



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

HOUSING

CONSTRUCT SPECIFICATION

BCA Class 2 and 3 buildings

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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PREFACE

This reference specification has been developed for use on all housing projects by the Western Australia Department of Communities, Housing of BCA class 2 and 3 buildings. It includes framed construction (steel and timber), masonry veneer and full masonry construction. It may include requirements which are not applicable to the project. Read this specification in conjunction with other project specific documents, including drawings, schedules and appendices, and refer/conform to the applicable requirements.

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0131 PRELIMINARIES**1 GENERAL****1.1 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.

1.2 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 and 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 trees and property which are to remain on or adjacent to the site, including adjoining property encroaching onto the site.

Existing services

Service to be continued: Repair, divert or relocate service, as documented.

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.

Proposals: Submit proposals for action to be taken to existing services before starting this work.

- Purpose of submission: For review.

Location of services: Verify the location of existing services from the appropriate authority and/or Dial Before You Dig (see www.1100.com.au), as required.

- Verges: Locate services before start of landscaping.

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.

Parking

Principal's existing parking areas: Use only designated parking areas.

1.3 DRAINAGE**Stormwater drainage**

Requirement: Liaise with the local government authority for the preferred method of drainage and other stormwater requirements. Provide installation to the authority's requirements.

1.4 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.

Occupied premises

General: For the parts of the site, designated as an occupied premise, conform to the following:

- Allow occupants to continue in secure possession and occupancy of the premises for the required period.
- Maintain safe access for occupants.
- Arrange work to minimise nuisance to occupants and for their safety.
- Protect occupants against weather, dust, dirt, water or other nuisance.

Proposals: Submit details of proposed methods.

- Purpose of submission: Information only.

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).

Safety

Accidents: Promptly notify the architect of the occurrence of the following:

- Accidents involving death or personal injury.
- Accidents involving loss of time.
- Incidents with accident potential such as equipment failure, slides and cave-ins.

Accident reports: Submit reports of accidents.

- Purpose of submission: Information only.

1.5 BUILDING THE WORKS

Contractor's representative

General: Must be accessible, and fluent in English and technical terminology.

Subcontracting

General: Submit a complete list of proposed subcontractors and suppliers.

Authority application

Watering exemption: Apply to the WA Water Corporation for a temporary watering roster exemption for new lawns and gardens.

Exemption period: 42 days.

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.

Materials

Requirement: All materials must be new, unless documented otherwise.

Items supplied by the principal

General: Materials and other items supplied free of charge to the contractor for installation in the execution of the works. Unload and take delivery, inspect for defects and take care of the items. If defects are found, advise. Return unused items to the principal.

Disposal of waste

Site waste (including food waste): Dispose of in compliance with state regulations and local government authority waste management requirements, including the following:

- *Environmental Protection Act 1986 (WA).*
- *Environmental Protection Regulations 1987 (WA).*
- *Health (Miscellaneous Provisions) Act 1911 (WA).*
- *Local Government Act 1995 (WA).*
- *Waste Avoidance and Resource Recovery Act 2007 (WA).*

Waste containing asbestos: Handle, transport and dispose of in compliance with state regulations including the following:

- *Environmental Protection (Controlled Waste) Regulations 2004 (WA).*
- *Environmental Protection (Rural Landfill) Regulations 2002 (WA).*
- *Environmental Protection (Clearing of Native Vegetation) Regulations 2004 (WA).*

1.6 COMPLETION OF THE WORKS

Notice of Completion Certificate

Submission: Within 7 days of completing the construction works, submit a Notice of Completion Certificate (BA7) to the Permit Authority with other required documentation.

Final cleaning

General: Before the date for practical completion, clean throughout, including interior and exterior surfaces exposed to view. Vacuum carpeted and soft surfaces. 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.

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 property

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.

Handover

Keys: Provide two keys for each set of locks keyed alike and two keys for each lock keyed to differ.

Record submission

Warranties: Register with manufacturers, as necessary, and provide copies of manufacturers' warranties.

Instruction manuals: Provide the manufacturers' instruction manuals.

Surveyor's certificate: Provide a certificate which confirms that the work, including boundary fences, has been correctly located.

Authorities' approvals: Provide evidence of approval from the local government authority or principal accredited certifier and statutory authorities whose requirements apply to the work.

Services as-constructed records: At practical completion, submit the services as-constructed drawings to the principal.

- New buildings: Prepare drawings accurately showing the site and the as-constructed location of services including details required for future maintenance.
- Underground services: Provide a plan which shows the location of underground services.

Electrical services and TV installations: Submit records with details of the following:

- Layout of submains.
- Layout of common services circuits.
- Switchboard layouts.
- Line diagrams of installations.
- Route of underground cabling and pit location.

Submission format: Submit records in plastic folders and fix folders inside main switchboard cabinets.

Occupancy permit

Application: Upon practical completion, apply for Occupancy permit (BA9) or Occupancy permit strata (BA11).

1.7 MISCELLANEOUS**Contractor and principal to observe confidentiality**

Publicity: Do not issue information concerning the project for publication in the media without prior written approval of the principal. Refer to the principal, enquiries from the media concerning the project.

Compliance with the law

Requirements of authorities: The principal, before entering into the contract, has given the notices, paid the fees, and obtained the permits, approvals and other authorisations, as documented.

Graffiti removal

Plant and equipment: Make sure all plant and equipment, including temporary offices and lunch rooms, are free of graffiti.

Removal: Remove any graffiti applied to buildings, plant and equipment.

Failure to remove: If graffiti is not removed within the time nominated by the principal, the Department of Communities, Housing will remove the graffiti and recover the cost from the contract.

0171 GENERAL REQUIREMENTS

1 GENERAL

1.1 DESIGN

Design development

General: Develop the design beyond that documented, as required.

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

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

1.2 PERFORMANCE

Corrosion resistance

General: Atmospheric corrosivity category as defined in AS 4312 for the site, and the AS/NZS 2312 series.

Light steel framing: To **STANDARDS** and **COMPONENTS** in 0342 *Light steel framing*.

Fasteners: To **FASTENERS** in 0181 *Adhesives, sealants and fasteners*.

Galvanizing

Severe conditions: Galvanize mild steel components (including fasteners) to AS/NZS 1214 or AS/NZS 4680 as appropriate, if:

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

Noise levels

General: Install systems to operate within the noise level limits, as documented for the contract design and documented equipment performance.

Structure

General: If required, provide structures, installations and components as follows:

- Fixed accessways: To AS 1657.
- Structural design actions: To the AS/NZS 1170 series.

1.3 PRECEDENCE

General

Order of precedence:

- The requirements of other worksections of the specification override conflicting requirements of this worksection.
- The requirements of worksections override conflicting requirements of their referenced documents. The requirements of the referenced documents are minimum requirements.

1.4 CROSS REFERENCES

Cross referencing styles

General: Within the text, titles are cross referenced using the following styles:

- Worksection titles are indicated by *Italicised* text.
- Subsection titles are indicated by **BOLD** text.
- Clause titles are indicated by **BOLD** text.
- Subclause titles are indicated by **Bold** text.

1.5 REFERENCED DOCUMENTS

General

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

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

European standards: Any national European Standard (e.g. BS EN or DIN EN) may be used in place of the equivalent referenced European Standard (EN).

1.6 INTERPRETATION

Documentation conventions

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

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

Abbreviations

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

- AS: Australian Standard.
- BCA: National Construction Code 2019 Series Volume One: Building Code of Australia Class 2 to 9 Buildings and Volume Two: Building Code of Australia Class 1 and Class 10 Buildings.
- EN: European Norm (European Standard).
- GRP: Glass Reinforced Plastic.
- IP: Ingress protection.
- NATA: National Association of Testing Authorities.
- NCC: National Construction Code 2019.
- NZS: New Zealand Standard.
- PCA: National Construction Code 2019 Series Volume 3: Plumbing Code of Australia.
- PVC: Polyvinyl Chloride.
- PVC-U: Unplasticised Polyvinyl Chloride. Also known as UPVC.
- SDS: Safety data sheets.
- VOC: Volatile Organic Compound.

Definitions

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

- Access for maintenance: Includes access for maintenance, inspection, measurement, operation, adjustment, repair, replacement and other maintenance related tasks.
- Accessible, readily: Readily accessible, easily accessible, easy access and similar terms mean capable of being reached quickly and without climbing over or removing obstructions, using a movable ladder, and in any case not more than 2.0 m above the ground, floor or platform.
- Accredited Testing Laboratory:
 - . An organisation accredited by the National Association of Testing Authorities (NATA) to test in the relevant field; or
 - . An organisation outside of Australia accredited to undertake the relevant tests by an authority recognised by NATA through a mutual recognition agreement; or
 - . An organisation recognised as being an Accredited Testing Laboratory under legislation at the time the test was undertaken.
- Attendance: Attendance, provide attendance and similar expressions mean give assistance for examination and testing.
- Contract administrator: Has the same meaning as architect or superintendent and is the person appointed by the owner or principal under the contract.
- Contractor: Has the same meaning as builder and is the person or organisation bound to carry out and complete the work under the contract.
- Default: Specified value, product or installation method which is to be provided unless otherwise documented.
- Design life: The period of time for which it is assumed, in the design, that an asset will be able to perform its intended purpose with only anticipated maintenance but no major repair or replacement being necessary.
- Documented: Documented, as documented and similar terms mean contained in the contract documents.
- Economic life: The period of time from the acquisition of an asset to the time when the asset, while still physically capable of fulfilling its function and with only anticipated maintenance, ceases to be the lowest cost alternative for satisfying that function.
- Electricity distributor: Any person or organisation that provides electricity from an electricity distribution system to one or more electrical installations. Includes distributor, supply authority, network operator, local network service provider, electricity retailer or electricity entity, as may be appropriate in the relevant jurisdiction.
- Fire hazard properties: Terminology to BCA A5.5.
- Geotechnical site investigation: The process of evaluating the geotechnical characteristics of the site in the context of existing or proposed construction.
- Give notice: Give notice, submit, advise, inform and similar expressions mean give notice (submit, advise, inform) in writing to the contract administrator.
- High level interface: Systems transfer information in a digital format using an open system interface.
- Hot-dip galvanized: Zinc coated to AS/NZS 4680 after fabrication with coating thickness and mass to AS/NZS 4680 Table 1.
- Ingress protection: IP, IP code, IP rating and similar expression have the same meaning as IP Code in AS 60529.
- Joints:
 - . Construction joint: A joint with continuous reinforcement provided to suit construction sequence.
 - . Contraction joint: An opening control joint with a bond breaking coating separating the joint surfaces to allow independent and controlled contraction of different parts or components, induced by shrinkage, temperature changes or other causes. It may include unbound dowels to assist vertical deflection control.
 - . Control joint: An unreinforced joint between or within discrete elements of construction which allows for relative movement of the elements.
 - . Expansion joint: A closing control joint with the joint surfaces separated by a compressible filler to allow axial movement due to thermal expansion or contraction with changes in temperature or creep. It may include unbound dowels to assist vertical deflection control.
 - . Sealant joint: A joint filled with a flexible synthetic compound which adheres to surfaces within the joint to prevent the passage of dust, moisture and gases.
 - . Structural control joint: A control joint (contraction, expansion and isolation) in structural elements when used with applied material and finishes.
 - . Substrate joint: A joint in the substrate which includes construction joints and joints between different materials.
 - . Weakened plane joint: A contraction joint created by forming a groove, extending at least one quarter the depth of the section, either by using a grooving tool, by sawing, or by inserting a premoulded strip.
- Local authority (local council): A body established for the purposes of local government by or under a law applying in a state or territory.
- Low level interface: Systems transfer information via terminals and voltage free contacts.
- Manufacturer's recommendations: Recommendations, instructions, requirements, specifications (and similar expressions) provided in written or other form by the manufacturer and/or supplier relating to the suitability, use, installation, storage and/or handling of a product.
- Metallic-coated: Steel coated with zinc or aluminium-zinc alloy as follows:
 - . Metallic-coated steel sheet: To AS 1397. Metal thicknesses specified are base metal thicknesses.

- . Ferrous open sections zinc coated an in-line process: To AS/NZS 4791.
- . Ferrous hollow sections zinc coated by a continuous or specialised process: To AS/NZS 4792.
- Network Utility Operator: The entity undertaking the piped distribution of drinking water or natural gas for supply or is the operator of a sewerage system or external stormwater drainage system.
- Northern areas: Sites located north of 27° latitude.
- Obtain: Obtain, seek and similar expressions mean obtain (seek) in writing from the contract administrator.
- Pipe: Includes pipe and tube.
- Practical completion or defects free completion: The requirements for these stages of completion are defined in the relevant building contract for the project.
- Principal: Principal has the same meaning as owner, client and proprietor and is the party to whom the contractor is legally bound to construct the works.
- Professional engineer: As defined by the NCC.
- Proprietary: Identifiable by naming the manufacturer, supplier, installer, trade name, brand name, catalogue or reference number.
- Prototype: A full size mock-up of components, systems or elements to demonstrate or test construction methods, junctions and finishes, and to define the level of quality.
- Provide: Provide and similar expressions mean supply and install and include development of the design beyond that documented.
- Record drawings: Record drawings has the same meaning as as-installed drawings, as-built drawings and work-as-executed drawings.
- Referenced documents: Standards and other documents whose requirements are included in this specification by reference.
- Required: Required by the contract documents, the local or statutory authorities.
- If required: A conditional specification term for work which may be shown in the documents or is a legislative requirement.
- Sample: A physical example that illustrates workmanship, materials or equipment, and establishes standards by which the work will be judged. It includes samples and sample panels.
- Statutory authority: A public sector entity created by legislation, that is, a specific law of the Commonwealth, State or Territory.
- Supply: Supply, furnish and similar expressions mean supply only.
- Tests – completion: Tests carried out on completed installations or systems and fully resolved before the date for practical completion, to demonstrate that the installation or system, including components, controls and equipment, operates correctly, safely and efficiently, and meets performance and other requirements. The superintendent may direct that completion tests be carried out after the date for practical completion.

- Tests – pre-completion: Tests carried out before completion tests, including:
 - . Production: Tests carried out on a purchased item, before delivery to the site.
 - . Progressive: Tests carried out during installation to demonstrate performance in conformance with this specification.
 - . Site: Tests carried out on site.
 - . Type: Tests carried out on an item identical with a production item, before delivery to the site.
- Tolerance: The permitted difference between the upper limit and the lower limit of dimension, value or quantity.
- Utility service provider: Includes organisations providing power, water, sewerage, gas and telecommunications services.
- Verification: Provision of evidence or proof that a performance requirement has been met or a default exists.

1.7 CONTRACT DOCUMENTS

Services diagrammatic layouts

General: Layouts of service lines, plant and equipment shown on the drawings are diagrammatic only, except where figured dimensions are provided or calculable.

Before commencing work:

- Obtain measurements and other necessary information.
- Coordinate the design and installation in conjunction with all trades.

Levels

General: Spot levels take precedence over contour lines and ground profile lines.

Drawings and manuals for existing services

Warranty: No warranty is given as to the completeness or accuracy of drawings and/or manuals of existing services.

1.8 SUBMISSIONS

Requirement

General: Submit the following:

- Authority approvals: Notes of meetings with authorities whose requirements apply to the work and evidence that notices, fees and permits have been sought and paid, that authority connections are complete and that statutory approvals by the authorities whose requirements apply to the work have been received.
- Building penetrations: Details of the methods to maintain the required structural, fire and other properties to **EXECUTION, BUILDING PENETRATIONS**.
- Certification: Certification of conformance to documented requirements, including certification that the plant and equipment submitted meets all requirements of the contract documents and that each installation is operating correctly.
- Design documentation: Design data and certification of proposed work, if required and as documented.

- Execution details: Execution programs, schedules and details of proposed methods and equipment. For building services include the following:
 - . Embedded services: Proposed method for embedding services in concrete walls or floors or chasing into concrete or masonry walls.
 - . Fixing of services: Typical details of locations, types and methods of fixing services to the building structure.
 - . Inaccessible services: If services will be enclosed and not accessible after completion, submit proposals for location of service runs and fittings.
- Fire performance: Evidence of conformity to requirement for combustibility, fire hazard properties and fire-resistance of building elements.
- Marking and labelling: Samples and schedules of proposed marking and labels to **EXECUTION, MARKING AND LABELLING**.
- Operation and maintenance manuals: For the whole of the work to **EXECUTION, OPERATION AND MAINTENANCE MANUALS**.
- Products: Products and materials data, including manufacturer's technical specifications and drawings, safety data sheets (SDS) for hazardous materials, type tests results, evidence of conformity to documented requirements, product certification, performance and rating tables, service connection requirements and installation and maintenance recommendations.
- Prototypes: Prototypes of components, systems or elements.
- Records: As-built documents, photographs, system diagrams, schedules and logbooks to **EXECUTION, RECORD DRAWINGS**.
- Samples: Representative of proposed products and materials and including proposals to incorporate samples into the works, if any to **EXECUTION, SAMPLES**.
- Shop drawings: To **EXECUTION, SHOP DRAWINGS**.
- Substitutions: To **PRODUCTS, GENERAL, Substitutions**.
- Tests:
 - . Inspection and testing plan consistent with the construction program including details of test stages and procedures.
 - . Test reports for testing performed under the contract.
- Warranties: To **EXECUTION, WARRANTIES**.

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

Submission times

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

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

Identification

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

Non-conformance: Identify proposals that do not conform with project requirements, and characteristics which may be detrimental to successful performance of the completed work.

Errors

Requirement: If a submission contains errors, make a new or amended submission as appropriate, indicating changes made since the previous submission.

1.9 INSPECTION

Notice

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

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

Minimum notice: As documented.

Light levels

Lighting levels for inspection: To AS/NZS 1680.2.4.

Attendance

General: Provide attendance for documented inspections and tests.

2 PRODUCTS

2.1 MATERIALS AND COMPONENTS

Manufacturers' or suppliers' recommendations

General: Provide and select, if no selection is given, transport, deliver, store, handle, protect, finish, adjust and prepare for use the manufactured items to the manufacturers' or suppliers' recommendations.

Proprietary items/systems/assemblies: Assemble, install or fix to substrate to the manufacturers' or suppliers' recommendations.

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

Product identification

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

Other products: Marked to show the following, as applicable:

- Manufacturer's identification.
- Product brand name.
- Product type.
- Quantity.
- Product reference code and batch number.
- Date of manufacture.

Consistency

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

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.

Substitutions

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

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

- Evidence that the performance is equal to or greater than that specified.
- Evidence of conformity to a cited standard.
- Samples.
- Essential technical information, in English.
- Reasons for the proposed substitutions.
- Statement of the extent of revisions to the contract documents.
- Statement of the extent of revisions to the construction program.
- Statement of cost implications including costs outside the contract.
- Statement of consequent alterations to other parts of the works.

Availability: If the documented products or systems are unavailable within the time constraints of the construction program, submit evidence.

Criteria: If the substitution is for any reason other than unavailability, submit evidence that the substitution:

- Is of net enhanced value to the principal.
- Is consistent with the contract documents and is as effective as the identified item, detail or method.

3 EXECUTION**3.1 SAMPLES****General**

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

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

Unincorporated samples: Remove on completion.

3.2 SHOP DRAWINGS**General**

Documentation: Include dimensioned drawings showing details of the fabrication and installation of structural elements, building components, services and equipment, including relationship to building structure and other services, cable type and size, and marking details.

Diagrammatic layouts: Coordinate work shown diagrammatically in the contract documents, and prepare dimensioned set-out drawings.

Services coordination: Coordinate with other building and service elements. Show adjusted positions on the shop drawings.

Space requirements: Check space and access for maintenance requirements of equipment and services indicated diagrammatically in the contract documents.

Building work drawings for building services: On dimensioned drawings show the following:

- Access doors and panels.
- Conduits to be cast in slabs.
- Holding down bolts and other anchorage and/or fixings required complete with loads to be imposed on the structure during installation and operation.
- Openings, penetrations and block-outs.
- Sleeves.
- Plinths, kerbs and bases.
- Required external openings.

Record drawings: Amend all documented shop drawings to include changes made during the progress of the work and up to the end of the defects liability period.

3.3 OFF-SITE DISPOSAL**Removal of material**

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

3.4 WALL CHASING**Holes and chases**

General: If holes and chases are required in masonry walls, make sure structural integrity of the wall is maintained. Do not chase walls with a fire-resistance level or an acoustic rating.

Parallel chases or recesses on opposite faces of a wall: Not closer than 600 mm to each other.

Chasing blockwork: Only chase core-filled hollow blocks or solid blocks which are not documented as structural.

Concrete blockwork chasing table

Block thickness (mm)	Maximum depth of chase (mm)
190	35
140	25
90	20

3.5 FIXING

General

Suitability: If equipment is not suitable for fixing to non-structural building elements, fix directly to structure and trim around penetrations in non-structural elements.

Fasteners

General: Use proprietary fasteners capable of transmitting the loads imposed, and sufficient for the rigidity of the assembly.

3.6 SERVICES CONNECTIONS

Connections

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

Utility service provider requirements

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

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.

3.7 SERVICES INSTALLATION

General

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

Installation: Install equipment and services as follows:

- Plumb and securely fixed.
- Allow for movement in both structure and services.
- Arrange services running together, parallel to each other and adjacent building elements.

Concealment: Conceal all cables, ducts, trays and pipes except where installed in plant spaces, ceiling spaces and riser cupboards or documented to be exposed. If alternative routes are available, do not locate on external walls.

Lifting: Provide heavy items of equipment with permanent fixtures for lifting to the manufacturer's recommendations.

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

Dissimilar metals

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

Temporary capping

Pipe ends: During construction, protect open ends of pipe with metal or plastic covers or caps.

Piping

General: Install piping in straight lines at uniform grades without sags. Arrange to prevent air locks. Provide sufficient unions, flanges and isolating valves to allow removal of piping and fittings for maintenance or replacement of plant.

Spacing: Provide at least 25 mm clear between pipes and between pipes and building elements, additional to insulation.

Changes of direction: Provide as follows:

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

Vibration: Arrange and support piping to prevent vibration whilst permitting necessary movement. Minimise the number of joints.

Embedded pipes: Do not embed pipes that operate under pressure in concrete or surfacing material.

Valve groupings: If possible, locate valves in groups.

Pressure testing precautions: Isolate items not rated for the test pressure. Restrain pipes and equipment to prevent movement during pressure testing.

Support and structure

Requirement: Provide incidental supports and structures to suit the services.

Pipe support systems

General: Provide proprietary support systems of metallic-coated steel construction.

Vertical pipes: Provide anchors and guides to maintain long pipes in position, and supports designed for the mass of the pipe and its contents.

Saddles: Provide saddle supports only on DN 25 or smaller pipes.

Dissimilar metals: If pipe and support materials are dissimilar, provide industrial grade electrically non-conductive material securely bonded to the pipe to separate them. Provide fasteners of electrolytically compatible material.

Uninsulated pipes: Clamp piping supports directly to pipes.

Insulated pipes:

- Spacers: Provide spacers at least as thick as the insulation between piping supports and pipes. Extend either side of the support by at least 20 mm.

- Spacer material: Rigid insulation material of sufficient strength to support the piping and suitable for the temperature application.

Support spacing: As follows:

- Cold and heated water pipes: To AS/NZS 3500.1 Table 5.6.4. Provide additional brackets, clips or hangers to prevent pipe movement caused by water pressure effects.
- Sanitary plumbing: To AS/NZS 3500.2 Table 10.2.1.
- Fuel gas: To AS/NZS 5601.1 Table 5.5.
- Other pipes: To AS/NZS 3500.1 Table 5.6.4.

Hanger size table

Nominal pipe size (DN)	Minimum hanger diameter for single hangers (mm)
50 maximum	9.5
65 to 90	12.7
100 to 125	15.8
150 to 200	19.0

Differential movement

General: If the geotechnical site investigation report predicts differential movements between buildings and the ground in which pipes or conduits are buried, provide control joints in the pipes or conduits, as follows:

- Arrangement: Arrange pipes and conduits to minimise the number of control joints.
- Magnitude: Accommodate the predicted movements.

3.8 BUILDING PENETRATIONS

Penetrations

Requirement: Maintain the required structural integrity, fire performance, waterproofing performance and other properties when penetrating or fixing to the following:

- Structural building elements including external walls, fire walls, fire doors and access panels, other tested and rated assemblies or elements, floor slabs and beams.
- Membrane elements including damp-proof courses, waterproofing membranes and roof coverings. If penetrating membranes, provide a waterproof seal between the membrane and the penetrating component.

Sealing

Fire-resisting building elements: Seal penetrations with a system conforming to AS 4072.1.

Non fire-resisting building elements: Seal penetrations around conduits and sleeves. Seal around cables within sleeves. If the building element is acoustically rated, maintain the rating.

Sleeves

General: If piping, cables or conduits penetrate building elements, provide metal or PVC-U sleeves formed from pipe sections as follows:

- Movement: Arrange to permit normal pipe or conduit movement.

- Diameter (for non fire-resisting building elements): Sufficient to provide a ring shaped space around the pipe or pipe insulation of at least 12 mm.
- Ferrous surfaces: Prime paint.
- Sealing: Seal between pipes or conduits and sleeves to prevent the entry of vermin.
- Terminations:
 - . Cover plates fitted: Flush with the finished building surface.
 - . Fire-resisting and acoustic rated building elements: 50 mm beyond finished building surface.
 - . Floors draining to floor wastes: 50 mm above finished floor.
 - . Other locations: 5 mm beyond finished building surface.
 - . Termite management: To AS 3660.1.
- Thickness:
 - . Metal: 1 mm or greater.
 - . PVC-U: 3 mm or greater.

3.9 CONCRETE PLINTHS

Construction

General: Provide concrete plinths as documented and under all equipment located on concrete floor slabs as follows:

- Surround: Galvanized steel, at least 75 mm high and 1.6 mm thick. Fix to the floor with masonry anchors. Fill with concrete.
- Height: 75 mm or greater, as documented.
- Reinforcement: Single layer of F62 fabric.
- Concrete: Grade N20.
- Finish: Steel float, flush with top edge of the surround.

3.10 PLANT AND EQUIPMENT

General

Location: Locate so failure of plant and equipment (including leaks) does not create a hazard for the building occupants and causes a minimum or no damage to the building, its finishes and contents including water sensitive equipment or finishes.

Safe tray and an overflow pipe: Provide to each tank, hot water heater and storage vessel.

3.11 ACCESS FOR MAINTENANCE

Clearances

Minimum clearances for access: Conform to the following:

- Vertical clearance: ≥ 2100 mm, vertically above horizontal floors, ground and platforms.
- Horizontal clearance: Preferably ≥ 750 mm clear, but in no case less than 600 mm between equipment or between equipment and building features including walls.
- If tools are required to operate, adjust or remove equipment, provide sufficient space so the tools can be used in their normal manner and without requiring the user to employ undue or awkward force.

- Hinged or removable components: To the manufacturer's recommendations.
- Within plant items: Conform to the preceding requirements, and not less than the clearances recommended in BS 8313.

Elevated services other than in occupied areas

Access classifications:

- Access class A: Readily accessible. Provide clear and immediate access to and around plant items. If plant or equipment is located more than 2.0 m above the ground, floor or platform, provide a platform with handrails accessible by a stair, all to AS 1657.
- Access class B: If the plant item requiring access is located more than 2.0 m above the ground, floor or platform, provide a platform with handrails accessible by a non-vertical ladder, all to AS 1657.
- Access class C: Locate plant so temporary means of access conforming to Work health and Safety regulations can be provided.

Temporary means of access: Make sure there is adequate provision in place which is safe and effective.

Areas in which access is restricted to authorised maintenance personnel: Provide access as follows:

- Instruments, gauges and indicators (including warning and indicating lights) requiring inspection at any frequency: Readily accessible.
- Access required monthly or more frequently: Access class A.
- Access required between monthly and six monthly: Access class A or B.
- Access required less frequently than six monthly: Access class A, B or C.

Other areas: Provide access as follows:

- Locate to minimise inconvenience and disruption to building occupants or damage to the building structure or finishes.
- In suspended ceilings, locate items of equipment that require inspection and/or maintenance above tiled parts. If not possible, provide access panels where located above set plaster or other inaccessible ceilings. Arrange services and plant locations to reduce the number of access panels. Coordinate with other trades to use common access panels where feasible.
- Do not locate equipment requiring access above partitions.
- Instruments, gauges and other items requiring inspection at any frequency: Readily accessible.
- Labelling: If equipment is concealed in ceilings, provide marking to **MARKING AND LABELLING, Equipment concealed in ceilings**.

Facilities for equipment removal and replacement

Requirement: Provide facilities to permit removal from the building and replacement of plant and equipment, including space large enough to accommodate it and any required lifting and/or transportation equipment. Arrange plant so large and/or heavy items can be moved with the minimum changes of direction.

Removal of components: Allow sufficient space for removal and replacement of equipment components including air filters, tubes of shell and tube heat exchangers, removable heat exchanger bundles, coils and fan shafts. Provide access panels or doors large enough to permit the safe removal and replacement of components within air handling units.

Facilities for access

Equipment behind hinged doors: Provide doors opening at least 150°.

Equipment behind removable panels: Provide panels with quick release fasteners or captive metal thread screws.

Removable panels: Provide handles to permit easy and safe removal and replacement.

Insulated plant and services: If insulation must be removed to access plant and services for maintenance, arrange it to allow for removal and replacement without damage.

Piping

Requirement: Conform to the following:

- Provide access and clearance at fittings which require maintenance, inspection or servicing, including control valves and joints intended to permit pipe removal.
- Arrange piping so it does not interfere with the removal or servicing of associated equipment or valves or block access or ventilation openings.
- Preferably run piping, conduits, cable trays and ducts at high level and drop vertically to equipment.

Electrical equipment and controls

Electrical equipment: Provide clearances and access space to AS/NZS 3000.

Switchboards and electrical control equipment: Locate near the main entrance to plant space and with switchboards visible from the plant being operated.

Control panels: Locate near and visible from the plant being controlled.

3.12 VIBRATION SUPPRESSION

General

Requirement: Minimise the transmission of vibration from rotating or reciprocating equipment to other building elements.

Standard

Machinery noise and vibration: Vibration severity in Zone A to ISO 20816-1 and ISO 10816-3.

Speeds

General: If no maximum speed is prescribed, do not exceed 1500 r/min for direct driven equipment.

Connections

General: Provide flexible connections to rotating machinery and assemblies containing rotating machinery. Isolate pipes by incorporating sufficient flexibility into the pipework or by use of proprietary flexible pipe connections installed to prevent placing stress on pipes due to end reaction.

Inertia bases

General: If necessary to achieve the required level of vibration isolation, provide inertia bases having appropriate mass and to the following:

- Construction: Steel or steel-framed reinforced concrete. Position foundation bolts for equipment before pouring concrete.
- Supports: Support on vibration isolation mountings using height saving support brackets.

Vibration isolation mountings

General: Except for external equipment that is not connected to the structure of any building, support rotating or reciprocating equipment on mountings as follows:

- For static deflections < 15 mm: Single or double deflection neoprene in-shear mountings incorporating steel top and base plates and a tapped hole for bolting to equipment.
- For static deflections ≥ 15 mm: Spring mountings.

Selection: Provide mountings selected to achieve 95% isolation efficiency at the normal operating speeds of the equipment.

Installation: Set and adjust vibration isolation mounting supports to give clearance for free movement of the supports.

Spring mountings: Provide freestanding laterally stable springs as follows:

- Clearances: ≥ 12 mm between springs and other members such as bolts and housing.
- High frequency isolation: 5 mm neoprene acoustic isolation pads between baseplate and support.
- Levelling: Provide bolts and lock nuts.
- Minimum travel to solid: ≥ 150% of the designated minimum static deflection.
- Ratio of mean coil diameter to compressed length at the designated minimum static deflection: ≥ 0.8:1.
- Snubbing: Snub the springs to prevent bounce at start-up.
- Vertical resilient limit stops: To prevent spring extension when unloaded, to serve as blocking during erection and which remain out of contact during normal operation.

3.13 FINISHES TO BUILDING SERVICES**General**

Requirement: If exposed to view (including in plant rooms), paint building services and equipment.

Surfaces painted or finished off-site: Conform to *0183 Metals and prefinishes*.

Exceptions: Do not paint chromium or nickel plating, anodised aluminium, GRP, stainless steel, non-metallic flexible materials and normally lubricated machined surfaces. Surfaces with finishes applied off-site need not be re-painted on-site provided the corrosion resistance of the finish is not less than that of the respective finish documented.

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.

Inaccessible surfaces: If surfaces are inaccessible after installation, complete finish before installation.

Powder coating

Coating: To *0673 Powder coatings*.

Painting systems

General: Conform to the following:

- New unpainted interior surfaces: To AS/NZS 2311 Table 5.1.
- New unpainted exterior surfaces: To AS/NZS 2311 Table 5.2.

Corrosive environments, atmospheric Category D to F: Galvanized or stainless steel.

Paint application

Coats: Apply the first coat immediately after substrate preparation and before contamination of the substrate can occur. Make sure each coat of paint or clear finish is uniform in colour, gloss, thickness and texture and free of runs, sags, blisters or other discontinuities.

Combinations: Do not combine paints from different manufacturers in a paint system.

Protection: Remove fixtures before starting to paint and refix in position undamaged when painting is complete.

Underground metal piping

Requirement: Provide corrosion protection for the following:

- Underground ferrous piping.
- Underground non-ferrous metal piping in corrosive environments.

Corrosion protection: Select from the following:

- Cathodic protection: Sacrificial anodes or impressed current. Incorporate a facility for periodic testing. Conform to the recommendations of AS 2832.1.
- Continuous wrapping using proprietary petroleum taping material.
- Impermeable flexible plastic coating.
- Sealed polyethylene sleeve.

Aggressive soils: If metallic piping or components are installed in chemically aggressive soil, provide additional protection as follows:

- Material: Continuous polyethylene sleeve to ASTM D1248 with a minimum thickness of 0.25 mm.
- Installation: Wrap or sleeve pipes and components. Tape joints between sections of polyethylene and between polyethylene and piping.

Low VOC emitting paints

Paint types: To the recommendations of AS/NZS 2311 Table 4.2.

Repairs to finishes

Requirement: Repair damaged finishes to restore their corrosion protection, appearance and service life.

3.14 MARKING AND LABELLING

General

Requirement: Mark and label services and equipment for identification purposes as follows:

- Locations exposed to weather: Provide durable materials.
- Pipes, conduits and ducts: To AS 1345 throughout its length, including in concealed spaces.
- Cables: Label to indicate the origin and destination of the cable.

Consistency: Label and mark equipment using a consistent scheme across all services elements of the project.

Label samples and schedules

Requirement: For each item or type of item, prepare a schedule of marking and labelling, including the following:

- A description of the item or type of item for identification.
- The proposed text for marking or labelling.
- The proposed location of the marking and labelling.

Submission timing: Before marking or labelling.

Electrical accessories

Circuit identification: Label isolating switches and outlets to identify circuit origin.

Operable devices

Requirement: Mark to identify the following:

- Controls.
- Indicators, gauges, meters.
- Isolating switches.

Equipment concealed in ceilings

Location: Provide a label on the ceiling, to indicate the location of each concealed item requiring access for routine inspection, maintenance and/or operation and as follows:

- Tiled ceilings, locate the label on the ceiling grid closest to the concealed item access point.
- Flush lined ceilings, locate adjacent to closest access panel.

Concealed equipment: Items to be labelled include the following:

- Fan coil units and terminal equipment (e.g. VAV terminals).
- Fire and smoke dampers.
- Isolating valves not directly connected to items otherwise labelled.
- Motorised dampers.

Wall mounted equipment in occupied areas

Location: Provide labels on wall mounted items in occupied areas including the following:

- Services control switches.
- Temperature and humidity sensors.

Points lists

Automatic control points: Provide plasticised, fade-free points lists for each automatic control panel and include terminal numbers, point addresses, short and long descriptors in the lists. Store in a pocket on the door of the panel.

Pressure vessels

General: Mount manufacturer's certificates in glazed frames on a wall next to the vessel.

Valves and pumps

General: Label to associate pumps with their starters and valves. Screw fix labels to body or attach label to valve handwheels with a key ring.

Labels and notices

Materials: Select from the following:

- Cast metal.
- For indoor applications only, engraved two-colour laminated plastic.
- Proprietary pre-printed self-adhesive flexible plastic labels with machine printed black lettering.
- Stainless steel or brass minimum 1 mm thick with black filled engraved lettering.

Emergency functions: To AS 1319.

Colours: Generally to AS 1345 as appropriate, otherwise black lettering on white background except as follows:

- Danger, warning labels: White lettering on red background.
- Main switch and caution labels: Red lettering on white background.

Edges: If labels exceed 1.5 mm thickness, radius or bevel the edges.

Labelling text and marking: To correspond to terminology and identifying number of the respective item as shown on the record drawings and documents and in operating and maintenance manuals.

Lettering heights:

- Danger, warning and caution notices: Minimum 10 mm for main heading, minimum 5 mm for remainder.
- Equipment labels within cabinets: Minimum 5 mm.
- Equipment nameplates: Minimum 40 mm.
- Identifying labels on outside of cabinets: Minimum 5 mm.
- Isolating switches: Minimum 5 mm.
- Switchboards, main assembly designation: Minimum 25 mm.
- Switchboards, outgoing functional units: Minimum 10 mm.
- Switchboards, sub assembly designations: Minimum 15 mm.
- Valves: Minimum 20 mm.
- Self-adhesive flexible plastic labels:
 - . Labels less than 2000 mm above floor: 5 mm.
 - . Labels minimum 2000 mm above floor: 10 mm.
 - . Other locations: Minimum 5 mm.

Label locations: Locate labels so they are easily seen and are either attached to, below or next to the item being marked.

Fixing: Fix labels securely using screws, rivets, proprietary self-adhesive labels or double-sided adhesive tape and as follows:

- If labels are mounted in extruded aluminium sections, use rivets or countersunk screws to fix the extrusions.
- Use aluminium or monel rivets for aluminium labels.

Vapour barriers: Do not penetrate vapour barriers.

3.15 TACTICAL FIRE DRAWINGS

General

Requirement: Provide sets of colour coded tactical fire drawings, showing all items and systems relevant in a fire to BCA Spec E1.8.

Scale: 1:200 or larger if required to be easily read under emergency conditions.

Coordination: Agree the format, colour coding and contents of the tactical fire plans with the Local Fire Authority before beginning documentation.

Location: Provide one set of the laminated drawings fixed to the wall or supplied in a vertical plan hanger in the fire control room.

Loose set: Provide a second set of identical drawings.

Operation and maintenance manuals: Provide a set of colour coded tactical fire drawings in each copy of the operating and maintenance manual.

Inclusions

Requirement: Include the following on the tactical fire drawings:

- Legend sheet at front of set.
- Colour coding key.
- Building: As follows:
 - . Floor plans.
 - . Pressurised and non-pressurised fire isolated stairs and passages.
 - . Smoke and fire compartments.
 - . Special risk areas.
- Fire services: As follows:
 - . Automatic fire detection systems.
 - . Automatic suppression systems including gas flooding systems.
 - . Communications including Warden Intercom Points.
 - . Fire control room.
 - . Fire equipment including booster connections.
 - . Fire hydrants, hose reels, portable fire extinguishers.
 - . Fire detection control and indicating equipment (FDCIE).
 - . Fire service lifts.
 - . Fire telephone and control panel.
 - . Hydrant and sprinkler pumps.
 - . Hydrant/hose reels.
 - . Sprinkler and hydrant, suction and booster connections.
 - . Sprinkler control valves.
- Electrical services: As follows:
 - . Emergency power supplies.
 - . Essential services switchboards.

- . Evacuation warning panel.
- . Standby power plant.
- . Substations/transformers.
- . Switchboards, main switch room.
- Mechanical ventilation and air handling equipment: As follows:
 - . Air intakes, fans, ducts, shafts.
 - . Conditioners and mixing boxes.
 - . Fire dampers.
 - . General exhaust air fans, ducts, shafts, discharges.
 - . Smoke dampers.
 - . Smoke fans including exhaust fans, zone and stair pressurisation fans.
 - . Stair pressurisation systems.
 - . Supply air system.
- Mechanical ventilation and air handling equipment operation: As follows:
 - . Statement of normal condition.
 - . Condition upon fire alarm.
 - . Manual controls available.
- Hydraulic services: As follows:
 - . Gas meters.
 - . Gas supply control.
 - . Incoming water supplies and valves for the sprinkler, hydrant and fire hose reel systems.
 - . Water tank.

