



Government of **Western Australia**
Department of **Communities**
Housing

HOUSING

DESIGN AND CONSTRUCT SPECIFICATION

PREFABRICATED HOUSING

NATSPEC October 2019



This reference specification has been developed by NATSPEC in conjunction with the Western Australia Department of Communities, Housing. 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.

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A. GENERAL**1 PROPOSAL REQUIREMENT 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 Western Australia Department of Communities, Housing *Part A: Qualitative brief – Prefabricated housing.*
- The Western Australia Department of Communities, Housing *Part B: Functional brief – Prefabricated housing.*
- The Western Australia Department of Communities, Housing *Addendum to Part B: Functional brief – Prefabricated housing.*
- The National Construction Code 2019 (NCC).
- This specification.

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.

Definition

Approval: If approval is required, this is required from the principal before works can proceed further.

GROH: Government Regional Officer's 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.

Prototype: An original, sample or first model of a product/building fabricated, from which other buildings will be copied or developed.

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**

Contractor's responsibilities: Cover all authority application and approval requirements, including fees and contributions.

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

Building applications

Applications: Submit to the Permit Authority a completed Certified Building Permit Application (BA1) and other documents required, including Certificate of Design Compliance (BA3) and Demolition Permit Application (BA5), if required.

Drawings and specifications submitted with application: Demonstrate compliance with the NCC and provide evidence that other relevant approvals have been obtained, including local government authority approval of public health requirements.

Building and Construction Industry Training Fund (BCITF) levy: Cover all costs and requirements, including additional payments required if the construction costs varies by more than \$25,000. Submit proof of BCITF Levy payment (receipt) with the Building Permit Application (BA1) submission.

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 Communities, Housing.

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.
- Foundation/footing.
- 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:

- Construction of additional structures, including porches, decking and carports to *Part B: Functional brief – Prefabricated housing*.
- Connecting to the plumbing, gas, electrical and communication systems.
- Installation of the HVAC system.
- Completion of exterior fittings, e.g. screens, locks and grilles, including:
 - . Installation of cyclone debris screens if required by the principal.

- . Installation of solar collector panels if required by the principal.
 - Completion of interior fittings, e.g. non-fixed items.
- Site built structures: Include works additional to the modular house, including:
- Detached storeroom to *Part B: Functional brief – Prefabricated housing*.
 - 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 this assessed BAL.

Structural design actions

Requirement: Conform to the following, including for external fixtures and fencing:

- AS/NZS 1170.2.
- AS 4055.

Designated design class/category: Wind Regions D and Terrain Category 1 (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

Footings and foundation: Design footings and foundations 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 Western Australia Department of Communities, Housing *Part A Qualitative Brief – Prefabricated Housing*.
- 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**Standards**

General: To the recommendations of one or more of the following:

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

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

Design criteria

Outside design conditions: Use outdoor design conditions listed in AIRAH DA09, Table 1 or Table 1A for the following:

- The location geographically closest to the site.
- Comfort (or non-critical process) conditions.

Inside design conditions:

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

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 conditions are in the range specified above.
- 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 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.

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) Regulation 1997.

System requirements

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

Standard: Conform to the recommendations of AS/NZS 2311 Sections 3, 6 and 7 or AS 2312.1 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 which adequately describes 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, provide 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: Provide drawings of minimum 1:100 scale (minimum 1:200 scale when printed at A3) showing the following:

- Room layout, room/space names, overall room dimensions, sizes (in m²) for all programmed spaces including entrances and corridors, floor finishes.
- Show module units, connections to adjoining unit(s) and 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.
- Any built-in fittings such as shelves, benches, and stairs and balustrading for the two storey dwelling prototype.
- Roof plan showing associated equipment, slopes, ridges, drains, and other items.

Elevations and sections: Submit drawings of minimum 1:100 scale showing the following:

- All building elements including entrances, windows, doors, louvres, vents, exhaust and similar items.
- Overall building, floor-to-floor and roof heights.
- Include longitudinal and transverse sections for each major area, indicating floor elevations, ceiling heights and roof lines. Show connections to adjoining module unit(s).
- Reference all sections and elevations on the floor plans.
- In the sections, show provisions for HVAC distribution and hood venting.

Interior details: As appropriate, provide plans, sections/elevations of minimum 1:50 scale showing the following:

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

Schedules: Provide schedules of 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: Provide 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: Include the following details on a detailed topographical survey:

- 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: Provide drawings of minimum 1:100 (minimum 1:200 scale when printed at A3) scale 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 AS 1428.1 and AS 1428.2.
- 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 buildings 2 storeys high, shadows cast by the building onto adjoining properties at 12 noon 21st June.

2.3 STRUCTURAL REQUIREMENTS

Prototype construction documentation

Requirement: Provide 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: Include details of 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 or AS/NZS 2312.2 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 comply with B. DESIGN DEVELOPMENT, **DESIGN CRITERIA** and **F. CONSTRUCTION SPECIFICATION**.

Site installation drawings

Requirement: Provide 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: Provide drawings of minimum 1:100 scale 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: Provide drawings of minimum 1:100 scale 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: Provide drawings of minimum 1:100 scale 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: Provide 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: Provide drawings of minimum 1:100 scale 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: Provide drawings of minimum 1:100 scale 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 SUBMISSION

Construction documentation review

Requirement: Submit construction documentation for review and approval upon 50% and 100% completion of documentation. Provide documentation as required to verify that the design complies with B. DESIGN DEVELOPMENT, DESIGN CRITERIA, F. CONSTRUCTION SPECIFICATION and other conditions of contract, including drawings, certification and calculations for the structural, HVAC, electrical, plumbing, and communications.

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

As-constructed drawings

Electronic copies/format: Provide at minimum files in pdf, dxf and dwg format. Additional file formats can be provided.

Hard copies: Provide 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 complies with B.DESIGN DEVELOPMENT, **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, 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/finished 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: Comply with 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 unit 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 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.

Temporary removal of fencing: Obtain consent from the owners and occupants of the adjoining properties to remove the fencing before carrying out. Complete the BA20A form supplied by the Department of Communities, Housing.

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, watching and traffic management until practical completion. Provide all measures required to guard against vandalism or works and materials on site.

Vandalism: Do not claim for costs or loss from vandalism of works, materials, plant or equipment on site.

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.

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

Natural vegetation and neighbouring properties

Protection of existing vegetation and properties: Retain existing vegetation and landscaping, as shown in the site installation construction documentation. Minimise wheel ruts to turf/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 PRELIMINARY SITE PREPARATION, **THE SITE, Adjoining property** is available, refer to this before reinstatement. Obtain written acceptance from the owner of the affected property after completing reinstatement.

Protective clothing

Protective clothing: Make available protective clothing for the use of visitors.

- Safety helmets: To AS/NZS 1801, Type 1.
- Certification: Required.
 - . Certification provider: An organisation accredited by the Joint Accreditation System of Australia and New Zealand (JAS-ANZ).

1.3 THE SITE**Project signboards**

General: Provide project-specific signboards and conform to the following:

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

Rectification

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

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

Existing services

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

Services location: Before starting site works, locate existing, including contact DIAL BEFORE YOU DIG 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.

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

Easements: Confirm easement required with the relevant utility authority.

Proposals: Submit proposals of action on existing services for review before starting this work.

- Purpose of submission: For review.

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 property

Notice: At least 10 working days before commencing work, submit to owners and occupants of adjoining property written notice 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 property on to the site or of existing site structures on to adjoining property, immediately seek instructions.

Records: For each property which may be affected adversely by the works, carry out the following:

- 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 record, including drawings, written descriptions, and photographs, 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: Information only.

1.4 BUILDING THE WORKS**Survey marks**

Definition: A survey peg, bench mark, 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 survey marks are disturbed or obliterated, immediately rectify.

2 DEMOLITION**2.1 STANDARDS****Demolition**

Standard: To AS 2601.

2.2 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.

Removal contractor: Carry out removal by a WorkSafe (WA) unrestricted asbestos licence holders listed at

www.commerce.wa.gov.au/worksafe/finding-and-selecting-asbestos-licence-holder

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 government authority.

State regulations

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

Form submission: Provide copies of submitted WorkSafe (WA) asbestos removal forms and evidence that all fees have been paid. Forms are available at:

www.commerce.wa.gov.au/publications/notifications-unrestricted-asbestos-removal-work.

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 the site. Prevent spillage of demolished materials in transit.

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

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.

Removal of hazardous substances

Standard: To AS 2601 clause 1.6.2.

Asbestos removal: To AS 2601 clause 3.3.2 and NOHSC 2002.

2.4 PROTECTION

Encroachment

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

2.5 DEMOLITION - BUILDING SERVICES

Existing septic tanks

Redundant/disused tanks: Decommission tank as follows:

- Completely empty tanks to the *Environmental Protection (Unauthorised Discharges) Regulations 2004 (WA)*, 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 tank, drains and wells as required.
- Fill up excavations, tank, drains and soak wells with clean fill such as yellow sand and compact.

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

2.6 COMPLETION

Notice of completion

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

Reinstatement

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

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

Temporary support

General: Remove at completion of demolition.

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.

3 SITE PREPARATION

3.1 CONTROL AND PROTECTION

Erosion control

General: Plan and carry out the work so as to avoid erosion, contamination, and sedimentation of the site, surrounding areas, and drainage systems.

Dewatering

Requirement: Keep earthworks free of water. Provide and maintain slopes, crowns and drains for excavations and embankments so 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 flowing over freshly laid work.

Water quality

Wash out: Prevent wash out from entering waterways or stormwater drains.

Cross connection: Make sure there are no cross connections between stormwater and the public sewerage system.

3.2 TREE PROTECTION

Trees to be retained

Extent: All trees NOT marked for removal.

Tree protection

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

Tree protective measures: To AS 4970 Section 4.

Work near trees

Harmful materials: 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: Use hand methods to locate, expose and cleanly remove the roots on the line of excavation.

3.3 SITE CLEARING

Extent

Requirement: Clear only areas to be occupied by works such as structures, paving, excavation, regrading and landscaping or other areas designated to be cleared.

Clearing and grubbing

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

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 of 500 mm below subgrade under buildings, embankments or paving, and 300 mm below the finished surface in unpaved areas. Backfill 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 EARTHWORKS

4.1 STANDARDS

General

Earthwork: To BCA 3.1.1 and the recommendations of AS 3798.

4.2 FILL MATERIALS

General

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

Unsuitable materials: AS 3798 clause 4.3.

4.3 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.

4.4 REMOVAL OF TOPSOIL

General

Extent: Areas of cut or fill and areas 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.

4.5 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 over the site to give correct levels and profiles required as the basis for structures, paving and landscaping. Make allowance for compaction or settlement or heaving.

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

Crawl space: Provide a clear space under bearers:

- Minimum clearance: 400 mm.

4.6 PREPARATION FOR FILLING

Preparation

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

4.7 PLACING FILL

General

Fill: Conform to the NCC 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.

Compacting fill: Compact 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.

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

Certification: Provide an engineer's signed compaction certificate before construction commences.

Placement: To BCA 3.2.2.

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: Adjust the moisture content of fill during compaction within the range of 85 to 115% of the optimum moisture content determined by AS 1289.5.1.1 or AS 1289.5.2.1 as appropriate, to achieve the required density.

Compaction

Density: 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.

Excavated and stripped ground surface: After excavation and/or stripping, compact these surfaces to minimum depth of 150 mm.

Minimum relative compaction: To AS 3798 Table 5.1.

5 TERMITE MANAGEMENT

5.1 TERMITE MANAGEMENT SYSTEMS

System requirements

Standard: To AS 3660.1.

