditioning condensers at each isolator location.

Locations where plinths are not required: If possible, mount condensers on the concrete verandah slab.

Plinths located in pathways: Increase pathway width to maintain the required uninterrupted pathway width.

10.3 SURFACE FINISHES

Unformed surfaces

General: Strike off, screed and level slab surfaces to finished levels and documented finish.

Finishing

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

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

Surface sealer
Application: Apply surface sealer after the curing period to the manufacturer's recommendations.

Finishing method
Broom finishing: Wood float and broom to an even textured transverse scored surface with steel tooled margins. On gradients steeper than 10%, roughen the surface by scoring using a stiff brush or rake.

10.4 DRIVEWAY, GARAGE OR CARPORT FLOORS

General
Compact base: To AS 1289.5.2.1 (2017).

Finish: Granolithic finish.

11 PAVING - SAND BED

11.1 STANDARDS

General
Concrete and clay pavers: To AS/NZS 4455.2 (2010).

11.2 PAVER THICKNESS

General
Requirement: Minimum thickness:

- Foot and bicycle traffic: 40 mm.
- Light domestic traffic occasionally up to 3 tonne gross: 50 mm.

11.3 MATERIALS

Sand
Bedding and joint filling: Well-graded and free of deleterious materials such as soluble salts that may cause efflorescence.

Cement
Standard: To AS 3972 (2010), type GP.

Mortar
Mix proportions (cement:sand): 1:3.

11.4 INSTALLATION

Bedding course
Preparation: Remove all loose material from the prepared base.

Geotextile: Place fabric between the base course and the bedding sand and lap 150 mm at joints.

Bedding sand: Screed uncompacted sand over prepared base uniformly to achieve a 30 mm thick layer. Maintain sand at a uniform loose density and moisture content.

Grading
Requirement: Grade to fall away from buildings and towards drainage outlets without ponding, minimum 1:100.

Cutting
Cutting units: Cut pavers to maintain sharp edges and accurate joints and margins.

Laying
General: Lay pavers on the screeded sand bedding to the documented set-out and pattern.

Compaction: Compact the sand bedding after laying paving with a vibrating plate compactor and appropriate hand methods. Continue until lipping between adjoining units is eliminated.

Joint filling: Spread dry sand over the paving and fill the joints by brooming. Carry out one or more passes with the vibrating plate compactor and refill the joints with sand. Repeat the process until the joints are completely filled.

12 PAVEMENT ANCILLARIES

12.1 KERB AND CHANNEL (GUTTER)

Concrete
Precast: Proprietary precast units as documented.

In situ: To AS 1379 (2007).

Stone
Kerb: To EN 1343 (2012).

Natural stone: Stone of uniform quality, sound and free from defects liable to affect its strength, appearance or durability.

12.2 LINEMARKING

Pavement marking paint
Requirement: Conform to the following:

- Solvent-borne paint: To AS 4049.1 (2005).
- Waterborne paint: To AS 4049.3 (2005).
- High performance: To AS 4049.4 (2006).

12.3 VEHICLE BARRIERS

Timber log barriers
Hardwood: To AS 2082 (2007).

Softwood: To AS 2858 (2023) and AS 1720.2 (2006).

Timber preservative for softwood: Minimum hazard class H4 to AS/NZS 1604.1 (2021).

Precast concrete wheel stops
Material: Precast concrete units with predrilled holes located 300 mm from each end for fixing to ground surface.

Plastic/rubber wheel stops
Material: Proprietary plastic or rubber wheel stops with black and yellow chevron markings.

H. FINISHING

1 COMPLETION OF THE WORKS

1.1 PRACTICAL COMPLETION

Final cleaning and testing

General: Before the date for practical completion, clean throughout, including interior and exterior surfaces exposed to view. Cleaning works include the following, as appropriate:

- Vacuum carpeted and soft surfaces.
- Wash tiled floors.
- Wash windows, inside and outside.
- Clean and disinfect toilet pans, basins and sinks.
- Clean ceiling fans and light fittings.
- Clean and disinfect evaporative cooler water chamber and air conditioning air filters.
- Clean shelving and cupboards.
- Clean skirtings.
- Clean debris from the site, roofs, gutters, downpipes and drainage systems.
- Remove waste and surplus materials.