3.16 RECORD DRAWINGS

General

Requirement: Prepare record drawings showing the following:

- Installed locations of building elements, services, plant and equipment.
- Off-the-grid dimensions and depth if applicable.
- Any provisions for the future.

Recording, format and submission

Requirement: Record changes made during the progress of the works on a set of drawings kept on site for that specific purpose.

Drawing layout: Use the same borders and title block as the contract drawings.

Quantity and format: Conform to **SUBMISSIONS**.

Endorsement: Sign and date all record drawings.

Accuracy: If errors in, or omissions from, the record drawings are found, amend the drawings and re-issue in the quantity and format documented for **SUBMISSIONS**.

Date for submission: Not later than 2 weeks after the date for practical completion.

Services record drawings

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

- Extensions and/or changes to existing: If a drawing shows extensions and/or alterations to existing installations, include sufficient of the existing installation to make the drawing

comprehensible without reference to drawings of the original installation.

- Detention: If on-site detention tanks or pondage are provided, include the volume required on the drawing and the permitted flow rate to the connected system.
- Domestic cold water or fire mains: Show the pressure available at the initial connection point and the pressure available at the most disadvantaged location on each major section of the works.
- Stormwater: If storm water pipes are shown, include the pipe size and pipe grade together with the maximum acceptable flow and the actual design flow.

Diagrams: Provide diagrammatic drawings of each system including the following:

- Controls.
- Piping including all valves and valve identification tags.
- Principal items of equipment.
- Single line wiring diagrams.
- Acoustic and thermal insulation.
- Access provisions and space allowances.
- Fasteners.
- Fixtures.
- Switchgear and control gear assembly circuit schedules including electrical service characteristics, controls and communications.
- Charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

Subsurface services: Record information on underground or submerged services to the documented quality level, conforming to AS 5488.

3.17 OPERATION AND MAINTENANCE MANUALS

General

Authors and compilers: Personnel experienced in the maintenance and operation of equipment and systems installed, and with editorial ability.

Referenced documents: If referenced documents or worksections require submissions of manuals, include corresponding material in the operation and maintenance manuals.

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

Contents

Requirement: Include the following:

- Table of contents: For each volume. Title to match cover.
- Directory: Names, addresses, and telephone and facsimile numbers of principal consultant, subconsultants, contractor, subcontractors and names of responsible parties.
- Record drawings: Complete set of record drawings, full size.
- Drawings and technical data: As necessary for the efficient operation and maintenance of the installation.

- Installation description: General description of the installation.
- Systems descriptions and performance: Technical description of the systems installed and mode of operation, presented in a clear and concise format readily understandable by the principal's staff. Identify function, normal operating characteristics, and limiting conditions.
- Baseline data: To AS 1851, AS 1668.1 and AS 1670.1.
- Documentation to AS 1851 including the schedule of essential functionality and performance requirements.
- Equipment descriptions:
 - . Name, address, email address and telephone and facsimile numbers of the manufacturer and supplier of items of equipment installed, together with catalogue list numbers.
 - . Schedules (system by system) of equipment, stating locations, duties, performance figures and dates of manufacture. Provide a unique code number cross-referenced to the record and diagrammatic drawings and schedules, including spare parts schedule, for each item of equipment installed.
 - . Manufacturers' technical literature for equipment installed, assembled specifically for the project, excluding irrelevant matter. Mark each product data sheet to clearly identify specific products and component parts used in the installation, and data applicable to the installation.
 - . Supplements to product data to illustrate relations of component parts. Include typed text as necessary.
- Certificates:
 - . Certificates from authorities.
 - . Copies of manufacturers' warranties.
 - . Product certification.
 - . Test certificates for each service installation and all equipment.
 - . Test reports.
 - . Test, balancing and commissioning reports.
 - . Control system testing and commissioning results.
- 7 day record of all trends at commissioning.
- Operation procedures:
 - . Manufacturers' technical literature as appropriate.
 - . Safe starting up, running-in, operating and shutting down procedures for systems installed. Include logical step-by-step sequence of instructions for each procedure.
 - . Control sequences and flow diagrams for systems installed.
 - . Legend for colour-codes services.
 - . Schedules of fixed and variable equipment settings established during commissioning and maintenance.
 - . Procedures for seasonal changeovers.

- . If the installation includes cooling towers, a water efficiency management plan.
- Maintenance procedures:
 - . Detailed recommendations for periodic maintenance and procedures, including schedule of maintenance work with frequency and manufacturers' recommended tests.
 - . Manufacturer's technical literature as appropriate. Register with manufacturer as necessary. Retain copies delivered with equipment.
 - . Safe trouble-shooting, disassembly, repair and reassembly, cleaning, alignment and adjustment, balancing and checking procedures. Provide logical step-by-step sequence of instructions for each procedure.
 - . Schedule of spares, recommended to be held on site, for those items subject to wear or deterioration and that may involve the principal in extended deliveries when replacements are required. Include complete nomenclature and model numbers, and local sources of supply.
 - . Schedule of normal consumable items, local sources of supply, and expected replacement intervals up to a running time of 40 000 hours. Include lubrication schedules for equipment.
 - . Schedules for recording recommissioning data to identify changes in the system over time.
 - . Instructions for use of tools and testing equipment.
 - . Emergency procedures, including telephone numbers for emergency services, and procedures for fault finding.
 - . Safety data sheets (SDS).
 - . Instructions and schedules conforming to AS 1851, AS/NZS 3666.2, AS/NZS 3666.3 and AS/NZS 3666.4.
- Maintenance records:
 - . Prototype service records conforming to AS 1851 prepared to include project specific details.
 - . Prototype periodic maintenance records and report to AS/NZS 3666.2, AS/NZS 3666.3 and AS/NZS 3666.4 as appropriate, prepared to include project specific details.
 - . Hard copies: Binders to match the manuals, containing loose leaf log book pages designed for recording completion activities including operational and maintenance procedures, materials used, test results, comments for future maintenance actions and notes covering the condition of the installation. Include completed log book pages recording the operational and maintenance activities performed up to the date for practical completion.
 - . Number of pages: The greater of 100 pages or enough pages for the maintenance period and a further 12 months.

Format – electronic copies

Scope: Provide the same material as documented for hardcopy in electronic format.

Printing: Except for drawings required in the **RECORD DRAWINGS** clause provide material that can be legibly printed on A4 size paper.

Site control

General: Report to the principal's designated representative on arriving at and before leaving the site.

3.18 WARRANTIES

General

Requirement: If a warranty is documented, name the principal as warrantee. Register with manufacturers as necessary. Retain copies delivered with components and equipment.

Warranty period: Start warranty periods at acceptance of installation.

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

3.19 POST-CONSTRUCTION MANDATORY INSPECTIONS AND MAINTENANCE

General

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

- AS 1851.
- Other statutory requirements applicable to the work.

Records: Provide mandatory records.

Certification: Certify that mandatory inspections and maintenance have been carried out and that the respective items conform to statutory requirements.

Annual inspection: Perform an annual inspection and maintenance immediately before the end of the defects liability period.

0181 ADHESIVES, SEALANTS AND FASTENERS**1 GENERAL****1.1 RESPONSIBILITIES****Performance**

Requirements: Conform to the following:

- Fitness for purpose: Capable of transmitting imposed loads, sufficient to maintain the rigidity of the assembly, or integrity of the joint.
- Finished surface: That will not cause discolouration.
- Compatibility: Compatible with the products to which they are applied.
- Sealant replacement: Capable of safe removal without compromising the application of the replacement sealant for future refurbishment.
- Movement: If an adhered or sealed joint is subject to movement, select a system certified to accommodate the projected movement under the conditions of service.
- Fasteners: Suitable for the particular use, capable of transmitting imposed loads and maintaining the rigidity of the assembly.

1.2 SUBMISSIONS**Products and materials**

Sealants: Submit technical data sheets.

Adhesives and sealants: Submit safety data sheets (SDS).

Samples

Visible joint sealants: Submit colour samples.

Tests

Compatibility testing: Submit adhesion and compatibility testing data demonstrating that adhesive, sealant or fastener is compatible with materials to be fixed and is suitable for the project conditions.

Warranties

Manufacturer's warranty: Submit the manufacturer's published product warranties.

1.3 INSPECTION**Notice**

Inspection: Give notice so that inspection may be made of prepared joints and penetrations for each sealant application.

2 PRODUCTS**2.1 ADHESIVES****Standards**

Gypsum plaster adhesive: To AS 2753.

High strength adhesive tape

General description: A foam of cross linked polyethylene or closed cell acrylic coated both sides with a high performance acrylic adhesive system, encased in release liners of paper or polyester.

Product classification: Select tape to suit substrate as follows:

- Firm high strength foam tapes: For high energy surfaces including most bare metals such as stainless steel and aluminium.
- Conformable high strength foam: For the following:
 - . Medium energy surfaces including many plastics and paints, and bare metals.
 - . Lower energy surfaces including many plastics, most paints and powder coatings, and bare metals.

Thickness: Select the tape to make sure a mismatch between surfaces does not exceed half the tape thickness under the applied lamination pressure.

2.2 SEALANTS**Standards**

General: To ISO 11600.

External masonry joints

General: Provide sealant and bond breaking materials which are non-staining to masonry. Do not use bituminous materials with absorbent masonry units.

Bond breaking backing:

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

Fire-resisting control joints

General: Provide sealant materials that maintain the nominated fire-resistance level (FRL).

- Fire-stopping: To AS 4072.1.

Lightweight building element joints

Joints subject to rapid changes of movement: Provide sealants that accommodate the movement of the contact materials.

Floor control joints

General: Provide trafficable sealants.

Bond breaking backing:

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

2.3 FASTENERS**General**

Masonry anchors: Proprietary expansion or bonded type anchors.

Plain washers: To AS 1237.1.

- Provide washers to the heads and nuts of bolts, and the nuts of coach bolts.

Plugs: Proprietary purpose-made plastic.

Stainless steel fasteners: To ASTM A240/A240M.

Steel nails: To AS 2334.

- Length: At least 2.5 times the thickness of the member being secured, and at least 4 times the thickness if the member is plywood or building board less than 10 mm thick.

Unified hexagon bolts, screws and nuts: To AS/NZS 2465.

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

Bolts

Coach bolts: To AS/NZS 1390.

Hexagon bolts Grades A and B: To AS 1110.1.

Hexagon bolts Grade C: To AS 1111.1.

Corrosion resistance

Atmospheric corrosivity category: To 0171 General requirements.

Steel products: 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

Finishes

Electroplating:

- Metric thread: To AS 1897.
- Imperial thread: To AS 4397.

Galvanizing:

- Threaded fasteners: To AS/NZS 1214.
- Other fasteners: To AS/NZS 4680.

Mild steel fasteners: Galvanize if:

- Embedded in masonry.
- In external timbers.
- In contact with chemically treated timber other than CCA treated timber.

Epoxy coated: CCA treated timber.

Nuts

Hexagon chamfered thin nuts Grades A and B: To AS 1112.4.

Hexagon nuts Grade C: To AS 1112.3.

Hexagon nuts Style 1 Grades A and B: To AS 1112.1.

Hexagon nuts Style 2 Grades A and B: To AS 1112.2.

Screws

Coach screws: To AS/NZS 1393.

Hexagon screws Grades A and B: To AS 1110.2.

Hexagon screws Grade C: To AS 1111.2.

Hexagon socket screws: To AS 1420.

Self-drilling screws: To AS 3566.1.

Self-tapping screws:

- Crossed recessed countersunk (flat – common head style): To AS/NZS 4407.
- Crossed recessed pan: To AS/NZS 4406.
- Crossed recessed raised countersunk (oval): To AS/NZS 4408.
- Hexagon: To AS/NZS 4402.
- Hexagon flange: To AS/NZS 4410.
- Hexagon washer: To AS/NZS 4409.
- Slotted countersunk (flat – common head style): To AS/NZS 4404.
- Slotted pan: To AS/NZS 4403.
- Slotted raised countersunk (oval – common head style): To AS/NZS 4405.

Blind rivets

Description: Expanding end type with snap mandrel.

Type: Closed end for external application, open end for internal application.

End material:

- Aluminium base alloy for metallic-coated or prepainted steel.
- Stainless steel for stainless steel sheet.
- Copper for copper sheet.

Size:

- For sheet metal to sheet metal: 3 mm.
- For sheet metal to supports, brackets and rolled steel angles: 4.8 mm.

3 EXECUTION

3.1 ADHESIVES

General

Requirement: Install to the manufacturer's recommendations.

Preparation

Substrates: Conform to the following:

- Remove any deposit or finish which may impair adhesion.
- If framed or discontinuous, provide support members in full lengths without splicing.
- If solid or continuous, remove excessive projections.
- If previously painted, remove cracked or flaking paint and lightly sand the surface.

Contact adhesive

Precautions: Do not use contact adhesive if:

- A substrate is polystyrene foam.
- A PVC substrate may allow plasticiser migration.
- The adhesive solvent can discolour the finished surface.
- Dispersal of the adhesive solvent is impaired.

Two-way method: Immediately after application, press firmly to transfer adhesive and then pull both surfaces apart. Allow to tack off and then reposition and press firmly together. Tap areas in contact with a hammer and padded block.

One-way method: Immediately after application, bring substrates together and maintain maximum surface contact for 24 hours by clamps, nails or screws as appropriate. If highly stressed, employ permanent mechanical fasteners.

High strength adhesive tape

Preparation:

- Non-porous surfaces: Clean with surface cleaning solvents such as isopropyl alcohol/water, wash down and allow to dry.
- Porous surfaces: Prime the surface with a contact adhesive compatible with the tape adhesive system.

Application to copper, brass, plasticised vinyl and hydrophilic surfaces such as glass and ceramics in a high humidity environment: Conform to manufacturer's recommendations.

Applied lamination pressure: Make sure the tape experiences 100 kPa.

Application temperature: Generally above 10°C and to the manufacturer's recommendations.

Completion: Do not apply loads to the assembly for 72 hours at 21°C.

3.2 JOINT SEALING

General

Requirement: Install to the manufacturer's recommendations.

Joint preparation

Cleaning: Cut flush joint surface protrusions and rectify if required. Mechanically clean joint surfaces free of any deposit or finish which may impair adhesion of the sealant. Immediately before sealant application, remove loose particles from the joint, using oil-free compressed air.

Bond breaking: Install bond breaking backing material.

Taping: Protect the surface on each side of the joint using 50 mm wide masking tape or equivalent means. On completion of sealant application, remove the tape and remove any stains or marks from adjacent surfaces.

Primer: Apply the recommended primer to the surfaces in contact with sealant materials.

Sealant joint proportions

General weatherproofing joints (width:depth):

- 1:1 for joint widths less than 12 mm.
- 2:1 for joint widths greater than 12 mm.

Sealant application

General: Apply the sealant to dry joint surfaces using a pneumatic applicator gun. Make sure the sealant completely fills the joint to the required depth, provides good contact with the full depth of the sides of the joint and traps no air in the joint. Do not apply the sealant outside the recommended working time for the material or the primer.

Weather conditions

Two pack polyurethanes: Do not apply the sealant if ambient conditions are outside the following:

- Temperature: Less than 5°C or greater than 40°C.

- Humidity: To the manufacturer's recommendations.

Joint finish

General: Force the sealant into the joint and finish with a smooth, slightly concave surface using a tool designed for the purpose.

Excess sealant: Remove from adjoining surfaces using cleaning material nominated by the sealant manufacturer.

Protection

General: Protect the joint from inclement weather during the setting or curing period of the material.

Rectification

General: Cut out and remove damaged portion of joint sealant and reinstall so repaired area is indistinguishable from undamaged portion.

3.3 TESTING

Installed sealant tests

Sampling: For each sealant test, take 3 samples of installed and cured sealant, each at least 50 mm long, from completed joints.

Reinstatement: Repair-as-new the joints from which the samples were taken.

3.4 FASTENERS

General

Requirement: Install to the manufacturer's recommendations.

Fastening to wood and steel

Timber substrates: To AS 1720.1 Section 4.

Self-drilling screws: To AS 3566.1 for timber and steel substrates.

Masonry anchors

Installation: To the manufacturer's recommendations.

0182 FIRE-STOPPING**1 GENERAL****1.1 STANDARDS****General**

Service penetration fire-stopping systems: To BCA C3.15.

Control/construction joint fire-stopping systems: To AS 4072.1.

1.2 SUBMISSIONS**Certification**

General: Submit evidence of conformity with the recommendations of AS 4072.1 Appendix B.

Certification: Submit a completed certification list and schedule for installed fire-stopped penetrations and control/construction joints.

- List form: To AS 4072.1 Figure B1.
- Schedule form: To AS 4072.1 Figure B2.

Execution details

General: Give notice, if substrates or penetrants or both are not suitable for fire-stopping.

Products and materials

General: Submit the following:

- Evidence that systems conform to documented requirements.
- Copies of relevant manufacturers' instructions.
- Safety data sheets (SDS).
- Product data sheets (PDS).

Type tests: Submit type test reports as evidence of conformance for each combination of fire-stopping system, application, type of service, substrate, penetration orientation and drawings of tested details. Include for the following:

- Service penetration fire-stopping systems: Fire-resistance tested to AS 1530.4.
- Fire-stop mortars: Resistance to explosive spalling to AS 1774.36.
- Control joint fire-stopping systems: Fire-resistance tested to AS 1530.4.

Samples

Sample panels: Supply a sample panel of each fire-stopping assembly, on representative substrates. If built into the works, identify by marking it as a control sample.

Size: 500 mm run for junction seals and 500 x 500 mm area for penetration seals.

Subcontractors

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

Warranties

Proprietary fire-stopping products and systems: Submit the manufacturer's published product warranties.

1.3 INSPECTION**Notice**

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

- Service penetrations completed and ready for fire-stopping.
- Control/construction joints completed and ready for fire-stopping.
- Finished fire-stopping, before being concealed.

2 PRODUCTS**2.1 MATERIALS****Toxicity**

Toxic materials: Free of asbestos and lead and free of, nor requiring the use of, toxic solvents.

Toxicity in fire: Non-toxic.

Product certification

Conformance: Address the following:

- Statutory and performance requirements.
- Adequacy of application/installation.

Appointment: In the joint names of the contractor and the principal.

2.2 FIRE-STOPPING PRODUCTS**Fire-stop mortars**

Type: Re-enterable cement-based compound, mixed with water. Non-shrinking, moisture resistant. Insoluble in water, after setting.

Formulated compound of incombustible fibres

Material: Formulated compound mixed with mineral fibres, non-shrinking, moisture resistant. Insoluble in water after setting.

Fibre stuffing

Material: Mineral fibre stuffing insulation, dry and free of other contaminants.

Standard: AS/NZS 4859.1 Section 7.

Intumescent fire pillows

Material: Self-contained self-locking intumescent fire pillows for medium to large openings, where no additional support is required.

Fire-stop composite sheets

Material: Composite system comprised of a number of components, including a fire-resistive elastomeric sheet, bonded on either side with layers of sheet steel and/or steel-wire mesh covered with aluminium foil.

Fire-stop sealants

Material: Elastomeric sealant. Soft, permanently flexible, non-sag, non-shrinking, moisture resistant. Capable of providing a smoke-tight, gas-tight and waterproof seal when properly installed. Insoluble in water after setting.

Fire-stop foams

Material: Single component compound of reactive foam ingredients, non-shrinking, moisture resistant. Insoluble in water after setting.

Fire-stop putty

Material: Single component, mouldable, permanently flexible, non-shrinking, moisture

resistant, intumescent compound which conforms to the following:

- Expands on exposure to surface heat gain to form a high-volume thermally insulating char that closes gaps and voids.
- Resists the turbulence of a severe fire.
- Can be placed by hand to form an immediate fire seal.
- Insoluble in water after setting.

2.3 COMPONENTS

Fire-stop collars

Material: Mechanical device with incombustible intumescent fillers covered with sheet steel jacket. Airtight and watertight.

Fire-stop pillows

Material: Formed self-contained compressible flexible mineral fibre in cloth bags, rated to permit frequent changes in service.

Multi-service cable transit box

Material: Mechanical device consisting of a sheet steel sleeve containing heat reactive intumescent polymer, including intumescent seals and smoke rated brushes. The insulation rating can be increased by the incorporation of other fire-stopping products.

Control joint insert – elastomeric foam strip

Material: Elastomeric foam strip laminated with a graphite based intumescent compound on both sides, which is a water resistant seal that expands when exposed to heat.

Accessories

Permanent dam material: Non-combustible.

Installation accessories: Provide clips, collars, fasteners, temporary stops and dams, and other devices required to position, support and contain fire-stopping and accessories.

3 EXECUTION

3.1 PREPARATION

Substrates

Cleaning: Clean substrates of dirt, dust, grease, oil, loose material, and other matter which may affect the bond of fire-stopping products.

Primer: Dry substrates for primers and sealants.

Restraint: Install backing and/or damming materials to arrest liquid material leakage. Remove temporary dams after material has cured.

3.2 INSTALLATION

General

Extent: Fire-stop and smoke-stop interruptions to fire-resistance rated assemblies, materials and components, including penetrations through fire-resisting elements, breaks within fire-resisting elements (e.g. expansion joints), and junctions between fire-resisting elements.

Sequence: Fire-stop after services have been installed through penetrations and properly spaced and supported, after sleeving where appropriate, and after removal of temporary lines, but before

restricting access to the penetrations, including before dry lining.

Ventilation: Supply ventilation for non-aqueous solvent-cured materials.

Density: Apply fire-stopping material to a uniform density.

Fire-stopping exposed to view: Finish surfaces to a uniform and level condition.

Cable separation: Maintain cable separation.

Protection: Protect adjacent surfaces from damage arising through installation of fire-stopping. Protect completed fire-stopping from damage arising from other work.

Loose or damaged fire-stopping material: Remove and replace.

Penetrations by pipes and ducts: Allow for thermal movement of the pipes and ducts.

Preventing displacement: Reinforce or support fire-stopping materials with non-combustible materials when:

- The unsupported span of the fire-stopping materials is greater than 100 mm.
- The fire-stopping materials are non-rigid (unless shown to be satisfactory by test).

Penetrations: Provide structural support around the opening.

Labelling

Requirement: To the recommendations of AS 4072.1 Appendix B.

Additional marking: Include the following text in addition to the above: CAUTION – FIRE BARRIER MUST REMAIN SEALED.

Location: Attach labels to cables, conduits, pipes and ducts on both sides of and close to, the control joint or penetration. On large items, provide multiple labels.

3.3 FIRE-STOPPING SYSTEMS

Control joint insert – elastomeric foam strip

Material: Elastomeric foam strip laminated with a graphite based intumescent compound on both sides, which is a water resistant seal that expands when exposed to heat.

Fire-stop mortars

Ambient conditions: Do not install below 5°C.

Fibre stuffing

Installation: Compress to 40% of its uncompressed volume.

Fire-stop sealants

Ambient conditions: Do not store above 32°C. Do not install outside the temperature range recommended by the sealant manufacturer. Do not install when humidity exceeds that recommended by the sealant manufacturer for safe installation.

Fire-stop foams

Ambient conditions: Do not store above 32°C. Do not install below 15°C or above 32°C. Do not apply when temperature of substrate and air is below 15°C. Maintain this minimum temperature before, during and for 3 days after installation.

Installation: Test substrates for adhesion and prime if necessary. Place in layers for homogenous density, filling cavities and spaces. Place sealant to completely seal junctions with adjacent dissimilar materials.

Fire-stop putty

Ambient conditions: Do not install below 5°C. Do not allow the material to freeze.

Fire-stop pillows

Material: Formed self-contained compressible flexible mineral fibre in cloth bags, rated to permit frequent changes in service.

3.4 COMPLETION

Cleaning

Requirement: Clean the finished surfaces and remove spilled and excess fire-stopping materials without damaging other work.

0183 METALS AND PREFINISHES

1 PRODUCTS

1.1 METALS

Coated steel

Electrogalvanized (zinc) coating on ferrous hollow and open sections: To AS 4750.

Metallic-coated: Steel coated with zinc or aluminium-zinc alloy as follows:

- Ferrous open sections by an in-line process: To AS/NZS 4791.
- Ferrous hollow sections by a continuous or specialised process: To AS/NZS 4792.
- Metallic-coated steel sheet: To AS 1397. Metal thicknesses specified are base metal thicknesses.

Steel wire: To AS/NZS 4534.

Stainless steel

Bars: To ASTM A276/A276M.

Plate, sheet and strip: To ASTM A240/A240M.

Welded pipe (plumbing applications): To AS 1769.

Welded pipe (round, square, rectangular): To ASTM A554.

2 EXECUTION

2.1 GENERAL

Metal separation

Incompatible sheet metals: Prevent direct contact between incompatible metals. Provide separation by one of the following:

- Apply an anti-corrosion low moisture transmission coating such as alkyd zinc phosphate primer or aluminium pigmented bituminous paint to contact surfaces.
- Insert a concealed, non-metallic separation layer such as polyethylene film, adhesive tape, neoprene, nylon or bituminous felt.

Incompatible fixings: Do not use.

Incompatible service pipes: Install lagging or grommets. Do not use absorbent, fibrous or paper products.

Brazing

General: Make sure brazed joints have sufficient lap to provide a mechanically sound joint.

Butt joints: Do not use butt jointing for joints subject to load. If butt joints are used, do not rely on the filler metal fillet only.

Filler metal: To AS/NZS 1167.1.

Finishing

Visible joints: Finish visible joints made by welding, brazing or soldering using methods appropriate to the class of work (including grinding or buffing) before further treatment such as painting, galvanizing or electroplating. Make sure self-finished metals are without surface colour variations after jointing.

Preparation

General: Before applying decorative or protective prefinishes to metal components, complete welding, cutting, drilling and other fabrication, and prepare the surface using a suitable method.

Standard: To AS 1627 series.

Priming steel surfaces: If site painting is documented to otherwise uncoated mild steel or similar surfaces, prime as follows:

- After fabrication and before delivery to the works.
- After installation, repair damaged priming and complete the coverage to unprimed surfaces.

Welding

Aluminium: To AS 1665.

Stainless steel: To AS/NZS 1554.6.

Steel: To AS/NZS 1554.1.

2.2 STAINLESS STEEL FINISHES**General**

Requirement: Provide a surface finish to match the approved sample.

Pre-assembly

Bead blasted finish: Provide a uniform non-directional low reflective surface by bead blasting. Do not use sand, iron or carbon steel shot. Blast both sides of austenitic stainless steel to equalise induced stress.

Post-assembly pre-treatment

Heat discolouration: Remove by pickling.

Welds: Grind excess material, brush, and polish to match the pre-assembly finish.

Post-assembly finish

Electropolish finish for external installations: Provide an electro-chemical process to stainless steel type 316.

Brushed electropolish finish: Conform to the following:

- Pre-assembly finish: No. 4 brushed finish.
- Post-assembly finish: Provide an electro-chemical processed finish to achieve a No. 7 to No. 8 brushed finish.

Mirror electropolish finish:

- Pre-assembly finish: Mill finish 2B or mirror polished finish.
- Post-assembly finish: Provide an electro-chemical processed finish to achieve a No. 8 mirror like finish.

Completion

Cleaning: Clean and rinse to an acid free condition and allow to dry. Do not use carbon steel abrasives or materials containing chloride.

Protection: Secure packaging or strippable plastic sheet.

2.3 ELECTROPLATING**Electroplated coatings**

Chromium on metals: To AS 1192.

- Service condition number: At least 2.

Nickel on metals: To AS 1192.

- Service condition number: At least 2.

Zinc on iron or steel: To AS 1789.

2.4 ANODISING**General**

Standard: To AS 1231.

Thickness grade: To AS 1231 Table H1.

Sample

General: Provide a finish to match the sample in terms of colour and finishing options.

2.5 PREPAINTING**Air-drying enamel**

Application: Spray or brush.

Finish: Full gloss.

General use:

- Primer: Two-pack epoxy primer to AS/NZS 3750.13.

- Top coats: 2 coats to AS 3730.6.

Oil resistant use:

- Primer: Two-pack epoxy primer to AS/NZS 3750.13.

- Top coats: 2 coats to AS/NZS 3750.22.

Equipment paint system

Description: Brush or spray application using paint as follows:

- Full gloss enamel finish coats, oil and petrol resistant: To AS/NZS 3750.22, two coats.

- Prime coat to metal surfaces generally: To AS/NZS 3750.19 or AS/NZS 3750.20.

- Prime coat to zinc-coated steel: To AS 3730.15 or AS/NZS 3750.16.

- Undercoat: To AS/NZS 3750.21.

Prepainted metal products

Standard: To AS/NZS 2728.

Product type as noted in AS/NZS 2728: Not lower than the type appropriate to the atmospheric corrosivity category.

Stoving enamel

Application: Spray or dip.

Two-pack liquid coating

Application: Spray.

Finish: Full gloss.

Primer: Two pack epoxy primer to AS/NZS 3750.13.

Topcoat:

- Internal use: Proprietary polyurethane or epoxy acrylic system.

- External use: Proprietary polyurethane system.

2.6 COMPLETION**Damage**

Damaged prefinishes: Remove and replace items, including damage caused by unauthorised site cutting or drilling.

Repair

Metallic-coated sheet: If repair is required to metallic-coated sheet or electrogalvanizing on inline galvanized steel products, clean the affected area and apply a two-pack organic primer to AS/NZS 3750.9.

0184 TERMITE MANAGEMENT**1 GENERAL****1.1 STANDARD****General**

Termite management systems: To AS 3660.1.

1.2 SUBMISSIONS**Certification**

Certificate of installation: Submit certificate to AS 3660.1 Appendix A3.

Tests

Site tests: Submit test results for chemical termite management systems.

Warranties

Management system warranty: Submit the manufacturer's warranty.

1.3 INSPECTION**Notice**

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

- The completed termite management system.

2 PRODUCTS**2.1 PHYSICAL SYSTEMS****Concrete slab**

Standard: To AS 3660.1 Section 4.

Termite caps and sheeting

Standard: To AS 3660.1 Section 5.

Granular materials

Standard: To AS 3660.1 Section 6.

2.2 CHEMICAL SYSTEMS**General**

Standard: To AS 3660.1 Section 7.

System assessment: To AS 3660.3 Section 5.

2.3 CHEMICALLY IMPREGNATED PHYSICAL SYSTEMS**Impregnated polymer sheeting**

Material: Flexible composite blanket, geotextile, fibre sheeting or membrane incorporating a termiticide.

Testing: To AS 3660.3 clause 5.5.

Impregnated accessories

Material/product: Extrusions, collars, foams and sealants incorporating a termiticide.

Testing: To AS 3660.3 clause 5.8.

3 EXECUTION**3.1 PHYSICAL SYSTEMS****Concrete slab**

Standard: To AS 3660.1 Section 4.

Termite caps and sheeting

Standard: To AS 3660.1 Section 5.

Granular materials

Standard: To AS 3660.1 Section 6.

3.2 CHEMICAL SYSTEMS**General**

Standard: To AS 3660.1 Section 7.

Soil treatments

Restrictions on areas of application: To AS 3660.1 clause 7.3.

Application areas: Hand spray chemical treatment to the entire dwelling perimeter and subfloor to AS 3660.1 clause 7.7 including the following:

- Footings.
- Carport subfloors.
- Verandah subfloors.

Soil and environmental condition: Do not treat soil that is water saturated or when it is raining.

Application method

Application: To AS 3660.1 clause 7.5.

Application timing: To AS 3660.1 clause 7.6.

Protection: Protect treated area as follows:

- If a treated area is not scheduled to be covered with a vapour barrier on the same day, protect treated area with a waterproof covering such as polyethylene sheeting. Provide protection until the slab is installed.

- Prevent soil disturbance and keep off treated area until the soil is completely dry.

Reapplication: Reapply soil treatment to areas disturbed by subsequent excavation, grading, landscaping and other construction activities following the application.

Chemically impregnated physical systems

Installation: In conformance with the manufacturer's recommendations.

3.3 COMPLETION**Termite management system notice**

Signage: Permanently fix a durable notice in a prominent location to BCA B1.4(i)(ii) or BCA 3.1.4.4.

Waste materials

Progressive cleaning: Make sure no waste materials which could attract termites remain on the site.

Warranties

Type: Renewable.

Completion inspection

Report: At the end of the defects liability period, inspect the termite management systems and prepare a report on their efficacy and status.

0185 TIMBER PRODUCTS, FINISHES AND TREATMENT

1 GENERAL**1.1 RESPONSIBILITIES****Performance****Requirements:**

- Appropriate for durability and fire-resistance.
- Appropriate certification for the finishing applications.

1.2 STANDARDS**General****Sawn and milled products:**

- Hardwood: To AS 2796.1.
- Softwood: To AS 4785.1.

Reconstituted wood based panels:

- Particleboard: To AS/NZS 1859.1.
- Dry process fibreboard: To AS/NZS 1859.2.
- Decorative overlaid wood panels: To AS/NZS 1859.3.
- Wet process fibreboard: To AS/NZS 1859.4.

Plywood:

- Structural: To AS/NZS 2269.0.
- Interior: To AS/NZS 2270.
- Exterior: To AS/NZS 2271.
- Marine: To AS/NZS 2272.

Glued laminated timber: To AS/NZS 1328.1.

Laminated veneer lumber: To AS/NZS 4357.0.

1.3 INTERPRETATION**Definitions**

General: For the purposes of this worksection the definitions given in AS/NZS 4491 and the following apply:

- Dry process fibreboard (MDF): Panel material with a nominal thickness of 1.5 mm or greater, manufactured from lignocellulosic fibres (derived from wood or other materials) with application of heat and/or pressure, the bond of which is derived from a synthetic adhesive added to the fibres and the panels are manufactured with a forming moisture content of less than 20%.
- Particleboard: Panel material manufactured under pressure and heat from particles of wood (wood flakes, chips, shavings, sawdust and similar) and/or lignocellulosic material in particle form (flax shives, hemp hurds, bagasse fragments, rice hulls, wheat straw and similar) with the addition of an adhesive.
- Wet process fibreboard: Panel material with a nominated thickness of 1.5 mm or greater, manufactured from lignocellulosic fibres (derived from wood or other materials) with application of heat and/or pressure, the bond of which is derived from the felting of the fibres and the panels are

manufactured with a forming moisture content greater than 20%.

1.4 SUBMISSIONS**Products and materials**

Chain of custody of forest products: Submit the following as evidence of conformity to

CERTIFICATION, Timber source certification:

- Third party certification of supplier's chain of custody management system.
- Formal claim of chain of custody by supplier.

Pressure preservative treatment: For timber required to be pressure treated, submit a certificate or other evidence showing that the timber has been treated.

Treated timber: Submit safety data sheets (SDS) for preservative treated timber.

2 PRODUCTS**2.1 GENERAL****Storage and handling**

General: Deliver timber products to site in unbroken wrapping or containers and store so that the moisture content is not adversely affected.

2.2 CERTIFICATION**Timber source certification**

Requirement: Use timber products originating from sustainably managed forests.

Engineered timber product certification and identification**Certification:**

- Glued laminated timber: To the Glued Laminated Timber Association of Australia (GLTAA) Product Certification System.
- Plantation timber: To the EWPAA Plantation Timber Certification Scheme.
- Plywood: To the EWPAA Plywood and LVL Product Certification Scheme.
- Wet process fibreboard, dry process fibreboard, particleboard: To the EWPAA Particleboard and MDF Product Certification Scheme.

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

Inspection: If neither branding nor certification is adopted, have an independent inspecting authority inspect the timber.

2.3 FIRE-RESISTANCE**General**

Timber structures: To AS 1720.4.

Bushfire prone areas

Standard: To AS 3959 Appendix F.

2.4 DURABILITY**General**

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

Natural durability class: To AS 5604.

Naturally termite-resistant timbers: To AS 3660.1 Appendix C.

Timber quality: Free of core wood (material within 50 mm of the tree's centre) and free of splits, checks, loose knots and cavities. Free of sapwood (lighter coloured wood found on the outer layer of the tree).

Lyctid susceptible timbers: Do not provide untreated timbers containing lyctid susceptible sapwood.

Untreated sapwood: If used, place to the outside of joints or in locations exposed to higher levels of ventilation.

Preservative treatment

Sawn and round timbers: To AS 1604.1.

Reconstituted wood-based products: To AS/NZS 1604.2.

Plywood: To AS/NZS 1604.3.

Laminated veneer lumber (LVL): To AS/NZS 1604.4.

Glued laminated timber products: To AS/NZS 1604.5.

Moisture content

Test: Methods as follows:

- Timber: To AS/NZS 1080.1.
- Plywood: To AS/NZS 2098.1.
- Reconstructed wood-based products: AS/NZS 4266.1.

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

Termite treatment

Requirement: To AS 3660.1 Appendix D.

Timber posts and stumps installed in the ground: To AS 3660.1 clause 3.3.4(b).

2.5 FINISHING

Production finish

Hardwood: To AS 2796.1 Table B1.

Softwood: To AS 4785.1 Table B1.

Surface coating

Painting and staining: To 0671 *Painting*.

Application: To the manufacturer's specification.

2.6 RECYCLED TIMBER

General

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

Classification: Visually graded.

3 EXECUTION

3.1 JOINTS

General

Joints and connections: Use hot-dipped galvanized or stainless steel fasteners, composite bolts, nails or nailed metal connectors.

Timber-to-timber interfaces: Provide a seal coating of preservative treatment and include inside bolt holes and the end grain of the timber.

Water retention: Avoid details that may trap water including housed, checked or birdsmouth joints.

Fasteners: To prevent chemical treatments reacting with fasteners, install to manufacturer's recommendations.

3.2 SHRINKAGE RESTRAINT

General

Requirement: Use seasoned timber, if possible, to avoid shrinkage restraint, particularly where timber elements are integrated with steel and/or concrete.

Moisture content: Use finishes and end-grain sealants to minimise moisture content changes.

Fasteners: Align fasteners along member axis and use single fasteners at joints.

Connections: Use connections that allow for movement without adversely affecting the performance of the connection.

Unseasoned timber: Provide as follows:

- Drill holes 10% oversize.
- Use species with similar shrinkage values to reduce movement and shrinkage.
- For framing provide adequate clearance at the top of masonry veneer and face fixed members to reduce vertical movement.

3.3 FINISHING

Ploughing

General: Back plough boards liable to warp (e.g. if exposed externally on one face). Make the width, depth and distribution of ploughs appropriate to the dimensions of the board and degree of exposure.

Painting

Edges: Chamfer edges of work to receive paint or similar coatings.

Priming: For woodwork to be painted, prime hidden surfaces before assembly.

Working with treated timber

Safety: Handle preservative treated timber to the manufacturer's recommendations and to NOHSC 2003 and the recommendations of NOHSC 3007.

0201 DEMOLITION

1 GENERAL

1.1 PERMITS, FEES AND CONTRIBUTIONS

Applications and approvals

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

Demolition Permit: Submit a completed Demolition Permit Application (BA5) to the Permit Authority in conformance with the *Building Act 2011* (WA).

1.2 STANDARD

Demolition

Standard: To AS 2601.

1.3 EXISTING SITE CONDITION

Services

Redundant/disused septic tanks: Locate and allow for decommissioning and removal to **DEMOLITION - BUILDING SERVICES, Existing septic tanks**.

Existing services: Disconnect, cap off and peg. If removal is required, remove to the junction.

Removal of existing vegetation

Approval: Do not remove any existing plants without approval.

1.4 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.

1.5 SUBMISSIONS

Authority approvals

Evidence of compliance: Before starting demolition, submit evidence of the following:

- Requirements of authorities relating to the work under the contract have been obtained.
- A permit to demolish has been obtained from the appropriate authority.
- A scaffold permit has been obtained from the appropriate authority (if scaffolding is proposed to be used).
- Certification that each person having access to the construction site has completed site-specific WHS induction training.
- Precautions necessary for protection of persons and property have been taken and suitable protective and safety devices have been provided to the approval of the relevant authority.
- Treatment for rodent infestation has been carried out and a certificate has been obtained from the appropriate authority.
- Fees and other costs have been paid.