Termite management: To BCA 3.1.4.

Termite reticulation systems

Type testing: To AS 3660.3 Section 5.

Termite management system notice

Requirement: Permanently fix a durable notice in a prominent location to BCA 3.1.4.4 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 SITE PREPARATION, **EARTHWORK, FILL MATERIALS**, free from stones larger than 100 mm maximum dimension and as follows:

- Next to services: Do not place any particles greater in size than 25 mm within 150 mm of services.
- Under paved areas and within 4 m of structures: Coarse sand, controlled low strength material or fine crushed rock.
- In reactive clay: In sites classified M, M-D, H1, H1-D, H2, H2-D, E or E-D to AS 2870, re-use excavated site material at a moisture content within $\pm 1\%$ 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 EXCAVATING

Excavation

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.

Layers: Compact all material in layers not exceeding 150 mm compacted thickness. Compact each layer to the relative compaction required before starting the next layer.

6.5 SURFACE RESTORATION

General

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

F. CONSTRUCTION SPECIFICATION

1 GENERAL REQUIREMENTS

1.1 SUBMISSION

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)*.

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*.
- Materials that use chlorofluorocarbon (CFC) or hydrochlorofluorocarbon (HCFC) in the manufacturing process.

1.3 TIMBER

Moisture content

General: Make milled products from timbers seasoned as follows:

- To within 3% of the equilibrium moisture content appropriate to the timber and its intended conditions of use.
- With no more than 3% difference between any 2 pieces in any one group.

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 timbers of equivalent durability.

Natural durability class of heartwood: To AS 5604.

Preservative treatment: To the AS 1604 series.

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

Natural and treated timber durability table

Exposure	Natural timber	Treated timber	Remarks
	Required durability class to AS 5604	Required hazard class to the AS 1604 series	
Inside, above ground. Completely protected from the weather. Well ventilated	Class 4	H1	Treated timber resistant to lyctids. Untreated timber must be protected from termites
Inside, above ground. Protected from wetting with nil leaching. Well ventilated	Class 3	H2	Treated timber resistant to borers and termites. Untreated timber must be protected with a finish
Above ground, exposed to weather. Periodic moderate wetting and leaching	Class 2	H3	Treated timber resistant to borers, termites and moderate decay. Applicable to weatherboards, fascias, pergolas (above ground), window joinery, framing and decking
In-ground	Class 1	H4 (Severe wetting and leaching)	Treated timber resistant to borers, termites and severe decay. Applicable to fence posts, greenhouses, pergolas (in-ground) and landscaping timbers
		H5 (Extreme wetting and leaching and/or critical uses)	Applicable to retaining walls, piling, house stumps, building poles, cooling tower fill

1.4 STEEL

Durability

General: Provide steel products protected from corrosion to suit the conditions of use.

Internal engineer designed steel members: Remove mill scale, rust, moisture and oil. Coat with a zinc phosphate primer to the manufacturer's instructions.

Built-in products below damp-proof course:

Stainless steel 316 or engineered polymer.

Corrosion resistance

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

Fasteners: Conform to the **Corrosion resistance table** or provide proprietary products with metallic and/or organic coatings of equivalent corrosion resistance.

Corrosion resistance table

Atmospheric corrosivity category to AS 4312	Threaded fasteners and anchors		Powder actuated fasteners
	Material	Minimum local metallic coating thickness (µm)	Material
C1 and C2	Electroplated zinc or Hot-dip galvanized	30	Stainless steel 316
C3	Hot-dip galvanized	50	Stainless steel 316
C4 and T	Stainless steel 316	-	Stainless steel 316

Preparation and pre-treatment

Standard: To the AS 1627 series.

Galvanizing

General: Galvanize mild steel components (including fasteners) to AS/NZS 1214, AS 1397 or AS/NZS 4680, as appropriate, and in the following conditions:

- Exposed to weather.
- Embedded in masonry.
- Exposed to or in air spaces behind external leaves of masonry walls.
- In contact with chemically treated timber.

1.5 PROTECTIVE COATINGS**General**

Environment: To AS 2312.1 clause 2.3.

Coating designation: To AS 2312.1 Table 6.3.

1.6 FASTENERS**Self-drilling screws**

Standard: To AS 3566.1.

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 and AS 3600.

2.2 STANDARDS**General**

Formwork design and construction: To AS 3610.1.

Plywood formwork: To AS 6669.

Reinforced concrete construction: To AS 3600.

Specification and supply of concrete: To AS 1379.

Residential ground slabs and footings: To AS 2870.

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 clause 17.5.

Finishes

Formed surface finish quality: To AS 3610.1 Table 3.3.3.1 and the following:

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

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

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: Provide independent certification by a professional engineer of conformance to the project criteria, of both the design and the completed works.

2.6 MATERIALS**Cement**

Standard: To AS 3972.

Age: Less than 6 months old.

Pre-mixed concrete supply

Standard: To AS 1379 by the batch production process.

Maximum slump: 100 mm.

Reinforcement

Standard: To AS/NZS 4671.

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 clause 17.2.1.2.

Polymeric film underlay

Vapour barriers and damp-proofing membranes: To AS 2870 clause 5.3.3.

Minimum thickness: 0.2 mm.

Curing compounds

Standard: To AS 3799.

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.

2.7 POLYMERIC FILM UNDERLAY

Location

Requirement: Under slabs on ground including integral ground beams and footings, provide a vapour barrier or, in areas prone to rising damp or salt attack, a damp-proofing membrane.

2.8 CONCRETE

Placing in cold weather

Temperature limits: Maintain the following:

- Freshly mixed concrete: $\geq 5^{\circ}\text{C}$.
- Forms and reinforcement before and during placing: $\geq 5^{\circ}\text{C}$.
- Water: Maximum 60°C when placed in mixer.

Placing in hot weather

Temperature limits: Maintain the following:

- Freshly mixed concrete at $\leq 35^{\circ}\text{C}$.
- Forms and reinforcement before and during placing: $\leq 35^{\circ}\text{C}$.

2.9 CURING

General

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

- Curing: Cure continuously from completion of finishing, when the concrete has set sufficiently not to be damaged by the curing process, until the minimum total cumulative number of days or fractions of days, during which the air temperature in contact with the concrete is above 10°C , conforms to the following:
 - . 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.

2.10 COMPLETION

Compliance

Tolerances: Check tolerances in conformance with AS 3610.1 Section 5.

3 PRECAST CONCRETE

3.1 REQUIREMENTS

Performance

Requirement: Provide pre-cast concrete as follows:

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

Design

Structural design: To AS 3600 and BCA B1.1.

3.2 STANDARDS

General

Precast elements: Conform to NP PCH (Precast concrete handbook).

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

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

Precast flooring systems: To AS 3600.

Design, installation and testing of post-installed and cast-in fastenings: To AS 5216.

3.3 INTERPRETATION

Definitions

General: For the purposes of this worksection the definitions given in AS 3850.1 clause 1.4 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 clause 17.5.3.

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

Formed surfaces finish quality: To AS 3610.1 Table 3.3.3.1.

3.5 SUBMISSIONS

Certification

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

3.6 MATERIALS

General

Standard: To AS 3600 and AS 1379.

Concrete cover: To AS 3600 clause 4.10.

Aggregates

Standard: To AS 2758.1.

Cement

Standard: To AS 3972.

Age: Less than 6 months old.

Type: Do not use high alumina cement.

Supplementary cementitious materials:

- Fly ash: To AS/NZS 3582.1.
- Slag: To AS 3582.2.
- Amorphous silica: To AS/NZS 3582.3.

Water

Standard: To AS 1379 clause 2.4.

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

Chemical admixtures

Standard: To AS 1478.1, used to manufacturer's recommendations.

Concrete colour

Standard: To AS 3610.1.

Pigments (oxides): As follows:

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

Reinforcement

Standard: To AS/NZS 4671.

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

Corrosion protection: To AS 3600 clause 17.2.1.2.

Prestressing tendons

Standard: To AS 4672.1.

Type: 7 wire, stress relieved, high tensile steel and strand.

Prestressing hardware: To AS 3600.

Welding tendons: Do not weld prestressing tendons.

3.7 CAST-IN ITEMS

Fixings and embedded items

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

Corrosion: In external or exposed locations, galvanize anchor bolts and embedded fixings, as follows:

- All threaded products: To AS/NZS 1214.
- All non-threaded products: To AS/NZS 4680.

3.8 MISCELLANEOUS

Bearing pads

Selections and testing: To AS 5100.4.

Flashings

Standard: To AS/NZS 2904.

3.9 INSTALLATION

Proprietary precast elements

Requirement: Install to the manufacturer's recommendations.

Lifting and handling

Requirement: Conform to the recommendations of the ASCC National code of practice for precast, tilt-up and concrete elements in building construction and AS 3850.2.

Temporary bracing and propping: To AS 3850.2 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.

3.10 COMPLETION

Compliance

Tolerances: Check element compliance with AS 3610.1 Section 3.

Rejection: Reject any precast elements not conforming to the documented tolerances.

4 LIGHT STEEL FRAMING

4.1 STANDARDS

General

Design, materials and protection: To AS/NZS 4600.

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

4.2 TOLERANCES

General

Manufacturing, assembly and installation tolerances: To NASH-1 Appendix D and NASH-2 Appendix A.

4.3 COMPONENTS

Cold-formed steel framing

Cold-form sections from metallic-coated steel: To AS 1397.

Corrosion protection: To NASH-2 Section 8.

Framing members

Cold-formed steel framing for proprietary systems: To NASH-1 and NASH-2.

4.4 INSTALLATION

Fabrication

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

Service holes: Form holes by drilling or punching.

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

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

Fastening

Type: Select from the following:

- Bolting.
- Self-drilling, self-tapping screws.

- Blind rivets.
- Proprietary clinching system.
- Structural adhesives.
- Welding. On-site welded connections are not permitted.

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. Provide temporary protection for members until permanent covering is in place.

Metal separation

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

Unseasoned or CCA treated timber

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

Earthing

Permanent earthing: Required.

Temporary earthing: Provide temporary earthing during erection until the permanent earthing is installed.

Protection

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

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

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 3.10.6.

4.6 WALL FRAMING**Damp-proof course**

Requirement: Provide damp-proof courses under the bottom plate of stud walls built off slabs or masonry dwarf walls, as documented or 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 FRAMING**Additional support**

General: Provide additional frame members at fibre cement or plasterboard sheeting or lining joint locations.

Battens

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

Anti-ponding boards

Standard: To AS 4200.2.

4.8 ROOF TRIM**Fascia, valley and barge boards**

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

4.9 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.

Membrane design and installation: To AS 4654.2.

6 ROOFING**6.1 COMPONENTS****Fasteners**

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.

6.2 MATERIALS**Sheet metal roofing**

Material: Prefinished/coated steel sheeting.

Standard: To AS 1562.1.

Corrosion protection: To BCA Table 3.5.1.1a.

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

Plastic sheet roofing

Unplasticised polyvinyl chloride (PVC-U) sheet: To AS 4256.2.

Glass fibre reinforced polyester (GRP) sheet: To AS 4256.3.

Polycarbonate: To AS 4256.5.

6.3 ROOF PLUMBING

General

Description: Flashings, cappings, gutters, rainwater heads, outlets, downpipes and accessories necessary to complete the roof system.

Flashing and capping: Notched to match profile of roof sheeting.

Standards

Roof drainage: To AS/NZS 3500.3.

Metal rainwater goods: To AS/NZS 2179.1.

PVC-U rainwater goods and accessories: To AS/NZS 3500.3.