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

Operation: Make sure moving parts operate safely and smoothly.

Reinstatement

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

Adjoining properties

Evaluation:

- At practical completion, inspect each property with the principal, owner and occupant of the property.
- Compare the current condition with the condition before carrying out the work by comparison to the endorsed dilapidation report.
- Identify damage caused by construction and rectify.

Pest eradication

General: Employ suitably qualified pest exterminators. At practical completion, verify that completed works are free of pest types, as documented.

Removal of temporary works and plant

General: Within 10 working days after practical completion, remove temporary works, services and construction plant.

Water Corporation approved sub-meter

Inspection: Once water meter is installed, conform to the following:

- Arrange for inspection by the Water Corporation to verify compliance and acceptance of payment for takeover.
- Submit a completed *Sub-meter Application Form* and *Works Request Form* and pay all application costs. These forms can be obtained from the Water Corporation. See www.watercorporation.com.au/Developing-and-building/Subdividing/Strata-and-green-title-subdivisions/Strata-subdivisions/Metering-options-for-stratas.

Verification: Submit a copy of the payment receipt for the application and registration of the meters as confirmation that sub-meters have been accepted by the Water Corporation. The fees will be reimbursed to the contractor on receipt of proof of payment.

Certificates

Certificate of occupation: Liaise with the authorities and carry out all works as required to obtain certificate.

Authorities' approvals: Provide evidence of approval from the local government authority or principal accredited certifier and statutory authorities whose requirements apply to the work.

Construction records and handover

Handover meeting: Arrange a meeting with the principal for handing over the record documents and explaining any required maintenance and operation actions.

Warranties: Register with manufacturers, as necessary, and provide copies of manufacturers' warranties.

Instruction manuals: Provide the manufacturers' instruction manuals, including operations and maintenance manuals, and product and material technical data sheets.

As-constructed drawings: At practical completion, submit 4 sets of hard copies and electronic files (on CDs or DVDs) of drawings, specifications and other documents of the constructed building, include revisions or changes made during the construction period. Include the following in the submission:

- Manufacturer's instruction manuals.
- List of suppliers of all equipment and major materials.
- Copies of certification documents, including local government authority approvals.
- Warranties.

Drawing format: To **B. DESIGN DEVELOPMENT**, DESIGN VERIFICATION, **SUBMISSIONS**, **As-constructed drawings**.

CDs and DVDs: Submit in durable plastic covers with printed labels.

Services layout: Provide a plan which shows the location of underground services.

Keys: Provide two keys for each set of locks keyed alike and two keys for each lock keyed to differ.

REFERENCED DOCUMENTS

The following documents are incorporated into this worksection by reference:

AS/CA S008	2020	Requirements for customer cabling products
AS/CA S009	2020	Installation requirements for customer cabling (Wiring Rules)
AS/NZS ISO 817	2016	Refrigerants - Designation and safety classification
AS 1056		Storage water heaters
AS 1056.1	1991	General requirements
AS/NZS 1163	2016	Cold-formed structural steel hollow sections
AS/NZS 1170		Structural design actions
AS/NZS 1170.2	2021	Wind actions
AS 1192	2004	Electroplated coatings - Nickel and chromium
AS/NZS 1214	2016	Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series) (ISO 10684:2004, MOD)
AS/NZS 1229	2002	Laundry troughs and tubs
AS 1231	2000	Aluminium and aluminium alloys - Anodic oxidation coatings
AS 1288	2021	Glass in buildings - Selection and installation
AS 1289		Methods of testing soils for engineering purposes
AS 1289.5.1.1	2017	Soil compaction and density tests - Determination of the dry density/moisture content relation of a soil using standard compactive effort
AS 1289.5.2.1	2017	Soil compaction and density tests - Determination of the dry density/moisture content relation of a soil using modified compactive effort
AS 1289.5.4.1	2007	Soil compaction and density tests - Compaction control test - Dry density ratio, moisture variation and moisture ratio
AS 1324		Air filters for use in general ventilation and airconditioning
AS 1324.1	2001	Application, performance and construction
AS 1367	2023	Coaxial cable and optical fibre systems for the RF distribution of digital television, radio and in-house analogue television signals in single and multiple dwelling installations
AS 1379	2007	Specification and supply of concrete
AS 1397	2021	Continuous hot-dip metallic coated steel sheet and strip - Coatings of zinc and zinc alloyed with aluminium and magnesium
AS 1417	2023	Receiving antennas for radio and television in the VHF and UHF broadcast bands - Design, manufacture and performance of outdoor terrestrial television antennas
AS 1428		Design for access and mobility
AS 1428.1	2009	General requirements for access - New building work
AS 1428.2	1992	Enhanced and additional requirements - Buildings and facilities
AS 1432	2004	Copper tubes for plumbing, gasfitting and drainage applications
AS/NZS 1477	2017	PVC pipes and fittings for pressure applications
AS 1478		Chemical admixtures for concrete, mortar and grout
AS 1478.1	2000	Admixtures for concrete
AS 1530		Methods for fire tests on building materials, components and structures
AS/NZS 1530.3	1999	Simultaneous determination of ignitability, flame propagation, heat release and smoke release
AS/NZS 1546		On-site domestic wastewater treatment units
AS/NZS 1546.1	2008	Septic tanks
AS/NZS 1546.2	2008	Waterless composting toilets
AS 1546.3	2017	Secondary treatment systems
AS 1546.4	2016	Domestic greywater treatment systems
AS/NZS 1547	2012	On-site domestic wastewater management
AS/NZS 1554		Structural steel welding
AS/NZS 1554.1	2014	Welding of steel structures
AS 1562		Design and installation of sheet roof and wall cladding
AS 1562.1	2018	Metal
AS 1562.3	2006	Plastic
AS 1571	2020	Copper - Seamless tubes for air-conditioning and refrigeration
AS/NZS 1596	2014	The storage and handling of LP Gas
AS/NZS 1604		Preservative-treated wood-based products
AS/NZS 1604.1	2021	Products and treatment
AS 1668		The use of ventilation and air conditioning in buildings
AS 1668.1	2015	Fire and smoke control in buildings
AS 1668.2	2012	Mechanical ventilation in buildings
AS 1720		Timber structures
AS 1720.2	2006	Timber properties
AS/NZS 1801	1997	Occupational protective helmets
AS 1810	1995	Timber - Seasoned cypress pine - Milled products
AS 1851	2012	Routine service of fire protection systems and equipment
AS/NZS 1859		Reconstituted wood-based panels - Specifications
AS 1859.1	2017	Particleboard
AS/NZS 1859.2	2017	Dry process fibreboard
AS/NZS 1859.3	2017	Decorative overlaid wood panels
AS/NZS 1859.4	2018	Wet process fibreboard
AS 1884	2021	Floor coverings - Resilient sheet and tiles - Installation practices
AS/NZS 2032	2006	Installation of PVC pipe systems