Execution details

Requirement: Submit the following, as documented:

- Hazardous Substances Management Plan.
- Investigation and work plan.

Off-site disposal locations: Submit details of the proposed locations for the disposal of material required to be removed from the site, and evidence of conformance with the requirements of relevant authorities.

Recycling: Submit details of the proposed recycling facility.

- Certification: Submit evidence of delivery of recycled materials.
- Concrete crushing: If proposed on site, submit details of plant and environmental controls.

Stockpile locations: Submit details of the proposed locations of on-site stockpiles for demolished materials for recycling in the works. Coordinate with the locations for storage of other waste streams, and prevent mixing or pollution.

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.

Records

Dilapidation record:

- Before demolition: Submit to each owner of each adjacent property, a copy of the part of the record

relating to that property and obtain their written agreement to the contents.

- Rectification work: Submit written acceptance of rectification works from the owner of each adjoining property affected.

Tests

Requirement: Submit test results of compliance tests for building service components to be re-used.

1.6 INSPECTION

Notice

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

- Adjacent structures before starting and at completion of demolition.
- Services before disconnection or diversion.
- Trees documented to be retained, before starting demolition.
- Contents of building before starting demolition.
- Structure after stripping and removal of roof coverings and external cladding.
- Underground structures after demolition above them.
- Excavations remaining after removal of underground work.
- Site after removal of demolished materials.
- Services after reconnection or diversion.

2 EXECUTION

2.1 PROCEDURAL

Work, health and safety

Requirement: To the Occupational Safety and Health Act 1984 (WA) and the Occupational Safety and Health Regulations 1996 (WA).

Unexpected finds

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

2.2 HAZARDOUS SUBSTANCES

Identified hazardous substances

Register: Prepared by the principal for hazardous substances identified as present on site.

Availability: Contact the principal.

Asbestos in the workplace: To NOHSC 2018.

Audit

Requirement: Prepare a Hazardous Substances Management Plan to AS 2601 clause 1.6.1. Include the following:

- Asbestos or material containing asbestos.
- Flammable or explosive liquids or gases.
- Toxic, infective or contaminated materials.
- Radiation or radioactive materials.
- Noxious or explosive chemicals.

- Tanks or other containers which have been used for storage of explosive, toxic, infective or contaminated substances.

Removal of hazardous substances

Standard: To AS 2601 clause 1.6.2.

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

2.3 INVESTIGATION AND WORK PLAN

General

Requirement: Before demolition or stripping work, prepare the work plan to AS 2601 Section 2. Include the check list items appropriate to the project from AS 2601 Appendix A, and the following:

- Method of protection and support for adjacent property.
- Locations and details of service deviations and terminations.
- Sequence of work.
- If the demolition program results in components temporarily cantilevered, provide a certificate from a professional engineer.
- Proposals for the safe use of mobile plant on suspended structural members including provisions for the protection of lower floors in the event of structural failure.
- If implosion methods are proposed, provide a separate report of methods and safeguards.
- Wheel loads of tipping or loading vehicles.

2.4 PREDEMOLITION

Engineering survey

Structural assessment: If required, carry out a survey by a professional engineer on the structural elements being removed and its effect on adjacent structures before starting demolition.

Scheduling and planning

Site access: Plan demolition activities so that interferences with roads, streets, walks, walkways and adjacent facilities are minimised.

Pest management

Survey of infestation: 6 weeks before starting demolition, survey the site and surrounding areas to identify for signs and extent of infestation.

Infestations: If identified, appropriately treat before starting demolition.

Baiting: Minimum 5 days before starting demolition, bait all rooms/sections in the buildings, including concealed spaces such as the roof space and subfloors. If required, continue baiting until all pests have been eradicated.

Redundant drains and sewers: Cap off to isolate redundant sewers and grub out if required.

Waste storage: Store waste in pest resistant, closable containers in suitable locations and remove regularly.

Fencing removal

Adjacent property owner: Before removing boundary fencing, notify adjoining property owners of commencement and anticipated completion date. Obtain consent before undertaking work.

Notice: Issue a Notice and Request for Consent Form (BA20A) to adjacent property owners and obtain consent for boundary fencing removal in conformance with the *Building Act 2011 (WA)*.

Removal of fences: Remove all wing fences and gates and any fence erected on the lot that will not form, in part or whole, a boundary fence with an existing lot.

Waste storage: Store waste in pest resistant, closable containers in suitable locations and remove regularly.

2.5 SUPPORT

Temporary support

General: If temporary support is required, certification for its design and installation is required from a professional engineer engaged by the contractor.

Existing buildings: Until permanent support is provided, provide temporary support for sections of existing buildings which are to be altered and which normally rely for support on work to be demolished.

Ground support: Support excavations for demolition of underground structures.

Adjacent structures: Provide supports to adjacent structures where necessary, sufficient to prevent damage resulting from the works.

- Lateral supports: Provide lateral support equal to that given by the structure to be demolished.
- Vertical supports: Provide vertical support equal to that given by the structure to be demolished.

Permanent supports

General: If permanent supports for adjacent structures are necessary and are not documented, give notice and obtain instructions.

2.6 PROTECTION

Encroachment

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

Weather protection

General: If walls or roofs are opened for alterations and additions, or the surfaces of adjoining buildings are exposed, provide temporary covers to prevent water penetration. Provide covers to protect existing plant equipment and materials intended for re-use.

Dust protection

General: Provide dustproof screens, bulkheads and covers to protect existing finishes and the immediate environment from dust and debris.

Security

General: If walls or roofs are opened for alterations or additions, provide security against unauthorised entry to the building.

Temporary screens

General: Fill the whole of designated temporary openings or other spaces using dustproof and weatherproof temporary screens, fixed securely to the existing structure, and installed to shed water to avoid damage to retained existing elements or adjacent structures and contents.

Type: Timber framed screens sheeted with 12 mm plywood and painted. Seal the junctions between the screens and the openings.

Temporary access

General: If required, provide a substantial temporary doorset fitted with a rim deadlock, and remove on completion of demolition.

Exposed surfaces

General: Where necessary, protect and weatherproof the surfaces of adjacent structures exposed by demolition.

Existing services

Location: Before starting demolition, locate and mark existing underground services in the areas which will be affected by the demolition operations.

Utility services: Contact DIAL BEFORE YOU DIG to identify location of underground utility services pipes and cables.

Excavation: Do not excavate by machine within 1 m of existing underground services.

Recovered items

General: If items are documented for recovery and re-use, minimise damage during removal and recover all associated components required for their re-use.

2.7 DEMOLITION – BUILDING WORKS

Encroachment

General: If encroachments from adjacent structures are encountered and are not documented, give notice and obtain instructions.

Concrete slabs

General: Using a diamond saw, neatly cut back or trim to new alignment with a clean true face existing concrete slabs to be partially demolished or penetrated. Do not overcut at corners.

Material below grade

Remaining voids: Stabilise and provide barriers.

Explosives

General: Do not use explosives.

2.8 DEMOLITION - BUILDING SERVICES

General

Requirement: Decommission, isolate, demolish and remove from the site all equipment and associated components that become redundant as a result of the demolition.

Breaking down: Disassemble or cut up equipment where necessary to allow removal.

Demolition of refrigeration systems

Standard: To AS/NZS 5149.4.

Components for re-use

General: Before returning to service, clean components and test for conformance to Australian Standards, as required.

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.

2.9 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.

0221 SITE PREPARATION

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide site preparation, as documented.

1.2 SUBMISSIONS

Certification

Vermis: Submit pest exterminator's certification as evidence that the completed site works are free from vermin.

Execution details

Requirement: Submit details of methods and equipment proposed for the following:

- Clearing and grubbing.
- Tree removal and transplanting.
- Protecting ground within and adjacent to tree driplines from compaction by proposed earthworks machinery.

1.3 INSPECTION

Notice

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

- Enclosures around trees requiring protection.
- Trees requiring removal.
- Trees for transplanting to determine final orientation.

2 EXECUTION

2.1 COMMUNITY LIAISON

Notification

General: Notify residents about construction activities which will affect access to, or disrupt the use of, their properties.

Notice: Minimum 5 working days, unless the work is of an urgent nature with safety implications.

Notification content:

- Description of the work.
- The reason for the work.
- The expected duration.
- Changes to traffic arrangements and property access.
- The 24-hour contact number of the representative responsible.

2.2 EXISTING SERVICES

General

Requirement: Before starting earthworks, locate and mark existing underground services in the areas affected by the earthworks operations including clearing, excavating and trenching.

Utility services: Contact DIAL BEFORE YOU DIG to identify location of underground utility services pipes and cables.

Excavation: Do not machine excavate within 1000 mm of existing services.

Existing service lines: If required, divert services detected during excavation, clear of the building, and reconnect to the utility service provider's requirements.

2.3 SITE CLEARING

Extent

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

Contractor's site areas: If not included within the areas documented above, clear only to the extent necessary for the performance of the works.

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.

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

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

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

Redundant/decommissioned works: Remove works no longer required, including slabs, foundations, paving, drain, and access chambers and covers within the works zone.

Batters

Temporary protection: If the change in level between crest and toe is more than 1500 mm, protect from erosion with geofabric, hessian and tar or heavy duty black polythene sheet cover. Securely fix down at crest and toe.

Surplus material

Topsoil and excavated material: Remove unwanted stripped soil and other material from the site as the work proceeds, including any material dropped on footpaths or roadways.

2.4 STORMWATER AND SEDIMENT CONTROL

Erosion control

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

Dewatering-Water quality

Requirement: Keep earthworks free of water and reduce impacts on groundwater and surface water and as follows:

- Provide and maintain slopes, crowns and drains for excavations and embankments, to make sure there is free drainage.

- Construct, including placing of fill, masonry, concrete and services, on ground where free water has been removed.

- Prevent water flow over freshly laid work.

Washout: Prevent washout from entering waterways or stormwater drains.

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

Water disposal: Dispose off-site.

Waterways and drains

Waterways: If required, temporarily divert ditches, field drains and other waterways affected by excavation and reinstate on completion.

Stormwater drains: Divert drains detected during excavation, clear of the building, and reconnect as documented or obtain approval.

2.5 EXISTING WORKS TO REMAIN

Marking

Requirement: Identify existing works to remain with 1000 mm high, 50 x 50 mm timber stakes connected by yellow plastic tape to prevent accidental damage.

2.6 TREE REMOVAL

Designation

Marking: Identify trees and shrubs for removal by tagging 1000 mm above ground level.

Tags: Select from the following:

- 100 x 50 mm zincanneal tags, painted yellow and lettered to conform to the tree number on the drawings. Secure tags to trees using loose galvanized steel wire bands.
- Surveyor's ribbon.
- Road marking paint.

2.7 TREE PROTECTION

General

Warning signs: In a prominent position at each entrance to the site, display warnings that trees and plantings require protection during the contract. Remove on completion.

Lettering: Road sign type sans serif letters, 100 mm high to AS 4970 Appendix C.

Protection measures: Provide before starting the earthworks.

Trees to remain

Extent: Trees not marked for removal.

Tree protection

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

Tree protective measures: To AS 4970 Section 4.

Monitoring and certification: To AS 4970 Section 5.

Work near trees

Materials placement: Conform to the following:

- Keep the area within the dripline of trees free of sheds and paths, construction material and debris.
- Do not place bulk materials and harmful materials within the dripline of trees.

- Do not place spoil from excavations against tree trunks.
- Prevent wind-blown materials such as cement from harming trees and plants.

Damage: Prevent damage to tree bark. Do not attach stays, guys and similar material to trees.

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

Excavation: If excavation is required near trees, give notice. Minimise period and extent of excavation within the dripline.

Hand methods: Use hand methods to locate, expose and cleanly remove the roots on the line of excavation. If excavation is required within the dripline, use hand methods so that root systems remain intact and undamaged.

Roots: Do not cut tree roots exceeding 50 mm diameter. If required to cut tree roots, use cutting methods that do not excessively disturb the remaining root system. Immediately after cutting, water the tree and apply a liquid rooting hormone to stimulate the growth of new roots.

Backfilling: Backfill excavations around tree roots. Place the backfill in layers of 300 mm maximum depth and compact to a dry density similar to that of the original or surrounding soil. Do not backfill around tree trunks to a height greater than 200 mm above the original ground surface. Immediately after backfilling, thoroughly water the root zone surrounding the tree.

Backfill material:

- Mix proportions (topsoil:well-rotted composts) by volume: 3:1.
- Neutral pH value.
- Free from weed growth and harmful materials.

Compacted ground: Do not compact the ground or use skid-steer vehicles under the tree dripline. If compaction occurs, give notice.

Compaction protection: Protect ground adjacent to the tree dripline.

Watering: Water trees as necessary, including where roots are exposed at ambient temperature more than 35°C.

Mulching: Spread 100 mm thick organic mulch to the whole of the area within the dripline of all existing trees to remain.

2.8 TEMPORARY LANDSCAPE FENCING

Fence dimensions

Height: 1200 mm.

Maximum post spacing: 5000 mm.

Component sizes

Corner and gate posts: Hardwood or preservative-treated softwood, 250 mm diameter.

Intermediate posts: Star picket.

Gate: Provide a suitable hinged gate with a gate latch.

Wire: Top, intermediate and bottom rows of 3.2 mm plain galvanized steel wire. Thread the top wire

through pieces of plastic tube and through corner posts.

2.9 COMPLETION

Site restoration

Requirement: Reinstate undeveloped ground surfaces to the condition existing at the commencement of the contract.

Clean up

Progressive cleaning: Keep the works clean and tidy, and regularly remove from the site, waste and surplus material arising from execution of the work.

Waste disposal: As documented and as follows:

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

Vermin management

Requirement: Employ a suitably qualified pest exterminator to remove vermin found during site preparation.

0222 EARTHWORK**1 GENERAL****1.1 RESPONSIBILITIES****General**

Requirement: Provide earthworks to the dimensions and tolerances, as documented.

1.2 STANDARDS**General**

Earthworks: Conform to the recommendations of those parts of AS 3798 that are referenced in this worksection.

Description and classification of soils: To AS 1726.

1.3 INTERPRETATION**Abbreviations**

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

- GITA: Geotechnical inspection and testing authority.
- GTA: Geotechnical testing authority.

Definitions

General: For the purposes of this worksection the definitions given in AS 3798 and the following apply:

- Bad ground: Ground unsuitable for the works, including fill liable to subsidence, ground containing cavities, faults or fissures, ground contaminated by harmful substances and ground that is, or becomes, soft, wet or unstable.
- Rock: Monolithic material with volume greater than 0.3 m³ that cannot be removed until broken up by rippers or percussion tools.
- Site topsoil: Natural soil, excavated from the site, that contains organic matter, supports plant life, conforms generally to the fine-to-medium texture classification to AS 4419 and is free from the following:
 - . Stones more than 25 mm diameter.
 - . Clay lumps more than 50 mm diameter.
 - . Weeds and tree roots.
 - . Sticks and rubbish.
 - . Material toxic to plants.
- Subgrade: The trimmed or prepared earth material on which the pavement, footing or slab is constructed. Generally taken to relate to the upper line of the earth material.
- Zone of influence: A foundation zone bounded by planes extending downward and outward from the bottom edge of a footing, slab or pavement and defining the extent of foundation material having influence on the stability or support of the footings, slab or pavement.

1.4 TOLERANCES**General**

Finish: Finish the surface to the required level, grade and shape within the following tolerances:

- Under building slabs and load bearing elements: + 0, - 25 mm.
- Pavement subgrades: + 0, - 40 mm.
- Batters: No steeper than the slope shown on the drawings. Make sure flatter slopes do not impact on boundaries or required clearances to buildings, pavements or landscaping.
- Other ground surfaces: ± 50 mm, provided the area remains free draining and matches adjacent construction where required. Provide smoothness as normally produced by a scraper blade.

1.5 SUBMISSIONS**Design documentation**

Calculations: Submit calculations by a professional engineer showing the stability and safety of proposed excavations and temporary supports, including supports required for adjacent structures.

Execution details

Report: Submit a time-based schedule detailing the methods and equipment proposed for the earthworks, including the following:

- Dewatering and groundwater control and disposal of surface water.
- Excavation methods, stages, clearances, batters and temporary supports.
- Stockpiles and borrow pits.
- Placing and compaction methods and stages.

Geotechnical site investigations: Provide a geotechnical report supporting the methods proposed for excavation.

Disposal location: Submit details of the locations and evidence of compliance with the appropriate authority requirements for the disposal of material requiring removal from site.

Temporary shoring: Submit a proposal for any temporary shoring required, including the progressive removal.

Proof rolling: Submit details of proposed method and equipment for proof rolling.

Records of measurement: Submit a certified copy of the agreed records of measurement.

Site records: Submit the following to AS 3798 clause 3.4 and Appendix B:

- Geotechnical site visit record.
- Earthworks summary report or daily geotechnical reports.

Products and materials

Imported fill: Submit certification or test results by a GTA registered laboratory of the imported fill as evidence of conformity with the contract, including the source.

Tests

Compaction: Submit certification and/or test results in conformance with the documented level of inspection and testing to AS 3798.

1.6 INSPECTION**Notice**

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

- Items to be measured as listed in **RECORDS OF MEASUREMENT**.
- Areas to be cleared and/or stripped of topsoil.
- Areas stripped of topsoil.
- Excavation completed to contract levels or founding material.
- Proof rolled subgrade before placing fill.
- Filling completed to contract levels.
- Stockpiled topsoil before spreading.

2 PRODUCTS

2.1 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: To AS 3798 clause 4.3.

Sulfur content: Do not provide material with sulfur content exceeding 0.5% within 500 mm of cement bound elements (for example concrete structures or masonry) unless the elements are protected by impermeable membranes or equivalent means.

Re-use of excavated material: Only re-use suitable material to AS 3798 clause 4.4.

Stockpiles

General: Segregate the earth and rock material and stockpile for re-use in backfilling operations.

Location: Do not stockpile excavated material against tree trunks, buildings, fences or obstruct the free flow of water along drainage channels.

2.2 BORROW OR IMPORTED FILL

General

Borrow or imported material: Use only when suitable excavated material from site is not available.

- Suitable material: To AS 3798 clause 4.4.

Borrow pits:

- Locate more than 3000 mm from any fence line, boundary, edge of excavation or embankment.
- Strip and stockpile topsoil.
- Provide erosion protection during winning operations of material and make sure drainage is maintained.
- On completion of winning operations grade abrupt changes of slope, respread topsoil, and apply and maintain hydroseeded grassing.

3 EXECUTION

3.1 SITE PREPARATION

Erosion and sedimentation control

Drainage, erosion and sedimentation control: To 0221 Site preparation.

3.2 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.
- Discrepancy in expected conditions.
- Rock.
- Springs, seepages.
- Topsoil more than 100 mm deep.

Inspection and testing

Inspection and testing: Conform to the following:

- Level 2 GTA required to AS 3798 clause 8.3.

Frequency of testing: To AS 3798 Table 8.1.

3.3 RECORDS OF MEASUREMENT

Excavation and backfilling

Agreed quantities: If a schedule of rates applies, provisional quantities are documented, or there are variations to the contract levels or dimensions of excavations, do not backfill or place permanent works in the excavation until the following have been agreed and recorded:

- Depths of excavations related to the datum.
- Final plan dimensions of excavations.
- Quantities of excavations in rock.

Method of measurement: By registered surveyor.

Rock

Level and class: If rock is measured for payment purposes, either as extra over excavation of material other than rock or for adjustment of provisional measurements, do not remove the rock until the commencing levels and the classes of rock have been determined.

3.4 REMOVAL OF TOPSOIL

General

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

Maximum depth: 200 mm.

Disposal: Remove topsoil unsuitable for re-use from the site to AS 3798 clause 6.1.8.

Topsoil stockpiles

General: Stockpile site topsoil intended for re-use.

Stockpile maximum height: 1.5 m.

Identification: Mark and label stockpiles of different soil types.

Vegetation: Do not burn off or remove plant growth that occurs during storage.

Protection: Conform to the following:

- Provide drainage and erosion protection.
- Do not allow traffic on stockpiles.
- If a stockpile is to remain for more than four weeks, sow with temporary grass.
- Protect the topsoil stockpiles from contamination by other excavated material, weeds and building debris.

3.5 EXCAVATION

Extent

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

Footings, pits, wells and shafts: Excavate to the required sizes and depths. Confirm that the foundation conditions meet the design bearing capacity.

Bearing surfaces

Requirement: Provide even plane bearing surfaces for loadbearing elements including footings. Step to accommodate level changes. If supporting masonry, make the steps appropriate to the courses.

Rock

General: Do not use explosives.

Existing footings

Requirement: If excavation is required within the zone of influence of an existing footing, provide supports to the footing sufficient to prevent damage arising from the works. Use methods including temporary shoring or underpinning.

Existing services

Location: Before starting earthworks, locate and mark existing underground services in the areas that will be affected by the earthworks operations including clearing, excavating and trenching.

Utility services: Contact DIAL BEFORE YOU DIG to identify location of underground utility services pipes and cables.

Excavation: Do not excavate by machine within 1000 mm of existing services.

Proof rolling

Extent: Proof roll excavations for pavements, filling and non-spanning slabs on ground to determine the presence of bad ground.

Proof rolling method and equipment: To AS 3798 clause 5.5.

Requirement: If excessive settlement, rebound or heaving is encountered, provide test pits or trenching to determine the extent of bad ground.

Disposal of excess excavated material

General: Remove excess excavated material from site not required or unsuitable for fill.

Standard: To AS 3798 clause 6.1.8.

3.6 REINSTATEMENT

Deterioration of bearing surfaces

Requirement: If the bearing surface deteriorates because of water or other cause, excavate to a sound surface before placing the loadbearing element.

Subgrades affected by moisture

Requirement: If, due to high moisture content the subgrade cannot support construction equipment or the overlying pavement cannot be compacted, perform one or more of the following:

- Allow the subgrade to dry until it provides support for equipment and allows compaction.

- Scarify the subgrade to a depth of 150 mm, work as necessary to accelerate drying, and recompact when the moisture content is satisfactory.
- Excavate the wet material and remove to spoil, and backfill excavated areas.

Over excavation

Requirement: If excavation exceeds the required depths, reinstate to the correct depths, levels and bearing capacity.

Zone of influence: Within the zone of influence of footings, beams, or other structural elements, use concrete of strength equal to the structural element, minimum 15 MPa. Make sure that remedial concrete does not create differential bearing conditions.

Below slabs or pavements: Rectify the over excavation as follows:

- Generally: Provide selected fill compacted to the documented density.
- Less than 100 mm: Do not backfill. Increase the thickness of the layer above.

Rock depressions and subsoil drains: Backfill rock depressions and over excavation of subsoil drains using coarse subsoil filter.

3.7 SUPPORTING EXCAVATIONS

Removal of supports

General: Remove temporary supports progressively as backfilling proceeds.

Voids

General: If voids occur outside sheeting or sheet piling, fill and compact voids to a dry density similar to that of the surrounding material.

3.8 ADJACENT STRUCTURES

Temporary supports

General: If required, provide supports to adjacent structures, sufficient to prevent damage arising from the works.

Lateral supports: Provide lateral support with shoring.

Vertical supports: If required, provide vertical support with piling or underpinning or both.

Permanent supports

General: If permanent supports for adjacent structures are required and are not documented, give notice and obtain instructions.

Encroachments

General: If encroachments from adjacent structures are encountered and are not documented give notice and obtain instructions.

3.9 ROCK BOLTING

General

Requirement: For temporary or permanent support of rock faces, provide proprietary high strength steel bars or tubes anchored into holes drilled in the rock and tensioned against plates bearing on the rock face. Schedule the installation to conform to systematic bolting or calculated relief, as documented.

Standard: To AS 4678.

Protection

General: Protect permanent rock bolts by grouting the drilled hole with cement grout after tensioning the rock bolt. Protect the bearing plate and the exposed portion of rock bolt and anchorage with a protective coating or by embedment in concrete.

3.10 GEOTEXTILE**General**

Material: UV stabilised, permeable, polymeric, woven or non-woven textile material used in contact with soil/rock material.

Identification and marking: To AS 3705.

Preparation: Trim the ground to a smooth surface free from cavities and projecting rocks.

Installation: Lay the fabric flat, not stretched tight, and secure with anchor pins. Overlap joints 300 mm minimum.

3.11 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.

Foundation preparation: To AS 3798 clause 6.1.7.

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

Ground treatment or improvement methods:

- Scarify method: Loosen exposed excavation by scarifying to a minimum of 150 mm, moisture-condition and compact to AS 3798 Section 5.
- Impact roller and impact compaction: Use an approved method.

Slope preparation: If fill is placed on a surface steeper than 4:1 (horizontal:vertical), bench the surface to form a key for the fill. As each layer of fill is placed, cut the existing ground surface progressively to form a series of horizontal steps more than 1 m in width and more than 100 mm deep. Recompact the excavated material as part of the filling. Shape to provide free drainage.

Under earth mounds

General: Cultivate the ground to a depth of 200 mm before mound formation.

Under slabs, paving and embankments

General: If required, loosen the ground to a depth of more than 200 mm and adjust the moisture content before compaction to a density consistent with subsequent filling.

Rock ledges

General: Remove overhanging rock ledges.

3.12 PLACING FILL**General**

Extent: Place fill to the documented dimensions, levels, grades, and cross sections so that the surface is always self-draining.

Layers: Place fill in near-horizontal layers of uniform thickness, deposited systematically across the fill area.

Edges: At junctions of fill and existing surfaces, do not feather the edges.

Mix: Place fill in a uniform mixture.

Previous fill: Before placing subsequent fill layers, make sure that previously accepted layers still conform to requirements, including moisture content.

Protection: Protect the works from damage due to compaction operations. If required, limit the size of compaction equipment or compact by hand.

Protective covering to membranes: Do not disturb or damage during backfilling.

Placing at structures

Fill adjacent structures and trenches: To AS 3798 clause 6.2.6.

Requirement: Place and compact fill in layers simultaneously on both sides of structures, culverts and pipelines to avoid differential loading. Commence compacting each layer at the structure and proceed away from structure.

Over the top of structures: Carefully place first layers of fill.

Retaining walls: Do not place fill against concrete retaining walls until the concrete has been in place for 28 days unless the structure is supported by struts.

Compaction

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

Maximum rock and lump size in layer after compaction: To AS 3798 clause 6.2.2.

Fill batter faces: Either compact separately, or overfill and cut back. Form roughened surfaces to the faces.

Minimum relative compaction: To AS 3798 Table 5.1.

3.13 PLACING TOPSOIL**Stockpiled topsoil**

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

Herbicide: Apply before placing topsoil.

Placing: Spread and grade evenly.

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

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

Disposal of excess topsoil

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

Off-site: Remove excess topsoil from the site and dispose of legally.

3.14 FILL MOISTURE CONTROL

General

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.

3.15 COMPACTION TESTS

Compaction control tests

Compaction control tests: To AS 1289.5.4.1 or AS 1289.5.7.1.

Compaction control test frequency

Standard: To AS 3798 Table 8.1.

Confined operations: 1 test per 2 layers per 50 m².

3.16 COMPLETION

Grading

External areas: Grade to give falls away from buildings, minimum 1:100.

Subfloor areas: Grade the ground surface under suspended floors to drain ground or surface water away from buildings without ponding.

Site restoration

Requirement: If variation of existing ground surfaces is not required as part of the works, restore surfaces to the condition existing at the commencement of the contract.

0223 SERVICE TRENCHING

1 GENERAL

1.1 DESIGN

Requirements

Trench design: Design and coordinate all trenching required for proposed inground services, as documented.

Existing services: Where possible, design to avoid all existing services. Locate existing services to **EXECUTION, EXISTING SERVICES.**

1.2 STANDARDS

Trenching

Earthworks: To AS 3798.

Electrical services: To AS/NZS 3000.

Hydraulic services: To AS/NZS 3500.1.

Communication services: AS/CA S009.

1.3 TOLERANCES

Surface levels

Earthworks: Finish the surface to the required level, grade and shape within the following tolerances:

- Under building slabs and load bearing elements: + 0, - 25 mm.
- Pavement subgrades: + 0, - 40 mm.
- Batters: No steeper than the slope shown on the drawings. Make sure flatter slopes do not impact on boundaries or required clearances to buildings, pavements or landscaping.
- Other ground surfaces: ± 50 mm, provided the area remains free draining and matches adjacent construction where required. Provide smoothness as normally produced by a scraper blade.

Pavement base and subbase: Finish the surface to the required level, grade and shape within the following tolerances:

- Subbase: + 10 mm, - 25 mm.
- Base: + 10 mm, - 5 mm.

Finished pavement or paving surface: Conform to the documented level within the following tolerances:

- Asphalt: ± 10 mm.
- Concrete: + 10 mm, - 0 mm.
- Paving:
 - . Finished level: ± 8 mm.
 - . Height deviation between adjacent units (lippage): ± 2 mm.
- Granular surfaces: ± 10 mm.
- Lippage between restored surface and adjacent existing surface: ± 5 mm.

1.4 SUBMISSIONS

Execution details

Excavation method: Submit details of proposed equipment and method of excavation, including the following:

- Service location and type: A plan of the trench works showing the location and type of service.
- Open excavation: Proposed duration.
- Shuttering and/or bracing of trench sides: If required for safety and stability, provide proposals.
- Geotechnical data: Geotechnical report supporting the procedures proposed for trenching and/or boring.
- Boring: Proposals for the following:
 - . Limits on length.
 - . Existence of other services and method of protection.
 - . Pressure grouting to voids.
 - . The effect of pressure grouting on other services, ground heave and proposals for minimising such effects.
 - . Access to properties outside the site.
 - . Council permits.
 - . Service interruptions including a plan for minimising unintended interruptions.
- Hazards: Identify WHS hazards that may be encountered with deep trenches including toxic gases and liquids.

Off-site disposal location: Submit details of the proposed disposal locations and evidence of conformance with the relevant authorities for the disposal of material required to be removed from the site.

Records

As-built location: Upon completion submit to the relevant authority, as-built documentation to show the location of the installed services.

1.5 INSPECTION

Notice

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

- Items to be measured as listed in **GROUND CONDITIONS, Records of measurement**.
- Service trenches excavated before laying the service.
- Services laid in trenches and ready for backfilling.
- Completed surface restoration.

2 PRODUCTS

2.1 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: Do not use unsuitable material for fill in conformance with AS 3798 clause 4.3.

Sulfur content: Do not provide filling with sulfur content exceeding 0.5% within 500 mm of cement bound elements (for example concrete structures or masonry) unless such elements are protected by impermeable membranes or equivalent means.

Re-use of excavated material: Only re-use suitable material in conformance with AS 3798 clause 4.4.

Material in reactive clay areas: 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.

2.2 SURFACE RESTORATION MATERIALS

General

Re-use: If possible re-use the existing surface materials that were removed during trench excavation, whilst conforming to the documented material requirements.

Subbase and base

Requirement: Provide crushed rock material configured in layers and depths to match existing and adjacent work, as follows:

- Base: 20 mm nominal size.
- Subbase: 40 mm nominal size.

Pathways and paved surfaces generally

Requirement: Provide materials consistent with those of the existing surface before service trenching works commenced.

Concrete surfaces

Material requirements: Normal-class to AS 1379.

Concrete strength grade: N25.

Slump: Maximum 100 mm.

Asphalt surfaces

Aggregate: To AS 2758.5 or to AS 2758.2 for sprayed bituminous surfaces.

Hot mix asphalt: To AS 2150.

Medium cut back bitumen: To AS 2157.

Bitumen emulsion: To AS 1160.

Bitumen binder: Class 170.

Segmental paving

Concrete and clay pavers: To AS/NZS 4455.2.

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

Stone pavers and setts: Provide sound stone pavers and setts of uniform quality. Reject any with defects liable to affect strength and durability.

Bedding mortar mix (cement:sand): Select from the range 1:3 to 1:4 to obtain satisfactory adhesion. Provide minimum water.

3 EXECUTION

3.1 EXISTING SERVICES

Location

Requirement: Before commencing service trenching, locate and mark existing underground services in the areas which will be affected by the service trenching operations.

Utility services: Contact DIAL BEFORE YOU DIG to identify location of underground utility services pipes and cables.

Excavation

General: Do not excavate by machine within 1 m of existing underground services.

3.2 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.

Removal of concrete and asphalt: Break out concrete or asphalt pavement material between the trench set out lines, remove and dispose of off-site.

Segmental paving

Removal: Take up segmental paving units both full and cut by hand, between the trench set out lines, and neatly stack on wooden pallets.

Concrete edging: Break out, remove and dispose of off-site.

Concrete subbase: If present, sawcut along the trench set-out lines.

Grass

Removal method: Neatly cut grass turf between trench set-out lines into 300 mm squares.

Grass suitable for re-use: Take up and store the turf and water during the storage period.

Unsuitable grass: Remove and dispose of off-site.

Small plants, shrubs and trees

Remove for re-planting: Take up and store. Wrap the rootball in a hessian or plastic bag with drain holes and water during the storage period.

Unsuitable vegetation: Remove and dispose of off-site.

3.3 GROUND CONDITIONS

As found site conditions

Unexpected conditions: If the following are encountered, give notice immediately and obtain instructions before carrying out any further work in the affected area:

- Bad ground.
- Discrepancies to expected ground conditions.
- Rock.
- Springs, seepages.
- Topsoil > 100 mm deep.

Records of measurement

Excavation and backfilling: If a schedule of rates applies, provisional quantities are specified, or there are variations to the contract levels or dimensions of excavations, do not commence backfilling or place permanent works in the excavation until the following have been agreed and recorded:

- Depths of excavations related to the datum.
- Final plan dimensions of excavations.
- Quantities of excavations in rock.

3.4 EXCAVATING

General

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

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

- Width tolerance: ± 50 mm, unless constrained by adjacent structures.

- Tree protection: To AS 4970.

Adjacent structures

Existing footings: If excavation is required within the zone of influence of an existing footing, use methods including (temporary) shoring or underpinning that maintain the support of the footing and make sure that the structure and finishes supported by the footing are not damaged.

Temporary supports: Provide supports to adjacent structures where necessary, sufficient to prevent damage arising from the works, as follows:

- Lateral supports: Provide lateral support using shoring.
- Vertical supports: Provide vertical support where necessary using piling or underpinning or both.

Permanent supports: If permanent supports for adjacent structures are necessary and are not described, give notice and obtain instructions.

Encroachments: If encroachments from adjacent structures are encountered and are not shown on the drawings, give notice and obtain instructions.

Trench widths

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

Trench depths

General: As required by the relevant service and its bedding method.

Obstructions

General: Clear trenches of sharp projections. Cut back roots encountered in trenches to at least 600 mm clear of services. Remove other obstructions including stumps and boulders which may interfere with services or bedding.

Dewatering

General: Keep trenches free of water. Place bedding material, services and backfilling on firm ground, free of surface water.

Pumping: Provide pump-out from adjacent sumps or install well points.

Adjacent subsidence: Provide recharge points to isolate the dewatering zone.

Excess excavation

General: If trench excavation exceeds the correct depth, reinstate to the correct depth and bearing value using compacted bedding material or sand stabilised with 1 part of cement to 20 parts of sand by volume.

Stockpiles

Topsoil removal: Stockpile topsoil intended for re-use to a maximum height of 1500 mm.

Excavated material for backfill: If required, segregate the earth and rock material and stockpile, for re-use in backfilling operations.

Locations: Do not stockpile excavated material against tree trunks, buildings, fences or obstruct the free flow of water along gutters where stockpiling is permitted along the line of the trench excavation.

Disposal: If stockpiling is not permitted, dispose of excavated material off-site.

Unsuitable material

Disposal: Remove unsuitable material from the bottom of the trench or at foundation level and dispose of off-site. Replace with trench backfill material.

Boring

Subcontractor: If boring is required instead of trenches, engage a suitably qualified subcontractor to do the work.

3.5 TRENCH BACKFILL

General

Place fill: To AS 3798 clauses 6.2.2 and 6.2.6.

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

Removal of supports: Remove temporary supports progressively as backfilling proceeds.

Marking services

Marking tape: Provide marking tape above service, with appropriate labelling, to AS/NZS 2648.1 and as follows:

- Non-metallic services: Provide tape capable of being detected by inground scanning devices.
- Location: Locate tape approximately half the depth of the service being marked, to a maximum depth of 200 mm below the finished ground level.

Boring: If boring techniques are used to install the service, provide permanent on site labelling at the start and end of the service run and record on the as-built documentation.

Bedding, haunch, side and overlay zones

Installation and material: To the particular utility authority or utility service requirements. Secure pipes against floatation.

Bedding of services: Surround pipes or conduits on all sides with a minimum of 75 mm compacted bedding sand, or as documented.

Overlay zone thickness: Maximum 300 mm immediately over the utility service.

Trees

Backfill at trees: Backfill minimum 300 mm thick, around tree roots with a topsoil mixture. Place and compact in layers of 150 mm minimum depth to a dry density equal to that of the surrounding soil.

Original surface level: Do not place backfill above the original ground surface around tree trunks or over the root zone.

Watering: Thoroughly water immediately after backfilling the tree root zone.

Compaction

Control moisture within backfill: To AS 3798 clause 6.2.3.

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

Compaction: To AS 3798 Section 5.

Frequency of testing: To AS 3798 clause 8.7.

Precautions: Use compaction methods which do not cause damage or misalignment to utility services.

Density tests

Testing authority: Carry out density tests of pipe bedding and backfilling by an Accredited Testing Laboratory.

Test methods: Conform to the following:

- Compaction control tests: To AS 1289.5.4.1 or AS 1289.5.7.1.
- Field dry density: AS 1289.5.3.2 or AS 1289.5.3.5.
- Standard maximum dry density: AS 1289.5.1.1.
- Dry density ratio: AS 1289.5.4.1.
- Density index: AS 1289.5.6.1.

3.6 SURFACE RESTORATION

Subbase and base

Compaction: Uniformly compact each layer of the subbase and base courses over the full area and depth within the trench to a relative compaction of 100% when tested in conformance with AS 1289.5.4.1.

Compacted layer thickness:

- Maximum: 200 mm.
- Minimum: 100 mm.

Compaction test frequency: Minimum 1/every second layer/50 m² of restoration surface area.

Concrete surfaces

Construction: Conform to the following:

- Prime coat the cut edges of the existing surfaces with cement slurry. Lay and compact concrete so that the edges are flush and the centre is cambered 5 mm above the adjoining existing surfaces.
- Surface finish and pattern: Match existing adjoining work.
- Minimum thickness: 75 mm or the adjacent pavement thickness, whichever is thicker.
- Reinforcement and dowels: If required, provide steel reinforcement with dowels into the adjacent concrete.
- Expansion joints: 15 mm thick preformed jointing material of bituminous fibreboard placed in line with joints in existing concrete.
- Control joints:
 - . Form control joints strictly in line with the control joints in existing concrete.
 - . Around service poles: Terminate the concrete paving 200 mm from the pole and fill the resulting space with cold mix asphalt.

Weather: Do not place concrete in ambient temperatures above 30°C or below 10°C, without adequate precautions. Protect surface from rain damage, if required.

Compaction: Compact as follows:

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

Curing: Cure by keeping continuously wet for 7 days.

Asphalt footpaths

Thickness: Match the adjoining footpath.

Finish: Compact to a smooth even surface.

Segmental paving units

Materials and installation: To 0276 *Paving – sand bed*.

- Laying: Re-lay to match the pattern and surface levels of the existing paving.
- Damaged paving units unsuitable for relaying: Replace paving units with new units of the same material, type, size and colour as the existing.

Landscaped areas

In topsoil areas: Complete the backfilling with topsoil for at least the top 100 mm.

Lawn: Re-lay stockpiled turf. If existing turf is no longer viable, re-sow the lawn over the trench and other disturbed areas.

Planted areas: Overfill to allow for settlement.

3.7 COMPLETION

General

As-built documentation: Upon completion, record the location of all installed services on the as-built documentation.

0241 LANDSCAPE – WALLING AND EDGING

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide landscape walling and edging, as documented, so that it is firmly fixed in place and does not form a safety hazard.

1.2 INSPECTION

Notice

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

- Set out before starting construction.
- Geotextiles and subsurface drainage in place before backfilling.

2 PRODUCTS

2.1 TIMBER

Durability

Natural durability class to AS 5604: Class 1.