Flashings and cappings: To AS/NZS 2904.

Gutters and fascias

Material: Prefinished/coated steel sheeting.

6.4 SHEET METAL ROOFING

Roof sheet installation

Metal sheet roofing: To AS 1562.1.

Cyclonic fasteners and washer: Galvanized steel EPDM bonded to the manufacturer's recommendations for the appropriate substrate.

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

Accessories: Provide material with the same finish as roofing sheets.

6.5 PLASTIC SHEET ROOFING

Installation

Standard: To AS 1562.3.

6.6 ROOF PLUMBING INSTALLATION

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 3.5.3.4.

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.

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 planks

Requirement: Proprietary system of single faced fibre cement building planks.

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

Plank thickness: 7.5 mm.

Joints and edges: PVC-U extrusion.

Corners: Preformed metal joining pieces.

Profiled sheet metal

Standard: To AS 1562.1.

Fibre cement sheet

Standard: To AS/NZS 2908.2.

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 3.5.4.5.
 - Minimum sheet thickness: 6 mm.
 - Joints: PVC-U extrusion.

7.2 COMPONENTS

Flashing material

Standard: To AS/NZS 2904.

7.3 CONSTRUCTION GENERALLY

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 PROPRIETARY SYSTEMS OR PRODUCTS

Fixing

Product fixing: Fix proprietary systems to manufacturer's recommendations.

7.5 PROFILED SHEET METAL CLADDING

Installation

Standard: To AS 1562.1.

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

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

Corner flashing

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

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 for the following:

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

Glazing: To BCA 3.6.

External glazing: To BCA 3.12.2.

Glazing

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

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

Testing

Debris impact resistance for glazed sidelights and sliding doors: Tested for loading to AS/NZS 1170.2 clause 2.5.8.

8.3 PRODUCTS AND MATERIALS**Glass**

Safety glass: To AS/NZS 2208.

Aluminium frame finishes

Powder coating: To AS 3715.

Anodising: To AS 1231:

- Thickness: ≥ 15 to 20 microns.

Bathroom windows

Obscure glazing: To WC, bathroom and ensuite windows.

Flashings

Standard: To AS/NZS 2904.

Window labelling and certification

Requirement: To AS 2047 Section 8.

Protection of openable windows

Fall prevention: To BCA 3.9.2.6 and BCA 3.9.2.7.

Testing: To AS 5203.

8.4 COMPONENTS**Louvre window assemblies**

Requirement: Louvre blades mounted in a metal surround frame or subframe and able to withstand the permissible-stress-design wind pressure for that location without failure or permanent distortion of members, and without blade flutter.

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

Insect screens

Requirement: Provide insect mesh screens fitted to all opening window sashes, short glazed windows and sliding doors.

Fixed screens: Provide fixed screens to the window frames with a clipping device which permits removal for cleaning.

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

Retractable screens: Provide a proprietary retractable insect screen comprising aluminium frame and fibreglass mesh fitted between guide channels incorporated in the frame, and a retraction system including tension spring, nylon bearings, positive self-locking device, and plastic sealing strip at sill.

Sliding screens: Provide a matching aluminium head guide, sill runner, and frame stile sections for screens not part of the window frame.

- Hardware: Nylon slide runners and finger pull handle. Provide pile strip closers against sash where necessary to close gaps.

Aluminium framed insect screens: Provide aluminium extruded or folded box frame sections with mesh fixing channel, mitred, staked and screwed at corners. Provide an extended frame section where necessary to adapt to window opening gear.

- 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: AS 3959.

Security screens

Security grilles and screen doors: To AS 5039.

Screen infill material: Type III to AS 5039.

Installation: To AS 5040 by a Police Licensed Security installer.

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.

Testing: Provide certification confirming the screen has been tested to withstand impact loading from windborne debris to AS/NZS 1170.2 clause 2.5.8.

8.5 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.

8.6 INSTALLATION

Windows and glazed doors

General: Install windows and glazed doors frames as follows:

- Plumb, level, straight and true within acceptable 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, drips, storm moulds, joint sealant and pointing to prevent water from penetrating the building between frames and the building structure under 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.

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 10g 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.

9.2 DOOR 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 the required hardware.

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

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.

Extruded gaskets and seals

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

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

- Flexible polyvinyl chloride (PVC): To BS 2571, 100% solids with high consistency, ultraviolet stabilised.
- Rubber products (neoprene, ethylene propylene diene monomer (EPDM) or silicone rubber): To BS 4255-1.

Tolerances

Standard: To AS 2688 clauses 4.1 and 5.3.

Security screen doors

Standard: To AS 5039.

Screen infill material: Type III to AS 5039.

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: AS 3959.

9.4 INSTALLATION**Security screen door**

Installation: To AS 5040 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.

9.5 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. Install to make neat and clean junctions between the frame and the adjoining building surfaces.

Weatherproofing

Flashings and weatherings: Install flashings, weather bars, 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.

9.6 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.

10 OVERHEAD DOORS**10.1 STANDARD****General**

Garage doors: To AS/NZS 4505.

10.2 SUBMISSION**Certification**

Requirement: Submit manufacturer's data verifying the following:

- Materials, products and installation: The door is able to withstand wind pressure to AS/NZS 4505 Table 5.2 in conformance with B.DESIGN DEVELOPMENT, **DESIGN CRITERIA**,
- **Structural design actions**.
- Testing: In conformance with AS/NZS 4505 Appendix A for cyclonic regions.

10.3 INSTALLATION**Frames, guides and tracks**

Requirement: Install frames 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**

Requirement: Provide 3 hinges for external doors and door leaves over 2040 mm in height and 600 mm in width. Conform to the **Hinges table**.

Hinges table

Size of door (mm x mm)	Number of hinges (per door leaf)	Size of hinges (steel)
2040 x 920	3	100 x 75 x 2.5 mm
2040/2400 x 1020	4	100 x 100 x 2.5 mm

Locksets

External doors: Fit standard range door locks, lever handles and latches with entrance sets to front and other external timber doors. Provide deadlocks with inside snib.

Internal doors:

- Generally: Passage sets.
- Bathrooms, showers and toilets: Privacy sets.
- Sliding patio doors and windows: Key-lockable surface mounted bolts.

Keying

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

Door buffers and stops

Internal doors: Provide a satin chrome finished, half moon, floor mounted door stop to all doors.

External doors: Provide a satin chrome, floor mounted door stop 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 stops

Fixing: Fix on the floor, skirting or wall, as appropriate, to prevent the door or door furniture striking the wall or other surface.

12 GLASS COMPONENTS**12.1 STANDARDS****General**

Materials and installation: To AS 1288.

Safety glass: To AS/NZS 2208.

12.2 MIRRORS**Reflective surface**

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

Protective coatings: Electrolytic copper coating at least 5 microns thick, and 2 coats of mirror backing

and edge sealing paint having a total dry film thickness of at least 50 microns.

Safety mirror

Type: Vinyl backed Grade A safety mirror.

Safety compliance: To AS/NZS 2208.

Solid backed annealed glass mirrors

Backing: 9 mm moisture resistant plywood.

Adhesive fixing to backing: Non-acidic silicone adhesive at the rate recommended by the manufacturer.

Installation to backing: Clean the back of the glass panel and apply walnuts of adhesive together with double sided adhesive tape for temporary support and affix directly to the backing.

Edge processing: If exposed, polished pencil edge.

12.3 SHOWER SCREENS**Type**

General: Proprietary system comprising frames of extruded aluminium, stainless steel, or PVC-U, assembled around safety glass to form fixed panels and sliding, hinged or pivoted doors.

Water shedding

General: Provide an assembly which 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 THERMAL INSULATION AND PLIABLE MEMBRANES**13.1 MATERIALS****Insulation**

Cellulosic fibre (loose fill): To AS/NZS 4859.1 Section 4.

Mineral wool blankets and cut pieces (compressible): To AS/NZS 4859.1 Section 7.

Polyester (compressible): To AS/NZS 4859.1 Section 6.

Polyisocyanurate (rigid cellular RC/PIR): To AS 1366.2.

Polystyrene (extruded rigid cellular RC/PS-E): To AS 1366.4.

Polystyrene (moulded rigid cellular RC/PS-M): To AS 1366.3.

Polyurethane (rigid cellular RC/PUR): To AS 1366.1.

IR reflective (formed shapes and compressible with one or more external IR reflective surfaces): To AS/NZS 4859.1, Section 9.

Wool: To AS/NZS 4859.1, Section 5.

Pliable building membrane

Standard: To AS/NZS 4200.1 and BCA 3.12.1.1.

13.2 INSTALLATION**Bulk insulation**

Standard: To AS 3999 and BCA 3.12.1.1.

Installation: Firmly butt together fibre batts or blankets, with no gaps except as follows:

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

Pliable building membrane

Standard: To AS 4200.2 and BCA 3.12.1.1.

14 LINING

14.1 MATERIALS AND COMPONENTS

Plasterboard

Standard: To AS/NZS 2588.

Minimum thickness: Conform to the following:

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

Fibre cement

Standard: To AS/NZS 2908.2.

Wall and ceiling linings: Type B, Category 2.

Minimum thickness: Conform to the following:

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

14.2 CONSTRUCTION GENERALLY

Ceiling linings

General: Do not install until at least 14 days after the timber roof structure is fully loaded.

14.3 PLASTERBOARD LINING

Installation

Gypsum plasterboard: To AS/NZS 2589.

14.4 FIBRE CEMENT LINING

Installation

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

Timber framed construction: Nail only or combined with adhesive.

Steel framed construction: Screw only or combined with adhesive.

Wall framing: Conform to the following:

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

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

Wet areas: Do not use adhesive fixing alone.

15 JOINERY

15.1 JOINERY MATERIALS AND COMPONENTS

Joinery timber

Hardwood for trim: To AS 2796.1.

Hardwood for furniture: To AS 2796.3.

Seasoned cypress pine: To AS 1810.

Softwood for trim: To AS 4785.1.

Softwood for furniture: To AS 4785.3.

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.

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

Wet process fibreboard (including hardboard)

Standard: To AS/NZS 1859.4.

Particleboard

Standard: To AS/NZS 1859.1.

Dry process fibreboard (including medium density fibreboard)

Standard: To AS/NZS 1859.2.

Decorative overlaid wood panels

Standard: To AS/NZS 1859.3.

Certification

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

High-pressure decorative laminate (HPDL) sheets

Standard: To AS/NZS 2924.1.

Minimum thickness: Conform to the following:

- For horizontal surfaces fixed to a continuous substrate: 1.2 mm.
- For vertical surfaces fixed to a continuous substrate: 0.8 mm.
- For post formed laminate fixed to a continuous substrate: 0.8 mm.
- For vertical surfaces fixed intermittently (e.g. to studs): 3.0 mm.
- For edge strips: 0.4 mm.

High-pressure decorative laminate sheet application table

Class to AS/NZS 2924.1	Application
HGS or HGP	Kitchen work-tops
VGS or VGP	Kitchen front panels
VLS	Other vertical locations

15.2 JOINERY ASSEMBLIES

General

Standard: To AS 4386.

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.

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

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

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

- Spacing: 32 mm.

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.

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 sheet.

Exposed edges: Extend laminate over shaped nosing, finishing more than 50 mm back on underside. Splay outside corners at 45°.

Minimum thickness: 32 mm.

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

15.5 TIMBER STAIRS AND BALUSTRADING

Configuration and installation

Requirement: Allow for timber stairs, balustrading, nosings and mouldings (including at landings) to the following:

- Stairs: BCA 3.9.1.
- Barriers and handrails: BCA 3.9.2.