AS 2047	2014	Windows and external glazed doors in buildings
AS 2082	2007	Timber - Hardwood - Visually stress-graded for structural purposes
AS/NZS 2179		Specifications for rainwater goods, accessories and fasteners
AS/NZS 2179.1	2014	Metal shape or sheet rainwater goods, and metal accessories and fasteners
AS 2201		Alarm and electronic security systems
AS/NZS 2201.1	2007	Client's premises - Design, installation, commissioning and maintenance
AS 2208	2023	Safety glazing materials in buildings
AS/NZS 2270	2006	Plywood and blockboard for interior use
AS/NZS 2271	2004	Plywood and blockboard for exterior use
AS 2303	2018	Tree stock for landscape use
AS/NZS 2311	2017	Guide to the painting of buildings
AS/NZS 2312		Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings
AS 2312.1	2014	Paint coatings
AS/NZS 2312.2	2014	Hot dip galvanizing
AS/NZS 2425	2015	Bar chairs in reinforced concrete - Product requirements and test methods
AS 2444	2001	Portable fire extinguishers and fire blankets - Selection and location
AS 2455		Textile floor coverings - Installation practice
AS 2455.1	2019	General
AS 2507	1998	The storage and handling of agricultural and veterinary chemicals
AS/NZS 2588	2018	Gypsum plasterboard
AS/NZS 2589	2017	Gypsum linings - Application and finishing
AS 2601	2001	The demolition of structures
AS 2663		Textiles - Fabrics for window furnishings
AS 2663.1	1997	Uncoated fabrics
AS 2663.2	1999	Coated curtain fabrics
AS 2663.3	1999	Vertical and holland blinds
AS 2688	2017	Timber and composite doors
AS/NZS 2712	2007	Solar and heat pump water heaters - Design and construction
AS/NZS 2728	2013	Prefinished/prepainted sheet metal products for interior/exterior building applications - Performance requirements
AS 2758		Aggregates and rock for engineering purposes
AS 2758.1	2014	Concrete aggregates
AS 2796		Timber - Hardwood - Sawn and milled products
AS 2796.1	1999	Product specification
AS 2796.2	2006	Grade description
AS 2796.3	1999	Timber for furniture components
AS 2858	2023	Timber - Softwood - Visually stress-graded for structural purposes
AS 2870	2011	Residential slabs and footings
AS/NZS 2904	1995	Damp-proof courses and flashings
AS/NZS 2908		Cellulose-cement products
AS/NZS 2908.2	2000	Flat sheets
AS/NZS 2924		High-pressure decorative laminates (HPL, HPDL) - Sheets based on thermosetting resins (usually called laminates)
AS/NZS 2924.1	2024	Introduction and general information (ISO 4586-1:2018, IDT)
AS/NZS 3000	2018	Electrical installations (known as the Australian/New Zealand Wiring Rules)
AS/NZS 3008		Electrical installations - Selection of cables
AS/NZS 3008.1.1	2017	Cables for alternating voltages up to and including 0.6/1 kV - Typical Australian installation conditions
AS/NZS 3017	2022	Electrical installations - Verification by inspection and testing
AS/NZS 3500		Plumbing and drainage
AS/NZS 3500.1	2021	Water services
AS/NZS 3500.2	2021	Sanitary plumbing and drainage
AS/NZS 3500.3	2021	Stormwater drainage
AS/NZS 3500.4	2021	Heated water services
AS/NZS 3504	2006	Fire blankets
AS 3566		Self-drilling screws for the building and construction industries
AS 3566.1	2002	General requirements and mechanical properties
AS/NZS 3582		Supplementary cementitious materials
AS/NZS 3582.1	2016	Fly ash
AS 3582.2	2016	Slag - Ground granulated blast-furnace
AS/NZS 3582.3	2016	Amorphous silica
AS 3582.4	2022	Pozzolans - Manufactured
AS 3600	2018	Concrete structures
AS 3610		Formwork for concrete
AS 3610.1	2018	Specifications
AS 3610.2 (Int)	2023	Design and construction
AS 3660		Termite management
AS 3660.1	2014	New building work
AS 3660.3	2014	Assessment criteria for termite management systems
AS/NZS 3666		Air-handling and water systems of buildings - Microbial control
AS/NZS 3666.1	2011	Design, installation and commissioning
AS 3715	2025	Metal finishing - Thermoset powder coatings for architectural applications of aluminium and aluminium alloys
AS 3727		Pavements
AS 3727.1	2016	Residential