Hardwood

General: To AS 2796.1 Section 2.

Softwood

General: To AS 4785.1 Section 2.

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, provide details.

2.2 STEEL

Steel tubes

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

- Grade: C350L0.

2.3 CONCRETE

General

Standard: To AS 1379.

Exposure classification: To AS 3600 Table 4.3.

Grade, if there are cast-in metal items: To AS 3600 Table 4.4.

2.4 SLEEPER WALLS

Sleepers

Hardwood: Sound durability class or preservative treated hardwood sleepers to AS 3818.2.

Softwood: Sound preservative treated softwood sleepers.

Concrete: Proprietary system of concrete sleepers and concrete or galvanized steel posts.

2.5 EARTH REINFORCEMENT

General

Type: Proprietary system of galvanized steel strips or steel mesh strips placed in layers with compacted selected fill and connected to precast concrete facing panels to form vertical retaining walls. Provide the necessary accessories including levelling pad, bearing pads, and joint fillers or covers to keep the selected fill material out of the panel joints.

2.6 GEOTEXTILES

General

Type: Polymeric fabric formed from a plastic yarn composed of at least 85% by weight of propylene, ethylene, amide or vinylidene chloride and containing stabilisers or inhibitors to make the filaments resistant to deterioration due to ultraviolet light.

Identification and marking: To AS 3705.

Geotextiles

Storage and handling: Store clear of the ground and out of direct sunlight. During installation do not expose the filter fabric to sunlight for more than 14 days.

2.7 EDGING

Concrete

Standard: To AS 1379 – Grade N20.

Steel

Finish: Hot-dip galvanized.

3 EXECUTION

3.1 GENERAL

Set-out

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

Geotextiles and subsurface drainage: Complete subsurface drainage installation and secure geotextile in place before backfilling.

Clearing

Extent: Except for trees or shrubs to be retained, clear vegetation within 1 m of the landscape walls. Grub out stumps and roots of removed trees or shrubs and trim the grass to ground level, but do not remove the topsoil.

Excavation

Extent: Excavate for foundations and footings.

3.2 SLEEPER WALLS

Construction

Timber sleeper wall: Erect sleeper posts at 2 m centres, buried one third. Brace wall at half height above ground with sleepers returned into embankment, spiked to posts. Lay sleepers in stretcher bond behind the verticals and securely spike together at joints and at 2 m centres. Back with geotextile and place a 100 mm draining layer of coarse sand or fine gravel between the fabric and backfill.

Concrete sleeper wall: To manufacturer's recommendations.

Backing: Backfill to ground level with compacted fine crushed rock or gravels.

3.3 EARTH REINFORCEMENT

Construction

Requirement: Construct walls to the manufacturer's written recommendations.

3.4 EDGING

Log edges

Installation: Excavate to lay logs at least half diameter into the ground. Spike through logs with two 13 mm diameter galvanized mild steel rods per log, penetrating a minimum of 500 mm into the subgrade. Drive the rods flush with the upper surface of the log. Butt the logs together to a close neat fit. Select adjacent logs with similar diameter.

Sawn timber

Installation: Set edgings flush with adjoining surfaces. Drive pegs into the ground at 1200 mm centres on the planting side of the edging and on both sides of joints between boards, with peg tops 15 mm below top of edging. Fix the pegs with galvanised nails, two per fixing.

Curving: Space the pegs to hold edging to a uniform curve. Reduce edging thickness to 15 mm if required for bending.

Sleeper

Installation: Spike through sleepers with two 13 mm diameter galvanized mild steel rods per sleeper, penetrating a minimum of 500 mm into the subgrade. Drive the rods flush with the upper surface of the sleeper. Arris the upper exposed sleeper edges to produce a 15 mm wide face at 45 degrees to the edges.

Concrete

Edging strip: Place in a shallow trench between timber forms. Wood float finish flush with the adjacent finished level. Provide control joints, filled with resilient bituminous material, at 3 m maximum centres.

Concrete kerb: Fixed form, extrusion or slip forms to AS 2876.

Spade edge

Edges: Define mass planting beds by cutting through soil with garden spade at approximately 70° to vertical. Remove sods from garden beds and spread throughout grassed areas.

Finish: Free from kinks in alignment with one curve grading evenly into the next, and free of straight sections.

Brick

Setting: On a 1:1:6 (cement:lime:sand) mortar haunch.

Joints: 3 mm struck flush.

Alignment: Even and free from dips, humps and bends.

Cleaning: Wash off mortar progressively.

0242 LANDSCAPE – FENCES AND BARRIERS**1 GENERAL****1.1 RESPONSIBILITIES****Performance**

Requirement: Provide fences and barrier systems as follows:

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

1.2 DESIGN**Wind regions C and D**

Requirement: Conform to the following:

- AS/NZS 1170.2 for Wind Regions C or D and Terrain Category 2 (TC2).
- AS 4055, as appropriate for the project site conditions.

Submission: Provide documentation of fencing details, supports and connection by a professional structural engineer.

1.3 INSPECTION**Notice**

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

- Boundary survey location.
- Set-out before construction.
- Foundation conditions after excavation.
- Completion of installation.

2 PRODUCTS**2.1 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 to the documented Hazard class.

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

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

2.2 STEEL**Steel tubes**

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

- Grade: C350L0.

Post and rail finish: Hot-dip galvanize.

Fencing wire

Chain wire, cable wire, tie wire and barbed wire: To AS 2423.

2.3 CONCRETE**General**

Standard: To AS 1379 - N20.

Exposure classification: To AS 3600 Table 4.3.

3 EXECUTION**3.1 CONSTRUCTION GENERALLY****Set-out**

General: Set out the fence line and mark the positions of posts, gates and bracing panels.

Property boundaries: Confirm by survey.

Clearing

Fence line: Except for trees or shrubs to be retained, clear vegetation within 1 m of the fence alignment. Grub out the stumps and roots of removed trees and shrubs, and trim the grass to ground level. Do not remove the topsoil.

Excavation

Posts: Excavate post holes so that they have vertical sides and a firm base. Spread surplus material on the principal's side of the fence.

Erection

Line and level: Erect posts vertically. Set heights to follow the contours of natural ground, unless documented otherwise.

Earth footings

Base: Place 100 mm of gravel in the footing base under posts.

Compaction: Backfill with earth around posts, compacting firmly by hand or machine in 150 mm deep layers.

Concrete footings

In ground: Place mass concrete around posts to protect posts from waterlogged conditions and finish with a weathered top falling 25 mm from the post to ground level.

On slabs: Provide welded and drilled post base flanges for fixing with masonry anchors to the concrete.

3.2 GATES**Hardware**

General: Provide the following:

- Drop bolt and ferrule to each leaf of double gates.
- Latch to one leaf of double gates.
- Provision for locking by padlock.
- Hinges with smooth operation and adjustment for future sagging.

Hand access

Requirement: Where required, provide hand holes to give access from outside to reach locking provision.

3.3 TIMBER FENCING

Radiata pine picket fencing

Maximum post spacing: 2400 mm.

Member sizes (dressed):

- Posts: 90 x 90 mm.
- Rails: 70 x 40 mm.
- Pickets: 70 x 19 mm.

Picket spacing: 125 mm maximum.

Footing type: Earth.

Footing size: 200 mm diameter x 600 mm depth.

Radiata pine paling fencing

Maximum post spacing:

- General: 2400 mm.
- For lap and cap: 2700 mm.

Member sizes (sawn):

- Intermediate posts: 140 x 45 mm.
- End, corner and gate posts: 100 x 100 mm.
- Rails: 75 x 50 mm.
- Capping for lap and cap type: 120 x 35 mm dressed with weathered top.
- Palings:
 - . General: 100 x 15 mm.
 - . For lap and cap: 150 x 15 mm.

Footing type: Earth.

Footing size: 250 mm diameter x 600 mm depth.

Hardwood paling fencing

Maximum post spacing: 2700 mm.

Member sizes (sawn):

- Intermediate posts: 125 x 50 mm.
- End, corner and gate posts: 125 x 125 mm.
- Rails: 75 x 50 mm.
- Capping for lap and cap type: 100 x 50 mm dressed with weathered top.
- Palings, general: 100 x 13 mm.
- Palings, for lap and cap: 150 x 13 mm.

Footing type: Earth.

Footing size: 250 mm diameter x 600 mm depth.

Installation

General: Mortice posts, taper splice rails and nail twice in mortices. Set pickets and palings clear of the ground.

Picket fence: Nail twice to each rail.

Plain paling fence: Provide 2 rails for fences up to 1800 mm high, and locate 200 mm from the tops and bottoms of the palings. Close butt palings and nail twice to each rail.

Lap and cap paling fence: Provide 2 rails for fences up to 1800 mm high, and locate 200 mm from the bottoms of the palings and abutting the tops of palings. Close-butt larger palings and nail twice to each rail. Fix smaller palings over joints and nail twice to each rail. Nail capping to the top rail.

Timber gates

Ledges and braces: Match fence rails.

3.4 CHAIN LINK FABRIC FENCING

Security fencing and gates

Standard: To AS 1725.1.

Design options:

- Type 1: Rail-less security fencing (with 3 cables).
- Type 2: Pipe rail security fencing (nominate pipe rail positions).

3.5 WELDED MESH FENCING

Fence dimensions

Maximum post spacing: 2440 mm.

Component sizes

End, corner and intermediate posts: 42.4 mm diameter, 2.6 mm wall thickness.

Gate posts (personnel): 60.3 mm diameter, 2.9 mm wall thickness.

Gate posts (vehicle): 88.9 mm diameter, 3.2 mm wall thickness.

Panel wire:

- Horizontal: 4.95 mm diameter at 75 mm centres.
- Vertical: 4.95 mm diameter at 50 mm centres.

Installation

General: Fit tightly fittings caps to steel posts.

Attach panels to posts with fixing clips and galvanized M8 x 75 mm hexagon head bolts before concreting footing.

Gates

Frame tubes: 33.7 mm diameter, 2 mm wall thickness.

Wire: Match fence.

0250 LANDSCAPE - GARDENING**1 GENERAL****1.1 RESPONSIBILITIES****General**

Plants: Provide plants that have been grown to a standard that allows them to establish rapidly and grow to maturity.

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

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

1.2 INTERPRETATION**Definitions**

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

- Imported topsoil: Similar to local natural soil, suitable for the establishment and ongoing viability of the selected vegetation, free of weed propagules and of contaminants, and classified by texture to AS 4419 Appendix K Table K1, as follows:
 - . Fine: Clay loam, fine sandy clay loam, sandy clay loam, silty loam, loam.
 - . Medium: Sandy loam, fine sandy loam.
 - . Coarse: Sand, loamy sand.
- Plant establishment period: The period between the date of practical completion and the end of the defects liability period.
- Site topsoil: Natural soil, excavated from the site, that contains organic matter, supports plant life, conforms generally to the fine-to-medium texture classification to AS 4419 and is free from the following:
 - . Stones more than 25 mm diameter.
 - . Clay lumps more than 50 mm diameter.
 - . Weeds and tree roots.
 - . Sticks and rubbish.
 - . Material toxic to plants.

1.3 SUBMISSIONS**Certification**

Plant species: Submit the supplier's certification as evidence that plants are true to the required species and type and free from diseases, pests and weeds at time of delivery.

Execution details

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

Products and materials

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

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

Samples

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

Bulk materials: At least 5 working days before bulk deliveries, submit a 1 kg sample of each type documented with required test results.

Subcontractors

General: Submit names and contact details of proposed suppliers and evidence of the following, if appropriate:

- Experience in the required type of work.
- Production capacity for material of the required type and quantity.
- Lead times for delivery of materials to the site.

2 PRODUCTS**2.1 TOPSOIL****Standard**

Site and imported topsoil: To AS 4419.

Potting mixes: To AS 3743.

Composts, soil conditioners and mulches: To AS 4454.

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.

Imported topsoil particle size table (% passing by mass)

Sieve aperture (mm)	Soil textures		
	Fine	Medium	Coarse
2.36	100	100	100
1.18	90 – 100	90 – 100	90 – 100
0.60	75 – 100	75 – 100	70 – 90
0.30	57 – 90	55 – 85	30 – 46
0.15	45 – 70	38 – 55	10 – 22
0.075	35 – 55	25 – 35	5 – 10
0.002		2 – 15	2 – 8

Imported topsoil nutrient level table

Nutrient	Unit	Sufficiency range
Nitrate-N (NO ₃)	mg/kg	> 25
Phosphate-P (PO ₄) – P tolerant	mg/kg	43 - 63
Phosphate-P (PO ₄) – P sensitive	mg/kg	< 28
Phosphate-P (PO ₄) – P very sensitive	mg/kg	< 6
Potassium (K)	mg/kg	178 - 388
Sulphate-S (SO ₄)	mg/kg	39 - 68
Calcium (Ca)	mg/kg	1200 - 2400
Magnesium (Mg)	mg/kg	134 - 289
Iron (Fe)	mg/kg	279 - 552
Manganese (Mn)	mg/kg	18 - 44
Zinc (Zn)	mg/kg	2.6 - 5.1
Copper (Cu)	mg/kg	4.5 - 6.3
Boron (B)	mg/kg	1.4 - 2.7

Method references

pH in H₂O (1:5), pH in CaCl₂ (1:5) and Electrical Conductivity (EC) by Rayment & Higginson (1992) method 4A2, 4B2, 3A1
 Soluble Nitrate-N by APHA 4500
 Soluble Chloride by Rayment and Lyons 2011 modified method 5A2
 Extractable P by Mehlich 3 – ICP
 Exchangeable cations – Ca, Mg, K, Na by Mehlich 3 – ICP
 Extractable S by Mehlich 3 – ICP
 Extractable trace elements (Fe, Mn, Zn, Cu, B) by Mehlich 3 – ICP

2.2 GRASS**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.

2.3 GRASS REINFORCING**Grass reinforcing**

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

2.4 MULCH**General**

Type: Free of deleterious and extraneous matter including soil, weeds, plastic, metal, paint and sticks. Do not include fine mulch.

Properties:

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

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.

2.5 FERTILISER**General**

Type: 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.

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

2.6 PLANTS - GENERAL**Supply**

Supply trees to AS 2303 and with the following properties:

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

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.

Labelling

General: To AS 2303 clause 4.2.1.

Label type: To withstand transit without erasure or misplacement.

Root system

Requirement: Supply plant material with a root system that is:

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

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

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

Sample plants: Replace plants used in investigative inspection.

Rejection: Do not provide root bound stock.

Stakes

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

Stake sizes and quantities:

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

Ties

Tie types:

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

2.7 IRRIGATION

General

Requirement: Provide and commission automatically controlled, fixed irrigation systems.

Backflow prevention device

Product/type: A Water Corporation approved brass dual check valve device installed immediately below a Water Corporation approved isolation valve.

Irrigation controllers

Type: Automatic controllers that are easily programmed and include the following:

- Valve boxes.
- Manual cycle and individual control valve operation.
- Manual on/off operation of irrigation without loss of program.
- ≥ 4 on/off cycles per day.
- Day omit.
- 240 V input and 24 V output capable of operating 2 control valves simultaneously.
- ≥ 24 hour battery program backup.

- Power surge protection.
- Mounted in a lockable cabinet minimum IP 54 to AS 60529 in external locations.
- Electrical connection: Where connected to wall outlets, provide 3 core 10 A, 240 V flexible cord and plug. Provide an isolating switch at the controller.

Power supply: For developments with multiple dwellings, connect to the common power source, not the power supply of individual dwellings.

- Metering: Connect to the common supply meter.

Number of stations in the controller: ≥ number of stations in the reticulation systems.

Number of controllers: Do not use more than one controller without the approval of the principal.

Controller type/product: Do not install without approval from the principal.

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.

Micro-irrigation systems

Tubing: Polyethylene micro-irrigation pipe.

Drip systems

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

Discrete drip emitter systems:

- Tubing: Polyethylene micro-irrigation pipe.
- Drippers: Turbulent flow types, easily dismantled for cleaning. Connect directly into piping or provide appropriately sized micro-tubes.

Fittings

Type: Barbed fittings rated for the pressure class of the pipe, fastened with ratchet type clamps.

Valve boxes

Requirement: Provide the following in each valve box:

- Automatic control valve.
- Isolating valve.
- Filter:
 - . Micro-irrigation systems: 200 µm.
 - . Drip irrigation systems: 100 µm.
- Pressure-reducing valve with 170 kPa outlet pressure.

Construction: UV-resistant high impact plastic with high impact snap lock plastic cover.

3 EXECUTION

3.1 PREPARATION

Weed eradication

Herbicide: Eradicate weeds using environmentally acceptable methods, such as a non-residual glyphosate herbicide conforming to the

Health (Pesticides) Regulations 2011 (WA), at the recommended maximum rate.

Manual weeding: Regularly remove weed growth by hand throughout grassed, planted and mulched areas. Remove weed growth from an area of 750 mm diameter around the base of the trees in grassed areas. Continue weeding throughout the course of the works and during the planting establishment period.

Vegetative spoil

Disposal: Remove vegetative spoil from site. Do not burn.

3.2 ROCK WORK

New rock work

Erosion control: Bury rock two thirds by volume, with weathered faces exposed. Protect the weathered faces from damage.

Site rock: Stockpile for future placement and accessibility for lifting. Dispose of other rock off site.

Imported rock: Provide rock which has been selected before delivery.

Placing rock: Place while ground formation work is being carried out, as documented.

3.3 EARTH MOUNDS

Construction

Placing: Place clean fill in layers approximately 150 mm thick compacted to 85% of the dry density ratio of the surrounding soil tested to AS 1289.5.4.1. Minimise slumping and further compacting.

Edges: Construct changes in grade over a minimum width of 500 mm to smooth, gradual and rounded profiles with no distinct joint.

Existing trees: Maintain the natural ground level under the canopy.

Pipes, culverts and associated structures: Construct mounding to avoid unbalanced loading.

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

3.4 SUBSOIL

Ripping

General: Rip parallel to the final contours. Do not rip when the subsoil is wet or plastic. Do not rip within the dripline of trees and shrubs to be retained.

Ripping depths: Rip the subsoil to the following typical depths:

- Compacted subsoil: 300 mm.
- Heavily compacted clay subsoil: 450 mm.

Planting beds

Excavated: Excavate to reduce the subsoil level to at least 300 mm below finished design levels.

Shape the subsoil to fall to subsoil drains, if required. Break up the subsoil to a further depth of 100 mm.

Unexcavated: Remove weeds, roots, rubbish and other debris. Reduce the planting bed level to 75 mm below finished design levels.

Cultivation

Minimum depth: 100 mm.

Services and roots: Do not disturb services or tree roots. If required, cultivate these areas by hand.

Cultivation: Cultivate manually within 300 mm of paths or structures. Remove stones exceeding 25 mm, clods of earth exceeding 50 mm, and weeds, rubbish or other deleterious material brought to the surface during cultivation. Trim the surface to design levels after cultivation.

Additives

General: Apply additives after ripping or cultivation and incorporate into the upper 100 mm layer of the subsoil as documented.

Gypsum: Incorporate at the rate of 0.25 kg/m².

3.5 TOPSOIL

Placing topsoil

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

Spreading: Spread the topsoil on the prepared subsoil and grade evenly, making allowances, if appropriate, for the following:

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

Steep batters: If using a chain drag, make sure there is no danger of batter disturbance.

Finishing: Feather edges into adjoining undisturbed ground.

Consolidation

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

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

Topsoil depths

General: Spread topsoil to the following typical depths:

- Excavated planting areas:
 - . For organic mulch: 225 mm.
 - . For gravel mulch: 250 mm.
- Irrigated grassed areas generally: 150 mm.
- Irrigated grassed areas, heavy use (e.g. playing fields, playgrounds, and public parks): 200 mm.
- Non-irrigated grass areas: 100 mm.
- Earth mounds:
 - . Mass planted surfaces: 300 mm.
 - . Grassed surfaces: 100 mm.
- Top dressing: 10 mm.

Surplus topsoil

General: Spread surplus topsoil on designated areas on site or dispose off-site.

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.

3.6 TURFING**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.

Supply

Elapsed time: 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 turf out on a flat surface with the grass up, and water as required to maintain a good condition.

Fertilising

Requirement: Mix the fertiliser thoroughly into the topsoil before placing the turf with a slow release fertiliser applied to the manufacturer's recommendations.

Application

Method: Lay the turf as follows:

- Stretcher bond pattern with the joints staggered and close butted.
- Parallel with the long sides of level areas, and with contours on slopes.
- Finish flush, after tamping, with adjacent finished surfaces of ground, paving edging, or grass seeded areas.

Strip turf: Close butt the end joints and space the strips 300 mm apart. Lay top dressing between the turf strips. Finish with an even surface.

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

Stabilising on steep slopes: Peg the turf to prevent downslope movement. Remove the pegs when the turf is established.

Watering

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

Initial establishment

General: Maintain turfed areas until there is a dense continuous sward of healthy grass over the whole turfed area, evenly green and of a consistent height.

Failed turf: Lift failed turf and replace with new turf.

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

Top dressing: Mow the established turf and remove cuttings. Lightly top dress to a depth of 10 mm. Rub the dressing into the joints and correct any unevenness in the turf surface.

3.7 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.

3.8 PLANTING**General**

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

Planting conditions

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

Watering

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

Placing

General: Place plants as follows:

- Remove the plant from the container with minimum disturbance to the root ball. Make sure that the root ball is moist.
- If required, root prune to make sure all circling roots have been either severed or aligned radially into the surrounding soil.
- Place the plant in its final position, in the centre of the hole and plumb, and with the topsoil level of the plant root ball level with the finished surface of the surrounding soil.

Fertilising

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

Backfilling

General: Backfill with topsoil mixture. Tamp lightly and water to eliminate air pockets. Make sure that

topsoil is not placed over the top of the root ball, so the plant stem remains the same height above ground as it was in the container. Avoid mixing mulch with topsoil.

Watering basins for plants in grassed areas

Location: To each individual plant not located in irrigated grassed areas or naturally moist areas.

Watering basin: Construct around the base of each individual plant, consisting of a raised ring of soil capable of holding at least 10 L.

3.9 IRRIGATION

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

Extent: To all landscaped areas.

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: Provide cabinet if documented. Install a 10 amp 250 volt socket outlet in the cabinet.

- Supply conduit and draw wire to the reticulation cabinet.

- Position labelled socket outlet at the bottom right hand corner of cabinet and connect to common services power circuit.

- Label socket outlet: SUPPLIED BY COMMON SERVICES POWER CIRCUIT.

Underground piping and PVC-U fittings

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

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

Micro-irrigation systems

General: Connect micro-tube laterals with proprietary push in or screw in fittings.

Drippers: Connect directly into piping or provide appropriately sized micro-tubes.

Microsprays: Mount microsprays 300 mm above ground on stakes and connect to the piping with appropriately sized micro-tubes.

Piping: Lay polyethylene micro-irrigation pipe on finished ground surface under planting bed mulch and anchor at 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.

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.

Northwest and Gold fields region

Sprinkler installation: Provide plastic sprinkler surrounds to all sprinklers to protect from lawn mower damage.

3.10 MULCHING

Placing mulch

General: Place mulch to the required depth and clear of plant stems, so that after settling it conforms to the following:

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

Extent: Provide mulch to 750 mm diameter to surrounds of plants planted in ripelines and grassed areas.

Depths:

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

Installation:

- In ripeline and grassed areas: Place mulch to 750 mm diameter around plants.
- In mass planted areas: Place after the preparation of the planting bed but before planting and other work.
- In smaller areas (e.g. planter boxes): Place after the preparation of the planting bed, planting and other work.

3.11 TREATMENT

General

Insect attack or disease: If evidence of insect attack or disease of plant material is discovered, immediately give notice.

Physical removal

General: Remove insect infestation and diseased plant material by hand if appropriate.

Pesticide

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

3.12 STAKES AND TIES

Stakes

Requirement: Provide for all new trees and shrubs.

Installation: Drive stakes into the ground at least one third of their length, avoiding damage to the root system. Position stake on the prevailing wind side of the plant.

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.

Protectors

Individual plantings in grassed areas: Fit with plastic stem protectors.

Trunk protection: Collar guards:

- 200 mm length of 100 mm diameter agricultural pipe split lengthways.

3.13 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.

3.14 ESTABLISHMENT

Planting

Requirement: Make sure the general appearance and presentation of the landscape and the quality of plant material at date of practical completion is maintained for the planting establishment period.

Plant replacement: Replace failed, dead and/or damaged plants at maximum 3 weekly intervals as necessary throughout the plant establishment period.

Pruning: To AS 4373 and as documented.

Fertilising: Apply either an all purpose fertiliser or a 12 month slow release fertiliser, in two rows and cultivated into soil to a depth of 100 mm.

- Program: September and March according to seasonal growth requirement.

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

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

Watering: Minimum 3 complete waterings, soaking to a depth of 150 mm at fortnightly intervals for the first 6 weeks of plant establishment irrespective of natural rainfall.

Grass

Preparation: Remove litter and fallen branches before mowing.

Mowing:

- Grass height: Consistent with the growth habit of the grass variety and maintained at 25 mm to 40 mm throughout the year. Do not remove more than one third of the grass height at any one time.
- Program: Weekly during the mowing season, November to March, and at fortnightly intervals from April to October. Do not mow during wet conditions.
- Clippings: Remove grass clippings from the site after each mowing.
- Raking: Once every month before mowing from November to March, rake the grass with a flexible rake. On alternate mowings, adopt a north-south and east-west pattern.

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

- Program: Quarterly, and as required to maintain the general lawn condition.

Edge trimming: At the same time as mowing, trim lawn edges to plant beds, pathways, base of trees and other obstacles. Do not damage trees and shrubs.

Topdressing for established lawns: Weed-free imported sandy topsoil to a depth of 5 mm.

- Program: The spring following initial establishment.

Fertilising: Apply lawn fertiliser at the completion of the first and last mowings of the plant establishment period, and at other times as required to maintain healthy grass cover.

3.15 COMPLETION

Irrigation

Requirement: On completion of the irrigation system, carry out the following:

- Flush system thoroughly, check heads, sprays and drippers and clean if blocked.
- Clean strainers.
- Adjust for even distribution with no dry areas.

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.

0271 PAVEMENT BASE AND SUBBASE

1 GENERAL

1.1 SUBMISSIONS

Products and materials

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

Conformance: Submit type test results for each proposed material from an Accredited Testing Laboratory as evidence of material conformance to documented requirements.

1.2 INSPECTION

Notice

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

- Prepared subgrade.
- Proof rolling of subbase before spreading of base.
- Proof rolling of base before sealing.

2 PRODUCTS

2.1 BASE AND SUBBASE MATERIAL

Granular material

Requirement: Provide unbound granular materials, including blends of two or more different materials, which when compacted develop structural stability and are uniform in grading and physical characteristics.

Crushed rock

Requirement: Provide crushed rock as follows:

- Base: 20 mm nominal.
- Subbase: 40 mm nominal.

Recycled materials

Requirement: Provide recycled materials as follows:

- Base and subbase: Conform to the **Limits on use of recycled and manufactured materials as constituent materials table** and the **Undesirable material properties table**.

Natural gravel

Requirement: Provide unbound natural gravel materials as follows:

- Base: 20 mm nominal.
- Subbase: 40 mm nominal.

Subbase material properties and test methods table

Property and test method	Differentiating criteria	Material requirements	
		Crushed rock	Natural gravel
Particle size distribution or grading (% passing through sieve) to AS 1289.3.6.1	Sieve size (mm)	—	—
	53.0 mm	100	100
	37.5	90 - 100	95 - 100
	26.5	74 - 96	80 - 97
	19.0	62 - 86	—
	13.2	—	—
	9.5	42 - 66	48 - 85
	4.75	28 - 50	35 - 73
	2.36	20 - 39	25 - 58
	0.425	8 - 21	10 - 33
	0.075	3 - 11	3 - 21
Maximum dry compressive strength on fraction passing 19 mm sieve (only applies if plasticity index is less than 1) to AS 1141.52	—	min 1.0 MPa	min 1.0 MPa
4 day soaked CBR (98% modified compaction) to AS 1289.6.1.1	—	min 30%	min 30%

Limits on use of recycled and manufactured materials as constituent materials table

Recycled material	Unbound or modified base and subbase	Bound base and subbase
Iron and steel slag	100%	100%
Crushed concrete	100%	100%
Brick	20%	10%
RAP	40%	40%
Fly ash	10%	10%
Furnace bottom ash	10%	10%
Crushed glass fines	10%	10%

Undesirable material properties table

Property and test method	Differentiating criteria	Material requirements		
		Crushed rock	Recycled material	Natural gravel
Undesirable constituent materials (% retained on a 4.75 mm sieve) to RMS T276	Material type	—	—	—
	Type I - Metal, glass, stone, ceramics and slag	—	max 2.0 %	—
	Type II - Plaster, clay lumps and other friable material	—	max 0.5%	—
	Type III - Rubber, plastic, paper, cloth, paint, wood and other vegetable matter	—	max 0.1%	—

Base material properties and test methods table

Property and test method	Differentiating criteria	Material requirements		
		Crushed rock	Recycled material	Natural gravel
Particle size distribution or grading (% passing through sieve) AS 1289.3.6.1	Sieve size (mm)	—	—	—
	26.5	100	100	100
	19.0	95 - 100	95 - 100	93 - 100
	13.2	77 - 93	78 - 92	—
	9.5	63 - 83	63 - 83	71 - 87
	4.75	44 - 64	44 - 64	47 - 70
	2.36	29 - 49	30 - 48	35 - 56
	0.425	13 - 23	13 - 21	14 - 32
	0.075	5 - 11	5 - 9	6 - 20
CBR (98% modified compaction) to AS 1289.6.1.1	—	min 80%	min 80%	min 80%
Unconfined compressive strength to AS 5101.4	—	max 1.0 MPa	max 1.0 MPa	—

3 EXECUTION

3.1 SUBGRADE PREPARATION

General

Requirement: Prepare the subgrade in conformance with 0222 Earthwork.

3.2 PLACING BASE AND SUBBASE

General

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

Spreading: Spread material in uniform layers without segregation.

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

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

Joints

General: Plan spreading and delivery to minimise the number of joints. Offset joints in successive layers by a minimum of 300 mm.

Start of shift: Remix last 2 m of previous days' work for continuity of compaction.

Final trimming

General: Trim and grade the base course to produce a tight even surface with no loose stones or slurry of fines.

3.3 TOLERANCES

Surface level

General: Provide a finished surface 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

General

Construction operation: Compact each layer of fill to the required depth and density, as a systematic construction operation.

Unstable areas: If unstable areas develop during rolling or are identified by proof rolling, open up, dry back and recompact, to the requirements of this worksection. If dry back is not possible, remove for the full depth of layer, dispose of and replace with fresh material.

Minimum relative compaction table

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

Compaction requirements

General: Apply uniform compactive effort over the whole area to be compacted, until the required density is achieved or until failure is acknowledged. If failure is acknowledged, conform to **Rectification**.

Equipment: Use rollers appropriate to the materials and compaction requirements documented.

Moisture content

General: During spreading and compaction, maintain material moisture content within the range of -2% to +1% from the optimum moisture content (modified compaction).

Spraying: Use water spraying equipment to distribute water uniformly, in controlled quantities, over uniform lane widths.

Dry back: Allow materials to dry to 60 to 80% of the optimum moisture content before applying the seal or wearing course.

Rectification

General: If a section of the pavement material fails to meet the required density or moisture content after compaction, remove the non-conforming material, dispose of off-site or rectify for re-use, replace with fresh material, and re-compact.

Level corrections

General: Rectify incorrect levels as follows:

- High areas: If the area can be rectified by further trimming to produce a uniform, hard surface by cutting without filling, trim so that the rectified area conforms to **TOLERANCES**.
- Low areas and high areas not rectifiable by further trimming: Remove layers to a minimum depth of 75 mm, lightly tyne and replace with new material and re-compact.

3.5 TESTING

Site tests

Compaction control tests: To AS 1289.5.4.1 and AS 1289.5.4.2.

Frequency of compaction control tests: Not less than the following (whichever requires the most tests):

- 1 test per layer per 100 lineal metres for two-lane roads.
- 1 test per layer per 2000 m² for car parks.
- 3 tests per layer.
- 3 tests per visit.

0274 CONCRETE PAVEMENT

1 GENERAL**1.1 RESPONSIBILITIES****Performance**

Requirement: Provide finished surfaces conforming to the following:

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

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

1.2 STANDARDS**Concrete**

Specification and supply: To AS 1379.

Materials and construction: To AS 3600.

Residential pavements: To AS 3727.1.

Slip resistance

Classification: To AS 4586.

1.3 INTERPRETATION**Definitions**

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

- Ambient temperature: The air temperature at the time of mixing and placing of concrete.
- Concrete class – normal: Concrete that is specified primarily by a standard compressive strength grade up to 50 MPa and otherwise in conformance with AS 1379 clause 1.5.3.
- Concrete class – special: Concrete that is specified to have certain properties or characteristics different from, or additional to, those of normal-class concrete and otherwise in conformance with AS 1379 clause 1.5.4.
- Weather – cold: Ambient shade temperature less than 10°C.
- Weather – hot: Ambient shade temperature greater than 30°C.

1.4 TOLERANCES**General**

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

Rigid pavement surface:

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

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

Joint locations in plan : 10 mm from documented position.

1.5 SUBMISSIONS**Products and materials**

Aggregates: Nominate the source for all aggregates.

Reinforcement: Submit the manufacturer's certificate of compliance with AS/NZS 4671, or submit test certificates from an Accredited Testing Laboratory.

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

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

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

Concrete: Submit the concrete supply delivery dockets.

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

Subcontractors

Pre-mixed supply: Submit names and contact details of proposed pre-mixed concrete suppliers, and alternative source of supply in the event of breakdown of pre-mixed or site mixed supply.

Tests

Site tests: Submit results, as follows:

- Slip resistance test of completed installations.

1.6 INSPECTION**Notice**

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

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

2 PRODUCTS**2.1 REINFORCEMENT****Steel reinforcement**

Standard: To AS/NZS 4671.

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

Accessories

Reinforcement supports: To AS/NZS 2425.

Tie wire: Galvanized annealed steel 1.25 mm diameter minimum.

Dowels

General: Provide each dowel in one piece, straight, cut accurately to length with ends square and free from burrs.

Standard: To AS/NZS 4671.

Grade: 250R steel bars 450 mm long.

Tie bars

Type: Deformed bar, 12 mm diameter, grade 500N, 1 m long.

2.2 AGGREGATE**Characteristics**

Standards: AS 2758.1.

Durability: Tested to AS 1141.22:

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

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

2.3 CEMENT**General**

Standard: To AS 3972.

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

Age: Less than 6 months old.

Storage: Store cement bags under cover and above ground.

Supplementary cementitious materials

Fly ash: To AS/NZS 3582.1.

Slag: To AS 3582.2.

Amorphous silica: To AS/NZS 3582.3.

2.4 WATER**General**

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

Limits: Not containing more than:

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

2.5 ADMIXTURES**General**

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

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

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

2.6 CURING COMPOUNDS**General**

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

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

2.7 OTHER MATERIALS**Tactile ground surface indicators**

Standard: To AS/NZS 1428.4.1.

3 EXECUTION**3.1 GENERAL****Traffic control**

Traffic restriction: Do not allow traffic or construction plant other than that associated with testing, sawcutting, cleaning or joint sealing on pavement for minimum 10 days after placing, or when the concrete has reached a compressive strength of at least 20 MPa, and joints have been completely sealed.

3.2 SUBGRADE**Preparation**

Conformance: Prepare subgrade to 0222 *Earthwork*.

Extent: Prepare a uniform subgrade for the full pavement formation, extending at least to the back of kerbs or at least 300 mm beyond each side of the carriageway if kerbs are not proposed.

Reinstatement: Make sure of uniformity for backfilling of any utility trenches.

3.3 SUBBASE**Width**

Subbase width: Extend the subbase at its full depth to at least the back of kerbs or other edge stops before their installation.

No integral kerbs: Extend granular unbound subbase at least 300 mm beyond each side of the carriageway.

Tolerance

Subbase finished surface level: + 0 mm, - 10 mm.

Placement

Bound and unbound subbase materials and placement: To 0271 *Pavement base and subbase*.

Friction reduction

Requirement: Provide 200 µm thick polyethylene sheeting with 200 mm taped minimum laps and/or a 20 mm thick layer of sand (silt and clay material less than 5%) directly beneath the concrete pavement.

3.4 CONCRETE MIX**Standard**

Concrete mix and supply: To AS 3600 clause 17.1 and AS 1379.

Properties

Slump: Maximum 100 mm.

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

Elapsed delivery time

General: Make sure that the elapsed time between the wetting of the mix and the discharge of the mix at the site is in conformance with the **Elapsed**

delivery time table. Do not discharge at ambient temperature below 10°C or above 30°C unless approved heating or cooling measures are taken to deliver concrete within the range 5°C to 35°C.

Elapsed delivery time table

Concrete temperature at time of discharge (°C)	Maximum elapsed time (minutes)
5 – 24	120
24 – 27	90
27 – 30	60
30 – 35	45

Site mixed supply

Emergencies: If mixing by hand, provide details.

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

Pre-mixed supply

Addition of water: Do not add water.

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

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

- Any binders or additives.
- Method of placement and climate conditions.
- Name of concrete delivery supervisor.
- The concrete element or part of the works for which the concrete was ordered, and where it was placed.

3.5 TESTING

Standards

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

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

Type and frequency: To AS 1379.

Testing authority: Concrete supplier or Accredited Testing Laboratory.

Concrete testing methods

Slump: To AS 1379 clause 5.2.

Compressive strength: Test to AS 1012.8.1 and AS 1012.9.

Drying shrinkage: Test to AS 1012.8.4 and AS 1012.13.

Flexural strength: Test to AS 1012.8.2 and AS 1012.11.

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

Sampling frequency: Provide a minimum of one sample from each 50 m³ of concrete.

3.6 INSTALLATION

Junctions with existing pavements

Trimming: If new pavement is to be joined to an existing pavement, trim the edge of the existing

pavement to create a neat vertical edge for its full depth before placing new pavement material.

Fixed formwork

Description:

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

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

Tolerances on position:

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

Staking: Stake forms in position using at least 3 steel stakes per form, not more than 1.5 m apart.

Lock joints between form sections to prevent movement.

Release agent: Before placing reinforcement, apply a release agent compatible with the contact surfaces, to the interior of the formwork, except where the concrete is to receive an applied finish for which there is no compatible release agent.

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

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

Reinforcement

Tolerances in fabrication and fixing: To AS 3600.

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

Minimum cover to reinforcement: 30 mm.

Splicing mesh: Overlap a minimum of 2 crosswires.

Supports: Provide reinforcement supports as follows:

- Able to withstand construction and traffic loads and maintain the concrete cover, as documented.
- With a protective coating if they are ferrous metal extending to the surface of the concrete.
- Use plastic or concrete supports with galvanized or zinc-coated reinforcement.
- Spacing:
 - . Bars: ≤ 60 diameters.
 - . Mesh: ≤ 600 mm.
- Supports over membranes: Prevent damage to waterproofing membranes or vapour barriers. If appropriate, place a metal or plastic plate under each support.

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

Tying: Secure the reinforcement against displacement at intersections with either wire ties, or clips. Bend the ends of wire ties away from nearby

faces of formwork or unformed faces to prevent the ties projecting into the concrete cover.

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

Cores, fixings and embedded items

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

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

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.

3.7 CONCRETE PLACING AND COMPACTION

Concrete placing

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

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

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

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

Compaction

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

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

Placing records

Log book: Keep on site and make available for inspection a log book recording each placement of concrete, including the following:

- Date.
- Specified grade and source of concrete.
- Slump measurements.
- The portion of work.
- Volume placed.

Rain

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

Concrete placing in cold weather

Cement: Do not use high alumina cement.

Temperature limits: Maintain the following:

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

High early strength cement: If deteriorating weather conditions are predicted, use high early strength cement.

Temperature control: Heat the concrete materials, other than cement, to the minimum temperature necessary so that the temperature of the placed concrete is $\geq 5^{\circ}\text{C}$.

Admixtures: Do not use calcium chloride, salts, chemicals or other material in the mix to lower the freezing point of the concrete.