15.6 TRIM

General

Requirement: Provide timber or medium density fibreboard trim, such as beads, skirtings, architraves, mouldings and stops to make neat junctions to openings and between components, finishes and adjacent surfaces.

Proprietary items: Provide complete with installation accessories.

Fixing

To masonry walls: Wall plugs at 600 mm centres, maximum.

To stud walls: Nail to plate or framing at 600 mm centres, maximum.

16 MISCELLANEOUS FIXTURES AND APPLIANCES

16.1 EXTERNAL FIXTURES

Clothes drying facilities

Single dwellings: Provide individual clothesline for each dwelling.

- Type: Height adjustable fold down rotary 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: Provide letterboxes only where postal deliveries are made by Australia Post.

Generally: Provide one numbered and lockable letterbox for each dwelling unit in conformance with Australia Post requirements.

Grouped and multiple dwellings: Provide a bank or banks of letterboxes located in conformance with the requirements of Australia Post.

16.2 APPLIANCES

Cooking appliances

Oven: Stainless steel, fan-forced, under bench or wall oven, as documented on drawings.

- Dimension: 600 mm wide.

Cooktop: Provide one of the following:

- Gas cooktop: Where reticulated gas is available, provide minimum 4 burners, stainless steel, gas cooktop.
- Electric cooktop: Where reticulated gas is not available, provide minimum 4 zone, ceramic glass, electric cooktop.

Rangehoods: Provide fixed rangehood, flued to the outside, and with removable filters.

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

Exhaust fans

Kitchen and bathroom: 200 mm diameter.

16.3 INSTALLATION**Rangehood and exhaust fan**

Requirement: Provide as follows:

- Habitable rooms: Fit with self-closing damper or filter to BCA 3.12.3.4.
- Exhaust fans: Operated by a separate wall switch.
- Ducting to the outside as follows:
 - . 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 WINDOW COVERINGS**17.1 MATERIALS****Fire hazard properties**

Windows coverings: Tested to AS/NZS 1530.3.

Fabrics

Uncoated woven and knitted fabrics: To AS 2663.1.

Coated woven and knitted fabrics: To AS 2663.2.

- Performance classification (minimum): 2.

Vertical blind fabrics: To AS 2663.3.

17.2 COVERING TYPES**Vertical blinds**

Requirement: Provide chainless weighted vertical blinds to all windows except in wet areas.

Type: 5 inch slats (127 mm), sunblock grade with fire retardant.

Warranty: Submit warranty for materials and mechanical components.

17.3 INSTALLATION**General**

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

18 RENDERING AND PLASTERING**18.1 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 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.

Plaster 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, by volume

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

Water

General: Clean and free from any deleterious matter.

18.2 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.

19 CEMENTITIOUS TOPPING**19.1 MATERIALS****Admixtures**

Standard: To AS 1478.1.

Aggregates

Standard: To AS 2758.1.

Coarse aggregate: Nominal single size less than or equal to 1/3 topping thickness.

Fine aggregate: Fine, sharp, well-graded sand with a low clay content and free from efflorescing salts.

Bonding products

General: Provide proprietary products manufactured for bonding cement-based toppings to concrete substrates.

Cement

Standard: To AS 3972.

- Type: GP.

Reinforcement

Standard: To AS/NZS 4671.

Water

General: Clean and free from any deleterious matter.

20 WATERPROOFING - WET AREAS

20.1 STANDARDS

Waterproofing wet areas

Standard: To AS 3740.

NCC compliance: To BCA 3.8.1

20.2 MEMBRANES

Standards

Standard: To AS/NZS 4858.

Membrane systems

Requirement: Provide a proprietary membrane system suitable for the intended internal waterproofing.

Shower tray

General: Purpose-made jointless shower tray, with wall upstands at least 50 mm higher than the hob upstands. Set hob masonry on the inside of the tray upstands.

Sealants

Requirement: Waterproof, flexible, mould-resistant and compatible with host materials.

20.3 COMPLETION

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.

21 CERAMIC TILING

21.1 STANDARDS

Tiling

General: Conform to the recommendations of AS 3958.1.

Slip resistance

Stair treads, ramps and landings: Classification to AS 4586.

21.2 TILES AND ACCESSORIES

Tiles

Standard: To AS ISO 13006.

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

Exposed edges: 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.

Accessories

General: If available, provide tile accessories such as round edge ceramic tiles, cove tiles, step treads and nosings to stairs, landings, and thresholds, skirtings, sills, copings and bath vents, which match the surrounding tiles, composition, colour and finish.

21.3 MATERIALS

Adhesives

Standard: To AS ISO 13007.1.

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

Mortar materials

Cement type to AS 3972: GP.

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

21.4 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.

22 RESILIENT FINISHES

22.1 STANDARDS

General

Installation: To AS 1884.

22.2 PREPARATION

Substrates

General: To AS 1884 Section 3.

22.3 MATERIALS

Luxury vinyl tiles (LVT)

Type: Loose laid wood design vinyl planks.

Total thickness: Minimum 5 mm.

Wear layer thickness: Minimum 0.55 mm.

Surface treatment: PUR treatment.

22.4 SHEET AND TILE INSTALLATION

Sheet set-out

General: Set out sheets to give the minimum number of joints. Position joints away from areas of high stress. Run sheet joints parallel with the long sides of floor areas, vertically on non-horizontal surfaces.

Tile set-out

General: Set out tiles from centre of room. If possible cut tiles at margins only, to give a cut dimension of at least 100 mm x full tile width. Match edges and align patterns. Arrange the cut tiles so that any variation in appearance is minimised.

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.

Luxury vinyl tiles (LVT)

Installation: Install using pressure sensitive adhesive to the manufacturer's recommendations. Make sure tiles are fully tacked up in a 1000 mm grid in both directions and the perimeter, or reinforced with double sided acrylic reinforced tape.

22.5 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.

23 CARPETS

23.1 MATERIALS

Carpet

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

Total VOC emission tested to ISO 10580: < 0.5 mg/m²/h.

23.2 LAYING CARPET

Standard

General: To AS 2455.1.

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 tapes.

24 ENGINEERED PANEL FLOORS

24.1 MATERIALS

Floating floor underlay

Requirement: Proprietary closed cell foam sheeting, integral to the flooring system.

Acoustic underlay

General: Resilient underlay fixed with compatible adhesive.

Moisture content alignment of flooring and subfloor

Concrete subfloor: Do not start installation of the flooring until the moisture content of the concrete subfloor conforms to AS 1884 clause 3.1.

Timber, plywood and particleboard subfloors: Do not start installation of the flooring until the moisture content of the subfloor conforms to the following:

- Dry in-service environment (air conditioned buildings): 8 to 10%.

- Normal in-service environment (intermittently heated buildings): To 12.5%.
- Moist in-service environment (unheated buildings): 12.5 to 15%.

25 TIMBER FLOORING

25.1 STRIP FLOORING

Recycled timber

Standard: To FWPA PN06.1039.

- Grading: To Section 5.1.

Grading table

Product	Standard	Grade
Hardwood	AS 2796.2	High Feature Grade if available for the species selected, otherwise Select Grade
Seasoned cypress pine	AS 1810	1
Softwood - pinus ssp	AS 4785.2	Appearance
Softwood - other	AS 4785.2	Select

26 FLOOR SANDING AND FINISHING

26.1 STANDARDS

General

Timber flooring - sanding and finishing: To AS 4786.2.

26.2 FINISH

Filler

General: Non-oil based and compatible with the coating system.

Coating system

Requirement: Proprietary floor finish system for the protection of timber substrate.

Quality: Provide premium quality lines.

Combinations

General: Do not combine products from different manufacturers in a system.

Clear timber finish systems: Provide only the combinations of filler, stain and sealer recommended by the manufacturer of the topcoats.

26.3 COATING SYSTEM

General

Finish: Provide coating systems with the following properties:

- Consistent film thickness.
- Consistent level of gloss.

Application

General: Apply coating systems in conformance with the manufacturer's recommendations. Maintain a wet edge throughout the whole area.

Timber floor coating system

Coating: If edge bonding of strip flooring is known to occur, apply a sealer compatible with the final coat.

Final coats: 2 coats of water-based polyurethane applied with a continuous wet edge and to the manufacturer's recommendations.

26.4 COMPLETION

Cleaning

General: Vacuum clean the area and protect with fabric drop sheets. Do not use plastic sheeting.

27 PAINTING

27.1 STANDARDS

Painting

General: To the recommendations of AS/NZS 2311.

27.2 PAINTING MATERIALS

Low VOC emitting paints

VOC limits for low odour/low environmental impact paint types:

- Primers and undercoats: < 65 g/litre.
- Low gloss white or light coloured latex paints for wall areas: < 16 g/litre.
- Coloured low gloss latex paints: < 16 g/litre.
- Gloss latex paints for timber doors and trims: < 75 g/litre.

27.3 PREPARATION

Exposed steelwork

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

27.4 PAINTING

Exposed steelwork

Paint application: To the recommendations of AS 2312.1 Section 5 and the paint manufacturer.

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

Paint application

Standard: To AS/NZS 2311 Section 6.

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

27.5 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 conforms to the **Paint final coat table**.

Paint systems for interior surfaces: Provide paint system conforming to AS/NZS 2311 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
Floor varnish - moisture cured	AS 3730.27
Floor varnish - two pack isocyanate cured	AS 3730.27
Low gloss latex	AS 3730.3
Semi-gloss latex	AS 3730.2
Gloss latex	AS 3730.12
Exterior	
Full gloss solvent-borne	AS 3730.6
Flat latex	AS 3730.7
Low gloss latex	AS 3730.8
Gloss latex	AS 3730.10
Stain, lightly pigmented	AS 3730.28
Latex stain, opaque	AS 3730.16
Semi-gloss latex	AS 3730.9
Paving	
Paving paint, semi-gloss	AS 3730.29
Paving paint, gloss	AS 3730.29

28 MECHANICAL SERVICES

28.1 STANDARDS

General

Mechanical ventilation: To AS 1668.1 and AS 1668.2, as required by the NCC.

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

Mechanical systems: Conform to the recommendations of SA HB 276.

Heating and cooling systems: To AS/NZS 5141.

28.2 AIR CONDITIONING SYSTEMS

General

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

- Unit type: All ceiling and wall-mounted air conditioning to be inverter type units.
- Air conditioning equipment: Install as documented on contract drawings and to be capable of meeting the documented performance standards.

Performance: Air conditioning equipment to be checked by the contractor to make sure performance criteria for all equipment components can meet the requirements of the manufacturer's specifications.

Standards

Ducted air conditioners: To AS/NZS 3823.1.2.

Non-ducted air conditioners: To AS/NZS 3823.1.1.

Concrete work

Requirement: Provide concrete plinths to suit the equipment.

Plumbing

Requirement: Provide external floor wastes and drain points to suit the equipment and the Western Australian Department of Communities, Housing *Part B: Functional brief – Prefabricated housing.*

Equipment

Performance: Supply equipment as follows:

- Made by a manufacturer with a demonstrated ability to provide spare parts and service promptly to the site.
- Operational within the documented range of outdoor design conditions under the calculated loads without excessive head pressure or icing.
- Labelled to AS/NZS 3823.2.

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

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

Split systems and variable refrigerant flow systems: Provide indoor and outdoor units from the same manufacturer, designed and automatically controlled to operate as an integrated whole, under the documented operating conditions and over the whole capacity range of the system.

Cabinet: 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.

Drain trays: Aluminium, stainless steel or plastic to collect all moisture inside indoor and outdoor units.