AS 3730		Guide to the properties of paints for buildings
AS 3730.1	2006	Latex - Interior - Flat
AS 3730.2	2006	Latex - Interior - Semi-gloss
AS 3730.3	2006	Latex - Interior - Low gloss
AS 3730.6	2006	Solvent-borne - Interior/exterior - Full gloss enamel
AS 3730.7	2006	Latex - Exterior - Flat
AS 3730.8	2006	Latex - Exterior - Low gloss
AS 3730.9	2006	Latex - Exterior - Semi-gloss
AS 3730.10	2006	Latex - Exterior - Gloss
AS 3730.12	2006	Latex - Interior - Gloss
AS 3730.16	2006	Latex - Self-priming timber finish - Exterior
AS 3730.27	2006	Clear coatings for interior timber floors
AS 3730.28	2006	Wood stain - Solvent-borne - Exterior
AS 3730.29	2006	Solvent-borne - Exterior/interior - Paving paint
AS 3740	2021	Waterproofing of domestic wet areas
AS 3786	2014	Smoke alarms using scattered light, transmitted light or ionization
AS 3798	2007	Guidelines on earthworks for commercial and residential developments
AS 3799	1998	Liquid membrane-forming curing compounds for concrete
AS/NZS 3823		Performance of electrical appliances - Airconditioners and heat pumps
AS/NZS 3823.1.2	2012	Ducted airconditioners and air-to-air heat pumps - Testing and rating for performance (ISO 13253:2011, MOD)
AS/NZS 3823.2	2013	Energy labelling and minimum energy performance standards (MEPS) requirements
AS 3850		Prefabricated concrete elements
AS 3850.1	2024	General requirements
AS 3850.2	2024	Building construction
AS 3958	2023	Installation of ceramic and stone tiles
AS 3959	2018	Construction of buildings in bushfire-prone areas
AS 3972	2010	General purpose and blended cements
AS 3996	2019	Access covers and grates
AS 3999	2015	Bulk thermal insulation - Installation
AS/NZS 4020	2018	Testing of products for use in contact with drinking water
AS 4049		Paints and related materials - Pavement marking materials
AS 4049.1	2005	Solvent-borne paint - For use with surface applied glass beads
AS 4049.3	2005	Waterborne paint - For use with surface applied glass beads
AS 4049.4	2006	High performance pavement marking systems
AS 4055	2021	Wind loads for housing
AS 4145		Locksets and hardware for doors and windows
AS 4145.2	2008	Mechanical locksets for doors and windows in buildings
AS 4200		Pliable building membranes and underlays
AS 4200.1	2017	Materials
AS 4200.2	2017	Installation
AS 4254		Ductwork for air-handling systems in buildings
AS 4254.1	2021	Flexible duct
AS 4254.2	2012	Rigid duct
AS 4256		Plastic roof and wall cladding materials
AS 4256.2	2006	Unplasticized polyvinyl chloride (uPVC) building sheets
AS 4256.3	2006	Glass fibre reinforced polyester (GRP)
AS 4256.5	2006	Polycarbonate
AS 4312	2019	Atmospheric corrosivity zones in Australia
AS 4373	2007	Pruning of amenity trees
AS 4386	2018	Cabinetry in the built-in environment - Commercial and domestic
AS 4419	2018	Soils for landscaping and garden use
AS 4454	2012	Composts, soil conditioners and mulches
AS/NZS 4455		Masonry units, pavers, flags and segmental retaining wall units
AS/NZS 4455.2	2010	Pavers and flags
AS/NZS 4505	2012	Garage doors and other large access doors
AS/NZS 4509		Stand-alone power systems
AS/NZS 4509.1	2009	Safety and installation
AS/NZS 4509.2	2010	System design
AS 4552	2005	Gas fired water heaters for hot water supply and/or central heating
AS 4586	2013	Slip resistance classification of new pedestrian surface materials
AS/NZS 4600	2018	Cold-formed steel structures
AS 4602		High visibility safety garments
AS 4602.1	2011	Garments for high risk applications
AS 4654		Waterproofing membranes for external above-ground use
AS 4654.1	2012	Materials
AS 4654.2	2012	Design and installation
AS/NZS 4667	2000	Quality requirements for cut-to-size and processed glass
AS/NZS 4671	2019	Steel for the reinforcement of concrete
AS 4672		Steel prestressing materials
AS 4672.1	2007	General requirements
AS/NZS 4672.2	2007	Testing requirements
AS/NZS 4680	2006	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
AS/NZS 4692		Electric water heaters
AS/NZS 4692.2	2005	Minimum Energy Performance Standard (MEPS) requirements and energy labelling