Frozen materials: Do not allow frozen materials or materials containing ice to enter the mixer, and keep free of frost and ice any formwork, materials, and equipment coming in contact with the concrete.

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

Concrete placing in hot weather

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

Hot weather placing: Maintain concrete at a temperature $\leq 35^{\circ}\text{C}$.

Formwork and reinforcement: Before and during placing maintain temperature $\leq 35^{\circ}\text{C}$.

Severe weather: If ambient shade temperature more than 38°C, do not mix concrete.

Temperature control: Select one or more of the following methods of maintaining the specified temperature of the placed concrete:

- Cool the concrete using liquid nitrogen injection before placing.
- Cover the container in which the concrete is transported to the forms.
- Spray the coarse aggregate using cold water before mixing.
- Use chilled mixing water or ice.

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

3.8 CONCRETE FINISH

General

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

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

Unformed surfaces

General: Strike off, screed and level slab surfaces to finished levels, to the tolerance class and finish documented.

Formed surfaces

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

Curing: If forms are stripped when concrete is at an age less than the minimum curing period,

commence curing exposed faces as soon as the stripping is completed.

Finishing methods - primary finish

Machine float finish:

- After levelling, consolidate the surface using a machine float.
- Cut and fill and refloat immediately to a uniform, smooth, granular texture.
- Hand float in locations inaccessible to the machine float.

Wood float finish: After machine floating use wood or plastic hand floats to produce the final consolidated finish free of float marks and uniform in texture and appearance.

Broom finish: After machine floating and steel trowelling draw a broom or hessian belt across the surface to produce a coarse even-textured transverse-scored surface.

Scored or scratch finish: After screeding, give the surface a coarse scored texture using a stiff brush or rake drawn across the surface before final set.

Sponge finish: After machine floating and steel trowelling, obtain an even textured sand finish by wiping the surface using a damp sponge.

Finishing methods - supplementary finish

Abrasive blast: After steel trowelling, abrasive blast the cured surface to provide texture or to form patterns without exposing the coarse aggregate, using hard, sharp graded abrasive particles.

Coloured applied finish: After machine floating, apply a proprietary liquid or dry shake material to the manufacturer's recommendations and trowel to achieve the required appearance.

Stamped and coloured faux paved or cobblestone finish: Provide finishing system.

Surface repairs

Repair method: If required, detail proposals.

3.9 CONCRETE CURING

General

Curing: Commence curing as soon as possible after finishing, when the concrete has set sufficiently not to be damaged by the curing process, and extend for a minimum period of 7 days.

End of curing period: Prevent rapid drying out at the end of the curing period.

Protection: Maintain at a reasonably constant temperature with minimum moisture loss, during the curing period.

Curing methods

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

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

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

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

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

3.10 JOINTS

General

Requirement: Construct expansion, contraction and construction joints straight and plumb. Make transverse joints normal to longitudinal joints.

Extend transverse expansion and contraction joints continuously from edge to edge of the pavement through interconnected slabs.

Contraction joints

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

Construction joints

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

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

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

Expansion joints

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

Jointing materials: Provide jointing materials compatible with each other, and non-staining to concrete in visible locations.

Foamed materials (in compressible fillers): Closed-cell or impregnated, not water absorbing.

Isolation joints

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

Preparing joints

Stripping time: At least 12 hours.

Clean: Immediately before installation of the sealer, make sure the joint space is dry, clean and free from loose material. Remove laitance, curing compound and protrusions of hardened concrete from the sides and upper edges of the joint.

Joint sealing

Sealant type: Provide silicone sealant in conformance with the manufacturer's recommendations.

Backing rod: Compressible closed cell polyethylene foam with a bond breaking surface.

3.11 SURFACE SEALERS**General**

Application: Apply surface sealer after the curing period and when concrete has dried to allow the sealer to penetrate into the concrete surface.

Curing sealer compound: If using the sealer as a curing compound, apply directly after finishing.

3.12 COMPLETION**Completion tests**

Slip resistance of completed installation: To AS 4663.

Rectification

Reinstating adjacent surfaces: Reinstate surfaces next to new pavements and associated elements. If an existing road pavement has been disturbed, trim back to a straight and undisturbed edge, 250 to 300 mm from and parallel to the new concrete for the full depth of the slab.

Cleaning

Excavated material: Remove from site.

0276 PAVING – SAND BED**1 GENERAL****1.1 RESPONSIBILITIES****Performance**

General: Coordinate with drainage, adjacent structures and trees.

Conformance: Conform to local authority requirements for levels, grades and paving details (including shape, colour and laying pattern) for paving to footpaths and driveways.

Requirements: Provide paving conforming to the following:

- The documented level tolerances.
- Consistent in colour and finish.
- To direct all water flowing from supply points to drainage outlets without leakage to the substrate or adjacent areas.

1.2 STANDARDS**General**

Concrete and clay pavers: To AS/NZS 4455.2.

Slip resistance

Classification: To AS 4586.

1.3 INTERPRETATION**Abbreviations**

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

- AGPT: Austroads Guide to Pavement Technology.
- CBR: California Bearing Ratio.
- CCAA: Cement Concrete and Aggregates Australia.
- CMAA: Concrete Masonry Association of Australia.

Definitions

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

- Absolute level tolerance: Maximum deviation from design levels.
- Base: One or more layers of material, forming the uppermost structural element of a pavement and on which the surfacing may be placed.
- Concrete segmental pavers: Units of not more than 0.10 m² in gross plan area, manufactured from concrete, with top and bottom faces parallel, with or without chamfered edges and identified by the following shape types:
 - . Shape Type A: Dentated chamfered units which key into each other on four sides, are capable of being laid in herringbone bond, and by plan geometry, when interlocked, resist the spread of joints parallel to both the longitudinal and transverse axes of the units.
 - . Shape Type B: Dentated units which key into each other on two sides, are not (usually) laid in herringbone bond, and by plan geometry, when keyed together, resist the spread of joints

parallel to the longitudinal axes of the units and rely on dimensional accuracy and accuracy of laying to interlock on the other faces.

- Shape Type C: Units which do not key together rely on dimensional accuracy and accuracy of laying to develop interlock.
- Density ratio (soil): Percentage of the maximum density at optimum moisture content as determined by AS 1289.5.2.1.
- Lippage: Height deviation between adjacent units.
- Pavers: Units made from clay, stone, precast concrete, ceramic, terrazzo and/or other inorganic raw materials, generally over 20 mm thick, used as coverings for horizontal surfaces. Larger pavers are often referred to as flags.
- Relative level tolerance: Maximum deviation from a 3 m straightedge laid on the surface.
- Soldier course: A course of whole or trimmed rectangular pavers at the pavement restraint edge.

1.4 TOLERANCES

Finished surface level

General: Conform to the following:

- Absolute level tolerance: ± 8 mm.
- Relative level tolerance: 8 mm.
- Lippage: Less than 2 mm.

1.5 SUBMISSIONS

Authority approvals

Local authority: Submit authority approvals for paving products, laying patterns, alignment and drainage for footpaths or crossovers.

Execution details

Base material: Submit test results on quality, grading and compaction.

Paving pattern: If it appears that minor variations to joint widths will minimise cutting, submit proposals.

Products and materials

Compliance certificate: Submit compliance certificates for the pavers, as documented.

Type tests: Submit results, as follows:

- Slip resistance of pavers.
- Accelerated wear test of pavers.

Samples

General: Submit labelled samples of pavers, illustrating the range of variation in colours and finish.

Tests

Site tests: Submit results, as follows:

- Slip resistance test of completed installations.

1.6 INSPECTION

Notice

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

- Completed base preparation.
- Completed trial set-out for paving.
- Completed paving.

2 PRODUCTS

2.1 SAND

Bedding sand

Quality: Free of deleterious material, such as soluble salts which may cause efflorescence.

Grading: To the **Bedding sand grading table** tested to AS 1141.11.1.

Fines: Do not use single-sized, gap-graded or excessive fine material.

Cement: Do not use cement bound material.

Moisture content: Make sure moisture content is uniform and between 4 to 8%.

Bedding sand grading table

Sieve aperture	Percentage passing (by mass) %
9.52 mm	100
4.75 mm	95 – 100
2.36 mm	80 – 100
1.18 mm	50 – 85
600 μ m	25 – 60
300 μ m	10 – 30
150 μ m	5 – 15
75 μ m	0 – 10

Joint filling sand

General: Well-graded sand, free of deleterious material such as soluble salts which may cause efflorescence.

Moisture content: Use dry sand.

Cement: Do not use cement.

Grading: To the **Joint filling sand grading table** tested to AS 1141.11.1.

Joint filling sand grading table

Sieve aperture	Percentage passing %
2.36 mm	100
1.18 mm	90 – 100
600 μ m	60 – 90
300 μ m	30 – 60
150 μ m	15 – 30
75 μ m	5 – 10

2.2 GEOTEXTILE MATERIALS

General

Standard: To AS 3705.

Quality: Free of flaws, stabilised against UV radiation, rot proof, chemically stable and with low water absorbency. Filaments resistant to delamination and dimensionally stable.

2.3 CONCRETE AND CLAY PAVERS

General

Standard: To AS/NZS 4455.2.

Permeable interlocking concrete segmental pavers: To CMAA PE01.

Properties

Requirements: To AS/NZS 4455.2 Table 2.8.

2.4 OTHER MATERIALS

Tactile ground surface indicators

Standard: To AS/NZS 1428.4.1.

2.5 EDGE RESTRAINT

Concrete

Standard: To AS 1379.

Compressive strength: 32 MPa.

Sleepers

Hardwood: Sound hardwood railway sleepers to AS 3818.2.

Softwood: Sound preservative-treated softwood sleepers.

Preservative treatment: Hazard class H4 to AS 1604.1.

3 EXECUTION

3.1 SUBGRADE

Preparation

Extent: Prepare the subgrade to the required profile and extend to the rear face of the proposed edge restraints or to the face of existing abutting structures.

Subgrade preparation: To *0222 Earthwork*.

Drainage of subgrade

Subgrade drainage: Prepare piped or channelled stormwater and subsoil drainage to *0224 Stormwater – site*.

Service trenches: Backfill all drainage trenches to perform similar to the undisturbed ground.

3.2 BASE COURSE

Preparation

Base course extent: Extend base course below the edge restraint for its full width except at walls or pits.

Base course: Conform to *0271 Pavement base and subbase*.

3.3 EDGE RESTRAINT

Lateral restraint to segmental paving

Perimeter: If not provided by other structures, provide edge restraints to bedding and units.

Drainage: Position edge restraint and pavers so that the tops of the pavers are slightly above the front edge of the edge restraint.

Edge restraint shape: Make sure the edge restraint has a vertical or near vertical side abutting the pavers.

Sleeper edging

General: Fix sleepers in position by spiking with two 13 mm diameter galvanized mild steel rods per sleeper, penetrating at least 400 mm into the subgrade. Drive the rods flush with the upper surface of the sleeper. Arris the upper exposed sleeper edges to produce a 15 mm wide chamfer at 45° to the edges.

Concrete edging or kerb

Construction: Fixed form, extrusion or slip forms to AS 2876.

Edging or kerb: Place in a shallow trench between timber forms. Wood float finish flush with the adjacent finished level.

Joints: Provide contraction joints 20 mm deep every 5 m.

Timing: Complete concrete edge restraints before bedding course. Allow concrete edge restraints to harden before vibration of the surface course.

Brick

Setting: On a 1:1:6 (cement:lime:sand) mortar haunch.

Joints: 3 mm struck flush.

Alignment: Even and free from dips, humps and bends.

Cleaning: Wash off mortar progressively.

3.4 BEDDING COURSE

General

Preparation: Remove all loose material from the prepared base.

Geotextile

Position: Place fabric between the base course and the bedding sand and lap 150 mm at joints.

Bedding sand

Spreading: Screed uncompacted sand over prepared base uniformly to achieve a 30 mm thick layer. Maintain sand at a uniform loose density and moisture content.

Bedding course drainage: If water ponding occurs at edge restraint, drain bedding course to existing subsurface drain or drainage pit using geotextile and 20 mm diameter PVC pipe.

Trial section

Moisture content: Prepare a trial section to establish the moisture content limits which will allow paver system compaction to be achieved.

3.5 LAYING PAVING

General

Paving pattern: Prepare a trial set-out for each area.

Laying: Lay paving units on the screeded sand bedding to the documented pattern.

Joints: 2 to 5 mm gap.

Cut courses: 50 mm minimum plan dimension. On footpaths and other linear elements, use at least two cut courses and maintain symmetry.

Control: Control alignment and laying pattern by stringlines or chalked stringlines every 5 m intervals.

Variable width areas: Include in situ concrete infill strips to make a straight area for paving and take up the variable width. If there is a concrete base, provide paving control joints as follows:

- Located over base control joints.
- 10 mm wide and filled with bitumen impregnated fibreboard.

Laying around obstacles

Public utility access pits and penetrations: Adjust access covers as required before commencing paving. Make sure water drains away from pits with lids and into surface inlet drainage structures.

Concrete surrounds:

- Plan shape: Square or rectangular with a smooth connection with the laying pattern of the pavers.
- Pit position: Centring not required.
- Minimum thickness between the pit and paving: 100 mm.
- Strength grade: N32.
- Colour: Natural.

Precast access chamber: Lay pavers to suit specific dimensions of authority access chambers.

Patterns around obstacles: Lay up both sides of the feature from the main or original laying face.

Compaction of bedding

Compaction: Compact the sand bedding after laying paving units with a vibrating plate compactor and appropriate hand methods.

Sequence: Compact paving as follows:

- Progressively behind the laying face.
- Complete compaction of laid paving at end of each day.
- Do not compact within 1 m of the laying face except where adjacent to an edge restraint.

Joint filling: Compact all paving units to design levels before starting of joint filling.

Joint filling

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.

Timing: Start joint filling immediately after compaction.

3.6 TESTING

Completion tests

Slip resistance of completed installation: To AS 4663.

3.7 COMPLETION

Protection of the work

Protection: Prevent all vehicular and pedestrian traffic from using the pavement until all compaction and joint filling is completed and all edge restraints are in place.

Spare pavers

General: Supply spare matching pavers of each type for future replacement purposes. Store the spare materials on site.

Quantity: At least 1% of the quantity installed.

Cleaning

General: Leave pavements clean on completion.

Final inspection

General: Before the date for practical completion carry out the following inspections:

- Cracking in bound pavements: Width 1.5 mm.
- Subsidence: Offset less than 1.5 m length of the design profile, not more than 5 mm.
- Stepping: Between adjacent elements within the pavement area, not more than 5 mm.

- Chipping and spalling to pavement units: Maximum 10/100 units with chipped or spalled arrises.
- Ponding: Maximum 10 mm deep 15 minutes after rain ceases.
- Paving joints: Refill joints as required.

0277 PAVEMENT ANCILLARIES**1 GENERAL****1.1 INTERPRETATION****Definitions**

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

- Absolute level tolerance: Maximum deviation from design levels.
- Relative level tolerance: Maximum deviation from a 3 m straightedge laid on the surface.

1.2 TOLERANCES**Channels and kerbs**

Absolute level tolerance: ± 10 mm at any point on the finished surface.

Relative level tolerance: 5 mm to the top or face of kerbs, and to the surface of channels.

Plan position deviation: 25 mm.

Exception: Kerb laybacks, grade changes or curves, or at gully pits requiring channel depression.

Linemarking

Longitudinal line lengths: ± 20 mm from the lengths documented in AS 1742.2.

Longitudinal line widths: ± 10 mm from the widths documented in AS 1742.2

Transverse line lengths and widths: ± 10 mm from the lengths and widths documented in AS 1742.2.

Other markings: ± 50 mm from the dimensions documented or in AS 1742.2 for arrows, chevrons, painted medians, painted left turn islands and speed markings. Place arrows and speed markings square with the centreline of the traffic lane.

Vehicle barriers

Plan position deviation: 50 mm.

Length: ± 20 mm.

Bollard plumb: H/100.

2 PRODUCTS**2.1 CHANNELS AND/OR KERBS****Concrete**

Precast: Proprietary precast units as documented.

In situ: To AS 2876.

Grade: N20.

2.2 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.

2.3 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.

Steel tube bollards

Type: Bollards fabricated from heavy steel tube, to AS 1074.

Minimum nominal size: DN 100.

3 EXECUTION**3.1 CHANNELS AND/OR KERBS****General**

Precast: Install to manufacturer's instructions.

In situ: Construct channels and/or kerbs in fixed forms, by extrusion or by slip forming to AS 2876.

Preparation

Requirement: To AS 2876 Section 8.

Subgrade or subbase material: Shape and compact to form a firm base before placing channels and/or kerbs.

Setting out

General: Set out the work so that all channels and kerbs are placed with tolerances, as documented.

Backfill

Timing: Not earlier than three days after placing channels and/or kerbs, backfill and reinstate the spaces on both sides of the channels and/or kerbs.

Material: Granular, free of organic material, clay and rock in excess of 50 mm diameter.

Compaction: Compact backfill in maximum 150 mm thick layers, to a relative compaction of 95% tested to AS 1289.5.4.1, for standard compactive effort.

Pavement: Backfill pavement material adjacent to new channels and/or kerbs to the documented requirements of the pavement material.

3.2 LINEMARKING**Preparation**

Surface: Clean, dry and free of any deposit which may impair adhesion of the linemarking.

Wet weather: Do not apply linemarking during wet weather or if rain is likely to fall during application or paint drying time.

Provision for traffic: Allow for traffic during application and protect linemarkings until the material has dried sufficiently to carry traffic without being damaged.

Mixing of paint: Before use, mix all paint in its original container to produce a smooth uniform product consistent with the freshly manufactured product.

Setting out

General: Set out the work so that all linemarkings are placed within tolerances, as documented.

Application of linemarking

Longitudinal lines: Spray all longitudinal lines with a self-propelled machine. For a one-way or two-way barrier line pattern, concurrently spray the two sets of lines.

Hand spraying: Hand spray transverse lines, symbols, letters, arrows and chevrons using templates.

Paint thickness: Uniform wet film thickness: 0.35 mm to 0.40 mm.

Linemarking alignment: Straight or with smooth, even curves as documented.

Edges: Form clean, sharp edges. Remove any paint applied beyond the defined edge of the linemarking and leave a neat and smooth marking on the wearing surface of the pavement.

Removal of existing pavement markings

General: Remove existing linemarking, as documented, from the wearing surface of pavements without causing significant damage to the surface.

3.3 VEHICLE BARRIERS**Timber log barriers**

Installation: Check out the posts to receive the rails. Set each post 600 mm below the finished surface level and surround with compacted fine crushed rock, gravel or cement stabilised rammed earth. Bolt rails to posts with M12 diameter galvanized bolts and washers, with bolt heads and nuts recessed.

Precast concrete wheel stops

Installation: Drive 12 mm diameter galvanized steel rods a minimum of 600 mm below finished surface level and stop the top of the rod 25 mm below the top of the wheel stop.

Concrete pavement/slab: Bolt the wheel stop to the pavement using galvanized steel masonry anchors, installed to manufacturer's recommendations. Top of bolt to stop 25 mm below the top of the wheel stop.

Completion: Grout fill the holes flush to match the concrete finish.

Steel tube bollards

Installation: Encase buried end of bollard in concrete footing, minimum 600 mm deep x 250 mm diameter. Finish top of footing minimum 100 mm below finished surface level.

On concrete slabs: Weld on a 10 mm thick baseplate drilled for 4 bolts, and bolt to concrete slab using galvanized steel masonry anchors installed to manufacturer's recommendations.

Filling: Fill the tube with 15 MPa concrete.

Open ends: Seal with matching fabricated end caps, spot welded and ground smooth.

0310 CONCRETE – COMBINED**1 GENERAL****1.1 RESPONSIBILITIES****Performance**

Requirements:

- Conforming to the design details and performance criteria.
- Satisfying quality and inspection requirements.
- Compatible with documented applied finishes.

1.2 DESIGN**Requirements**

Formwork: The design of formwork, other than permanent composite form systems, is the contractor's responsibility. Allow for dimensional changes, deflections and cambers resulting from the following:

- Imposed actions.
- Concrete shrinkage and creep.
- Temperature changes.

1.3 STANDARDS**General**

Formwork design and construction, and formed surfaces: To AS 3610.1.

Plywood formwork: To AS 6669.

Composite steel-concrete construction, including profiled steel sheeting and shear connectors: To AS/NZS 2327.

Specification and supply of concrete: To AS 1379.

Reinforced concrete construction: To AS 3600.

Residential ground slabs and footings: To AS 2870.

Slip resistance

Classification: To AS 4586.

1.4 INTERPRETATION**Definitions**

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

- Ambient temperature: The air temperature at the time of mixing and placing of concrete.
- Average ambient temperature: Average value of the daily maximum and minimum ambient temperatures over the defined period at a site.
- Batch: A quantity of concrete containing a fixed amount of ingredients and produced in a discrete operation.
- Concrete class – normal: Concrete that is specified primarily by a standard compressive strength grade up to 50 MPa and otherwise in conformance with AS 1379 clause 1.5.3.
- Early age strength: A mean compressive strength at 7 days exceeding the values shown in AS 1379 Table 1.2.
- Production assessment: An assessment procedure for concrete defined by strength grade,

carried out by the supplier and based on the statistical assessment of standard compressive strength tests on concrete, specified by compressive strength and produced by a specific supplying plant.

- Sample: A physical example that illustrates workmanship, materials or equipment, and establishes standards by which the work will be judged. It includes samples and sample panels.
- Specimen: A portion of a sample which is submitted for testing.
- Weather – cold: Ambient shade temperature less than 10°C.
- Weather – hot: Ambient shade temperature greater than 30°C.

1.5 TOLERANCES

Formwork

Plumb of elements > 8 m high: 1:1000.

Plumb of elements ≤ 8 m high: To AS 3610.1.

Position: Construct formwork so that finished concrete conforms to AS 3600 clause 17.5 and as documented.

Reinforcement

Reinforcement and tendon position: To AS 3600 clause 17.5.3.

Formed surfaces

Finish quality: To AS 3610.1 Table 3.3.3.1.

Flatness tolerance class table

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

1.6 SUBMISSIONS

Execution details

Re-shoring: Submit details of any proposed re-shoring.

Surface repair method: Submit details of any proposed surface repair method before starting repairs.

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

- Changes to the concrete mix.
- Curing and protection methods.
- Cutting or displacing reinforcement, or cutting or coring hardened concrete.
- Handling, placing, compaction and finishing methods and equipment, including pumping.
- Sequence and times for concrete placement and construction joint locations and relocations.
- Site storage, mixing and transport methods and equipment, if applicable.
- Temperature control methods.
- Sawn joints: Submit details of proposed methods, timing and sequence of sawing joints.

Reinforcement: Submit the following:

- General: Details of any proposed changes to documented reinforcement.
- Damaged galvanizing: Details of proposed repair to AS/NZS 4680 Section 8.
- Mechanical bar splices: Details and test certificates for each size and type of bar to be spliced.
- Provision for concrete placement: Details of spacing or cover to reinforcement that does not conform to AS 3600.
- Splicing: Details of any proposed changes to documented requirements.
- Welding: Details of any proposed welding of reinforcement to AS/ANZ 1554.3.

Pre-mixed supply delivery dockets: For each batch, submit a docket listing the information required by AS 1379, and the following:

- Method of placement and climate conditions during pour.
- Name of concrete delivery supervisor.
- Project assessment carried out each day.
- The concrete element or part of the works for which the concrete was ordered, and where it was placed.
- The total amount of water added at the plant and the maximum amount permitted to be added at the site.

Products and materials

Product conformity: Submit evidence of conformity, as appropriate, as follows:

- Certification by a JAS-ANZ accredited third party.
- Report by a registered testing authority describing tests and giving results which demonstrate that the product conforms.

Concrete mixes: Submit details, for each grade and type of concrete including any proposed use of special-purpose cement types.

Curing compounds: Submit details of any proposed curing compound, including the following:

- Evidence of compatibility with concrete, and with applied finishes including toppings and render, if any, including methods of obtaining the required adhesion.
- For visually important surfaces, evidence that an acceptable final surface colour will be obtained.

Admixtures: Submit details of any proposed admixtures, including the following:

- Brand name.
- Place of manufacture.
- Basic chemical composition.

Shop drawings

Cores, fixings and embedded items: Submit the proposed locations, clearances and cover and show any proposed repositioning of reinforcement.

Subcontractors

Pre-mixed supply: Submit names and contact details of proposed pre-mixed concrete suppliers and alternative source of supply in the event of breakdown of pre-mixed or site mixed supply.

Tests

Requirement: Submit test results, as follows:

- Concrete compressive strength test results to AS 1012.9.
- Slip resistance test of completed installations.

1.7 INSPECTION

Notice

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

- Used forms, after cleaning and before re-use.
- Base or subgrade before covering.
- Membrane or film underlay installed on the base or subgrade.
- Completed formwork and reinforcement, tendons, cores, fixings and embedded items fixed in place before placing concrete.
- Concealed surfaces or elements before covering.
- Commencement of concrete placing.
- Evaluation of the off-form finishes.
- Evaluation of surface finish.

2 PRODUCTS

2.1 CONCRETE

Properties

Concrete mix and supply: Conform to the following:

- Normal-class: To AS 1379 clause 1.5.3.
- Special-class: To AS 1379 clause 1.5.4.

Aggregates

Standard: To AS 2758.1.

Cement

Standard: To AS 3972.

Age: Less than 6 months old.

Storage: Store cement bags under cover and above ground.

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.

Concrete colour

Standard: To AS 3610.1.

Chemical admixtures

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

2.2 FORMWORK

General

Form face, linings and release agents: Compatible with documented concrete surface finish and any proposed applied finishes to concrete.

Trapped forms: Free of timber or chlorides and not to impair the structural performance of the concrete members.

Void formers

Requirement: Material capable of maintaining rigidity and shape until the concrete has set, capable of withstanding construction loads and non-collapsible on absorption of moisture.

Laboratory testing: Use void formers tested under laboratory conditions for conformance with the following:

- Deflection during placing and compaction of the concrete does not exceed beam or slab span/1000.
- Additional deflection between initial set and 7 days does not exceed span/400.

Test method: Place formers on damp sand and load with a mass of wet concrete at least equal to the mass of the beams or slabs to be supported.

Profiled steel sheeting composite forms

Material: Hot-dipped zinc-coated sheet steel to AS 1397.

Minimum steel grade: G550.

Accessories: Use materials and corrosion protection compatible with the profiled steel sheeting.

Plywood forms

Material: To AS 6669.

Grade: Use appropriate grade for the documented design dimensions, loading and surface quality.

Joints: Seal the joints consistent with the documented surface finish class.

Tolerances: To AS 3610.1 Section 3.

2.3 REINFORCEMENT

Steel reinforcement

Standard: To AS/NZS 4671.

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

Protective coating

Standard: To AS 3600 clause 17.2.1.2.

Requirement: For concrete elements containing protective coated reinforcement, provide the same coating type to all that element's reinforcement and embedded ferrous metal items, including tie wires, stools, spacers, stirrups, plates and ferrules, and protect other embedded metals with a suitable coating.

Epoxy coating: High-build, high solids, chemically resistant coating to AS/NZS 3750.14.

- Thickness: 200 µm minimum.

Galvanizing: To AS/NZS 4680, as follows:

- Sequence: If fabricating after galvanizing, repair damaged galvanizing and coat cut ends.
- Zinc-coating (minimum): 600 g/m².

Tie wire

General: Annealed steel 1.25 mm diameter (minimum).

External and corrosive applications: Galvanized.

2.4 MISCELLANEOUS

Polymeric film underlay

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

Curing compounds

Liquid membrane-forming compounds: To AS 3799.

Surface modifiers

Hardeners, sealants and protectors: If documented, proprietary products conforming to the manufacturer's recommendations.

Slip resistance treatment: If documented, proprietary products conforming to the manufacturer's recommendations.

3 EXECUTION

3.1 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.

Base preparation

Requirement: Conform to base type, as follows:

- Concrete working base: Remove projections above the plane surface, and any loose material.
- Graded prepared subgrade: Blind with sand to create a smooth surface free from hard projections. Lightly wet the sand just before laying the underlay.

Installation

Standard: To AS 2870 clause 5.3.3.

Requirement: Lay underlay over the base, as follows:

- Lap joints at least 200 mm and seal the laps and penetrations with waterproof adhesive tape.
- Face the laps away from the direction of concrete pour.
- Continue up vertical faces past the damp-proof course where applicable, and tape fix at the top.
- Patch or seal punctures or tears before placing concrete.
- Cut back as required after concrete has gained strength and formwork has been removed.

3.2 FORMWORK

Substrates

Cleaning: Before placing concrete remove free water, dust, debris and stains from the form face and the formed space.

Bolt holes

Formwork tie bolts left in the concrete: Position more than 50 mm from the finished surface.

Corners

Work above ground: Bevel with a chamfer at re-entrant angles, and a fillet at corners.

Face of bevel: 25 mm.

Embedments

Fixing: Fix embedments through formwork to prevent movement, or loss of slurry or concrete, during concrete placement.

Openings

Requirement: In vertical forms provide openings or removable panels for inspection and cleaning, at the base of columns, walls and deep beams.

Access: For thin walls and columns, provide access panels for placing concrete.

Release agents

Application: Before placing reinforcement, apply a release agent to form face and linings.

Profiled steel sheeting composite formwork

Fixing: If sheeting cannot be fixed to structural steel supports with puddle welds, or with welded shear studs, provide details of proposed fixings.

Visually important surfaces

Surface finish classes 1, 2 or 3: Set out the formwork to give a regular arrangement of panels, joints, bolt holes, and similar visible elements in the formed surface.

Void formers

Protection: Keep void formers dry until use, install on a firm level surface and place reinforcement and concrete with minimum delay.

3.3 REINFORCEMENT

Dowels

Fixing: If a dowel has an unpainted half, embed that half in the concrete placed first.

Tolerances:

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

Grade: 250 N.

Cover

Concrete cover generally: To AS 3600 clause 4.10.

Concrete cover for structures for retaining liquids: To AS 3735.

Supports

Concrete, metal or plastic supports: Provide as follows:

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

Spacing:

- Bars: \leq 60 bar diameter.
- Mesh: \leq 600 mm.

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

Projecting reinforcement

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

Tying

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

Beams: Tie stirrups to bars in each corner of each stirrup. Fix other longitudinal bars to stirrups at 1 m maximum intervals.

Bundled bars: If required, tie bundled bars in closest possible contact. Provide tie wire at least 2.5 mm diameter and spaced not more than 24 times the diameter of the smallest bar in the bundle.

Columns: Secure longitudinal column reinforcement to all fitments (or helical reinforcement) at every intersection.

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

3.4 CONCRETE**Elapsed delivery time**

General: Make sure that the elapsed time between the wetting of the mix and the discharge of the mix at the site is in conformance with the **Elapsed delivery time table**. Do not discharge at ambient temperature below 10°C or above 30°C unless approved heating or cooling measures are taken to deliver concrete within the range 5°C to 35°C.

Elapsed delivery time table

Concrete temperature at time of discharge (°C)	Maximum elapsed time (minutes)
5 – 24	120
24 – 27	90
27 – 30	60
30 – 35	45

Pre-mixed supply

Addition of water: To AS 1379 clause 4.2.3.

Transport method: Select to prevent segregation, loss of material and contamination of the environment, and not to adversely affect placing or compaction.

Site mixed supply

Emergencies: If mixing by hand, provide details.

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

3.5 TESTING**General**

Test authority: Concrete supplier or an Accredited Testing Laboratory.

Reports and records of test results: To the relevant parts of the AS 1012 series. Keep results on site.

Assessment process of test results

Standard: To AS 1379.

Sampling

Method of sampling: AS 1012.1.

Sampling locations: To AS 1012.1 and the following:

- Slump tests: On site, at the point of discharge from the agitator.

Frequency of sampling: To AS 1379 Sections 5 and 6 and the following:

- Slump tests: Take at least one sample from each batch.

3.6 CORES, FIXINGS AND EMBEDDED ITEMS**General**

Requirement: Install fasteners to manufacturer's recommendations and the assumptions of AS 5216 Appendix D.

Adjoining elements

Fixings: Provide fixings for adjoining elements. If required, provide temporary support to the adjoining elements during concreting, to prevent movement.

Protection

General: Grease threads. Protect embedded items against damage.

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

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

Structural integrity

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

Isolation: Isolate embedded items to prevent water tracking to concrete that provides minimum cover to reinforcement.

Tolerances

General: Maximum deviation from correct positions:

- Anchor bolt groups for structural steel: To AS/NZS 5131.
- Cores and embedded items generally: 10 mm.
- Other fixing bolts: 3 mm.

3.7 CONCRETE WORKING BASE**Finish**

Membrane support: Wood float finish or equivalent.

Installation

General: Lay over the base or subgrade and screed to the required level.

Surface flatness tolerance

Maximum deviation: 6 mm from a 3 m straightedge.

3.8 PLACING AND COMPACTION**Placing**

Horizontal transport: Use suitable conveyors, clean chutes, troughs, hoppers or pipes.

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

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

Compaction

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

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

Placing records

Log book: Keep on site and make available for inspection a log book recording each placement of concrete, including the following:

- Date.
- Specified grade and source of concrete.
- Slump measurements.
- The portion of work.
- Volume placed.

Rain

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

Vertical elements

Placement: Limit the free fall of concrete to maximum of 2000 mm.

Placing in cold weather

Cement: Do not use high alumina cement.

Temperature limits: Maintain the following:

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

High early strength cement: If deteriorating weather conditions are predicted, use high early strength cement.

Temperature control: Heat the concrete materials, other than cement, to the minimum temperature necessary so that the temperature of the placed concrete is $\geq 5^{\circ}\text{C}$.

Admixtures: Do not use calcium chloride, salts, chemicals or other material in the mix to lower the freezing point of the concrete.

Frozen materials: Do not allow frozen materials or materials containing ice to enter the mixer, and keep free of frost and ice any forms, materials, and equipment coming in contact with the concrete.

Freezing: Prevent concrete from freezing.

Placing in hot weather

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

Temperature limits: Maintain the following:

- Normal concrete in footings, beams, columns, walls and slabs: $\leq 35^{\circ}\text{C}$.
- For concrete strength grade less than 40 MPa with section thickness ≥ 1 m in all dimensions: $\leq 27^{\circ}\text{C}$.
- For concrete strength grade 40 MPa or greater with section thickness ≥ 600 mm in all dimensions: $\leq 27^{\circ}\text{C}$.
- Forms and reinforcement before and during placing: $\leq 35^{\circ}\text{C}$.

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

Temperature control: Select one or more of the following methods of maintaining the temperature of the placed concrete at 35°C or less:

- Cool the concrete using liquid nitrogen injection before placing.
- Cover horizontal transport containers.
- Spray the coarse aggregate using cold water before mixing.
- Use chilled mixing water.

3.9 JOINTS**Construction joints**

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

Finish: Butt join the surfaces of adjoining pours. In visually important surfaces make the joint straight and true, and free from blemishes impermissible for its surface finish class.

Preparation: Roughen and clean the hardened concrete joint surface. Remove loose or soft material, free water, foreign matter and laitance. Dampen the surface just before placing the fresh concrete and coat with a neat cement slurry.

Expansion joints

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

Preparation: Before filling, dry and clean the joint surfaces, and prime.

Watertightness: Apply the jointing material so that joints subject to ingress of water are made watertight.

Jointing materials: Provide jointing materials compatible with each other, and non-staining to concrete in visible locations.

Bond breaking: Provide back-up materials for sealants, including backing rods, which do not adhere to the sealant.

Foamed materials (in compressible fillers): Closed-cell or impregnated, not water absorbing.

Slip joints

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

3.10 FORMED SURFACES**General**

Surface finish: As documented.

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

Curing

Requirement: If formwork is stripped before the minimum curing period for the concrete has elapsed, continue curing the exposed faces as soon as the stripping is completed.

Evaluation of formed surfaces

General: If evaluation of formed surface is required, complete the evaluation before surface treatment.

Finishing methods

Requirement: If soffits of horizontal concrete elements or faces of vertical concrete elements are to have a finish other than an off-form finish, provide finishes as documented.

Form removal: If vertical face formwork needs to be removed for finishing methods, while the concrete is green, make sure the concrete has sufficiently set to prevent slump.

Floated finishes:

- Sand floated finish: While the concrete is green, wet the surface and rub using a wood float. Rub fine sand into the surface until a uniform colour and texture are produced.
- Grout floated finish: While the concrete is green, wet the surface and spread a slurry, using hessian pads or sponge rubber floats. Remove surplus slurry and work until a uniform colour and texture are produced.

Smooth rubbed finish: While the concrete is green, wet the surface and rub using a carborundum or similar abrasive brick until a uniform colour and texture are produced.

3.11 UNFORMED SURFACES**General**

Finished levels: Strike off, screed and level slab surfaces to finished levels and to the flatness tolerance class documented.

Surface repairs

Method: If surface repairs are required, submit proposals.

Finishing methods - primary finish

Machine float finish:

- After levelling, consolidate the surface using a machine float.
- Cut and fill and refloat immediately to a uniform, smooth, granular texture.
- Hand float in locations inaccessible to the machine float.

Steel trowel finish: After machine floating, finish as follows:

- Use power or hand steel trowels to produce a smooth surface relatively free from defects.
- When the surface has hardened sufficiently, re-trowel to produce the final consolidated finish free of trowel marks and uniform in texture and appearance.

Wood float finish: After machine floating, use wood or plastic hand floats to produce the final consolidated finish free of float marks and uniform in texture and appearance.

Broom finish: After machine floating and steel trowelling use a broom or hessian belt drawn across the surface to produce a coarse even-textured transverse-scored surface.

Scored or scratch finish: After screeding, use a stiff brush or rake drawn across the surface before final set, to produce a coarse scored texture.

Sponge finish: After machine floating and steel trowelling, use a damp sponge to wipe the surface to produce an even textured sand finish.

Finishing methods – supplementary finish

Stamped and coloured faux paved or cobblestone finish: Provide a proprietary finishing system.

3.12 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, unless accelerated curing is adopted:
 - . Fully enclosed internal surfaces/Early age strength concrete: 3 days.
 - . Other concrete surfaces: 7 days.
- End of curing period: Prevent rapid drying out at the end of the curing period.
- Protection: Maintain at a reasonably constant temperature with minimum moisture loss, during the curing period.

Curing compounds

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

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

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

Visually important surfaces: Apply curing compounds to produce uniform colour on adjacent surfaces.

Cold weather curing

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

Hot weather curing

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

Water curing

Method: Select a method of ponding or continuously sprinkling to prevent damage to the concrete surface during the required curing period.

3.13 COMPLETION**Formwork removal**

Extent: Remove formwork, other than permanent forms and trapped forms, including formwork in concealed locations.

Timing: Do not disturb formwork until concrete is hardened enough to withstand formwork movements and removal without damage.

Stripping:

- General: To AS 3600 where it is more stringent than AS 3610.1.
- Vertical formwork: To AS 3610.1 Appendix C Table C2.
- Multi-storey work: Remove formwork without disturbing props supporting succeeding floors.

Removable bolts: Remove tie bolts without damaging the concrete.

Bolt hole filling: Provide material with durability and colour matching the concrete.

Recessed filling: Fill or plug the hole to 6 mm below the finished surface.

Curing: If formwork is stripped before the minimum curing period for the concrete has elapsed, continue curing the exposed faces as soon as the stripping is completed.

Protection

General: Protect the concrete from damage due to construction loads, physical and thermal shocks, and excessive vibrations, particularly during the curing period.

Surface protection: Protect finished concrete surfaces and applied finishes from damage.

Completion tests

Slip resistance of completed installation:
To AS 4663.

0331 BRICK AND BLOCK CONSTRUCTION

1 GENERAL

1.1 STANDARDS

General

Materials and construction: To AS 3700.

1.2 TOLERANCES

General

Requirement: To AS 3700 Table 12.1.

1.3 INSPECTION

Notice

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

- Set-out.
- Unit type, colour and texture.
- Bottoms of cavities, after cleaning out.
- Bottoms of core holes, before grouting.
- Reinforcement type and diameter.
- Positioning of reinforcing before grouting.
- Control joints, ready for insertion of joint filler.
- Damp-proof courses, in position.
- Flashings, in position.
- Lintels, in position.
- Structural steelwork, including bolts and shelf angles, in position.