Filters: Washable panel type with at least 85% of arrestance when tested to AS 1324.2, Test Dust No.4.

Coils: Copper tube with aluminium plate fins.

Wall and ceiling mounted split system units – for GROH projects

Requirement: Provide units conforming to the following:

- Refrigerant:
 - . Listed as Safety Group A1 or A2L in AS/NZS ISO 817.
 - . Ozone Depletion Potential: 0.
 - . Global Warming Potential: ≤ 700.
- Factory assembled, pre-piped, pre-wired and tested ready for installation on site.
- Providing not less than the required capacities.
- AS/NZS 3823.1.1.

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 with aluminium plate fins.

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 manufacture 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 ≥ 6 temperature programs per day, separate programs for each day of the week, manual set point over ride and Vacation temperature set back.

Warranty

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

28.3 DUCTWORK**Standard**

Flexible duct: To AS 4254.1.

Rigid ductwork: To AS 4254.2.

Flexible duct

Material: Aluminised fabric clamped on formed metal helix with insulation blanket wrapped around duct and covered with an outer vapour barrier.

Installation: Install flexible duct as straight as possible with minimum number of bends. Maximise bend radius but not less than required by AS 4254.1 clause 2.5.3(i). Check for and rectify any crushed flexible duct.

Support: To AS 4254.1. Limit sag to less than 40 mm/m.

Duct insulation

General: Insulate ducts to reduce heat gain and prevent condensation. Provide continuous vapour barrier around ducts carrying conditioned air. Insulate flexible connections on ducts carrying air below ambient temperature.

Cleaning

General: Clean interior of ductwork progressively during installation.

28.4 REFRIGERATION PIPEWORK**General**

Pipes: To AS/NZS 1571.

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

Pipe insulation

General: Insulate all refrigerant and drain piping that may sweat with chemically blown closed cell nitrile rubber in tubular form to ASTM C534. Protect insulation from sunlight and mechanical damage.

Insulation thickness: 13 mm for pipes less than DN 20, 19 mm otherwise.

Pipe duct

Duct: Run exposed piping external to the building in a metallic-coated steel duct and run cables in the same duct. Provide a removable cover or similar for access. Paint duct to match the surrounding surface.

Condensate drains

Requirement: Provide trapped, at least DN 20 condensate drains to AS/NZS 3666.1 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.

28.5 UNIT INSTALLATION**General**

Outdoor equipment: Provide clearance around units for condenser air flow and maintenance access. Make sure discharge air does not short-circuit to condenser intake.

Equipment at ground level: Mount on 100 mm level concrete plinth or equivalent impervious material.

Duct connections: Provide internal or external flexible duct connections at indoor unit.

GROH projects

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

Drains: Provide insulated and trapped condensate drains to AS/NZS 3666.1, at least DN 20 Class 9

PVC-U, from each indoor coil and safety tray and from each reverse cycle outdoor coil unless casing freely drains to a roof or other location where condensate will not cause damage or pond.

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 to achieve this.

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

Vibration isolation

Suspended units: Provide at least 4 metal spring or rubber-in-shear isolation mountings with at least 25 mm static deflection and 98% isolation efficiency.

Floor mounted units: Provide neoprene waffle pads. Bolt in place.

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.

28.6 COMPLETION**Commissioning**

General: Commission the systems to manufacturer's recommendations using instruments calibrated within the past 12 months.

Checklist: Submit signed commissioning checklist before the date for practical completion.

Cleaning

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

Operating and maintenance instructions

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

- Contractor's contact details for service calls.
- Manufacturers' maintenance and operation 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.

28.7 MAINTENANCE**General**

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.

Preventative maintenance: Provide preventative maintenance recommended by the equipment

manufacturer. Provide all materials including consumable items and refrigerant.

Summer preventative maintenance visit: Provide at least one preventative maintenance visit during the months of December, January or February. Carry out preventative maintenance and provide electronic data logger or thermohydrograph to record temperatures at one location in each zone over a period of 7 days. Submit results. If the temperature recorded is outside the specified tolerance identify and correct the cause and repeat the test.

Maintenance reports: Submit a signed maintenance report setting out the work done and any measured values after each visit.

29 HYDRAULIC SERVICES

29.1 STANDARDS

General

Plumbing and drainage: To the AS/NZS 3500 series.

Authorised products: Listed in the WaterMark Product Database, unless otherwise required by the network utility operator.

29.2 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 Mines, Industry Regulation and Safety or Plumbers Licensing Board. Include all required documentation.

29.3 FIXTURES

Sanitary fixtures

Toilet suites: Minimum 4 stars WELS rated dual flush.

Shower heads: Minimum 3 stars WELS rated.

Bath: 1500 mm nominal length with soap holder, waste outlet, bar grate and plug.

Basin: White, vitreous china basin with overflow.

- Properties: Size, configuration and tap hole configuration, as documented on drawings.

Towel rail and robe hooks: Chrome plated brass or stainless steel rail, as documented on drawings.

Toilet roll holder: Chrome plated brass or stainless steel single roll holder, as documented on drawings.

Soap dish: Chrome plated brass or stainless steel dish, as documented on drawings.

Laundry tub: 42 litres tub and prefinished steel cabinet with side entry for concealed washing machine taps

- Tub material: Type 304 stainless steel.

Internal tap fittings

Rating: Minimum 4 stars WELS rated.

Type: All fittings other than bath outlets and showers to be chrome plated lever handled mixer tap (hot and cold) with 150 mm swivel arm with aerator outlet.

Kitchen fixtures

Sink type: One and a half or double bowl with drainer on each side and single tap hole, as documented on drawings.

Sink size: As documented on drawings.

29.4 WATER HEATERS

Types

Electric water heaters: To AS/NZS 4692.1.

- Energy performance: To AS/NZS 4692.2.

Gas hot water heaters: To AS/NZS 5263.1.2. If a flue damper is available for the water heater supplied, provide one.

- Energy performance: To AS/NZS 4552.2.

Solar water heaters: To AS/NZS 2712.

Heat pump water heaters: To AS/NZS 2712.

Heaters installed in Northern areas

Installations with hard water source: Provide heaters with bobbin elements to the manufacturer's recommendations.

29.5 INSTALLATION

Connections to Network Utility Operator mains

General: Excavate to locate and expose the connection points and connect to the Network Utility Operator mains. On completion, backfill and compact the excavation and reinstate surfaces and elements which have been disturbed such as roads, pavements, kerbs, footpaths and nature strips.

Water meters

Sub-meters: Provide Water Corporation approved meters for multi-unit residential developments of three (3) or more units including:

- Separate meters for individual dwellings.
- Common meter for common landscaped areas.

Installation: In conformance with the *Water Corporations Application and Agreement Form and Water Corporation 20 mm and 25 mm meter – Requirements/layout*. (See www.watercorporation.com.au)

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.

29.6 FINISHES

General

Requirement: Finish exposed piping, including fittings and supports as follows:

- In internal locations such as toilet and kitchen areas: Chrome plate copper piping to AS 1192 service condition 2, bright.
- External above ground piping, steel piping, exposed iron fittings: Paint.
- In concealed but accessible spaces (including cupboards and non-habitable enclosed spaces): Leave copper and plastic unpainted except for required identification marking. Prime steel piping and iron fittings.
- Valves: Finish valves to match connected piping.

29.7 COLD AND HEATED WATER

Standards

General: To AS/NZS 3500.1 and AS/NZS 3500.4.

Copper pipe: To AS 4809.

Piping

Pipe materials:

- Between water main and the building: Copper.
- Other locations: To the PCA.

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 and the requirements of the network utility operator.

Tap positions

Requirement: Locate hot tap to the left of, or above, the cold water tap.

Fittings and accessories

General: Provide the accessories and fittings necessary for the proper functioning of the plumbing systems, including taps, valves, outlets, pressure and temperature control devices, strainers, gauges and pumps.

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.

5 star natural gas hot water units: Connect hot water service to points as required.

- Hot water system: Design and install to AS/NZS 3500.4.

Tariff: Install so that the heating system qualifies for the tariff concession or subsidy offered by the statutory authority.

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.

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.

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.

Cleaning

General: On completion, flush the pipelines using water and leave pipelines clean.

29.8 STORMWATER

Standards

General: To AS/NZS 3500.3.

Cleaning

General: During construction, use temporary covers to openings and keep the system free of debris. On completion, clean and flush the system.

Pipe laying

General: Lay pipelines with the spigot ends in the direction of flow.

Downpipe connections

General: Turn up drain branch pipelines to finish 50 mm above finished ground or pavement level.

Subsoil drains

Connection: Connect subsoil drains to the stormwater drainage system.

Trench width: Minimum 450 mm.

Subsoil drains: Provide proprietary perforated plastic pipe.

Filter fabric: Provide a polymeric fabric formed from a plastic yarn containing stabilisers or inhibitors to make the filaments resistant to deterioration due to ultraviolet light.

Filter sock: Provide a polyester permeable sock capable of retaining particles of 0.25 mm size. Securely fit or join the sock at each joint.

Pits

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: Set to receive the runoff without ponding.

29.9 WASTEWATER

Standards

General: To AS/NZS 3500.2.

Waterless composting toilets: To AS/NZS 1546.2.

On-site domestic wastewater treatment units: To AS 1546.3.

Cleaning

During construction: Use temporary covers to openings and keep the system free of debris.

On completion: Clean and flush the system.

Vent pipes

Staying to roof: If fixings for stays penetrate the roof covering, seal the penetrations and make watertight.

Terminations: Provide bird-proof vent cowls made of the same material and colour as the vent pipe.

Septic tanks

Requirement: Provide the design and installation of septic tank and associated fittings to AS/NZS 1546.1 and the *Code of Practice for Product Approval of Onsite Wastewater Systems*.

Effluent disposal: To AS 1547.

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.

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).

29.10 RAINWATER TANKS

Standards

Metal tanks and rainwater goods: To AS/NZS 2179.1.

Design and installation: To the recommendations of SA HB 230.

Polyethylene tanks: To AS/NZS 4766.

Coated steel tanks: Metallic-coated steel with polymer film to AS 2070 on the inside and prepainted on the outside.

Bladder tanks: Proprietary plastic bladder type constructed from polymer conforming to AS 2070, 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 insect proof screens at all openings.
- Flap valves at every opening to the tank.
- Calmed inlet to the tank to prevent stirring sediment.
- Flywire screened 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 a first flush diverter. Arrange to drain completely.

Sizing: Select for at least 20 L/100 m² rainwater catchment area.

Construction: Corrosion resistant and compatible with the rainwater plumbing and tank.

Discharge: Discharge waste water 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.

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, when empty, caused by wind and other loads. Provide a level base with gaps not exceeding 10 mm, free of sharp projections and projecting beyond the edge of the tank at all points.

Polyethylene 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. Remove swarf with a magnet if drilling or cutting.

Bladder tanks: Locate on 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.

29.11 GREYWATER SYSTEMS

Standards

Design and installation: To AS 1546.4.

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 AS/NZS 3500.1 and the requirements of the network utility operator.

29.12 GAS

Standard

Reticulated gas systems: To AS/NZS 5601.1.

Buried pipes

Warning tape: During backfilling, lay plastic warning tape 300 mm above and for the full length of buried gas pipes.

- Type: 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 installation.

Gas room heater and outlet - GROH projects

Heater connection: Flexible hose connection to a gas bayonet fitting. Gas outlet location 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, finished flush with ground level or the top of concrete or paving.

Above ground gas points: To be 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.

Labour and material: Supply labour and material required to complete the gas supply system, including manual changeover gas regulator and metal hood.