AS/NZS 4766	2020	Rotationally moulded buried, partially buried and non-buried storage tanks for water and chemicals
AS/NZS 4777		Grid connection of energy systems via inverters
AS/NZS 4777.1	2024	Installation requirements
AS/NZS 4777.2	2020	Inverter requirements
AS 4785		Timber - Softwood - Sawn and milled products
AS 4785.1	2002	Product specification
AS 4785.3	2002	Timber for furniture components
AS/NZS 4791	2006	Hot-dip galvanized (zinc) coatings on ferrous open sections, applied by an in-line process
AS/NZS 4792	2006	Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or a specialized process
AS 4809	2017	Copper pipe and fittings - Installation and commissioning
AS/NZS 4858	2004	Wet area membranes
AS/NZS 4859		Thermal insulation materials for buildings
AS/NZS 4859.1	2018	General criteria and technical provisions
AS 4970	2009	Protection of trees on development sites
AS/NZS 5033	2021	Installation and safety requirements for photovoltaic (PV) arrays
AS 5039		Security door and window screens
AS 5039.1	2023	Classification and performance
AS 5039.2	2024	Installation
AS 5100		Bridge design
AS 5100.4	2017	Bearings and deck joints
AS/NZS 5139	2019	Electrical installations - Safety of battery systems for use with power conversion equipment
AS/NZS 5141	2018	Residential heating and cooling systems - Minimum applications and requirements for energy efficiency, performance and comfort criteria
AS/NZS 5149		Refrigerating systems and heat pumps - Safety and environmental requirements
AS/NZS 5149.1	2016	Definitions, classification and selection criteria (ISO 5149-1:2014, MOD)
AS/NZS 5149.2	2016	Design, construction, testing, marking and documentation (ISO 5149-2:2014, MOD)
AS/NZS 5149.3	2016	Installation site (ISO 5149-3:2014, MOD)
AS/NZS 5149.4	2016	Operations, maintenance, repair and recovery (ISO 5149-4:2014, MOD)
AS/NZS ISO 5151	2023	Non-ducted air conditioners and heat pumps - Testing and rating for performance
AS 5203	2016	Protection of openable windows/ fall prevention - Test sequence and compliance method
AS 5216	2021	Design of post-installed and cast-in fastenings in concrete
AS/NZS 5601		Gas installations
AS/NZS 5601.1	2022	General installations
AS 5604	2022	Timber - Natural durability ratings
AS 6669	2016	Plywood - Formwork
AS 11801		Information technology - Generic cabling for customer premises
AS 11801.1	2019	General requirements (ISO/IEC 11801-1:2017, MOD)
AS 11801.4	2019	Single-tenant homes (ISO/IEC 11801-4:2017, MOD)
AS 13006	2020	Ceramic tiles - Definitions, classification, characteristics and marking (ISO 13006:2018 (ED.3.0) MOD)
AS ISO 13007		Ceramic tiles - Grouts and adhesives
AS ISO 13007.1	2020	Terms, definitions and specifications for adhesives
AS/NZS 14763		Information Technology - Implementation and operation of customer premises cabling
AS/NZS 14763.2	2020	Planning and installation (ISO/IEC 14763-2 (ED. 2.0) MOD)
AS 16890		Air filters for general ventilation
AS 16890.1	2024	Technical specifications, requirements and classification system based upon particulate matter efficiency (ePM) (ISO 16890-1:2016, MOD)
AS 60529	2004	Degrees of protection provided by enclosures (IP Code)
AS/NZS 60598		Luminaires
AS/NZS 60598.1	2017	General requirements and tests (IEC 60598-1, Ed. 8.0 (2014) MOD)
AS/NZS 61000		Electromagnetic compatibility (EMC)
AS/NZS 61439		Low-voltage switchgear and controlgear assemblies
AS/NZS 61439.1	2016	General rules (IEC 61439-1, Ed. 2.0 (2011), MOD)
AS/NZS 61439.3	2016	Distribution boards intended to be operated by ordinary persons (DBO) (IEC 61439-3, Ed 1.0 (2012), MOD)
HB 230	2008	Rainwater tank design and installation handbook
HB 276	2004	A guide to good practice for energy efficient installation of residential heating, cooling and air conditioning plant and equipment
BCA B1D2	2022	Structure - Structural provisions - Resistance to actions
BCA H1D3	2022	Class 1 and 10 buildings - Structure - Site preparation
BCA H1D4	2022	Class 1 and 10 buildings - Structure - Footings and slabs
BCA H1D7	2022	Class 1 and 10 buildings - Structure - Roof and wall cladding
BCA H1D8	2022	Class 1 and 10 buildings - Structure - Glazing
BCA H1D11	2022	Class 1 and 10 buildings - Structure - Attachment of framed decks and balconies to external walls of buildings using a waling plate
BCA H2D6	2022	Class 1 and 10 buildings - Damp and weatherproofing - Roof and wall cladding
BCA H3D6	2022	Class 1 and 10 buildings - Fire safety - Smoke alarms and evacuation lighting
BCA H4D2	2022	Class 1 and 10 buildings - Health and amenity - Wet areas
BCA H5D2	2022	Class 1 and 10 buildings - Safe movement and access - Stairway and ramp construction
BCA H5D3	2022	Class 1 and 10 buildings - Safe movement and access - Barriers and handrails