2 PRODUCTS

2.1 FIRE PERFORMANCE

Fire-resistance of building elements

Fire-resistance level: Tested to AS 1530.4.

2.2 DURABILITY

General

Exposure locations: To AS 3700 clause 5.4.

2.3 MATERIALS

Brick and block units

Standard: To AS/NZS 4455.1 and AS/NZS 4455.3.

Salt attack resistance grade: To AS 3700 Table 5.1.

Minimum age of clay bricks: 7 days.

Mortar materials

Mortar class: To AS 3700 Table 5.1.

Cement: To AS 3972.

White cement: With $\leq 1\%$ iron salts content.

Lime: To AS 1672.1.

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

Water: Clean and free from any deleterious matter.

Admixtures: To AS 3700 clause 11.4.2.4.

Pigment: To EN 12878, and as follows:

- Integral pigment mix proportion: $\leq 10\%$ by weight of cement.

Masonry cement mortar mix proportions table (cement:lime:sand), by volume

Mortar class to AS 3700	Clay	Concrete	Calcium silicate	Water thickener
M3	1:0:4	1:0:4	n/a	Yes
M4	1:0:3	n/a	n/a	Yes

Cement (GP/GB) mortar mix proportions table (cement:lime:sand), by volume

Mortar class to AS 3700	Clay	Concrete	Calcium silicate	Water thickener
M2	1:2:9	n/a	n/a	No
M3	1:1:6	1:1:6	n/a	Optional
M3	1:0:5	1:0:5	1:0:5	Yes
M4	1:0.5:4.5	1:0.5:4.5	n/a	Optional
M4	1:0:4	1:0:4	1:0:4	Yes
M4	1:0-0.25:3	1:0-0.25:3	n/a	Optional

Grout

Standard: To AS 3700 clause 11.7.

Minimum characteristic compressive strength: 12 MPa.

2.4 BUILT-IN COMPONENTS

General

Durability class of built-in components: To AS 3700 Table 5.1.

Steel lintels

Angles and flats: To AS/NZS 3679.1.

Cold formed proprietary lintels: Designed to AS/NZS 4600.

Corrosion protection: To AS/NZS 2699.3.

Galvanizing: Do not cut after galvanizing.

Reinforcement

Standard: To AS/NZS 4671.

Corrosion protection: To AS 3700 clause 5.9.

Minimum cover: To AS 3700 Table 5.1.

Wall ties

Standard: To AS/NZS 2699.1.

Corrosion protection: To AS/NZS 2699.1.

Duty classification rating:

- Cavities > 60 mm and < 200 mm wide: Heavy duty.

Corrosive environments (atmospheric corrosivity Category D to F): Conform to **MATERIALS AND COMPONENTS** of 0171 *General requirements*.

Acoustic rated walls: Resilient or plastic ties, as appropriate.

Connectors and accessories

Standard: To AS/NZS 2699.2.

Corrosion protection: To AS/NZS 2699.2.

Flashings and damp-proof courses

Standard: To AS/NZS 2904.

Slip joints

Standard: To AS 3700 clause 4.14.

Air vents

Blockwork: Select from the following:

- Concrete framed: Bronze wire mesh in concrete frame, 390 x 190 mm.

- Vent blocks: Purpose-made vent blocks.

Brickwork: Select from the following:

- Concrete framed: Bronze wire mesh in concrete frames, 470 x 160 mm.

- Cut brick: 2 cut bricks laid vertically and evenly spaced in a 230 mm wide x 2 course high opening, backed with bronze wire mesh built in.

- Terracotta: Perforated, 230 x 160 mm.

3 EXECUTION

3.1 GENERAL

Mortar mixing

General: Measure volumes accurately to the documented proportions. Machine mix for at least six minutes.

Protection

Masonry materials and components: Protect from ground moisture and contamination.

During construction: Cover the top surface of brickwork and blockwork to prevent the entry of rainwater and contaminants.

Bond

Type: Stretcher bond.

Building in

Embedded items: Build in wall ties and accessories as the construction proceeds. If not practicable to obtain the required embedment within the mortar joint in hollow masonry units, fill appropriate cores with grout or mortar.

Steel door frames: Fill the backs of jambs and heads solid with mortar as the work proceeds.

Clearance for timber frame shrinkage

General: In timber frame brick veneer construction, leave clearances between window frames and brick sill and between roof frames and the brick veneer as follows:

- Single storey frames and ground floor windows (not for slab on ground): 10 mm.
- Two storey frames and upper floor windows: 20 mm.
- Additional clearance: To accommodate additional shrinkage of unseasoned floor timbers.

Monolithic structural action

Construction at different rates or times: If two or more adjoining sections of masonry, including intersecting walls, are constructed at different rates or times, rake back or tie the intersections between those sections to obtain monolithic structural action in the completed work.

Header units: Except in stretcher bond facework, provide brick and block header units, to AS 3700 clause 4.11.2.

- Spacing: 600 mm maximum.

- Location: Provide header units in the following locations:
 - . At engaged piers.
 - . At engagement of diaphragms with the leaves in diaphragm walls.
 - . At intersections of flanges with shear walls.
 - . At intersections with supporting walls and buttresses.
 - . Between leaves in solid masonry construction.

Joining to existing

General: Provide a control joint where joining to existing structures. Do not tooth new masonry into existing work unless approved by a professional engineer.

Mortar joints

General: Set out masonry with joints of uniform width and minimum cutting of masonry units.

Solid and cored units: Lay on a full bed of mortar. Fill perpend solid. Cut mortar flush.

Face-shell bedded hollow units: Fill perpend solid. Cut mortar flush.

Joint thickness: 10 mm.

Finish: Conform to the following:

- Externally: Tool to give a dense water-shedding finish.
- Internally: If wall is to be plastered, do not rake more than 10 mm to give a key.

Rate of construction

General: Regulate the rate of construction to eliminate joint deformation, slumping or instability.

Rods

Set-out: Construct masonry to the following rods:

- 75 mm high units: 7 courses to 600 mm.
- 90 mm high units: 6 courses to 600 mm.
- 190 mm high units: 3 courses to 600 mm.

Temporary support

General: If the final stability of the masonry is dependent on construction of (structural) elements after the brickwork and blockwork is completed, provide proposals for temporary support or bracing.

3.2 FACEWORK**Cleaning**

General: Clean progressively as the work proceeds to remove mortar smears, stains and discolouration. Do not erode joints if using pressure spraying.

Acid solution: Do not use.

Colour mixing

Distribution: In facework, distribute the colour range of units evenly to prevent colour concentrations and banding.

Below ground

Facework: Commence face brickwork at least 1 full course for blockwork, or 2 full courses for brickwork, below adjacent finished surface level.

Double face walls

Selection: Select face units for uniform width and double-face qualities.

Preferred face: Before starting, obtain approval of the preferred wall face, and favour that face should a compromise be unavoidable.

Perpends

General: If other than vertically aligned perpends in alternate courses are proposed, provide details.

Sills and thresholds

General: Solidly bed sills and thresholds and lay them with the top surfaces draining away from the building.

Minimum size of cut unit: Three quarters full width.

3.3 SUBFLOOR WORK**Access openings**

General: In internal walls, leave door width openings beneath doorways to give access to underfloor areas.

Air vent locations

General: Provide air vents to give adequate cross ventilation to the space under suspended ground floors.

Cavity walls: Provide matching vents in the internal leaves located as near as practicable to the vents in the external leaves.

Location: Below damp-proof course to internal and external walls.

Underpinning

Requirement: Install underpinning, without causing damage to the building.

Grouting: Pack dry mix M4 mortar between underpinning and existing structure at the completion of each panel of underpinning.

3.4 CAVITY WORK**Cavity clearance**

General: Keep cavities clear at all times.

Cavity fill

General: Fill the cavity with mortar to 1 course above adjacent finished (ground) level. Fall the top surface towards the outer leaf.

Cavity width

General: Construct minimum cavity widths in conformance with the following:

- Masonry walls: 50 mm.
- Masonry veneer walls: 40 mm between the masonry leaf and the load bearing frame and 25 mm minimum between the masonry leaf and sheet bracing.

Openings

Jambs of external openings: Do not close the cavity.

Wall ties, connectors and accessories

Protection: Install to prevent water passing across the cavity.

3.5 DAMP-PROOF COURSES**Location**

General: Locate damp-proof courses, as follows:

- Timber floors: In the first course below the level of the underside of ground floor timbers in internal walls and inner leaves of cavity walls.

- Cavity walls built off slabs on ground: In the bottom course of the outer leaf, continuous horizontally across the cavity and up the inner face bedded in mortar, turned 30 mm into the inner leaf 1 course above.
- Masonry veneer construction built off slabs on ground: In the bottom course of the outer leaf, continuous horizontally across the cavity. Fasten to the inner frame 75 mm above floor level.
- Walls adjoining infill floor slabs on membranes: In the course above the underside of the slab in internal walls and inner leaves of cavity walls. Project 40 mm and dress down over the membrane turned up against the wall.

Height: Not less than:

- 150 mm above the adjacent finished ground level.
- 75 mm above the finished paved or concrete area.
- 50 mm above the finished paved or concreted area and protected from the direct effect of the weather.

Installation

General: Lay in long lengths. Lap full width at angles and intersections and at least 150 mm at joints. Step as necessary, but not exceeding 2 courses per step for brickwork and 1 course per step for blockwork. Sandwich damp-proof courses between mortar.

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

Lap sealing: Seal with a bituminous adhesive and sealing compound.

3.6 FLASHINGS

Location

General: Locate flashings, as follows:

- Floors: Full width of outer leaf immediately above slab or shelf angle, continuous across cavity and up the inner face bedded in mortar, turned 30 mm into the inner leaf 2 courses above for brick and 1 course above for block. If the slab supports the outer skin and is not rebated, bed the flashing in a suitable sealant.
- Under sills: 30 mm into the outer leaf bed joint 1 course below the sill, extending up across the cavity and under the sill in the inner leaf or the frame for masonry veneer. Extend at least 150 mm beyond the reveals or each side of the opening.
- Over lintels to openings: Full width of outer leaf immediately above the lintel, continuous across cavity, turned 30 mm into the inner leaf 2 courses above for brick and 1 course above for block or turned up against the inner frame and fasten to it. Extend at least 150 mm beyond the lintels.
- At abutments with structural frames or supports: Vertical flash in the cavity using 150 mm wide material, wedged and grouted into a groove in the frame opposite the cavity.
- At jambs: Vertically flash jamb, extending 75 mm into the cavity, interleaved with the sill and head flashing at each end. Fix to jambs.

- At roof abutments with cavity walls: Cavity flash immediately above the roof and over-flash the roof apron flashing.

Installation

General: Sandwich flashings between mortar except where on lintels or shelf angles. Bed flashings, sills and copings in one operation to maximise adhesion.

Laps: If required, lap full width at angles and intersections and at least 150 mm at joints. Step as necessary, but not exceeding 2 courses per step for brickwork and 1 course per step for blockwork.

Lap sealing: Seal with a bituminous adhesive and sealing compound.

Pointing: Point up joints around flashings, filling voids.

Weepholes

Requirement: Locate weepholes to external leaves of cavity walls in the course immediately above flashings, and cavity fill, and at the bottoms of unfilled cavities.

Form: Open perpend.

Maximum spacing: 1200 mm.

3.7 WALL TIES

Location

General: Space wall ties in conformance with AS 3700 clause 4.10 and at the following locations:

- Not more than 600 mm in each direction.
- Adjacent to vertical lateral supports.
- Adjacent to control joints.
- Around openings.

Installation

Fixing of masonry veneer ties:

- To timber frames: Screw fix to outer face of timber frames with fasteners to AS 3566.1.
- To concrete: Masonry anchors.
- To steel frames: Screw fix to outer face of steel studs with fasteners to AS 3566.1.

3.8 CONTROL JOINTS

General

Location and spacing: Provide contraction joints, expansion joints or articulation joints to AS 3700 clause 4.8.

Control joint filling

Filler material: Provide compatible sealant and bond breaking backing materials which are non-staining to brickwork and blockwork. Do not use bituminous materials with absorbent masonry units.

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

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

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

Fire-resisting control joints

General: If a control joint is located in an element of construction required to have a fire-resistance level (FRL), construct the control joint with fire stopping materials which maintain the FRL of the element.

Fire-stopping: To AS 4072.1.

3.9 BRICKWORK AND BLOCKWORK DUCT RISERS**General**

Location: Build a one-piece corrosion resistant metal tray to the masonry duct risers at roof level.

Installation

General: Cut an opening for the riser. Turn tray edges up 25 mm around the opening 13 mm clear of the walls. Externally turn the tray up 100 mm under the stepped flashing and down 100 mm over the apron flashing. Lap and solder joints.

Weepholes

General: Provide 2 weepholes through the masonry duct riser walls on opposite sides immediately above the tray.

3.10 BRICKWORK BED JOINT REINFORCEMENT**Location**

General: Locate as follows:

- In 2 bed joints below and above head and sill flashings to openings.
- In 2 bed joints below and above openings.
- In third bed joint above bottom of wall.
- In second bed joint below top of wall.

Maximum vertical intervals: 500 mm.

Installation

General: Lap 450 mm at splices. Fold and bend at corners so that the longitudinal wires are continuous. Stop 50 mm short of control joints. Extend 450 mm beyond each side of openings.

Reinforcement

Material: Galvanized welded wire mesh.

Width: Equal to the width of the leaf, less 15 mm cover from each exposed surface of the mortar joint.

3.11 REINFORCED AND GROUTED BLOCKWORK**Cleaning core holes**

General: Provide purpose-made cleanout blocks or machine cut a cleaning hole at the base of each grouted core.

Location: Locate on the side of the wall which is to be rendered or otherwise concealed.

Cleaning: Rod cores to dislodge mortar fins protruding from the blocks and mortar droppings from reinforcement. Remove through the clean-out blocks.

Grouting

Commencement: Do not commence until grout spaces have been cleaned out and the mortar joints have attained sufficient strength to resist blow-outs.

Height of lift: Limit the height of individual lifts in any pour to make sure that the grout can be thoroughly compacted to fill all voids.

Compaction: Compact by vibration or by rodding.

Topping up: On the completion of the last lift, top up the grout after 10 min and within 30 min, and vibrate or rod to mix with the previous pour.

3.12 LINTELS**Location**

General: Install one lintel to each wall leaf as documented

Installation

General: Do not cut on site. Keep lintels 10 mm clear of heads of frames.

Steel lintels: Pack mortar between any vertical component and supported masonry units. For angles, install the long leg vertical.

Minimum bearing each end:

- Span ≤ 1000 mm: 100 mm.
- Span > 1000 mm ≤ 3000 mm: 150 mm.
- Span > 3000 mm: To structural drawings.

Propping: Provide temporary props to lintels to prevent deflection or rotation.

- Minimum propping period: 7 days.

3.13 CONNECTORS AND ACCESSORIES**Slip joints**

General: Install slip joints to top of all unreinforced masonry walls supporting concrete slabs and other concrete elements.

Protection: Keep the slip joints in place and protect from displacement.

Flexible masonry ties

General: Install stabilising ties at control joints and abutting structural elements, including columns, beams and slab soffits.

Locations and details: As documented.

3.14 BAGGING**Preparation**

General: Cut joints flush before bagging.

Dry bagging

Application: Apply laying mortar to the surface using a hessian bag or similar. Flush up irregularities, but leave a minimum amount of mortar on the surface.

Textured bagging

Application: Apply laying mortar to the surface using a sponge float. Flush up irregularities, but leave approximately 2 mm of mortar on the surface. When initial set is reached, texture using a hand bristle brush.

0341 STRUCTURAL STEELWORK**1 GENERAL****1.1 RESPONSIBILITIES****Performance**

Adjoining elements: Provide for the fixing of adjoining building elements that are to be connected to or supported on the structural steel.

1.2 STANDARDS**General**

Materials and design: To AS 4100.

Materials and design of cold-formed decking, purlins and girts: To AS/NZS 4600.

Composite steel-concrete construction including profiled steel sheeting and shear connectors: To AS/NZS 2327.

Fabrication and erection: To AS/NZS 5131.

1.3 INTERPRETATION**Abbreviations**

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

- AESS: Architecturally Exposed Structural Steel.
- ILAC: International Laboratory Accreditation Cooperation.

1.4 TOLERANCES**General**

Requirement: To AS/NZS 5131 Section 12 and Appendix F.

Tolerance class: 1.

1.5 SUBMISSIONS**Design documentation**

Adequacy of structure: If required, submit calculations to justify the adequacy of the structure to sustain loads and/or procedures, which may be imposed during construction.

Execution details

Anchor bolts: If anchor bolts do not meet documented location tolerances, submit proposals for rectification before proceeding.

Bolting connections: For connections not documented, submit proposals.

Bolt tensioning procedure: Submit details of procedure, equipment to be used and calibration of the process.

Site base plate holing: If hand cutting of bolt holes in column base plates is required, submit details.

Purlins and girts: If purlins and girts support components other than roofing or cladding, submit details.

Site modifications: Submit details of proposed on-site modifications or rectifications to any steel member, connection component, mechanical fastener, weld or corrosion protection.

Splices: If variations to documented splice locations or additional splices are proposed, submit details.

Temporary connections or attachments: If not documented, submit details.

Undocumented weld types: Submit proposals for weld type and electrodes.

Welding plan: Submit a welding plan to AS/NZS 5131 clause 7.2.

Work method statement: Before any erection work commences, submit a work method statement to AS/NZS 5131 clause 11.2.3.

Fabrication details

Distortions: Submit proposals for the following:

- Preventing or minimising distortion of galvanized components, welded components or welded and galvanized components.
- Restoration to the designed shape.

Identification marks: If members and/or connections will be exposed to view, submit details of proposed marking.

Program: Submit a fabrication program showing the proposed sequence of operations and time required.

Products and materials

Steel members and sections: Submit test reports or test certificates conforming to AS 4100 clause 2.2.2.

Bolts, nuts and washers: Submit test reports or test certificates conforming to AS/NZS 1252.1 Section 6.

Verification testing of bolt assemblies: Submit test reports or certificates conforming to AS/NZS 1252.2 Section 2, together with the Supplier Declaration of Conformity (SDoC).

Anchor bolts: If anchors, other than those documented, are required or proposed for supporting or fixing structural steel, submit evidence of the anchor capacity to carry the load.

Substitution: If alternative sections or connections are proposed, submit details.

Records

Survey: Submit survey of erected structural steel to verify components have been installed as documented.

Drawings: Upon completion, submit as-built structural drawings.

Samples

Special finishes: Submit samples of finished steel as documented.

Minimum sample size: 0.1 m².

Shop detail documentation

General: Submit shop detail documentation to a scale that best describes the detail, conforming to AS/NZS 5131 clause 4.4.

Subcontractors

General: Submit names and contact details of proposed fabricator and installer.

Tests

Site tests: Submit results, as follows:

- Bars and sections: Non-destructive tests.
- Plates: Ultrasonic tests.
- Welds: Non-destructive examinations.

1.6 INSPECTION

Notice – off-site

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

- Materials including welding consumables before fabrication.
- Testing of welding procedures and welder qualification tests.
- Commencement of shop fabrication.
- Commencement of welding.
- Complete penetration butt welds before the placement of root runs.
- High-strength bolt tensioning (when completed off-site).
- Completion of fabrication before surface preparation.
- Surface preparation before protective coating.
- Completion of protective coating before delivery to site.

Notice – on-site

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

- Steelwork on-site before erection.
- Anchor bolts in position before casting in.
- Steelwork and column bases erected on site, before grouting, encasing, site protective coating or cladding.
- Tensioning of bolts in categories 8.8/TB and 8.8/TF.
- Reinforcement and formwork in place before any encasement.
- Completed grouting, encasement, fire protection or site applied protective coating.

2 PRODUCTS

2.1 GENERAL

Materials

Requirement: To AS/NZS 5131 Section 5.

Storage and handling

Requirement: Pack, support, transport and handle members and components without overstressing, deforming or damaging them or their protective coating.

Damaged items: Rectify or replace. Do not assemble into the structure without approval.

Protection: Wrap or otherwise protect members or components to prevent damage to surface finishes during handling and erection.

Storage: Store off the ground.

Lifting points: Do not allow steel slings to come into direct contact with coated steelwork.

Purchasing and traceability

Purchasing documentation and procedure: To AS/NZS 5131 clause 4.6.

Level of traceability: As defined in AS/NZS 5131 clause 4.7 and the following:

- CC1: Basic traceability.

- CC2: Partial traceability.
- CC3: Full traceability.
- CC4: Full traceability.

2.2 STRUCTURAL STEEL

Steel members and sections steel grade table

Type of steel	Minimum grade
Hot-rolled sections to AS/NZS 3679.1 and SA TS 102	300
Welded sections to AS/NZS 3679.2	300
Hot-rolled plates, floor plates and slabs to AS/NZS 3678 and SA TS 102	250
Hot-rolled flat products to AS/NZS 1594	HA300
Hollow sections to AS/NZS 1163 and SA TS 102: Circular sections less than 166 mm nominal outside diameter	C250
Hollow sections to AS/NZS 1163 and SA TS 102: Sections other than circular sections less than 166 mm nominal outside diameter	C350
Cold-formed purlins and girts to AS 1397	G450, Z350 or Z450

Certification

Steel: Minimum requirements for test and inspection certificates, to the following:

- Hot-rolled bars or sections: To AS/NZS 3679.1 clause 11.2.4.
- Welded I sections: To AS/NZS 3679.2 clause 11.2.4.
- Hot-rolled plate: To AS/NZS 3678 clause 11.2.4.
- Cold-formed hollow sections: To AS/NZS 1163 clause 11.2.4.

2.3 MECHANICAL FASTENERS

Standards

Bolts: To AS 1110.1, AS 1111.1 and AS/NZS 1252.1.

Nuts: To AS 1112.1, AS 1112.2, AS 1112.3, AS 1112.4 and AS/NZS 1252.1.

Certification

High-strength bolt assemblies: Minimum requirements for test reports, to AS/NZS 1252.1 clause 6.4.2.

Finish

Bolts, nuts and washers: Hot-dip galvanized to AS/NZS 1214, corrosion-free, and in serviceable condition.

3 EXECUTION

3.1 PREPARATION, ASSEMBLY AND FABRICATION

Identification

Traceability: To AS/NZS 5131 clause 6.2.

Marking: Provide marks or other means of identifying each member compatible with the finish, for setting out, locating, erecting and connecting the steelwork to the marking plans.

High-strength bolting: If the work includes more than one bolting category, mark high-strength structural bolted connections with a 75 mm wide flash of colour, clear of holes.

Cold-formed members: Clearly mark material thickness.

Monorail beams: Identify and mark rated capacity in conformance with AS 1418.18 clause 5.12.6.

Natural beam camber

General: If steel beams have a natural camber, within the straightness tolerance, fabricate the steelwork element with the camber up.

Shaping

Requirement: Where forming, shaping or correcting distorted members, avoid damage and conform to AS/NZS 5131 clause 6.6.

Site work

General: Other than work shown on the shop detail documentation as site work, do not fabricate, modify or weld structural steel on-site.

Tolerances

Measurement: Check tolerances by measurement after fabrication and application of corrosion protection.

3.2 WELDING

General

Requirements: To AS/NZS 5131 Section 7.

Standard: To AS/NZS 1554.1.

Weld category

Weld categories not documented: Category GP.

Weld type

Weld type not documented: Submit proposals for weld type and electrodes.

Non-destructive weld examination (NDE)

Requirement: To AS/NZS 5131 clause 13.6.2.

Non-visual NDE: By a third party testing authority.

Repairs: Repair welds revealed as faulty by NDE and repeat the examination.

Site welds

Completion: Weld only when correct alignment and preset or camber have been achieved.

3.3 MECHANICAL FASTENING

Connection contact surfaces

General: To AS/NZS 5131 clause 8.4.1.

Bolting category 8.8/TF: Clean, as rolled and free from applied finishes.

Washers

Requirement: Place one washer under the part rotated during tightening process (nut or bolt head).

Tensioning of bolting categories 8.8/TB and 8.8/TF

Method: Use part-turn method or a direct tension indicator device.

Permanent bolting

Completion: Bolt only when correct alignment and preset or camber has been achieved.

3.4 SURFACE PREPARATION AND TREATMENT

General

Requirement: Conform to *0344 Steel – hot-dip galvanized coatings* and/or *0345 Steel – protective paint coatings*, as appropriate.

3.5 FIRE PROTECTION COATINGS

General

Requirement: Apply fire protection to structural steelwork to *0346 Structural fire protection systems*.

3.6 ARCHITECTURALLY EXPOSED STRUCTURAL STEELWORK

General

Requirement: Provide AESS to AS/NZS 5131 Section 10.

Fabrication

Additional requirements: To AS/NZS 5131 clause 10.4.

Corners and edges: Grind smooth sharp, marred, or roughened corners and edges.

Rough surfaces: Deburr and ground smooth.

3.7 ERECTION

General

Execution: Make sure every part of the structure has sufficient design capacity and is stable under construction loads produced by the construction procedure.

Calculations: Verify the adequacy of the structure to sustain any loads and/or procedures, which may be imposed.

Temporary work

General: Provide all necessary temporary bracing or propping.

Temporary connections: Detail required cleats, if not shown on shop detail documentation.

Temporary members: If temporary members are required, fix so as not to weaken or deface permanent steelwork.

Purlins

Trimming members: Provide to support edges of roof sheeting along hips, valleys and roof penetrations.

Movements

General: Allow for thermal movements during erection.

Anchor bolts

General: For each group of anchor bolts, provide a template with set-out lines clearly marked for positioning the bolts when casting in.

Grouting at supports

Preparation: Before grouting steelwork supported by concrete or masonry, set steelwork on packing or wedges.

- Permanent packing or wedges: Form with solid steel or grout of similar strength to the permanent grout.
- Temporary packing or wedges: Remove before completion of grouting.

Timing: Grout at supports before constructing supported floors, walls and roofing.

Temperature: Do not grout if the temperature of the base plate or the footing surface exceeds 35°C.

Drifting

Limitation: Use drifting only to bring members into position, without enlarging holes or distorting components.

3.8 REPAIRS

General

Requirement: Repair finishes to restore the full integrity of any coating.

3.9 COMPLETION

Tolerances

Conformance: After completing erection, verify conformance with AS/NZS 5131 Section 12 and Appendix F.

Temporary connections

General: Remove temporary cleats on completion and restore the surface.

0342 LIGHT STEEL FRAMING

1 GENERAL

1.1 RESPONSIBILITIES

Performance

Requirement: Provide light steel floor, wall, roof and truss framing as follows:

- Suitable for having flooring, linings, cladding and roofing fixed to it.
- In conformance with the documented performance criteria.
- Independently designed and documented.
- Independently certified by a professional engineer for the design and the erected framing.

1.2 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.

Corrosion protection: To BCA 3.4.4 based on steel member exposure.

1.3 INTERPRETATION

Definitions

General: For the purposes of this worksection the definitions given in the NASH-1 and NASH-2 Standards apply.

1.4 TOLERANCES

General

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

1.5 SUBMISSIONS

Design documentation

General: Where the structural documentation defines performance criteria, submit independent design, documentation and certification from a professional engineer including certification for the erected work.

Reactions: Submit the location and magnitude of reactions that are to be accommodated by the support structure.

Floor and wall frame member sizes: Submit a schedule of proposed member sizes, certified as meeting stated project, and AS/NZS 4600 requirements for span, spacings and loadings.

Shop drawings

General: Submit shop drawings, to a scale that best describes the detail, requirements for the documented configurations and loadings, certified by a professional engineer stating that the design has been carried out to AS/NZS 4600 or NASH-1 and NASH-2.

Prefabricated roof trusses: Include the following:

- Plan: Truss layout.

- Elevations: Arrangement of members, allowing for the accommodation of in-roof services, and the size and section type of each member.
- Method of assembly and connection details.
- Holding down and bracing: Details demonstrating capability to resist lateral and uplift forces.

Prefabricated wall frames: Include the following:

- Plan: Wall layout.
- Elevation: Arrangement of members, and size and section type of each member.
- Method of assembly, connection, holding down and bracing.

1.6 INSPECTION

Notice

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

- Steel framing erected on site before lining or cladding.

2 PRODUCTS

2.1 GENERAL

Storage and handling

Requirement: Transport all components to site and store if required in a manner so as not to damage or distort the components.

2.2 COMPONENTS

Cold-formed steel framing

General: Cold-form sections from steel, metallic-coated 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.

3 EXECUTION

3.1 GENERAL

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.

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.

3.2 FLOOR FRAMING

General

Protection: If floor framing is for ground floor construction, make sure that it is protected from moisture.

Construction loads: If construction loading exceeds design loading, provide additional support so as to avoid overstressing of members.

Decks and balconies

Attachment to external walls: To BCA 3.10.6.

3.3 WALL FRAMING

Wall studs

General: Provide studs in single lengths without splices. Place a stud under each structural load point from the roof or ceiling (except at openings). Provide multiple studs at points of concentrated load.

Maximum stud spacing: 600 mm.

Heads to openings

Requirement: Provide lintels appropriate to load and span.

Additional support

General: Provide additional support in the form of noggings, trimmers and studs for support and fixing of lining, cladding, hardware, accessories, fixtures and fittings.

Vermin barriers

Brick veneer barrier: Close nail 10 mm steel wire mesh to the underside of the bottom plate of external stud walls, extending across the cavity for building into brickwork.

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 if not documented otherwise:

- External walls (not masonry veneer): Turn up a minimum of 75 mm on the inside and tack to studs. 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 damp-proof courses, sarking 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.

3.4 ROOF FRAMING

Beam framing

General: Construct framing for flat or pitched roofs where the ceiling follows the roof line, consisting of rafters or purlins supporting both ceiling and roof covering.

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.

3.5 TRUSSES

Fabrication

Assembly: Factory assemble trusses.

Supports for in roof services

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

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

Marking

General: Permanently mark each truss to show:

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

Installation

Support: Support and fix trusses on the bottom chord only, at the nominated support points, unless designed for additional support.

Vertical movement: Over internal walls not providing support to trusses, provide at least 10 mm vertical

clearance and use wall bracing methods which allow for vertical movements.

3.6 ROOF TRIM

Fascia, valley and barge boards

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

3.7 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.

0344 STEEL – HOT-DIP GALVANIZED COATINGS

1 GENERAL

1.1 STANDARDS

General

Coating: To AS/NZS 4680.

Coating on fasteners: To AS/NZS 1214.

Durability: To AS/NZS 2312.2.

Metal finishing

Coating mass/thickness minimum: To AS/NZS 4680.

Threaded fasteners coating mass/thickness minimum: To AS/NZS 1214.

1.2 SUBMISSIONS

Execution details

Holes and lifting lugs: If holes and lifting lugs are required to facilitate handling, filling, venting and draining during galvanizing, submit details on size and location.

Detailing features: If design and fabrication features of the items to be galvanized may lead to dimensional change, distortion or difficulties during galvanizing, identify these and submit details for improvement.

1.3 INSPECTION

Notice

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

- Coating appearance and thickness, at the galvanizing plant.

2 EXECUTION

2.1 GENERAL

Care

Embrittlement: Take due care to avoid embrittlement of susceptible steels.

Mechanical properties: Avoid mechanical damage. Make sure that mechanical properties of the base metal do not change.

Surface preparation

Surface contaminants and coatings generally: Chemical clean, then acid pickle.

Chemical cleaning: To AS 1627.1.

Acid pickling: To AS 1627.5.

- Inhibitor: Required.

Coating process

General: To AS/NZS 4680 Section 6.

Threaded fasteners: To AS/NZS 1214 Section 5

Post treatment

General: Passivate.

Drilling after completion of hot-dip galvanizing

Repair: Prime drill hole surfaces to AS/NZS 4680 clause 8 before the surfaces begin to corrode.

Surface finish

Standard: To AS/NZS 4680 clause 7.

Coating quality: Continuous and as smooth and evenly distributed as possible. Free of blisters, roughness, sharp points, flux residues and any defects that may affect the end use of the article.

Silicon killed steels: Dull grey is acceptable.

Surplus zinc on fastener threads: Remove.

Friction-type bolted connections: Treat coated contact surfaces to achieve the required design slip factor, without removing excessive coating thickness as follows:

- Contact surface preparation: To *GAA Galvanizing After fabrication hot dip galvanizing* Chapter 4.
- Slip factor test: To AS/NZS 5131 Appendix G.

Coating repair

Rejection: If uncoated surfaces or areas damaged by handling at the galvanizing plant exceed the limits specified for repair in AS/NZS 4680 clause 8, reject the galvanizing.

Extent and methods: To AS/NZS 4680 clause 8.

Preparation of galvanized surfaces for paint finishes

Coarse preparation: Remove spikes, and make sure edges are free from lumps and runs.

Light sweep blasting before painting: Required.

- Maximum zinc removal: 10 microns.
- Abrasive grade (range): 150 to 180 microns.
- Abrasive type: Clean ilmenite or garnet.
- Blasting angle to surface: 45° maximum.
- Blast pressure (maximum): 275 kPa.
- Distance of nozzle from surface (range): 350 to 400 mm.
- Nozzle type: 10 to 13 mm minimum diameter venturi type.

2.2 SITE WORK

Site welding

Grinding of edges: Permitted.

Weld areas: Reinstate coating to AS/NZS 4680 clause 8.

Site coating reinstatement

Rejection: If any item has damaged areas exceeding the limits specified for repair in AS/NZS 4680 clause 8.1, reject the item.

Extent: Areas damaged by transport, site welding, site flame cutting, site handling, or erection.

Method: To AS/NZS 4680 clause 8.

0345 STEEL - PROTECTIVE PAINT COATINGS**1 GENERAL****1.1 RESPONSIBILITIES****General**

Requirement: Provide protective paint coatings for the protection of steel products and structural steelwork against interior and exterior atmospheric corrosion, as documented.

1.2 STANDARDS**General**

Surface preparation and coating: To AS/NZS 5131 Section 9 and the recommendations of AS 2312.1.

1.3 INTERPRETATION**Abbreviations**

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

- DFT: Dry Film Thickness.
- ITP: Inspection and Test Plan.
- MIO: Micaceous Iron Oxide.
- PDS: Product Data Sheet.
- SDS: Safety Data Sheet.
- µm: Micron (10⁻⁶m).

1.4 SUBMISSIONS**Execution details**

Detailing features: If design and fabrication features of the items to be coated may lead to difficulties, identify these and submit details for improvement.

Repair of damaged coating: If the protective coating is damaged, submit a coating repair proposal, based on the coating manufacturer's recommendations for reinstating the corrosion protection function of the system.

Reinstatement: If final coat varies from the submitted sample, submit proposals for reinstatement of the visible final coating system.

Samples

Painting and coating colour: Submit a 400 x 400 mm sample of the finished product for each coating system.

Retention: Retain samples for comparison during application.

Subcontractor

Substrate acceptance: Submit evidence of applicator's acceptance of the coating substrate before starting installation.

Warranties

General: Submit details of the proposed warranty terms, form and period.

1.5 INSPECTION**Notice**

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

- Items after fabrication, before commencing surface cleaning and preparation.
- Surfaces after preparation, before application of first coating.
- Coating stages:
 - . After application of primer or seal coats.
 - . After application of each subsequent coat.
- Repair of coating damage: Exposure of corrosion pitting or significant metal loss by blasting process.

2 PRODUCTS**2.1 GENERAL****Storage and handling**

Requirement: Handle, store, mix and apply all protective coatings in conformance with the manufacturer's recommendations.

Original containers: Deliver coating products to site in manufacturer's labelled and sealed containers.

Ambient temperature range for storage: 3°C to 30°C, or to manufacturer's recommendations.

Sunlight: Protect coating materials from direct sunlight before mixing or adding the converter (catalyst).

Use-by-date: Use products with limited shelf life before their use-by-date, unless written authorisation from the coating manufacturer's technical services section is provided.

Paint material

Requirement: To AS/NZS 5131 clause 9.9.3.

Proprietary products

Requirement: Provide all products from the one manufacturer's supply.

Product data sheets (PDS): Keep on site copies of all relevant manufacturer's PDS.

Safety data sheets (SDS): Keep on site copies of all relevant manufacturer's SDS.

Recording: To AS/NZS 5131 clause 9.9.5.

3 EXECUTION**3.1 GENERAL****Product warnings**

Requirement: Conform to the SDS.

Surroundings

Protection: Prevent the release of abrasives, overspray or paint waste debris into the air, ground or to any watercourse. Prevent damage to other assets, services or equipment.

Reinstatement: Repair and/or clean affected surrounding areas.

Working area

General: Perform all painting under cover and/or protected from rain, condensation, dew, excessive wind, overspray or wind-blown dust.

Period: Continue protection where any of these conditions exist until the coating is no longer affected.

3.2 SURFACE PREPARATION

General

Requirement: Conform to AS/NZS 5131 clauses 9.3, 9.4 and 9.5.

Galvanized, aluminium and zinc primed surfaces

Requirement: Remove grease, oil and other solvent-soluble contaminants to AS 1627.1. Allow to dry and immediately proceed with the next operation.

Galvanized and aluminium surfaces: Abrade surfaces to a medium coarse type finish to provide an adhesion key.

Zinc primed surfaces: If present, remove zinc salts from zinc primers.

Treatment of welds

Requirement: Clean welds to remove roughness, using power tools to AS 1627.2. Remove filings by vacuuming or compressed air.

Temporary welds: Grind flush any temporary welds.

Porous, skip or stitch welds: Not permitted.

Site welding: If possible, avoid site welding. If on site welding is required, prepare and treat the weld to AS/NZS 5131 clause 9.12.2.

Shop priming

Requirement: Dust off and apply a coat of primer in conformance with the manufacturer's recommendations.

Site coating

General: High pressure wash down all surfaces with clean water. Lightly sand down primer/intermediate coats, which have been shop applied, before site application of next coat.

3.3 COATING APPLICATION

General

Requirement: Conform to the product data sheets.

Painting and coating colour: Verify all project finish colours with the retained samples.

Final surface preparation or coating application

Limits: If the environmental/climatic/substrate conditions listed in AS/NZS 5131 clause 9.9.10 and the following are present do not apply coating:

- Ambient air temperature below 5°C or above 40°C.
- Substrate temperature below 10°C or above 45°C.
- Full prime coat application cannot be carried out before the specified cleanliness of the surface deteriorates.
- Surface preparation standard has not been achieved.
- Time between final surface preparation and the commencement of coating has exceeded 4 hours.
- Visual tarnishing or black spots develop on the surface of the steel.

Exception: Preliminary blast or other surface preparations may be performed in conditions that are outside the limits, providing the final surface preparation and all coating applications are undertaken under the limit conditions.

Pre-coating: Before the spray application of each coating, stripe coat by brush method all edges,

welds, seams, rivets, bolts, boltholes (including slots) and difficult to spray areas. Prime the underlying surfaces of replacement bolting, washers and nuts before installation.

Procedure: Conform to the manufacturer's recommendations.

Subsequent coats: Before applying any subsequent coating layer, make sure the surface condition of the preceding coat conforms to the manufacturer's recommendations and is clean and free from defects.

3.4 PROTECTION

Contamination

Surfaces: Prevent contamination of coated surface, which are not yet dry, from blasting dust, abrasive or surface preparation debris and any other foreign matter.

Post application care

General: Protect the coating against physical, chemical, or atmospheric damage until all components are fully cured.

Care: Stack and handle all coated items using fabric slings or padded chains. Use soft packaging, carpet strips or other deformable materials between all coated items.

Water ponding: Stack coated items to prevent water ponding.

3.5 COATING REPAIR

Repair of coating damage

Preparation: Feather back by hand or machine sanding all leading edges of intact coating adjacent to the repair, to remove any sharp edge.

Surface contamination: Remove by dusting or blowing down before applying the first coat of paint.

Sequence: Apply the repair coating in the same sequence and manner as the original coating.

Areas damaged without exposing the primer: Wash with a proprietary detergent solution, rinse with clean water and abrade so that edges of sound paint are feathered. Coat the area with the appropriate intermediate and finishing coat materials.