30 ELECTRICAL SERVICES

30.1 STANDARDS

General

Electrical installation: To AS/NZS 3000 and SA HB 301.

Electrical cable selection: To AS/NZS 3008.1.1.

Telecommunications cabling: To AS/CA S008, AS/CA S009, AS/NZS 11801.1, and SA/SNZ HB 252.

30.2 POWER SUPPLY

General

Connection to network supply: To the private pole or as shown on drawings, to the *WAER*.

Power supply to be underground: 415/240 V, single-phase, 50 Hertz a.c., unless required otherwise.

Electrical services installation: Concealed.

30.3 PRODUCTS

Earth electrodes and earth conductors

Earthing system: A Multiple Earth Neutral (MEN) system conforming to AS/NZS 3000, 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 BCA A5.0, for all fire protection products.

Smoke detection

Smoke alarms: To AS 3786.

Approved smoke alarms: Photoelectric, non-removable battery (with 10 years battery life) smoke alarms. Select from the following:

- Brooks EIB166e.
- Brooks EIB650IC.

Interconnection devices: Wireless smoke alarms. Select from the following:

- Brooks EIB166e: For EIB100.
- Brooks EIB650IC: For EIB600.

30.4 CEILING FANS - NORTHERN AREAS

Internal ceiling sweep fans

Type: White fans with 1400 mm diameter metal blades and sealed bearings.

Mounting: Flush.

Controls: Supplied by the manufacturer with variable speed and off control.

- Mounting height: 1500 mm above finished floor level.

External ceiling sweep fans

Type: Brown or black fans with 1400 mm diameter metal blades and sealed bearings.

Design and installation: To AS/NZS 3000 clause 1.5.14.

Mounting: Flush.

Switches and socket outlets: With an International Protection (IP) Rating, to AS/NZS 3000, if installed in a location where water ingress is possible, including where exposed to cyclonic conditions.

Controls: Supplied by the manufacturer with variable speed and off control.

- Mounting height: 1500 mm above finished floor level.

30.5 INSTALLATION

Applications and compliance

General: Submit all necessary applications for electricity supply. Liaise with the electricity distributor and comply with the WAER.

Consumers mains and metering

General: Provide consumers mains and automatic meter reading in conformance with the WAER.

- 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.

30.6 LOW VOLTAGE POWER SYSTEMS

Switchboards

Standard: To AS/NZS 61439.3.

Construction: Enclosed type with a hinged lid. Provide circuit breakers and RCDs.

Location: Verify that the location selected is compliant before proceeding.

Power circuit breakers: Conform to the following:

- Provide RCD/MCB's on every circuit.
- Individually protect lighting circuits and power (GPOs) circuits by combined Residual Current Device **compliant with Department of Communities, Housing <40 ms trip time** and Miniature Circuit Breakers (RCD/MCBs).
- Where 15A 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

General: Calculate the maximum demand of the installation in accordance with AS/NZS 3000 and provide 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 necessary for a complete installation including but not limited to switches, dimmers, socket outlets, and telecommunications outlets. Provide accessories located in close proximity of the same size and material and from the same manufacture.

Mounting: Flush mount accessories to the wall (or ceiling) unless noted otherwise. Provide proprietary wall boxes in masonry and wall brackets in stud walls.

Wet areas: Position accessories in locations containing baths showers or other fixed water containers to comply with the requirements of AS/NZS 3000.

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.
- Power requirements: Provide as follows:
 - . Bedrooms: 15 amp single phase.
 - . Kitchen/dining: 25 amp single phase.
 - . Lounge: 25 amp single phase.

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.

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. Arrange wiring such that it does not bridge the cavity in external masonry.

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 strain > 100 kg.

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 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.

30.7 LIGHTING**Luminaires**

Standard: to AS/NZS 60598.1.

Luminaire type: Provide the following and/or as documented on drawings:

- Oyster light fittings: 32W, 350 mm diameter (nominal) fluorescent fittings and acrylic diffuser.
- LED recessed downlights: 15W fittings spaced at maximum 1.5 m spacing.
- Fluorescent tube fittings: Twin 18W T8 fluorescent tube, battens and clear prismatic diffuser or vandal resistant cover.

Luminaire colour rendering: Cool white.

Non-specified luminaires: Provide a bayonet cap batten holder and lamp at each lighting point location where no luminaire is documented.

Minimum energy performance standards:

- General: To AS/NZS 4783.2 and AS 4782.2.
- Self-ballasted lamps: To AS 4847.2.

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.

30.8 TELECOMMUNICATIONS**Services and cabling**

Requirement: Conform to the Australian Government's policy document

Telecommunications infrastructure in new developments.

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 comply with all standards and requirements of the carrier.

Data cabling: Conform to the requirements of the NBN company.

Installations requiring telephony only: To AS/CA S009.

Small office/home office installations: Category 6, to AS/CA S009 and AS 11801.4.

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/NZS 11801.1.

Telecommunications cables: Provide as follows:

- Type: Copper.
- Standard: To AS/CA S009 and AS 11801.4.
- Voice cabling: Multicore CAT 6 UTP cable as documented.

Television systems

General: Provide an analog and digital television distribution system to AS/NZS 1367 and conforming to the recommendations of Broadcast Australia and 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.

Antennae: Provide and locate antennae to receive all locally available free-to-air television stations.

- Antenna system: To AS 1417.

Network systems

General: Provide a coaxial cabling system suitable for satellite or cable network operator's services.

Conduits for future cabling: ≥ 25 mm diameter with drawstrings.

NBN installation

Requirement: To the *NBN Guideline*.

New buildings: To the *NBN Guideline* clause 3.5.

Location type: Open enclosures to the
NBN Guideline clause 4.4.3.

30.9 ELECTRONIC SECURITY

Intruder alarm system

General: Provide intruder alarm system.

Standard: To AS/NZS 2201.1.

30.10 FIRE DETECTION AND ALARMS

Smoke detection

General: Provide smoke detectors to the requirements of the BCA 3.7.5. Connect smoke alarms to mains power.

Smoke alarms: Install hardwired smoke alarms to BCA 3.7.5 and the manufacturer's recommendations.

- More than one alarm: Interconnect alarms to BCA 3.7.5.2 (d).

30.11 CABLES 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 accordance with the requirements of AS/NZS 11801.1.

Label colours

Generally: 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.

30.12 COMPLETION

Testing and certification

Electrical installations: Test to AS/NZS 3017.

Provide a certificate showing test results, certifying compliance with AS/NZS 3000.

Telecommunications cabling: To AS/NZS ISO/IEC 11801.4. Test the cable link performance at the maximum frequency and data rate for the cable class, and the cable category. Provide a certificate showing test results and certifying compliance with AS/NZS ISO/IEC 11801.4.

Submission: Provide ACMA Telecommunications Cabling Advice (TCA1) form.

Television and audio systems: To AS/NZS 1367. Test the complete television and audio system. Provide a certificate showing test results and certifying compliance

G. LANDSCAPING

1 LANDSCAPE - FENCES AND BARRIERS

1.1 REQUIREMENTS

General

Requirement: Provide fences and barrier systems as follows:

- Complete for their function.
- Conforming to the detail and location drawings as documented.
- Firmly fixed in position.

1.2 TIMBER

Posts and rails

Hardwood: To AS 2082.

Softwood: To AS 2858.

Pickets and palings

Hardwood: To AS 2796.1, Section 8.

- Grade to AS 2796.2: Select.

Softwood: To AS 4785.1, Section 7.

Seasoned cypress pine: To AS 1810, Section 5.

Preservative treatment

Timber type: Provide only timbers with preservative treatment appropriate to the Hazard class.

Cut surfaces: Provide supplementary preservative treatment to all cut and damaged surfaces.

CCA treated timber: If proposed to be used, provide details.

1.3 STEEL

Steel tubes

Posts, rails, stays and pickets: To AS/NZS 1163.

- Grade: C350L0.

Post and rail finish: Hot-dip galvanized.

1.4 CONCRETE

General

Standard: To AS 1379 – N20 or proprietary packaged mix.

1.5 COMPONENTS

Steel panel fencing

Steel framing: Zinc-coated or aluminium/zinc alloy coated steel to AS 1397.

Steel sheeting: Prepainted to AS/NZS 2728.

Steel posts

Finish: Galvanized.

Timber fencing sizes table

Member	Preservative treated soft wood picket (mm)	Preservative treated soft wood paling/lap and cap (mm)	Hardwood or cypress pine paling/lap and cap (mm)
Maximum height	1200	1800	1800
End/corner gate posts	90 x 90	100 x 100	125 x 125 or 100 x 100
Intermediate posts	90 x 90	140 x 45 or 100 x 75	125 x 50 or 100 x 75
Maximum post spacing	2400	2400/2700*	2700*
Rails	70 x 40	75 x 50 or 100x 38	75 x 50 or 100x 38
Picket/paling size	70 x 19	75, 100 or 150* x 15	100 or 150* x 13
Capping	-	125 x 35	100 x 50
Footing type	Earth	Earth	Earth
Footing size (diameter x depth)	200 x 600	250 x 600	250 x 600
* Three rail fences only			

2 LANDSCAPE - GARDENING

2.1 STANDARDS

Soils

Site and imported topsoil: To AS 4419.

Potting mixes: To AS 3743.

Composts, soil conditioners and mulches: To AS 4454.

2.2 SUBMISSIONS

Execution details

Irrigation plan: Before installation, submit an irrigation plan in pdf format and hard copy.

2.3 LANDSCAPE MAINTENANCE

Maintenance

Requirement: Maintain landscaping works from plant establishment to practical completion.

Dead or unhealthy plants: Replace before practical completion with plants of the same size, quality and species.

Plant protection: Protect plant damage from landscape operations and the operations of other trades. Maintain protection during the installation and maintenance periods. Treat, repair, or replace damaged plantings.

2.4 MATERIAL

Topsoil

Requirement: Topsoil containing organic matter, able to support plant life and free from stones, contaminants and weeds.

Source: If the topsoil cannot be provided from material recovered from the site, provide imported topsoil.

Mix proportion (loam:sand): 1:1.

Turf

Supplier: Obtain turf from 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.
- Species: Couch grass (*Cynodon dactylon*), including the Wintergreen variety.

Turf dimension:

- Roll width: Minimum 300 mm, in sound unbroken condition.
- Length: Minimum 1.5 m.

Certification: Provide certification verifying turf is pest free.

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.

Grass reinforcing

Description: Lightweight interlocking plastic cellular paving system suitable for pedestrian and occasional vehicular traffic including emergency vehicles.

Fertiliser

Description: Proprietary fertilisers, delivered to the site in sealed bags marked to show manufacturer or supplier, weight, fertiliser type, N:P:K ratio, recommended uses and application rates.

Plants

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.

Health: Foliage size, texture and colour at time of delivery consistent with the size, texture and colour shown in healthy specimens of the nominated species.

Vigour: Extension growth consistent with that exhibited in vigorous specimens of the species nominated.

Damage: Free from damage and from restricted habit due to growth in nursery rows.

Pests and disease: Foliage free from attack by pests or disease.

Irrigation

Micro-irrigation systems: Polyethylene micro-irrigation pipe tubing with dripper emitters.

Integrated drip line systems: Tubing with integral drippers inserted into the tube during manufacture.

Irrigation controllers: Programmable automatic controllers.

Underground piping and PVC-U fittings

PVC-U pipes: To AS/NZS 1477.

Mainline piping: Minimum Class 12 PVC-U.

Lateral piping: Minimum Class 9 PVC-U.

PVC-U fittings: Minimum Class 18 PVC-U.