BCA H6D2	2022	Class 1 and 10 buildings - Energy efficiency - Application of Part H6
NCC A5G1	2022	Governing requirements - Documentation of design and construction - Suitability
NCC Schedule 1	2022	Schedule 1 Definitions
PCA	2022	National Construction Code Series Volume 3 - Plumbing Code of Australia
ABCB HP	2022	ABCB Housing Provisions
ACCC SS	2014	Competition and Consumer (Corded Internal Window Coverings) Safety Standard
AIRAH DA09	2022	Air conditioning load estimation and psychrometrics
AIRAH DA19	2019	HVAC&R maintenance
APVMA PubCRIS		Public Chemical Registration Information System (PubCRIS) database for registered agricultural and veterinary chemical products and approved actives
AUS Gov Telecom	2024	Telecommunications in new developments policy
NASH		NASH Standard residential and low-rise steel framing
NASH-1	2005	Design criteria
NASH-2	2014	Design solutions
NBN Guideline 11	2024	Residential preparation and installation guide - SDUs and MDUs
NGIA Guidelines	2023	National plant labelling guidelines
NPCAA PCH	2009	Precast concrete handbook
SWA Asbestos removal	2020	How to safely remove asbestos Code of Practice
SWA HCIS		Hazardous chemical information system
WAER	2023	WA Electrical Requirements (WAER)
WA Gov Act No. 023	2007	Biosecurity and Agriculture Management Act 2007
WA Gov Act No. 36	2020	Work Health and Safety Act 2020
WA Gov Act No. 53	1972	Aboriginal Heritage Act 1972
WA Gov CoP Wastewater		2013 Code of practice for product approval of onsite wastewater systems (Department of Health)
WA Gov R Health	1974	Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974
WA Gov R Noise	1997	Environmental Protection (Noise) Regulations 1997
WA Gov R Pesticides	2011	Health (Pesticides) Regulations 2011
WA Gov R UD	2004	Environmental Protection (Unauthorised Discharges) Regulations 2004
WA Gov R Waste	2004	Environmental Protection (Controlled Waste) Regulations 2004
ASHRAE 52.2	2017	Method of testing general ventilation air-cleaning devices for removal efficiency by particle size
ASHRAE Handbook F	2021	ASHRAE Handbook - Fundamentals
EN 1343	2012	Kerbs of natural stone for external paving - Requirements and test methods
ISO 10580	2010	Resilient, textile and laminate floor coverings - Test method for volatile organic compound (VOC) emissions
UN GHS	2023	Globally Harmonized System of Classification and Labelling of Chemicals (GHS)

Government of **Western Australia**
Department of **Housing and Works**

Design and Construct Specification
Prefabricated Housing

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