Areas damaged exposing the primer or steel surface: Blast clean to the original standard. Prepare at least 50 mm into the sound coating and to a further feathering zone of approximately 50 mm. Recoat with the documented system to restore the film thickness and integrity over the whole prepared surface including the feathered zone.

Aesthetic reinstatement: If required, repaint to a physical or discernible boundary line.

Defects: If corrosion pitting or areas of significant metal loss and defects are exposed by the blasting process, advise for inspection and have areas passed as being fit for service before proceeding with the coating system.

Timing: Apply the protective coating system within 4 hours of blast cleaning or in any case before visual tarnishing of the steel occurs.

3.6 COMPLETION

General

Joints: On completion, seal all joints and mating surfaces with a compatible polyurethane sealant.

Warranties

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

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

0346 STRUCTURAL FIRE PROTECTION SYSTEMS

1 GENERAL

1.1 STANDARDS

Structural fire protection systems

Materials and components: To BCA Schedule 5.

1.2 SUBMISSIONS

Certification

Certificate of compliance: Submit evidence of compliance with the BCA requirements for suitability of the completed repairs to the fire protection system for the designated FRL.

Execution details

Substrate cleaning: Give notice of surface conditions which cannot be corrected by normal hand tool cleaning methods.

Products and materials

Manufacturer's documentation: For sprayed and board structural fire protection systems, submit manufacturers' product data of the following:

- Product technical data sheets.
- Safety data sheets (SDS).
- Preventive maintenance procedures.
- Instructions and procedures for the maintenance and/or repair of damage to parts of the system.

Samples

General: Submit samples of each system thickness, density, colour, texture and support type.

1.3 INSPECTION

Notice

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

- Substrate preparation.
- System support installation.
- Steel protective primer application.
- Completed application of protective system coating thickness.

2 PRODUCTS

2.1 SPRAYED FIRE-RESISTING MATERIALS

Material

Requirement: Perlite or vermiculite with a hydraulic binding agent and filler to form plaster.

Standard: To EN 13055.

Fillers

General: Hydrated lime, limestone or other aggregate.

Applied decorative and protective surface finishes

Compatibility: Compatible with the sprayed fire-resisting materials, without impairing their performance.

2.2 BOARD FIRE PROTECTION

Grade and thickness

Fire-resistance level (FRL): Provide grade and thickness to achieve the required FRL.

System: Select from the following for building elements to achieve the required FRL or refer to a finishes schedule.

2.3 METAL COMPONENTS

General

Atmospheric corrosion category: To 0171 *General requirements*.

Expanded metal lath

Reinforcement mesh: To BCA Schedule 5 Annexure to Table 1 clause 1.6.

Keying mesh:

- Aperture: 6 to 20 mm.
- Self-furring expanded metal lath ribs: V-shaped at 100 to 150 mm intervals.

Welded steel wire mesh

Reinforcement mesh: To BCA Schedule 5 Annexure to Table 1 clause 1.6.

Keying mesh:

- Wire diameter: 0.7 to 1.6 mm.

Twisted steel wire mesh

Conformance: To AS 2423.

Reinforcement mesh: To BCA Schedule 5 Annexure to Table 1 clause 1.6.

Keying mesh aperture: Nominally 25 to 32 mm.

Fixings

Screws: Deep threaded self-tapping screws, preferably with ribbed heads.

Staples: Steel wire staples.

3 EXECUTION

3.1 SPRAYED FIRE-RESISTING PRODUCTS

Applicators

General: Approved by the coating manufacturer to install the coating.

Surface preparation

Requirement: Before coating application, remove materials which may impair adhesion to the substrate, including mill scale, dirt, grime, oil, grease, mould release agents, dust, loose rust, non-compatible primers and paint.

Compatibility: If paint on the steel sections is not compatible with the coating, apply an alkali-resistant sealer compatible with the paint.

Stable gaps and joints wider than 15 mm: Bridge with an appropriate supporting material before applying the coating.

Unstable gaps and joints: Provide a control joint in the spray, with metal lath support on either side of the joint.

Protection of areas not to be coated

Requirement: Prevent damage from spillage, overspray, contamination and fallout.

Sequence

General: Apply coatings after installation of supports, fixings and other attachments and before installation of items which may obstruct the application.

Support and fixing of reinforcement

Support on walls, columns and beams: To BCA Schedule 5 Annexure to Table 1 clause 7.

Encapsulated substrates: If reinforcement support is not required, wrap and overlap reinforcement at joints and wire tie together.

Thickness

Coatings application: As documented.

Spraying

General: Provide full cohesion in the coating.

External coatings

Detailing: Provide water shedding slopes to sprayed surfaces and at sprayed terminations provide a weather seal at the coating-substrate interface with UV stable mastic sealant or weather shields.

Finishes

Care should be given when selecting and applying fungicides to minimise any toxic effects or any incompatibility with the costing.

Thickness measurements testing

Thickness gauge: If possible, use a direct-reading pin-type thickness gauge with a base plate of 25 mm diameter. Alternatively, use prefixed gauges that do not impair fire performance.

Acceptance criteria for deficient areas:

- Thickness not less than 85% specified thickness:
Deficient area not to exceed 1 m², and no other deficient area within 3 m of this deficient area.
- Thickness not less than 75% specified thickness:
Deficient area not to exceed 0.2 m², and no other deficient area within 1 m of this deficient area.

Density measurements testing

Acceptance criterion: The manufacturer's stated average dry density $\pm 15\%$.

3.2 BOARD FIRE PROTECTION

Fixing

System: Fix proprietary systems in conformance with the recommendations of the manufacturer or supplier to achieve the documented FRL.

Joints

General: Make butt joints true and flush. For single layer construction, provide 6 mm thick cover strip on the rear face of the joint. For multi-layer systems, stagger the joints in the inner and outer layers at least 100 mm.

Access panels

Sealing: Seal joints to the recommendations of the manufacturer or supplier.

0382 LIGHT TIMBER FRAMING**1 GENERAL****1.1 STANDARDS****General**

Framing: To AS 1684.2, AS 1684.3 or AS 1684.4, as appropriate.

Design: To AS 1720.1.

1.2 INTERPRETATION**Definitions**

General: For the purposes of this worksection the definitions given in the AS 1684 series apply.

1.3 TOLERANCES**Floors**

Maximum deviation from a 3 m straightedge laid in any direction on the floor framing: 5 mm.

Walls tolerances table

Property	Permitted deviation
Generally: Verticality in 2 m	1:500
Generally: Flatness ¹ in 2 m	3 mm
Features ² : Verticality in 2 m	1:1000
Features ² : Horizontality in 2 m	1:1000
1. Flatness: Measured under a straightedge laid in any direction on a surface. 2. Features: Conspicuous horizontal or vertical lines including external corners, parapets, reveals, heads, sills.	

1.4 SUBMISSIONS**Design documentation**

Requirement: Submit certification by a professional engineer of the design, documentation and erected work to AS 1684 and AS 1720.1. Include the following:

- Reactions: Provide location and magnitude of reactions to be accommodated by the support structure.
- Floor, wall and roof frame member sizes: A schedule of proposed member sizes, certified as meeting stated project requirements for spans, spacings, loadings and deflections.
- Species and stress grade.

Products and materials

Identification: Submit a supplier's certificate (which may be included on an invoice or delivery docket) verifying that the timber conforms to the documented requirements.

Inspection: Submit the inspection authority's certificate verifying that the timber conforms to the documented requirements.

Moisture content: Submit records of moisture content.

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

Shop drawings

General: Submit shop drawings, to a scale that best describes the detail, certified by a professional engineer stating that the design has been carried out to AS 1684 series and AS 1720.1 requirements for the documented configurations and loadings.

Prefabricated roof trusses: Include the following:

- Marking plans.
- Truss plan layout.
- Elevations, with the arrangement of members allowing for the accommodation of in-roof services and the size and section type of each member.
- Camber of all elements.
- The method of assembly, connection, lifting, holding down and bracing.

Prefabricated wall frames: Include the following:

- Wall plan, showing all wall layouts.
- Elevations showing the arrangement of members, and the size and section type of each member.
- The method of assembly, connection, lifting, holding down and bracing.

Subcontractors

Prefabricated items: Submit the name and contact details of proposed manufacturers, suppliers and installers.

1.5 INSPECTION**Notice**

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

- Prefabricated units before installation.
- Fabricated items before priming or water-repellent treatment.
- Bolts after final tightening.
- Timber work after erection but before it is covered.

2 PRODUCTS**2.1 GENERAL****Storage and handling**

General: Do not distort or damage timber or timber products.

Moisture content: Maintain the equilibrium moisture content of seasoned timber.

Protection from weather: Provide temporary protection for members until permanent covering is in place.

Marking

Branding: Brand structural timber, under the authority of a recognised product certification scheme to *0185 Timber products, finishes and treatment* as applicable to the product. Locate the brand mark on faces or edges which will be concealed in the works. Include the following data for timbers not covered by branding provisions in Australian standards or regulations for which branding is required:

- Stress grade.
- Method of grading.

- If seasoned, the word, SEASONED or DRY, or an abbreviation of seasoned, such as SEAS or S.
 - The certification mark of the product certification scheme.
 - The applicable standard.
- Trusses: Permanently mark each truss to show:
- Project identification.
 - Manufacturer.
 - Tag or number.
 - Location.
 - Support points.

2.2 TIMBER

Certification

Requirement: Certification, chain of custody and product labelling to *0185 Timber products, finishes and treatment*.

Fascias and barge boards

Hardwood: To AS 2796.1.

Seasoned cypress pine: To AS 1810.

Softwood: To AS 4785.1.

Preservation treatment including termite treatment: To *0185 Timber products, finishes and treatment*.

Trusses

Design: To AS 1720.1.

Nailplated roof trusses: To AS 1720.5.

Camber: Camber bottom chord upward.

Overhangs: Free from spring or splits.

2.3 STRUCTURAL PLYWOOD

General

Standard: To AS/NZS 2269.0.

Bond: Type A to AS/NZS 2754.1.

Veneer

Veneer quality to visible surfaces: CD (minimum).

2.4 COMPONENTS

Nailplated joined beams

Standard: To AS 4446.

Type: Engineered beam made from stress-graded timber pieces joined together with nailplates.

Mild steel post bases

Minimum dimensions: Conform to AS 1684.2 Table 9.20(p) and AS 1684.3 Table 9.20(p), as appropriate.

Location: To timber posts supported off concrete slabs or footings.

Finish: Galvanize after fabrication.

Fasteners

General: Conform to *0181 Adhesives, sealants and fasteners*.

Installation: Do not split or otherwise damage the timber.

Coating: Before placing bolts in contact with CCA treated timber, coat the shank of the bolt in a grease or bituminous coating.

Damp-proof course

Material: To AS/NZS 2904.

Flashings

Material: To AS/NZS 2904.

2.5 RECONSTITUTED STRUCTURAL TIMBER PRODUCTS

Wet process fibreboard (including hardboard)

Standard: To AS/NZS 1859.4.

3 EXECUTION

3.1 FLOOR FRAMING

Bearers and joists

Levelling: Level bearers and joists by checking or by packing for the full width of the member with dense corrosion resistant material which is secured in place.

Maximum thickness of packing: 3 mm.

Spring: Lay bearers and joists to allow for straightening under loading.

Joints

Requirement: Locate joints only over supports:

- Minimum bearing of bearers: 50 mm.
- Minimum bearing of joists: 30 mm.

Fixing and restraint

Fixing: Secure bearers and joists to supports to provide restraint against lateral movement.

Deep joists: To AS 1684.2 clause 4.2.2.3.

Herringbone strutting dimensions: $\geq 38 \times 38$ mm.

Trimmers or blocking dimensions:

- Depth: Joist depth less 25 mm.
- Minimum thickness: ≥ 25 mm.

Engineered timber joists 200 mm deep or greater: Provide lateral restraint using blocking or seasoned rim board.

Decks and balconies

Attachment to external walls: To BCA 3.10.6.

3.2 WALL FRAMING

Additional support

Requirement: Provide additional support in the form of noggings, trimmers and studs for fixing lining, cladding, hardware, accessories, fixtures and fittings, as required.

Spacing of noggings: Maximum 1350 mm centres.

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

Vermin barriers

Requirement: Provide vermin barriers as follows:

- Brick veneer barrier: Close nail 10 mm galvanized steel wire mesh to the underside of the bottom plate of external stud walls, extending across the cavity for building into brickwork.
- Stud wall barrier: Metallic-coated steel sheet, 600 mm wide x 0.6 mm thick, fixed to each side of the external stud wall frame at the base. Lap joints 25 mm.

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 if not documented otherwise:

- External walls (not masonry veneer): Turn up at least 75 mm on the inside and tack. 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 at least 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 at junctions of damp-proof courses, sarkings and waterproof membranes.

Flashings

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

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

3.3 ROOF AND CEILING FRAMING

Wall plates

Fixing: Fix timber wall plates to masonry, with straps, bolts or both.

Fixing plates

Requirement: Provide 45 mm minimum thick timber fixing plates to transfer the design loads where timber joists, rafters or purlins bear on or into steel members. Bolt to the steel member at maximum 500 mm centres and at maximum 100 mm from the end of the fixing plate.

Beam framing

Ridge straps: Butt ends of rafters together at ridge, and strap each pair together with 900 mm long steel strap passing over the ridge, triple nail to each rafter.

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

Additional support: Provide a frame member behind every joint in fibre cement sheeting or lining.

Anti-ponding boards

Standard: To AS 4200.2.

Trusses

Nailplated prefabricated roof trusses: To AS 4440.

Support: Support trusses on bottom chord at two points only, unless designed for additional support.

Plumb: The lesser of $H/50$ or 50 mm, where H is the height of the truss at point where plumb is being measured.

Vertical movement: Provide minimum vertical clearance of 10 mm plus ceiling batten depth over internal non-load bearing walls. Use bracing methods which allow for the design vertical movements.

3.4 ROOF TRIM

Fascia, valley and barge boards

Requirement: Fix fascia, valley gutter boards and barge boards.

3.5 COMPLETION

Fasteners

Requirement: Make sure all bolts, screws and other fixings have been tightened so that joints and anchorages are secure at the date of practical completion.

Cleaning

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

0383 SHEET FLOORING AND DECKING**1 GENERAL****1.1 STANDARD****General**

Flooring and decking: To AS 1684.2, AS 1684.3 or AS 1684.4, as appropriate.

Slip resistance

Classification: To AS 4586.

1.2 INTERPRETATION**Definitions**

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

- Butt joints (flooring): Floor units cross cut square with plain ends for joining over supports.
- Decking: Intermittently-supported external flooring with drainage gaps between boards.
- Flooring - fitted: Flooring fitted between the walls of each room i.e. not platform floors.
- Flooring - intermittently-supported: Flooring which is supported by, and spans across joists or battens.
- Platform flooring: Flooring laid over the whole of the joisted floor structure prior to the erection of external and internal wall frames.
- Subfloor: The structure that supports the flooring.

1.3 TOLERANCES**Sheet flooring**

Maximum deviation from a 3 m straightedge laid in any direction on the floor surface: 3 mm.

1.4 SUBMISSIONS**Certification**

Certificate: Submit a supplier's certificate (which may be included on an invoice or delivery docket) verifying conformance to grading, species and board size and noting the moisture content.

Inspection: If neither branding nor certification is adopted, submit a report by an independent inspecting authority verifying conformance.

Samples

General: Submit samples of each timber or synthetic decking type illustrating the range of variation in colour and figure.

Subcontractors

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

1.5 INSPECTION**Notice**

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

- Subfloor before laying sheet flooring, fibre cement flooring or decking.

2 PRODUCTS**2.1 GENERAL****Storage**

Timber decking: Deliver to site and store on dry ground on level bearers 150 mm high, block stacked, banded and protected against the weather.

Plywood and particleboard sheet flooring: Deliver to site and store on dry ground on level bearers 150 mm high, stacked on flat and protected against the weather.

2.2 DECKING**Recycled timber decking**

Standard: To FWPA PN06.1039.

New timber decking

Standard:

- Treated softwood to AS 4785.1 Section 4.
 - . Minimum grade to AS 4785.2: Appearance.
- Hardwood to AS 2796.1 Section 4.
 - . Grade to AS 2796.2: Select.

Durability:

- Natural durability classification to AS 5604 Class 2 minimum.
- Preservative treatment to AS 1604.1 Table D1: H3 minimum.
- Identification: Brand preservative treated decking timber to AS 1604.1.

Arrises: Chamfered or round.

Compressed fibre cement decking

Standard: To AS/NZS 2908.2.

Category: Minimum 4.

Classification: Type A.

2.3 SHEET FLOORING**Plywood**

Standard: To AS/NZS 2269.0.

Plywood formaldehyde emission class to AS/NZS 2269.0: Class E₁.

- Surface grade: CD.
- Bond: Type A to AS/NZS 2754.1.

Durability:

- Preservative treatment to AS 1604.1 Table D1:
 - . Indoors above ground: H2 minimum.
 - . Outdoors above ground: H3 minimum.
- Identification: Brand preservative treated decking timber to AS 1604.1.

Particleboard

Particleboard flooring: To AS/NZS 1860.1, Class 1.

Particleboard formaldehyde emission Class to AS/NZS 1860.1: Class E₁.

Identification

Requirement: Identify timber using branding or certification.

- Branding: Brand plywood and particleboard under the authority of a recognised product certification scheme to *0185 Timber products, finishes and treatment*, as applicable to the product. Locate the

brand mark on faces or edges which will be concealed.

- Certification: Provide certification from a recognised product certification scheme to *0185 Timber products, finishes and treatment* as appropriate to the product.

Compressed fibre cement sheeting

Standard: To AS/NZS 2908.2.

Category: Minimum 4.

Classification: Type: B.

3 EXECUTION

3.1 PREPARATION

Subfloors

General: Make sure support members are in full lengths without splicing.

Flatness: Less than 3 mm deviation of the substrate under a 3 m straightedge laid in any direction with no abrupt variations greater than 1 mm over 250 mm.

Timber decking on steel joists

General: Screw fix seasoned battens to the steel joists so that their top surfaces are aligned.

- Batten size: Minimum 35 mm thick.
- Spacing of fasteners: Less than 600 mm.

3.2 FIXING SHEET FLOORING

Particleboard flooring

Installation: To AS 1860.2.

Plywood flooring

Installation: To AS 1684.2, AS 1684.3 or AS 1684.4, as appropriate.

Compressed fibre cement flooring

Installation: Lay the length of the sheets at right angles to the joists. Stagger the end joints and locate centrally over joists. Apply adhesive to edges of sheets and firmly butt join together.

Minimum number of spans across support: 2.

Fixing: Pre-drill screw holes with 1 mm clearance over screw diameter and countersink. Fix with corrosion resistant countersunk screws.

Spacing of fasteners:

- Sheet edge and intermediate: Less than 450 mm.
- Corners and sheet edges: At least 12 mm from sheet edges and 50 mm from corners.

Wet area flooring: Stop screw heads with sealant.

3.3 FIXING DECKING

Timber decking

Standard: To AS 1684.2, AS 1684.3 or AS 1684.4 as appropriate.

Installation: Lay in long lengths with the ends of each board firmly butted to the next and firmly in contact with the joists. Stagger the end joints and locate them centrally over joists.

Gap between edges of seasoned boards: Minimum 4 mm.

Minimum number of spans across supports: 3.

Nailing:

- General: Make sure the boards are in contact with the joists at the time of nailing, particularly where boards are machine nailed. If nails are to be less than 10 mm from ends of boards, pre-drill nail holes 0 to 1 mm undersize.
- Top nailing: Double nail at each bearing with hot dip galvanized or stainless steel nails driven flush. Offset nails at intermediate fixings or skew nail 10° in opposite directions.

Sealing: Apply 1 coat of water repellent preservative and 1 coat of finish coat to top surface of joists and all surfaces of boards before fixing.

Compressed fibre cement decking

Installation: Lay the length of the sheets parallel or at right angles to the joists. Locate end joints centrally over joists. Provide noggings or trimmers joists, cut between and fixed to joists to support the edges of sheets.

Minimum number of spans across support: 2.

Fixing: Pre-drill screw holes with 1 mm clearance over screw diameter and countersink. Fix with corrosion resistant countersunk screws. Apply sealant to screw hole and screw before fixing and stop screw head with sealant, finished slightly below the surface after fixing.

Spacing of fasteners:

- Sheet edge and intermediate: Less than 450 mm.
- Corners and sheet edges: At least 12 mm from sheet edges and 50 mm from corners.

Joints: Provide butt joints 5 mm wide. Insert compressible closed cell polyethylene foam backing rod and fill the joint with a flexible sealant.

Composite decking

Installation: In conformance with manufacturer's recommendations.

0411 WATERPROOFING - EXTERNAL AND TANKING**1 GENERAL****1.1 RESPONSIBILITIES****Performance**

Requirements: Provide waterproofing and tanking systems to substrates as follows:

- Graded to falls to dispose of stormwater without ponding above the depth of lapped seams.
- Able to accommodate anticipated building movements.
- Able to accommodate its own shrinkage over the warranty life of the roofing system.
- Able to resist water under hydrostatic pressure.

1.2 STANDARDS**External waterproofing**

Membrane materials: To AS 4654.1.

Membrane design and installation: To AS 4654.2.

Stormwater drainage

Standard: To AS/NZS 3500.3.

1.3 INTERPRETATION**Definitions**

General: For the purposes of this worksection the definitions given in AS 4654.1 and AS 4654.2 and the following apply:

- Bitumen: A viscous material from the distillation of crude oil comprising complex hydrocarbons, which is soluble in carbon disulphide, softens when it is heated, is waterproof and has good powers of adhesion. It is produced as a refined by-product of oil.
 - . APP Bitumen: Bitumen modified with Atactic (meaning non-crystalline or amorphous) polypropylene wax to form a plastomeric sheet. The membrane is reinforced with fibreglass or non-woven polyester (NWP).
 - . SBS bitumen: Bitumen modified with Styrene Butadiene Styrene, a thermoplastic rubber that undergoes a phase inversion at elevated temperature and converts to an elastomeric material. The membrane is reinforced with fibreglass or non-woven polyester (NWP).
- Bond breaker: A system preventing a membrane bonding to the substrate, bedding or lining.
- Double detail joint: A joint formed by turning up and bonding the horizontal membrane to a vertical substrate and adding an overflashing of membrane material bonded to the vertical substrate and folded over and bonded to the horizontal membrane. In certain situations the double detail can be achieved by bonding an angle profile of membrane material to the junction prior to laying the membrane.
- Liquid applied: A water-based formulation which cures to form an elastomeric membrane.

- Polyurethane: Water or solvent based formulations which moisture cure to form an elastic rubber membrane.
- PVC membrane: Flexible plastic sheet membrane (vinyl).
- Slip sheet: A sheet used to isolate the membrane system from the supporting substrate or from the topping or mortar bedding. The most common material is polyethylene.
- Substrate: The surface to which a material or product is applied.

1.4 SUBMISSIONS**Records**

Placing records: Photographically record the application of membranes and label with the following information:

- Date.
- Portion of work.
- Substrate preparation.
- Weather during application and curing.
- Protection provided from traffic and weather.
- Type test certificates verifying compliance with AS 4654.1 Section 2, Tables 2.1 to 2.3.

1.5 INSPECTION**Notice**

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

- Substrate preparation completed.
- Secondary layers preparation completed.
- Before membranes are covered up or concealed.
- Underflashings complete before installation of overflashings.
- After flood testing.

2 PRODUCTS**2.1 MEMBRANES****Membrane systems**

Requirement: Provide a proprietary membrane systems suitable for the intended external waterproofing.

Tanking systems

Requirement: Provide a proprietary membrane system suitable for the intended below ground tanking.

2.2 ACCESSORIES**Internal roof outlets**

General: Proprietary funnel shaped sump cast into the roof slab, set flush with membrane, with a flat removable grating and provision for sealing the membrane into the base of the outlet.

Flashings

General: Proprietary or custom made flashings and materials for sealing membranes at junctions and terminations.

Control joint covers

Corners, crossovers, tees and bends: Factory mitred, welded and provided with 500 mm legs.

End closures: Factory folded and sealed to match joint cover profile.

2.3 THERMAL INSULATION**Insulation boards**

General: Proprietary insulation boards.

2.4 PROTECTION**Protection board**

General: Proprietary rigid or semi-rigid protection board.

2.5 SLIP SHEETS**Sheet material**

General: A sheet to isolate the membrane system from the supporting substrate or from the topping or mortar bed.

2.6 DRAINAGE CELL PANELS**Walls and planter bases**

General: Lightweight, high strength modular drainage cell for below ground or subsoil drainage.

Filter fabric: An open weave geotextile fabric to reduce soil and fines ingress into drainage system.

3 EXECUTION**3.1 PREPARATION****Substrates**

General: Prepare substrates as follows:

- Fill all cracks in substrates wider than 1.5 mm with a filler compatible with the membrane system.
- Fill voids and hollows in concrete substrates with a concrete mix not stronger than the substrate.
- Remove projections.
- Remove deleterious and loose material.
- Remove all traces of a concrete curing compound if used.
- Leave the surface free of contaminants, clean and dust free.

Concrete substrates: Cure for more than 28 days.

Moisture content

Requirement: Verify that the moisture content of the substrate is compatible with the water vapour transmission rate of the membrane system by testing to AS 1884 Appendix A.

Falls

Requirement: Verify that falls in substrates are greater than 1:80.

Joints and fillets

External corners: Round or arris edges.

Control joints: Prepare all substrate joints to suit the membrane system.

Priming

Compatibility: If required, prime the substrates with compatible primers for adhesion of the membrane system.

3.2 APPLICATION**Protection during installation**

Damage: Protect membrane from damage during installation and for the period after installation until the membrane achieves its service characteristics that resist damage.

Drains

General: Prevent moisture from tracking under the membranes at drainage locations.

Drains and cages: Provide removable grates or cages to prevent blockage from debris. If the finished surface is above the level of the membrane, provide a slotted extension piece to bring the grate up to the level of the finished surface.

Overflows: Apply a bond breaker to the perimeter of the overflow outlet at its junction with the surface to which the membrane will be fixed. Turn the membranes into the overflow to prevent moisture from tracking behind the membrane.

Sheet membrane joints

Orientation of laps: Lap sheets on the upslope side of the roof fall over sheets on the downslope side.

End laps generally: Stagger end lap joints.

Bituminous sheet membranes:

- Side laps: 75 mm.
- End laps: 100 mm.
- Method: Heat welded.

Synthetic rubber membranes:

- Factory-vulcanized laps: More than 40 mm.
- Field side laps: More than 50 mm for side laps.
- Field end-laps: More than 100 mm for end laps.

PVC membranes:

- Factory welded laps: More than 30 mm.
- Field-welded laps:
 - . If used over insulation boards: More than 100 mm.
 - . Other instances: More than 75 mm overlaps.

Curing of liquid applied systems

General: To the manufacturers' instructions.

Control of movement

General: Provide control joints located over control joints in the substructure.

Fillets and bond breakers: Size to allow the membrane to accommodate movement.

Control joint covers: Install after fixing hobs and membranes.

Bonded membranes: Carry control joints in the substrate through to and into the surface finish.

Membrane terminations

Membrane upturns: Provide upturns above the maximum water level expected from the exposure conditions of rainfall intensity and wind.

- Height: To AS 4654.2 Appendix A, Table A1.
- Anchoring: Secure sheet membranes along the top edge.
- Edge protection: Protect edges of the membrane.

Waterproofing above vertical terminations:

Waterproof the structure above the termination to

prevent moisture entry behind the membrane using cavity flashings, capping, waterproof membranes or waterproof coatings.

Horizontal terminations: Do not provide. Use vertical terminations.

Membrane vertical penetrations

Pipes, balustrades, ducts, and vents: Provide separate sleeves for all pipes, ducts and vents, and fix to the substrate.

Membrane horizontal penetrations

Sleeves: Protect rigid PVC-U conduits and pipes with a sleeve of SBS bitumen in order to seal to the membrane without burning the PVC-U. Do not use high density polyethylene (HDPE), polypropylene (PP) pipes or flexible PVC conduit.

Membrane at balcony doors and windows

Requirement: Install membrane before the fixing of door or window frames.

Hobless and flush thresholds: Install membrane before the fixing of door or window frames with a continuous grated drain abutting the external face of the door or window sill.

Membrane at parapets

Requirement: Terminate membrane upstands under parapet flashing or capping giving 75 mm overlap. Do not top fix parapet cappings. Seal heads of fasteners against capping.

Membrane at gutters

Requirement: Terminate membrane over a corrosion resistant metal angle fixed to the gutter support substrate with the vertical leg of the angle turned down into the gutter at least 35 mm.

Membrane to planter boxes

Membrane: Extend root-resistant membrane at least 100 mm vertically above the soil fill level and secure.

Drainage: Grade the base of the planter to adequately sized drainage outlets and terminate the membrane in the outlets.

Drainage riser: Install a riser with drainage slots that extend from the membrane level to the top of the drainage cell. Extend the riser above the soil fill level and finish with a screw cap to provide access for drain clearing.

Protection board: Provide protection board to the full extent of the membrane including areas between soil level and the underside of flashings and cappings.

Drainage cell: Provide geo-filter fabric wrapped drainage cell to the base of the planter and turn geo-filter fabric up drainage riser at least 100 mm above drainage slots.

Cappings and flashings: Provide capping to the tops of planter walls to protect the membrane. Extend the capping to overlap the top of the protection board on the inside face of the planter wall. Where planter walls abut other walls, provide a flashing over the top of the membrane.

Membrane to below ground structures

Membrane: Externally apply membrane to all walls and return to horizontal surfaces to prevent water tracking around structure at joints and corners.

Protection board: Provide protection board to the full extent of the membrane.

Drainage cell: Provide geo-filter fabric wrapped drainage cell to vertical surfaces of the structure.

Reinforcement: Provide reinforcement to the membrane at junctions, corners and over joints to the manufacturer's recommendations.

Overlaying finishes on membranes

Compatibility: If a membrane is to be overlaid with another system such as tiles, pavers, ballast, insulation or soil, provide an overlaying system that is compatible with and not cause damage to the membrane.

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

Slip sheet: If the topping or bedding mortar is structurally sufficient not to require bonding to the substrate, lay a double slip sheet over the membrane to separate it from the topping or bedding mortar.

Paint coatings: If maintenance pathways are indicated by a paving paint, use a paving paint which is compatible with the membrane.

Membrane protection boards: If the membrane is overlaid, topped or backfilled against, provide a protection board to protect the membrane from hydrostatic pressure, wear and puncture.

3.3 TESTING

Flood test

Application: Perform a flood test before the installation of surface finishes.

Moisture content measurement method: Conform to AS 1884 Appendix A.

Set-up:

- Measure the wall/floor junction of adjacent spaces and of the slab soffit below for dryness.
- Record the result for each area.
- Dam the access openings and seal drainage outlets to allow 50 mm water level but no higher than 25 mm below the weir level of the perimeter flashings.
- Provide temporary overflows of the same capacity as the roof outlets to maintain the flood level.
- Fill space with clean water and leave overnight.

Evaluation:

- Make a visual inspection after a minimum period of 2 hours, of the wall/floor junction of adjacent spaces and of the slab soffit below for obvious water or moisture.
- Test the same areas for dryness using a moisture meter, and compare the results to the measurements taken before flooding.

Conformance:

- Evidence of water from the visual test: Failure.
- No visual evidence of water: Proceed with the moisture meter test.

- Increase in test results before and after flooding: Failure.

Records: Submit records of all flood tests.

3.4 COMPLETION

Protection

General: Keep traffic off membrane surfaces until bonding has set or for 24 hours after laying, whichever period is the longer.

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

Warranties

Waterproofing: 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.

0423 ROOFING – PROFILED SHEET METAL

1 GENERAL

1.1 TOLERANCES

Sheet metal roofing

Supporting members: To AS 1562.1 clause 4.2.3.

1.2 SUBMISSIONS

Operation and maintenance manuals

On completion: Submit a manual of recommendations from the roofing manufacturer or supplier for the maintenance of the roofing system including, frequency of inspection and recommended methods of access, inspection, cleaning, repair and replacement.

Products and materials

Type tests: Submit results as follows:

- Metal roofing generally: Roof sheeting and fastenings to AS 1562.1 clause 5.4 for resistance to concentrated load and clause 5.5 for resistance to wind pressure.
- Metal roofing in cyclonic regions to AS/NZS 1170.2: Roof sheeting and fastenings to AS 1562.1 clause 5.6.
- Plastic sheet roofing: Roofing and fastenings to AS 1562.3 Section 5 for resistance to wind forces and resistance to impact.

Recycled material content: Submit documentation from the roofing material manufacturer.

Samples

Requirement: Submit samples of the following:

- Custom profiled flashings and cappings.
- Sheet metal finishes showing the range of variation available.
- Sealants.
- Trims and accessories with a colour finish.

Warranties

Roofing materials: Submit the manufacturer's product warranties.

1.3 INSPECTION

Notice

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

- Roof supports.
- The parts of the roofing, sarking, vapour barrier, insulation and roof plumbing installation before covering up or concealing.

2 PRODUCTS

2.1 GENERAL

Storage and handling

Storage: Store metal roofing materials, as follows:

- Away from uncured concrete and masonry, on a level base and not in contact with other materials

that cause staining, denting or other surface damage.

Handling: Handle metal roofing materials, as follows:

- Use gloves when handling precoated metal roofing material.
- Use soft soled shoes when fixing or working on roofs.
- Protect edges and surfaces from damage. Do not drag sheets across each other or over other materials.

Safety mesh

Standard: To AS/NZS 4389.

2.2 SHEET METAL ROOFING

Standards

Design and materials: To AS 1562.1.

Fasteners

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

Fastenings to timber battens: Fastenings long enough to penetrate the thickness of the batten without piercing the underside.

Insulation spacers

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

Profiled fillers

Type: Purpose-made closed cell polyethylene foam profiled to match the roofing profile.

Location: Provide profiled fillers under flashings to the following:

- Ridges.
- Eaves.
- Lapped joints in roof sheeting.

2.3 ROOF PLUMBING

General

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

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

Matching fascia/barge capping: If the selected eaves gutter is a proprietary high front pattern forming part of a combined system of gutter, fascia and barge, provide matching proprietary fascias and barge cappings to roof verges and edges.

Standards

Roof drainage: To AS/NZS 3500.3.

Metal rainwater goods: To AS/NZS 2179.1.

Flashings and cappings: To AS/NZS 2904.

2.4 PLASTIC SHEET ROOFING

Materials

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.

Sealants: Neutral curing silicone or modified silane (MS) polymer based sealant to the roofing manufacturer's recommendations.

2.5 ROOF VENTILATORS

General

Description: A proprietary roof ventilator system including framing, fixing, trim, seals, accessories and flashings.

2.6 ROOF PLANT ACCESS

Walkways

Description: A proprietary roof walkway system including fixings.

3 EXECUTION

3.1 INSTALLATION

Protection

General: Keep the roofing and rainwater system free of debris and loose material during construction.

Thermal movement

Requirement: Allow for thermal movement in the roof installation and the structure, including movement in joints and fastenings.

Pan type sheets

Removal: Install sheets so that individual sheets can be removed without damage.

Curved corrugated sheet

General: Form by rolling from material recommended for curving or bullnosing. Minimise crimping or creasing across the face of the sheet. Trim off crimped or creased edges and ends.

Metal separation

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

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

Wind regions C and D

Fixing of roof sheeting: To the manufacturer's recommendations and as follows:

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

3.2 SHEET METAL ROOFING

Roof sheet 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 roofing sheets.

3.3 BUILDING ELEMENTS

Ridges and eaves

Sheet ends: Treat as follows:

- Project sheets 50 mm into gutters.
- Close off ribs at bottom of sheets using mechanical means or with purpose-made fillers or end caps.
- Turn pans of sheets up at tops and down into gutters by mechanical means.
- Pre-cut notched eaves flashing and birdproofing if required.
- Close off ridges with purpose-made ridge fillers of closed cell polyethylene foam.

Ridge and barge

Capping: Finish off along ridge and verge lines with purpose-made ridge capping or barge rolls.

Sprung curved ridge

General: Lay the roofing sheets in single lengths from eaves to eaves by naturally curving the sheets over the ridge.

Ridge: Seal side laps at the ridge and extend the sealant to the point where the roof pitch equals the recommended pitch of the roofing profile.

End laps

General: If end laps are unavoidable, and the sheet profile is not suitable for interlocking or contact end laps, construct a stepped type lap.

3.4 ROOF PLUMBING

Jointing sheet metal rainwater goods

Butt joints: Make joints over a backing strip of the same material.

Soldered joints: Do not solder aluminium or aluminium/zinc-coated steel.

Sealing: Seal fasteners and mechanically fastened joints. Fill the holes of blind rivets with silicone sealant.

Flashings

Installation: Flash roof junctions, upstands, abutments and projections through the roof. Preform to required shapes if possible. Notch, scribe, flute or dress down as necessary to follow the profile of adjacent surfaces. Mitre angles and lap joints 150 mm in running lengths. Provide matching expansion joints at 6 m maximum intervals.

Upstands: Flash projections above or through the roof with two part flashings, consisting of a base flashing and a cover flashing, with at least 100 mm vertical overlap. Provide for independent movement between the roof and the projection.

Large penetrations in low pitch roofs: Extend the base flashing over the roofing ribs to the ridge to prevent ponding behind the penetrating element.

Wall abutments: Where a roof abuts a wall, provide over flashing as follows:

- In masonry walls, planked cladding or concrete: Step in courses to the roof slope. Interleave with damp proof course, if any.
- Raking in masonry: Build into the full width of the outer leaf. Turn up within cavity, slope inward across the cavity and fix to or build into the inner leaf at least 75 mm above the roofing line.
- Raking in concrete: Turn 25 mm into joints or grooves, wedge at 200 mm centres with compatible material and point up.

Fixing to pipes: Solder or seal with neutral cured silicone rubber and secure with either of the following:

- Clamping ring.
- Proprietary flexible clamping shoe with attached metal surround flashing.

Gutters

Gutter and sump support: Provide framing and lining to support valley gutters, box gutters and sumps. Line the whole area under the gutters and sumps.

Box gutter: Prefabricate box gutters to the required section and shape. Form stop ends, downpipe nozzles, bends and returns. Dress downpipe nozzles into outlets.

- Hail guards: Install grating over the whole of the box gutter, over all box gutter sumps and over the edges of roofing sheeting entering box gutters.
- Overflows: Provide overflows to prevent back-flooding. Size to pass 100% of the design rainfall. Discharge overflows in visible locations and so water does not enter the building or cause damage to the building.
- Sumps: Minimum 150 mm deep and the full width of the box gutter.

Valley gutters: Profile to suit the valley boarding. Turn back both edges 180 x 6 mm radius. Nail or screw to the valley boarding at the top end to prevent the gutter creeping downwards.

Gratings: Install removable gratings over rainheads and sumps.

Leaf guard location: All gutter outlets.

External 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.

Access cover: Provide a removable watertight access cover at the foot of each downpipe stack.

Downpipe support: Provide supports and fixings for downpipes.

Internal downpipes

Access: Provide access openings as follows:

- At each junction and bend.
- At the foot of each stack.
- At every second floor level.

Acoustic insulation: Mineral fibre pipe insulation 50 mm thick, spirally bound on with 1.5 mm wire at 150 mm pitch.

Building in: If pipes are built into masonry or concrete, spiral wrap the pipe (and insulation, if any) with building paper.

3.5 PLASTIC SHEET ROOFING

Installation

Standard: To AS 1562.3.

Fixing to timber: 30 mm minimum penetration.

3.6 TESTING

Site tests

Internal downpipes: Test each stack hydrostatically in stages, each test to run over two storeys high for two hours. Remedy defects and retest if necessary.

3.7 COMPLETION

Reinstatement

Extent: Repair or replace damage to the roofing and rainwater system. If the work cannot be repaired satisfactorily, replace the whole area affected.

Touch up: If it is necessary to touch up minor damage to prepainted metal roofing, do not use spray paints.

Cleaning

Roofing and rainwater drainage system: Remove debris, metal swarf, solder, sealants and unused materials.

Exposed metal surfaces: Clean surfaces of substances that interfere with uniform weathering or oxidation.

Roof plumbing: Clean out spoutings, gutters and rainwater pipes after completion of roof installation.