Low density polyethylene pipes: Minimum 19 mm when used with drippers.

2.5 PREPARATION**Site clearing**

Requirement: Clear entire site except where trees are documented to be retained. Clear rear and front yards, including front verges, rake and machine to an even gradient before handover.

After site clearing

Relief gullies: Provide overflow and disconnected gullies, in locations other than paved areas. Install grating at a level which allows for the placing of 100 mm thick garden soil over the existing soil level.

After site cleanup: Remove undulations and fill depressions to form even grades in areas to be covered by garden soil.

Weed eradication

Herbicide: Eradicate weeds with a herbicide conforming to the *Health (Pesticides) Regulations 2011 (WA)*, at the recommended maximum rate.

Earth mounds

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. Minimise slumping and further compaction.

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.

Drainage: Construct mounds to allow free drainage of surface water and to eliminate ponding.

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.

Services and roots: Do not disturb services or tree roots; if necessary cultivate these areas by hand.

Preparation for turfing

Requirement: Keep free of rubbish, rubble stones and roots.

Watering: Keep moist to 100 mm deep before planting.

Planting area preparation: Prepare planting area for turfing as follows:

- Rotary hoe: To a minimum depth of 150 mm and provide runners with minimum 50 mm soil cover.
- Light rolling: Lightly roll to form an even, levelled surface without wheel ruts.

Placing topsoil

Spreading: Spread the topsoil on the prepared subsoil and grade evenly, making the 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.

Topsoil depths

Requirement: Minimum 100 mm thick garden soil over the entire site, excluding areas covered by buildings and paving.

Front and common areas finished soil level: 75 mm below finished height of paths and driveways, ready for planting by others.

Shrub planting areas

Ground level: Level planting areas to the following levels:

- 100 mm below grassed area.
- Minimum 1 brick course below the damp-proof course of buildings.
- Levelled with concrete driveways.

2.6 TURFING**Installation**

Supply: Deliver the turf within 24 hours of cutting, and lay within 36 hours of cutting. Prevent turf from drying out between cutting and laying. If not laid within 36 hours of cutting, roll out on a flat surface with the grass up, and water as required to maintain a good condition.

Laying: 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, with adjacent finished surfaces of ground, paving edging, or grass seeded areas.

Tamping: Lightly tamp to an even surface immediately after laying. Do not use a roller.

Fertilising: Mix the fertiliser thoroughly into the topsoil before placing the turf. Apply lawn fertiliser at the completion of the first and last mowings, and at other times as required to maintain healthy grass cover.

Watering: Water immediately after laying until the topsoil is moistened to its full depth. Maintain moisture to this depth.

Levels: If levels have deviated from the design levels after placing and watering, lift turf and regrade topsoil to achieve design levels.

2.7 GRASS REINFORCING

Installation

Preparation: Excavate to the 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 diameter.
- 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: Place and interlock grass pavers, and spread an 80:20 (sand:organic sandy soil) mix.

Height of growing media over the pavers:

- Turf: 5 mm.
- Hydroseeded: 15 mm.

Protection: Exclude traffic until the root system becomes established and anchored to the base course.

2.8 PLANTING

Installation

Individual plantings in grassed areas: Prepare for planting as follows:

- Excavate a hole twice the diameter of the rootball and at least 100 mm deeper than 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.

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

Placing: Place plants as follows:

- Remove the plant from the container with minimum disturbance to the rootball. Make sure that the rootball is moist.
- Place the plant in its final position, in the centre of the hole and plumb, and with the topsoil level of the plant root ball level with the finished surface of the surrounding soil.

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

Backfilling: Backfill with topsoil mixture. Tamp lightly and water to eliminate air pockets.

2.9 IRRIGATION FOR GROH

General

Requirement: Comply with local water restrictions.

Performance

Irrigation systems: Provide systems as follows:

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

Performance and efficiency of the system: Conduct a flow and pressure test and rectify system if inadequate.

Precipitation: Allow for minimum 40 mm precipitation per week throughout all sections of the irrigation system.

Reticulation

Type: Provide as follows:

- Lawn areas: Pop-up sprinklers.
- Individual plants: Drippers.

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.

Water supply: From a separate cut in within 2 m of the master mains water meter, with a 25 mm tested gate valve fitted with an approved backflow prevention device.

Reticulation sleeves: Provide as follows:

- 100 mm PVC-U sleeve 300 mm below driveways, as documented. If not documented, provide sleeve at the junction of driveway and carport floor.
- Provide a 90° elbow to each end, 300 mm out from the ground, visible for the landscaper.
- 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.

Garden reticulation cabinet:

- Cabinet: Galvanized sheet steel with top hinged door and the Department of Communities, Housing E key lock.
- Size: 450 mm (high) x 450 (width) x 150 mm (clear internal depth).

Services requirements for cabinets: Provide the following:

- A single GPO.
- Conduit with draw wire, extending from the cabinet to the nearest garden bed. If required, run under paths. Terminate to allow connection of landscaping services.
- Isolating valve to the PCA.

Underground piping and PVC-U fittings

PVC-U pipe installation: To AS/NZS 2032.

PVC-U fittings: Allow for changes in pipework direction using fittings. Do not install pipes with excessive bending.

Drip systems

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 1.5 m maximum intervals with U-shaped stakes.

Air release valves: Provide at the highest point in each section to drain the system when flow stops.

Sprinkler head protection

Sprinklers along kerbs: For those installed along roads, driveways or parking areas, set sprinkler head in 90 mm thick concrete, extending minimum 300 mm diameter around the head.

Sprinklers in lawn/grassed area: Set sprinkler head in 80 mm thick concrete, extending minimum 200 mm diameter around the head.

2.10 MULCHING

Placing mulch

General: Place mulch to the required depth, and clear of plant stems, and rake to an even surface flush with the surrounding finished levels. Spread and roll mulch so that after settling, or after rolling, it is

- Smooth and evenly graded between design surface levels.
- Flush with the surrounding finished levels.
- Sloped towards the base of plant stems in plantation beds.
- For gravel mulches: Not closer to the stem than 50 mm.

Depths:

- Organic mulch: 75 mm.
- Gravel mulch: 50 mm.

Extent of mulch

Requirement: 750 mm diameter around the plants placed in grassed areas and areas with drip lines.

2.11 STAKES AND TIES

Stakes

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

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

Ties

General: Provide 50 mm hessian webbing 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.

2.12 VERGES AND STREET TREES

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.

Planting

Turf species: Use a species approved by the local government authority for verge treatments.

Plant dimensions: Select plant varieties that meet the following requirements:

- Maximum height: 0.75 m.
- Impact on the public: The plant does not pose a hazard to (such as is toxic or an irritant) or obstruct pedestrians.

Irrigation: Install as follows:

- Water source: 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.

2.13 COMPLETION

Cleaning

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

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

3 PAVEMENT BASE AND SUBBASE

3.1 GENERAL

Subgrade

Requirement: Prepare the subgrade to **E PRELIMINARY SITE PREPARATION, EARTHWORKS**.

Subbase: Install as required by the subgrade evaluation by a professional engineer.

3.2 PLACING BASE AND SUBBASE

General

Weak surfaces: Do not place material on a surface that is weakened by moisture and is unable to support, without damage, the construction plant required to perform the works.

Spreading: Spread material in uniform layers without segregation.

Moisture content: Maintain wet mixed materials at the required moisture content before and during spreading. Add water to dry mixed materials through fine sprays to the entire surface of the layer after spreading, to bring the material to the required moisture content.

Compacted layer thickness: 200 mm maximum and 100 mm minimum. Provide layers of equal thickness in multilayer courses.

3.3 TOLERANCES

Surface level

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

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.

3.4 BASE AND SUBBASE COMPACTION

Minimum relative compaction table

Item description	Minimum dry density ratio (modified compaction) to AS 1289.5.2.1
Subbase	95%
Base	98%

4 CONCRETE PAVEMENT

4.1 STANDARDS

General

Specification and supply: To AS 1379.
Materials and construction: To AS 3600.
Residential pavements: To AS 3727.1.

Vapour barrier

Requirement: To AS 2870 clause 5.3.3.

4.2 PAVEMENT

Grading

General: Grade paving to even falls to drain away from buildings to drainage outlets without ponding.

Minimum fall for drainage:

- Vehicle traffic pavements: 1:40.
- Other pavements: 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.

4.3 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 and when concrete has dried to allow the sealer to penetrate into the concrete surface.

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.

4.4 DRIVEWAY, GARAGE OR CARPORT FLOORS

General

Compact base: To AS 1289.5.2.1.

Finish: Granolithic finish.

5 PAVING - SAND BED

5.1 STANDARDS

General

Concrete and clay pavers: To AS/NZS 4455.2.

5.2 PAVER THICKNESS

General

Requirement: Minimum thickness:

- Foot and bicycle traffic: 40 mm.
- Light domestic traffic occasionally up to 3 tonne gross: 50 mm.

5.3 MATERIALS

Sand

Bedding and joint filling: Well-graded and free of deleterious materials such as soluble salts which may cause efflorescence.

Cement

Standard: To AS 3972.

Type: GP.

Mortar

Mix proportions (cement:sand): 1:3.

5.4 INSTALLATION

Bedding course

Preparation: Remove all loose material from the prepared base.

Geotextile: Place fabric between the base course and the bedding sand.

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

General: Grade paving to even falls to drain away from buildings to drainage outlets without ponding.

Minimum fall for drainage: 1:100.

Cutting

Cutting units: Cut paving units to maintain sharp edges and accurate joints and margins.

Laying

General: Lay paving units on the screeded sand bedding to the nominated pattern shown on the drawings.

Compaction: Compact the sand bedding after laying paving units using a vibrating plate compactor and appropriate hand methods, and continue until lipping between adjoining units is eliminated.

Joint filling: Spread dry sand over the paving units 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.

6 PAVEMENT ANCILLARIES

6.1 CHANNELS AND/OR KERBS

Concrete

Precast: Proprietary precast units as documented.

In situ: To AS 2876.

Grade: N20.

6.2 LINEMARKING

Pavement marking paint

Requirement: Conform to the following:

- Solvent-borne paint: To AS 4049.1.
- Waterborne paint: To AS 4049.3.
- High performance: To AS 4049.4.

6.3 VEHICLE BARRIERS

Timber log barriers

Hardwood: To AS 2082.

Softwood: To AS 2858 and AS 1720.2, Grade 5.

Timber preservative for softwood: Minimum hazard class H4 to AS 1604.1.

Size: Diameter range 125 to 150 mm for both posts and rails.

Precast concrete wheel stops

Material: Precast concrete units with pre-drilled holes located 300 mm from each end for fixing to ground surface.

Size: 2000 x 150 x 100 mm high.

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, prototypes and sample panels.

Operation: Make sure moving parts operate safely and smoothly.

Reinstatement

General: 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 architect, owner and occupant of the property, recording any damage that has occurred since the pre-commencement inspection.

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.
- Complete the *Water Corporation Application and Agreement Form*, selecting Option 1 (3 or more dwelling units) for water meters to each individual unit and a separate water meter for common area landscaping, and pay all application costs. These forms can be obtained from the Water Corporation.

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 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, 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:

NOHSC 2002	2005	National code of practice for the safe removal of asbestos 2nd edition
AS/CA S008	2010	Requirements for customer cabling products
AS/CA S009	2013	Installation requirements for customer cabling (Wiring Rules)
AS/NZS ISO 817	2016	Refrigerating systems - Refrigerant classification
AS/NZS 1163	2016	Cold-formed structural steel hollow sections
AS/NZS 1170		Structural design actions
AS/NZS 1170.2	2011	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 1231	2000	Aluminium and aluminium alloys - Anodic oxidation coatings
AS 1288	2006	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 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 1324.2	2003	Methods of test
AS 1366		Rigid cellular plastics sheets for thermal insulation
AS 1366.1	1992	Rigid cellular polyurethane (RC/PUR)
AS 1366.2	1992	Rigid cellular polyisocyanurate (RC/PIR)
AS 1366.3	1992	Rigid cellular polystyrene - Moulded (RC/PS - M)
AS 1366.4	1989	Rigid cellular polystyrene - Extruded (RC/PS-E)
AS/NZS 1367	2016	Coaxial cable and optical fibre systems for the RF distribution of digital television, radio and in-house analog signals in single and multiple dwelling installations
AS 1379	2007	Specification and supply of concrete
AS 1397	2011	Continuous hot-dip metallic coated steel sheet and strip - Coatings of zinc and zinc alloyed with aluminium and magnesium
AS 1417	2015	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/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 1546.4	2016	Domestic greywater treatment systems
AS/NZS 1546.2	2008	Waterless composting toilets
AS 1546.3	2017	Secondary treatment systems
AS/NZS 1547	2012	On-site domestic wastewater management
AS 1562		Design and installation of sheet roof and wall cladding
AS 1562.1	2018	Metal
AS 1562.3	2006	Plastics
AS/NZS 1571	1995	Copper - Seamless tubes for airconditioning and refrigeration
AS/NZS 1596	2014	The storage and handling of LP Gas
AS 1604		Specification for preservative treatment
AS 1604.1	2012	Sawn and round timber
AS 1627		Metal finishing - Preparation and pretreatment of surfaces
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/NZS 1859		Reconstituted wood-based panels - Specifications
AS/NZS 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	2012	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 2070	1999	Plastics materials for food contact use

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		Intruder alarm systems
AS/NZS 2201.1	2007	Client's premises - Design, installation, commissioning and maintenance
AS/NZS 2208	1996	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/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 2455		Textile floor coverings - Installation practice
AS 2455.1	2019	General
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	2008	Timber - Softwood - Visually stress-graded for structural purposes
AS 2870	2011	Residential slabs and footings
AS 2876	2000	Concrete kerbs and channels (gutters) - Manually or machine placed
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 - Sheets made from thermosetting resins
AS/NZS 2924.1	1998	Classification and specifications
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	2007	Electrical installations - Verification guidelines
AS/NZS 3500		Plumbing and drainage
AS/NZS 3500.1	2018	Water services
AS/NZS 3500.2	2018	Sanitary plumbing and drainage
AS/NZS 3500.3	2018	Stormwater drainage
AS/NZS 3500.4	2018	Heated water services
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 3600	2018	Concrete structures
AS 3610		Formwork for concrete
AS 3610.1	2018	Specifications
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	2002	Metal finishing - Thermoset powder coating 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	2010	Waterproofing of domestic wet areas
AS 3743	2003	Potting mixes
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 - Air conditioners and heat pumps
AS/NZS 3823.1.1	2012	Non-ducted airconditioners and heat pumps - Testing and rating for performance (ISO 5151:2010, MOD)
AS/NZS 3823.1.2	2012	Ducted airconditioners and air-to-air heat pumps - Testing and rating for performance (ISO 13253:2010, MOD)
AS/NZS 3823.2	2013	Energy labelling and minimum energy performance standards (MEPS) requirements
AS 3850		Prefabricated concrete elements
AS 3850.1	2015	General requirements
AS 3850.2	2015	Building construction
AS 3958		Ceramic tiles
AS 3958.1	2007	Guide to the installation of ceramic tiles
AS 3959	2018	Construction of buildings in bushfire prone areas
AS 3972	2010	General purpose and blended cements
AS 3999	2015	Bulk thermal insulation - Installation
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	2012	Wind loads for housing
AS/NZS 4200		Pliable building membranes and underlays
AS/NZS 4200.1	2017	Materials
AS 4200.2	2017	Installation requirements
AS 4254		Ductwork for air-handling systems in buildings
AS 4254.1	2012	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	2008	Atmospheric corrosivity zones in Australia
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 4552	2005	Gas fired water heaters for hot water supply and/or central heating
AS/NZS 4552.2	2010	Minimum energy performance standards for gas water heaters
AS 4586	2013	Slip resistance classification of new pedestrian surface materials
AS/NZS 4600	2018	Cold-formed steel structures
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	2001	Steel reinforcing materials
AS 4672		Steel prestressing materials
AS 4672.1	2007	General requirements
AS/NZS 4680	2006	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
AS/NZS 4692		Electric water heaters
AS/NZS 4692.1	2005	Energy consumption, performance and general requirements
AS/NZS 4692.2	2005	Minimum Energy Performance Standard (MEPS) requirements and energy labelling
AS/NZS 4766	2006	Polyethylene storage tanks for water and chemicals
AS/NZS 4782		Double-capped fluorescent lamps - Performance specifications
AS 4782.2	2019	Minimum Energy Performance Standard (MEPS)
AS/NZS 4783		Performance of electrical lighting equipment - Ballasts for fluorescent lamps
AS/NZS 4783.2	2002	Energy labelling and minimum energy performance standards requirements
AS 4785		Timber - Softwood - Sawn and milled products
AS 4785.1	2002	Product specification
AS 4785.2	2002	Grade description
AS 4785.3	2002	Timber for furniture components
AS 4786		Timber flooring
AS 4786.2	2005	Sanding and finishing
AS 4809	2017	Copper pipe and fittings - Installation and commissioning
AS/NZS 4847		Self ballasted lamps for general lighting services
AS 4847.2	2019	Performance specifications - Minimum energy performance standard (MEPS)
AS/NZS 4858	2004	Wet area membranes
AS/NZS 4859		Thermal insulation of buildings
AS/NZS 4859.1	2018	General criteria and technical provisions
AS 4970	2009	Protection of trees on development sites

AS 5039	2008	Security screen doors and security window grilles
AS 5040	2003	Installation of security screen doors and window grilles
AS 5100		Bridge design
AS 5100.4	2017	Bearings and deck joints
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)
AS/NZS 5149.4	2016	Operations, maintenance, repair and recovery (ISO 5149-4:2014, MOD)
AS 5203	2016	Protection of openable windows/ fall prevention – Test sequence and compliance method
AS 5216	2018	Design of post-installed and cast-in fastenings in concrete
AS/NZS 5263		Gas appliances
AS/NZS 5263.1.2	2016	Gas fired water heaters for hot water supply and/or central heating
AS/NZS 5601		Gas installations
AS/NZS 5601.1	2013	General installations
AS 5604	2005	Timber - Natural durability ratings
AS 6669	2016	Plywood - Formwork
AS 11801		Information technology - generic cabling for customer premises
AS/NZS 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 ISO 13006	2013	Ceramic tiles - Definitions, classification, characteristics and marking (ISO 13006:1998)
AS ISO 13007		Ceramic tiles
AS ISO 13007.1	2013	Grouts and adhesives - Terms, definitions and specifications for adhesives
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 61439.3	2016	Distribution boards intended to be operated by ordinary persons (DBO) (IEC 61439-3, Ed 1.0 (2012), MOD)
SA HB 230	2008	Rainwater tank design and installation handbook
SA/SNZ HB 252	2014	Communications Cabling Manual - Module 3: Residential communications cabling handbook
SA HB 276	2004	A guide to good practice for energy efficient installation of residential heating, cooling & air conditioning plant & equipment
SA HB 301	2001	Electrical installations - Designing to the Wiring Rules
ACCC SS	2014	Competition and Consumer (Corded Internal Window Coverings) Safety Standard
AIRAH DA09	1998	Air conditioning load estimation
ASCC	2008	National Code of Practice for Precast, Tilt-up and Concrete Elements in Building Construction
Aus Gov Telecom	2015	Telecommunications infrastructure in new developments - A new approach to competition
BCA 3.1.1	2016	Acceptable construction - Site preparation - Earthworks
BCA 3.2.2	2019	Acceptable construction - Footings and slabs - Preparation
BCA 3.1.4	2019	Acceptable construction - Site preparation - Termite risk management
BCA 3.1.4.4	2019	Acceptable construction - Site preparation - Termite risk management - Durable notices
BCA 3.10.6	2019	Attachment of decks and balconies to external walls of buildings
BCA Table 3.5.1.1	2019	Acceptable construction - Roof and wall cladding - Sheet roofing - Acceptable corrosion protection for metal sheet roofing
BCA 3.5.4.5	2019	Acceptable construction - Roof and wall cladding - Timber and composite wall cladding - Eaves and soffit linings
BCA 3.12.2	2016	Acceptable construction - Energy efficiency - External glazing
BCA 3.9.2.6	2019	Acceptable construction - Safe movement and access - Barriers and handrails - Protection of openable windows - bedrooms
BCA 3.12.1.1	2019	Acceptable construction - Energy efficiency - Building fabric - Building fabric thermal insulation
BCA 3.9.1	2019	Acceptable construction - Safe movement and access - Stairway and ramp construction
BCA 3.9.2	2019	Acceptable construction - Safe movement and access - Barriers and handrails
BCA 3.12.3.4	2019	Acceptable solutions - Energy efficiency - Building sealing - Exhaust fans
BCA 3.8.1	2019	Acceptable construction - Health and amenity - Wet areas and external waterproofing
BCA 3.7.5.2	2019	Acceptable construction - Fire safety - Smoke alarms and evacuation lighting- Smoke alarm requirements
BCA 3.5.3.4	2019	Acceptable construction - Roof and wall cladding - Gutters and downpipes - Installation of gutters
BCA 3.7.5	2019	Acceptable construction - Fire safety - Smoke alarms and evacuation lighting
BCA 3.9.2.7	2019	Acceptable construction - Safe movement and access - Barriers and handrails - Protection of openable windows - rooms other than bedrooms
BCA 3.6	2019	Glazing
BCA A5.0	2019	Governing requirements - Documentation of design and construction - Suitability
BCA B1.1	2019	Structure - Structural provisions - Resistance to actions
FWPA PN06.1039	2008	Interim industry standard – Recycled timber – Visually graded recycled decorative
NASH		NASH Standard Residential and Low-rise Steel Framing
NASH-1	2005	Design criteria
NASH-2	2014	Design solutions
NBN Guideline	2016	Residential preparation and installation: Single Dwelling Units (SDUs) and Multi Dwelling Units (MDUs)

PCA	2019	National Construction Code 2019 Series Volume 3 - Plumbing Code of Australia
NP PCH	2009	Precast concrete handbook
WA Gov S.R. Health	1974	Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations
WA Gov S.R. Pesticides	2011	Health (Pesticides) Regulations
WA Gov S.R. UD	2004	Environmental Protection (Unauthorised Discharges) Regulations
WA Gov S.R. Waste	2004	Environmental Protection (Controlled Waste) Regulations
WA Gov S.R. Wastewater	2013	Code of Practice for Product Approval of Onsite Wastewater Systems (Department of Health)
WAER	2015	WA Electrical Requirements (WAER)
BS 2571	1990	Specification for general-purpose flexible PVC compounds for moulding and extrusion
BS 4255		Rubber used in preformed gaskets for weather exclusion from buildings
BS 4255-1	1986	Specification for non-cellular gaskets
ASTM C534/C534M	2019	Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form
ISO 10580	2010	Resilient, textile and laminate floor coverings - Test method for volatile organic compound (VOC) emissions
UN GHS	2019	Globally Harmonized System of Classification and Labelling of Chemicals (GHS)



Government of **Western Australia**
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