Warranties

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

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

0427 ROOFING – TILES

1 GENERAL

1.1 PERFORMANCE

Ambient climatic conditions

Requirement: Design to suit rainfall intensity to AS/NZS 3500.3.

Roof access

Type: Normal roof maintenance.

1.2 TOLERANCES

General

Roof tiles: Dimensional tolerance to AS 2049 clause 5.2.

Battens: To AS 2050 clause 3.2.

1.3 SUBMISSIONS

Operation and maintenance manuals

On completion: Submit a manual of recommendations from the roofing manufacturer or supplier for the maintenance of the roofing system including, frequency of inspection and recommended methods of access, inspection, cleaning, repair and replacement.

Products and materials

Type tests: As appropriate for the project, submit evidence of conformity to the following:

- Plastic sheet roofing: Roofing and fastenings to AS 1562.3 Section 5 for resistance to wind forces and resistance to impact.
- Tile roofing: Dynamic weather resistance test to AS 4046.9.

Samples

Requirement: Submit samples of the following, showing the range of variation available:

- Bedding and pointing mortar.
- Tiles.
- Trims and accessories with a colour.

Warranties

Roofing materials: Submit the manufacturer's published product warranties.

1.4 INSPECTION

Notice

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

- Roof supports.
- The parts of the roofing, sarking, vapour barrier, insulation and roof plumbing installation before covering up or concealing.

2 PRODUCTS

2.1 GENERAL

Safety mesh

Standard: To AS/NZS 4389.

2.2 TILING

Terracotta, concrete and composite roof tiling materials

Standard: To AS 2049.

Ancillaries: Provide accessories compatible with the tiles, necessary to complete the tiling.

Fasteners

Requirement: To AS 2334 for clout nails and AS 3566.1 for self-drilling screws, with durability not less than roofing materials.

2.3 ROOF PLUMBING

General

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

Matching fascia/barge capping: If the selected eaves gutter is a proprietary high front pattern forming part of a combined system of gutter, fascia and barge, provide matching proprietary fascias and barge cappings to roof verges and edges.

Material and colour: To match roof sheeting.

Standards

Roof drainage: To AS/NZS 3500.3.

Metal rainwater goods: To AS/NZS 2179.1.

Flashings and cappings: To AS/NZS 2904.

2.4 PLASTIC SHEET ROOFING

Materials

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.

Sealants: Neutral curing silicone or modified silane (MS) polymer based sealant to the roofing manufacturer's recommendations.

2.5 ROOF VENTILATORS

General

Description: A proprietary roof ventilator system including framing, fixing, trim, seals, accessories and flashings.

3 EXECUTION

3.1 INSTALLATION

Protection

General: Keep the roofing and rainwater system free of debris and loose material during construction.

Thermal movement

Requirement: Provide for thermal movement in the roof installation and the structure, including movement in joints and fastenings.

Metal separation

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

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

3.2 TILING

Installation

Standard: To AS 2050.

Setting out: Set out the roof to give an even tile gauge in each course, with full or saw cut tiles at verges.

Bedding and pointing: Bed and point ancillary tiles, including ridges, hips and verges, in coloured mortar to match the tiles.

Tile verge: Finish the verge with cover tiles pointed to the roof tiles. Screw fix to the barge board with round head galvanized screws.

Pointed verge: Bed and point tiles on 100 x 5 mm fibre cement pointing strip.

3.3 ROOF PLUMBING

Jointing sheet metal rainwater goods

Butt joints: Make joints over a backing strip of the same material.

Soldered joints: Do not solder aluminium or aluminium/zinc-coated steel.

Sealing: Seal fasteners and mechanically fastened joints. Fill the holes of blind rivets with silicone sealant.

Flashings

Installation: Flash roof junctions, upstands, abutments and projections through the roof. Preform to required shapes if possible. Notch, scribe, flute or dress down as necessary to follow the profile of adjacent surfaces. Mitre angles and lap joints 150 mm in running lengths. Provide matching expansion joints at 6 m maximum intervals.

Upstands: Flash projections above or through the roof with two part flashings, consisting of a base flashing and a cover flashing, with at least 100 mm vertical overlap. Provide for independent movement between the roof and the projection.

Large penetrations in low pitch roofs: Extend the base flashing over the roofing ribs to the ridge to prevent ponding behind the penetrating element.

Wall abutments: Where a roof abuts a wall, provide overflashing as follows:

- In masonry walls, planked cladding or concrete: Step in courses to the roof slope. Interleave with damp proof course, if any.
- Raking in masonry: Build into the full width of the outer leaf. Turn up within cavity, slope inward across the cavity and fix to or build into the inner leaf at least 75 mm above the roofing line.
- Raking in concrete: Turn 25 mm into joints or grooves, wedge at 200 mm centres with compatible material and point up.

Fixing to pipes: Solder or seal with neutral cured silicone rubber and either of the following:

- Secure with a clamping ring.
- Provide a proprietary flexible clamping shoe with attached metal surround flashing.

Gutters

Gutter and sump support: Provide framing and lining to support valley gutters, box gutters and sumps. Line the whole area under the gutters and sumps.

Box gutter: Prefabricate box gutters to the required section and shape. Form stop ends, downpipe nozzles, bends and returns. Dress downpipe nozzles into outlets.

- Hail guards: Install grating over the whole of the box gutter, over all box gutter sumps and over the edges of roofing sheeting entering box gutters.
- Overflows: Provide overflows to prevent back-flooding. Size to pass 100% of the design rainfall. Discharge overflows in visible locations and so water does not enter the building or cause damage to the building.
- Sumps: Minimum 150 mm deep and the full width of the box gutter.

Valley gutters: Profile to suit the valley boarding. Turn back both edges 180 x 6 mm radius. Nail or screw to the valley boarding at the top end to prevent the gutter creeping downwards.

Gratings: Install removable gratings over rainheads and sumps.

Leaf guard location: All gutter outlets.

External 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.

Access cover: Provide a removable watertight access cover at the foot of each downpipe stack.

Downpipe support: Provide supports and fixings for downpipes.

Internal downpipes

Access: Provide access openings as follows:

- At each junction and bend.
- At the foot of each stack.
- At every second floor level.

Acoustic insulation: Mineral fibre pipe insulation 50 mm thick, spirally bound on with 1.5 mm wire at 150 mm pitch.

Building in: If pipes are built into masonry or concrete, spiral wrap the pipe (and insulation, if any) with building paper.

3.4 PLASTIC SHEET ROOFING**Installation**

Standard: To AS 1562.3.

Fixing to timber: 30 mm minimum penetration.

3.5 TESTING**Site tests**

Internal downpipes: Test each stack hydrostatically in stages, each test to run over two storeys high for two hours. Remedy defects and retest if necessary.

3.6 COMPLETION**Reinstatement**

Extent: Repair or replace damage to the roofing and rainwater system. If the work cannot be repaired satisfactorily, replace the whole area affected.

Touch up: If it is necessary to touch up minor damage to prepainted metal roofing, do not overspray onto undamaged surfaces.

Cleaning

Roofing and rainwater drainage system: Remove debris, metal swarf, solder, sealants and unused materials.

Exposed metal surfaces: Clean surfaces of substances that interfere with uniform weathering or oxidation.

Roof plumbing: Clean out spoutings, gutters and rainwater pipes after completion of roof installation.

Spare tiles

Number: Provide one spare matching tile for every hundred tiles on the roof. Provide spare accessories in the same ratio.

Location: Stack spares within the roof space.

Designated locations: On or next to lines of supporting walls.

Warranties

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

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

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

Requirement: Provide lightweight external wall cladding and associated work, as documented.

1.2 TOLERANCES**Permitted deviations**

Profiled metal sheet cladding: To AS 1562.1 clause 4.2.3.

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

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

Structural steelwork for wall panels: ± 5 mm between bearing planes of adjacent supports.

1.3 SUBMISSIONS**Fire performance**

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

Fire-resistance level: Submit evidence of conformity to PRODUCTS, **FIRE PERFORMANCE**, **Fire-resistance of building elements**.

Operation and maintenance manuals

General: Submit manufacturer's published use, care and maintenance requirements.

Products and materials

Type tests: As appropriate for the project, submit evidence of conformity to the following:

- Metal cladding generally: Cladding and fastenings to AS 1562.1 clause 5.5 for resistance to wind pressures.
- Metal cladding in cyclonic regions to AS/NZS 1170.2: Cladding and fastenings to AS 1562.1 clause 5.6.
- Plastic cladding: Cladding and fastenings to AS 1562.3 Section 5 for resistance to wind forces and resistance to impact.

Samples

Finish: Submit samples of the cladding material showing the range of variation available.

1.4 INSPECTION**Notice**

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

- Framing, sarking, vapour barrier and insulation before covering up or concealing.

2 PRODUCTS**2.1 GENERAL****Storage and handling**

Requirement: Store and handle materials to the manufacturer's recommendations and the following:

- Protect materials including edges and surfaces from damage.
- Keep dry and unexposed to weather.
- Do not drag sheets or panels across each other or over other materials.
- AAC panels: Stack on edge, support off the ground and level to avoid sagging and damage to ends, edges and surfaces.
- Composite panels: Store unpacked panels by size in racks and protect from scratching, warping or bending.
- Sheeting: Stack flat and off the ground on at least 3 evenly placed bearers.
- Store metal materials away from uncured concrete and masonry on a level base.
- Do not store metal materials in contact with other materials which may cause staining, denting or other surface damage.
- Use gloves when handling precoated metal cladding material.

Components

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

Flashings: To AS/NZS 2904.

- Material: Prefinished sheet steel.

2.2 FIRE PERFORMANCE**Combustibility**

Cladding: Tested to AS 1530.1.

Fire-resistance of building elements

Fire-resistance level: Tested to AS 1530.4.

2.3 AERATED AUTOCLAVED CONCRETE (AAC) PANELS**General**

Requirement: Proprietary AAC panels.

Standard: To AS 5146.1.

Joint adhesive: Proprietary adhesive to the manufacturer's recommendations.

Sealant: Flexible sealant to the manufacturer's recommendations.

2.4 COMPOSITE PANELS**General**

Requirement: Proprietary non-combustible composite panels.

Panel joints and control joints: Integral.

Flexible sealant: Non-staining to the manufacturer's recommendations.

2.5 FIBRE CEMENT (FC) PLANKS

General

Requirement: Proprietary single faced fibre cement building planks.

Standard: To AS/NZS 2908.2 and the following:

- Type A Category 3.

Corners: Preformed metal joining pieces.

2.6 FIBRE CEMENT (FC) SHEETS

General

Requirement: Proprietary single faced fibre cement sheets.

Standard: To AS/NZS 2908.2 and the following:

- Type A Category 3.

Sealant and bond breaking tape: To the manufacturer's recommendations.

Eaves and soffit lining

Sheets: Single faced fibre cement.

Minimum sheet thickness: 6 mm.

Joints: PVC-U extrusion.

2.7 PROFILED SHEET METAL

General

Requirement: Proprietary profiled sheet metal cladding.

Design and installation: To AS 1562.1.

3 EXECUTION

3.1 PREPARATION

Substrates or framing

Requirement: Before fixing cladding, check the alignment of substrates or framing and adjust if required.

Flexible underlay: Check that the underlay is restrained.

3.2 INSTALLATION

General

Fixing method: As documented or to one of the following fixing methods to the manufacturer's recommendations:

- Steel framing: Screw.
- Timber framing: Nail or screw.
- Minimum penetration for profiled metal sheets: 30 mm for timber framing.

Horizontal cladding surface:

- Minimum slope: 1:15.
- Staining: Slope away from visible vertical facade areas to prevent staining.

Defective components: Do not install component parts which are defective, including warped, bowed, dented, abraded or broken members.

Damaged parts: Remove and replace damaged members during installation.

External suspended soffits

General: Support external suspended soffits on rigid members capable of carrying the loads from imposed actions. Install members to minimise any

eccentricity, and carry the upward and downward loads from wind actions through to the supporting structure.

Accessories and trim

Requirement: Provide accessories and trim required to complete the installation, or as documented.

Corner flashing for profiled and seamed metal sheets: Finish off at corners with purpose-made folded flashing strips.

Metal separation

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

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

Incompatible metal fixings: Do not use.

Proprietary systems or products

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

Wind regions C and D

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

3.3 AAC PANEL CLADDING

General

Installation: To AS 5146.3.

Preparation: Make sure the panel is clean and free of dust and loose particles.

Panel layout: As documented.

Joint adhesive: Apply to vertical and horizontal joints. Remove excess adhesive from the face after panels are butted together.

Sealant: Caulk control joints, gaps between panels and infill or penetration framing with flexible sealant.

Vertical joints: Finish flush.

Cracking: For render finishes, minimise cracking at joints to the manufacturer's recommendations.

3.4 COMPOSITE PANEL CLADDING

General

Fabrication: Factory fabricate panels and elements wherever possible.

Installation: Install composite panels 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 recommendations.
- Isolated from any building loads, including loads caused by structural deflection or shortening.
- Allow for thermal movement.

Protection: Protect surfaces and finishes, including the retention of protective coatings during installation.

Joints

Requirement: Rigidly secure joints other than movement and open joints. Reinforce as required and fix with hairline abutments or as documented.

Control joints:

- Location: To coincide with structural movement joints, as documented.

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

3.5 FC SHEET CLADDING**Preparation**

Requirement: Cut sheets to suit the layout as documented.

Joints

Control joints:

- Locate between the panel and fixing system and the supporting structure, as documented.
- Sheet edges: Square cut.
- Sealant: Do not apply finish coating over joint sealants.

Arrangement: Set out in even panels with joints coinciding with framing or as documented.

Fixing

General: Corrosion resistant nails or screws to the manufacturer's recommendations.

Eaves and soffit lining: Fix at 150 mm centres to soffit bearers at a maximum of 450 mm centres.

3.6 PROFILED SHEET METAL CLADDING**Installation**

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

Ground clearance: Maintain documented clearance.

Cutting sheets: Wherever possible, factory cut to length. Do not use an abrasion disc.

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

3.7 COMPLETION**Reinstatement**

Extent: Repair or replace damage to the cladding. If the work cannot be repaired satisfactorily, replace the whole area affected.

Touch up: If it is necessary to touch up minor damage to prepainted metal cladding, do not use spray paints.

Cleaning

Requirement: Remove excess debris, metal swarf, solder, sealants and unused materials.

Exposed metal surfaces: Clean surfaces of substances that interfere with uniform weathering or oxidation.

Protection: Remove protective coatings using methods required by the manufacturer after completion.

Composite panels: Clean surfaces with soft, clean cloths and clean water to the manufacturer's recommendations.

Warranties

Requirement: Cover materials and workmanship in the form of interlocking warranties from the supplier and installer.

0451 WINDOWS AND GLAZED DOORS**1 GENERAL****1.1 RESPONSIBILITIES****Performance**

Product design: Provide windows with sashes capable of being opened to satisfy the maintenance requirements, as documented.

1.2 STANDARDS**General**

Selection and installation: To AS 2047.

Glazing

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

Materials and installation: To AS 1288.

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

Windows and glazed doors in Northern areas

Selection and installation: To AS 2047 for the following:

- Serviceability design wind pressure: To AS 2047 Table 2.1, as appropriate for the project site conditions.
- Ultimate strength test pressure: To AS 2047 Table 2.5, as appropriate for the project site conditions.

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

1.3 SUBMISSIONS**Certification**

Conformance: Submit evidence that window and door assemblies conform to AS 2047.

Sealant compatibility: Submit statements from all parties to the installation certifying the compatibility of sealants and glazing systems to all substrates.

Opacified glass: Submit a report, from the manufacturer, certifying that the proposed method of opacifying the glass will not be detrimental to the glass or affect the glass product warranty.

Toughened glass: For each batch of glass, submit certification from the manufacturer of heat soaking.

Protection of openable windows: Submit a certificate of on-site fall prevention testing.

Fire performance

Fire-resistance level: Submit evidence of conformity to PRODUCTS, **FIRE PERFORMANCE, Fire-resistance of building elements.**

Operation and maintenance manual

Window and door assemblies: Submit the window and glazed door manufacturer's published instructions for operation, care and maintenance.

Hardware: Submit the manufacturer's published recommendations for use, care and maintenance.

Products and materials

Safety glazing materials: Submit evidence of conformity to AS/NZS 2208 Appendix A.

Type tests: Submit results, as follows:

- Acoustic performance of windows and doors.
- Protection of openable windows.

Samples

Window and door framing: Submit the following:

- Colour samples of prefinished production materials showing the limits of the range of variation in the documented colour.
- Joints made by proposed techniques.

- Sections for frames, sashes, louvres and slats.

Glazing: Submit samples of glazing materials, each at least 200 x 200 mm, showing the visual properties and range of variation, if any, for each of the following:

- Tinted or coloured glass or glazing plastics.
- Surface modified or surface coated glass.
- Patterned or obscured glass or glazing plastics.
- Ceramic-coated glass.
- Wired glass.
- Mirror glass.

Hardware and accessories: Submit samples of the following:

- Window manufacturer's standard hardware and accessories including locks, latches, handles, catches, sash operators, anchor brackets and attachments, masonry anchors and weather seals (pile or extruded).
- Generic hardware: Submit samples of generic hardware not documented as proprietary items.

Labelling: Label each sample, with the series code reference and date of manufacture.

Shop drawings

General: Submit shop drawings, to a scale that best describes the detail, showing the following:

- Full size sections of members.
- Hardware, fittings and accessories including fixing details.
- Junctions and trim to adjoining surfaces.
- Layout (sectional plan and elevation) of the window assembly.
- Lubrication requirements.
- Methods of assembly.
- Methods of installation, including fixing, caulking and flashing.
- Provision for vertical and horizontal expansion.
- Method of glazing, including the following:
 - . Rebate depth.
 - . Edge restraint.
 - . Clearances and tolerances.
 - . Glazing gaskets and sealant beads.

Subcontractors

General: Submit names and contact details of proposed manufacturers and installers.

1.4 INSPECTION

Notice

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

- Openings prepared to receive windows (where windows are to be installed in prepared openings).
- Fabricated window assemblies at the factory ready for delivery to the site.
- Fabricated window assemblies delivered to the site, before installation.
- Commencement of window installation.

2 PRODUCTS

2.1 GENERAL

Acoustic performance

Windows and doors: Tested to AS 5218.

Protection of openable windows

Fall prevention: To BCA D2.24 and BCA 3.9.2.

Testing: To AS 5203.

Marking

Window assemblies: To AS 2047 Section 8.

2.2 FIRE PERFORMANCE

Fire-resistance of building elements

Fire-resistance level: Tested to AS 1530.4.

2.3 GLASS

Performance

Glass: Free from defects which detract from appearance or interfere with performance under normal conditions of use.

Glazing plastics: Free from surface abrasions, and warranted by the manufacturer for 10 years against yellowing or other colour change, loss of strength and impact resistance, and general deterioration.

Safety glass

Standard: To AS/NZS 2208.

Type: Grade A to AS 1288.

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

Heat soaking

Requirement: All toughened and heat strengthened glass products.

Standard: To EN 14179-1.

Unacceptable blemishes in heat-treated flat glass (including tinted and coated glass)

Standard: To AS/NZS 4667.

Insulating glass units (IGUs)

Selection and installation: To AS 4666.

2.4 GLASS IDENTIFICATION

Heat soaked glass

Requirement: Marked to EN 14179-1 or certified by the manufacturer to AS 1288 clause 3.8.2.

Safety glazing materials

Identification: To AS 1288.

2.5 GLAZING MATERIALS

General

Requirement: Glazing materials including putty, glazing compounds, sealants, gaskets, glazing tapes, spacing strips, spacing tapes, spacers, setting blocks and compression wedges appropriate for the conditions of application and required performance.

Jointing materials

Requirement: Provide jointing and pointing materials to manufacturer's recommendations that are compatible with each other and with the contact surfaces and non-staining to finished surfaces. Do not provide bituminous materials on absorbent surfaces.

Elastomeric sealants

Sealing compound (polyurethane, polysulfide, acrylic): To ASTM C920 or ISO 11600.

Sealing compound (silicone): To ASTM C920 or ISO 11600.

Sealing compound (butyl): To ASTM C1311.

Primer

Compatibility: Apply the manufacturer's recommended primer to the surfaces in contact with sealant materials.

Control joints

Depth of elastomeric sealant: One half the joint width or 6 mm, whichever is the greater.

Foamed materials (in compressible fillers and backing rods): Closed-cell or impregnated types that do not absorb water.

Bond breaking: Provide backing rods, and other back-up materials for sealants, that do not adhere to the sealant.

2.6 INSECT SCREENS

Fixed screens

General: Provide fixed screens fitted to the window frames with a clipping device that permits removal for cleaning.

Hinged screens

General: Hinged at the top to give access to opening sash.

Retractable screens

General: Provide a proprietary retractable insect screen, comprising aluminium frame and fibreglass mesh, fitted between the 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

General: 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 screens

General: 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.

2.7 SECURITY WINDOW GRILLES

General

Requirement: Provide proprietary metal security grille screens, or operable screen and frame, fixed to the building structure with tamper resistant fastenings.

Security window grilles: To AS 5039.

Screen infill material: Type III to AS 5039.

Cyclone debris screen

Location: Provide to all windows in Northern areas.

Requirement: Powder coat finished stainless steel screw clamped 0.9 mm strand type 304 stainless steel wire mesh screens.

Testing: Provide certification that screen has been tested to withstand impact loading from wind borne debris conforming to AS/NZS 1170.2 clause 2.5.8.

2.8 ALUMINIUM FRAME FINISHES

Powder coatings

Standard for architectural applications: To AS 3715, AAMA 2604 or AAMA 2605 as appropriate.

Anodised

Standard: To AS 1231.

Thickness: ≥ 15 microns to 20 microns.

2.9 ANCILLARY COMPONENTS AND FITTINGS

Trims

Timber: Solid timber at least 19 mm thick, mitred at corners.

Extruded gaskets and seals

General: Provide seals, as documented.

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.

Flashings

General: Corrosion resistant, compatible with the other materials in the installation, and coated with a non-staining compound where necessary.

Standard: To AS/NZS 2904.

Nylon brush seals

General: Dense nylon bristles locked into galvanized or stainless steel strips and fixed in a groove in the edge of the door or in purpose-made anodised aluminium holders fixed to the door with double sided PVC foam tape.

Pile weather strips

Standard: To AAMA 701/702.

Materials: Polypropylene or equivalent pile and backing, low friction silicone treated, ultraviolet stabilised.

Finned type: A pile weather seal with a central polypropylene fin bonded into the centre of the backing rod and raised above the pile level.

Weather bars

General: A weather bar for hinged external doors, located under the centres of closed doors.

2.10 HARDWARE

Hardware documented generically

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.

Locks and latches

Standard: To AS 4145.3.

Window catches: Provide 2 catches per sash to manually latched awning or hopper sashes over 1000 mm wide.

Sliding patio doors and windows: Key-lockable patio bolts to all doors and windows.

Sash balances

Requirement: Match the spring strength of the balances to the sash weight they support.

2.11 KEYING

Identification

Labelling: Supply each key with a purpose-made plastic or stamped metal label legibly marked to identify the key, attached to the key by a metal ring.

Key material

Pin tumbler locks: Nickel alloy, not brass.

Lever locks: Malleable cast iron or mild steel.

3 EXECUTION

3.1 GLASS PROCESSING

General

Processing: Perform required processes on glass, including cutting, obscuring, silvering and bending. Form necessary holes, including for fixings, equipment, access openings and speaking holes. Process exposed glass edges to a finish not inferior to ground arrised.

3.2 INSTALLATION

Glazing

General: Install the glass as follows:

- Permanently fix in place each piece of glass to withstand the normal loadings and ambient conditions at its location without distortion or damage to glass and glazing materials.
- No transfer of building movements to the glass.
- Watertight and airtight for external glass.

Temporary marking: Use a method which does not harm the glass. Remove marking on completion.

Toughened glass: Do not cut, drill, edge-work or permanently mark after toughening. Use installation

methods which prevent the glass making direct contact with metals or other non-resilient materials.

Heat absorbing glass: In locations exposed to direct sunlight, provide wheel cut edges free from damage or blemishes, with minimum feather.

Preglazing

Window assemblies and glazed doors: Supply inclusive of glazing, shop preglazed.

Site glazing

External timber framed glazing: Glaze with putty.

Windows and glazed doors

General: Install windows and glazed doors frames as follows:

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

Weatherproofing

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

Fixing

Fasteners and fastener spacing: Conform to the recommendations of the manufacturer.

Packing: Pack behind fixing points with durable full width packing.

Fasteners: Conceal fasteners.

Prepared masonry openings: If fixing of timber windows to prepared anchorages needs fastening from the frame face, sink the fastener heads below the surface and fill the sinking flush with a material compatible with the surface finish.

Joints

General: Make accurately fitted tight joints so that neither fasteners nor fixing devices such as pins, screws, adhesives and pressure indentations are visible on exposed surfaces.

Sealants:

- If priming is recommended, prime surfaces in contact with jointing materials.
- If frames are powder coated apply a neutral cure sealant.

Operation

General: Make sure moving parts operate freely and smoothly, without binding or sticking, at correct tensions or operating forces and are lubricated.

Protection

Removal: Remove temporary protection measures from the following:

- Contact mating surfaces before joining up.
- Exposed surfaces.

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.

Insect screens

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

Security screens

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

Cyclone debris screen

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.

3.3 HARDWARE

Fasteners

Materials: Use materials compatible with the item being fixed and of sufficient strength, size and quality to perform their function.

- Concealed fixings: Provide a corrosion-resistant finish.
- Exposed fixings: Match exposed fixings to the material being fixed.

Support: Provide appropriate back support (for example lock stiles, blocking, wall noggings and backing plates) for hardware fixings.

- Hollow metal sections: Provide backing plates drilled and tapped for screw fixing, or provide threaded inserts (rivet nuts) with machine thread screws. Do not use self-tapping screws or pop rivets.

Proprietary window systems

Requirement: Provide the standard hardware and internal fixing points for personnel safety harness attachment, if required by and conforming to the governing regulations.

Operation

General: Make sure working parts are accurately fitted to smooth close bearings, without binding or sticking, free from rattle or excessive play, lubricated where appropriate.

Supply

Delivery: Deliver window hardware items, ready for installation, in individual complete sets for each window set, as follows:

- Clearly labelled with the intended location.
- In a separate dust and moisture proof package.
- Including the necessary templates, fixings and fixing instructions.

3.4 COMPLETION

Hardware

Adjustment: Leave the hardware with working parts in working order, and clean, undamaged, properly adjusted, and lubricated where appropriate.

Keys

Contractor's keys: Immediately before the date for practical completion, replace cylinders to which the contractor has had key access during construction with new cylinders that exclude the contractor's keys.

Keys: For locks keyed to differ and locks keyed alike, verify quantities against key records, and deliver to the contract administrator at practical completion.

Key codes: Submit the lock manufacturer's record of the key coding system showing each lock type, number and type of key supplied, key number for re-ordering, and name of supplier.

Repair of finish

Polyester or fluoropolymer coatings: Contact supplier for approval to apply touch up products, otherwise replace damaged material.

Cleaning

Method: Clean with soft clean cloths and clean water, finishing with a clean squeegee. Do not use abrasive or alkaline materials.

Extent: All frames and glass surfaces inside and out.

Warranties

Window and door assemblies: Provide the manufacturer's published product warranties.

Hardware: Provide the manufacturer's published product warranties.

0453 DOORS AND ACCESS PANELS

1 GENERAL

1.1 STANDARDS

General

Timber and composite doors: To AS 2688.

1.2 INTERPRETATION

Definitions

General: For the purposes of this worksection the definitions given in AS 2688 and the following apply:

- Fire-resisting doorset: A doorset which retains its integrity, provides insulation and limits, if required, the transmittance of radiation in a fire.
- Smoke-doorset: A doorset which restricts the passage of smoke.

1.3 SUBMISSIONS

Operation and maintenance manuals

Recommendations: Submit the manufacturer's published recommendations for service use.

Samples

General: Submit 2 samples as follows:

- Colour range from prefinished production material (e.g. anodised or organic coated extrusions and sheet). Following the colour selection, submit 5 sets of samples showing the colour range.
- Door manufacturer's standard hardware items.
- Finishes to prepared surfaces.
- Joints using proposed techniques.
- Proposed sections for frames, louvres and slats.

Products and materials

Type tests: Submit results, as follows:

- Fire-resisting and smoke doorsets.
- Acoustic performance of doorsets.

1.4 INSPECTION

Notice

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

- Door frames in place before building in to masonry.
- Door frames installed before fixing trim.

2 PRODUCTS

2.1 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 flashings, with provision for fixing documented hardware.

Threshold: If the frame includes a threshold member, provide a self-draining section with anti-skid surface.

Steel frames

Construction: Continuously welded from metallic-coated steel sheet sections, including accessories such as buffers, strike plates, spreaders, mortar guards, switch boxes, fixing ties or brackets, and cavity flashing with provision for fixing documented hardware and electronic security assemblies, and prefinished with a protective coating.

Base metal thickness (minimum):

- General: 1.1 mm.
- Fire-resisting doorsets: 1.5 mm.
- Security doorsets: 1.6 mm.

Metallic-coating class to AS 1397 interior: ZF100.

Finish: Grind the welds smooth, cold galvanize the welded joints and shop prime.

Hardware and accessories: Provide 4 mm backplates and lugs for fixing hardware including hinges and closers. Screw fix the hinges into tapped holes in the backplates.

Timber frames

Hardwood: To AS 2796.1:

- Grade: Select.

Softwood: To AS 4785.1:

- Grade: Select.

Joints:

- Morticed head and through tenons.
- Trenched head:
 - . Bare faced tenons on jambs.
 - . Full let-in jambs.

2.2 DOORS

General

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

Materials

Standards: Conform to the following:

- Decorative laminated sheets: To AS/NZS 2924.1.
- Wet process fibreboard (including hardboard): To AS/NZS 1859.4.
- Dry process fibreboard (including medium density fibreboard): To AS/NZS 1859.2.
- Particleboard: To AS/NZS 1859.1.
- Plywood and blockboard for interior use: To AS/NZS 2270.
- Plywood and blockboard for exterior use: To AS/NZS 2271.
- Seasoned cypress pine: To AS 1810.
- Timber – hardwood: To AS 2796.1.
- Timber – softwood: To AS 4785.1.

Identification

Panel doors: Provide panels branded under the authority of a recognised certification scheme to *0185 Timber products, finishes and treatment*, as applicable to the product. Locate the brand on faces or edges which will be concealed in the works.

Flush panel doors

General: Provide flush panel doors of balanced construction, as documented.

Medium density fibreboard doors: Single thickness of moisture resistant general purpose medium density fibreboard with the same surface finish to both sides, for internal use.

Smoke doors: Solid core not less than 35 mm thick.

Construction

Adhesives:

- Internal: To AS/NZS 2270.
- External: To AS/NZS 2271.

Door thickness:

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

Door width: 870 mm, unless documented otherwise.

Cut-outs: If openings are required in flush panel doors (e.g. for louvres or glazing), do not make cut-outs closer than the width of the stiles at the edges of the doors.

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.

Louvre grilles: Construct by inserting the louvre blades into a louvre frame, and fix the frame into the door.

Double doors

Square edged doors: Bevel as necessary to prevent binding between the leaves.

Rebated meeting stiles: If not double acting doors, provide rebated meeting stiles or fix equivalent metal T stop to one leaf. Form rebates to suit standard rebated hardware.

Tolerances

Standard: To AS 2688 clauses 4.1 and 5.3.

2.3 DOORSETS

Acoustic performance

Doorsets: Tested to AS 5218.

Automatic door assemblies

Standard: To AS 5007.

Control systems: To *0455 Door hardware*.

Cavity sliding doors

General: 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.

Duct access panels

General: Proprietary products comprising metal-faced doors side hung to steel door frames, including hardware and accessories such as hinges and lock and installation lugs.

Fire-resisting doorsets

Standard: To AS 1905.1 and BCA Spec C3.4.

Floor access panels

Frame: Weld from 50 x 50 x 6 mm angle, with two 40 mm cogged fixing lugs each side and shop prime.

Covers: 6.5 mm checker floorplate, on 40 x 40 x 6 mm angle welded frame with 32 x 6 mm diagonal stiffening flats. Cut, radius and grind off 100 x 25 mm lifting slots in each end of covers.

Security screen doorsets

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.
- Held open position: Allow for mechanisms for holding in position.
- Make sure screens are compatible with door/window system and does not interfere with its operation.

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

2.4 ANCILLARY MATERIALS**Trims**

Timber: Solid timber at least 19 mm thick, mitred at corners.

Extruded gaskets and seals

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.

Flashings

General: Corrosion resistant, compatible with the other materials in the installation, and coated with a non-staining compound where necessary.

Standard: To AS/NZS 2904.

Jointing materials

General: Compatible with each other and with the contact surfaces and non-staining to finished surfaces. Do not provide bituminous materials on absorbent surfaces.

Nylon brush seals

General: Dense nylon bristles locked into galvanized steel strips and fixed in a groove in the edge of the door or in purpose-made anodised

aluminium holders fixed to the door with double sided PVC foam tape.

Pile weather strips

General: Polypropylene or equivalent pile and backing, low friction silicone treated, ultraviolet stabilised.

Standard: To AAMA 701/702.

Weather bars

General: Provide a weather bar under hinged external doors, locate under the centres of closed doors.

3 EXECUTION**3.1 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.

Frame fixing

Brackets: Metallic-coated steel:

- Width: Minimum 25 mm.
- Thickness: Minimum 1.5 mm.

Depth of fixing for building into masonry:

- Brackets: Minimum 200 mm.
- Expansion anchors: Minimum 50 mm.
- Plugs: Minimum 50 mm.
- Rods: Minimum 60 mm.

Jamb fixing centres: Maximum 600 mm.

Joints

General: Make accurately fitted joints where fasteners, pins, screws, adhesives and pressure indentations are not visible on exposed surfaces.

Aluminium frames

Building into masonry: Screw galvanized steel brackets twice to jambs and build in.

Fixing to masonry openings: Build in seasoned timber plugs to masonry joints or use proprietary expansion anchors and screw twice through jambs at each fixing.

Fixing to stud frame openings: Screw once to studs at each fixing.

Steel frames

Building into masonry: Attach galvanized steel rods to jambs, build in and grout up.

Fixing to masonry openings: Build in hairpin anchors and install locking bars, or use proprietary expansion anchors and screw twice through jambs at each fixing.

Fixing to stud frame openings: Attach galvanized steel brackets to jambs and screw twice to studs at each fixing.

Timber frames

Building into masonry: Screw galvanized steel brackets twice to jambs and build in.

Fixing to masonry openings: Build in seasoned timber plugs to masonry joints or use proprietary

expansion anchors and screw twice through jambs at each fixing.

Fixing to stud frame openings: Back screw twice to jambs at each fixing.

Fixing to thresholds: Dowel external door frames to thresholds other than timber with 10 mm diameter brass dowels, 100 mm long.

Heads of fasteners: Conceal if possible, otherwise sink the head below the surface and fill the sinking flush with a material compatible with the surface finish.

Finishing

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

Seals

General: Provide the fixings, rebates, grooves, and clearances required for installation and operation of the seals. Allow seals unwound from coils to settle before use.

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.

3.2 DOORS

Priming

General: Prime timber door leaves on top and bottom edges before installation.

3.3 DOORSETS

Security doors

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.

3.4 COMPLETION

Operation

General: Make sure moving parts operate freely and smoothly, without binding or sticking, at correct tensions or operating forces and that they are lubricated where appropriate.

Protection

Temporary coating: On or before the date for practical completion, or before joining up to other surfaces, remove all traces of temporary coatings used as a means of protection.

0454 OVERHEAD DOORS

1 GENERAL

1.1 STANDARDS

General

Garage doors and other large access doors: To AS/NZS 4505.

Fire shutters: To AS 1905.2.

1.2 SUBMISSIONS

Certification - Wind regions C and D

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 for the wind classification appropriate to the project site.

- Testing: In conformance with AS/NZS 4505 Appendix A for cyclonic regions.

Fire shutters: Submit evidence of compliance of installation to AS 1905.2.

Operation and maintenance manual

General: Submit the manufacturer's published instructions for operation, care and maintenance.

Products and materials

Type tests: Submit the following:

- Fire-resistance level: Verification from an Accredited Testing Laboratory of fire-resistance level.
- Acoustic performance: Verification from an Accredited Testing Laboratory of weighted sound reduction index (R_w).
- Wind-borne debris impact: Verification from an Accredited Testing Laboratory of wind-borne debris impact rating.

1.3 INSPECTION

Notice

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

- Framing or structure to receive tracks and motor.
- Tracks and guides installed before doors or shutters are hung.

2 PRODUCTS

2.1 GENERAL

Door assembly

Requirement: Proprietary system complete with the manufacturer's standard operating system, hardware, and accessories.

Marking and labelling

General: To AS/NZS 4505 Section 8.

2.2 SECTIONAL OVERHEAD DOORS

Panels

Requirement: Materials and finishes, as documented.

Bottom panel: Adapted to follow the contour of sloping floors or threshold and fitted with a compressible PVC or neoprene seal strip.

Side tracks

Material: Roll formed galvanized steel.

Reinforcing: If required to carry door loads without distortion, reinforce horizontal track sections with a galvanized rolled steel channel.

Counterbalancing

General: Counterbalance the door by an adjustable torsion spring system connected to the door by cables of galvanized steel multi-strand wire rope, or by an equivalent system.

Operation method

General: Method of opening and closing the door:

- Manual: From inside and outside, by lockable handle attached to the door panel.
- Motorised: Motor connected to the door through a shock absorbing connecting arm.

2.3 RIGID OVERHEAD DOORS

Panels

Requirement: Materials and finishes, as documented.

Rigid door frame: Braced frame capable of resisting the structural design actions without distortion when the door is in both vertical and horizontal positions.

Operation method

General: Method of opening and closing the door:

- Manual: From inside and outside, by lockable handle attached to the door panel.
- Motorised: Motor connected to the door through a shock absorbing connecting arm.

2.4 ROLLING CURTAIN AND ROLLING SHUTTER DOORS

General

Requirement: Materials and finishes, as documented.

Curtain

Rolling curtain: Continuous roll formed profiled steel.

Rolling shutter: Individual horizontal interlocking slats with interlocking hinges.

Rolling grille: Articulated curtain formed of horizontal members spaced apart and connected by vertical links.

Fire shutter: Roll formed galvanized interlocking steel slats, each slat fitted with steel end caps.

Bottom rail

Requirement: Provide a stiffening member as follows:

- Interlocking with the bottom edge or lowest part of the curtain.
- Extending between the inner faces of the vertical guides.

- Formed or adapted as required to follow the contour of a sloping floor or threshold.
- Adapted to house a locking device, if required.

Wind locks

General: Provide wind lock end clips and guides to retain the curtain in wide openings or under extreme wind conditions.

Drum

Maximum drum deflection: 1/360th of the span.

Springs: Helical torsion springs housed in the drum and arranged to counterbalance the curtain weight without exceeding the safe working stress of the spring material.

Wickets

General: Provide doors with metal frame and facings to match the curtain, and manufacturer's standard lockset and furniture.

Operation method

General: Method of opening and closing the door:

- Manual:
 - . Hand stick (for high openings): By a boat hook type pole supplied with the installation.
 - . Chain: By pulling on a chain passing over a sprocket on the drum, with reduction gears where necessary.
 - . Crank handle: By a removable crank handle inserted into a gearbox mounted above the opening.
- Motorised: If a wicket is fitted to the shutter, provide a limit switch device to prevent motor operation until wicket and the frame are hinged clear of the curtain.

2.5 OPERATION

Manual operation

General: Install so that the force required to operate the door manually does not exceed 220 N.

Motorised operation

General: Provide a motorised door operating system incorporating the following:

- An electric motor with limit switches, and of adequate capacity to operate the specified door smoothly and without strain.
- Overload cutout.
- Automatic safety system to stop and reverse door if obstructed while closing, or stop door if obstructed while opening.
- Photocell or IR beam safety device.
- Manufacturer's standard light fixture, automatically switched on when opener is activated, and switched off by timer.
- Manual release handle to disengage door from drive mechanism in the event of a power failure.
- Operation by battery-powered radio remote controller, supplied as part of the system.
- Additional operation by push-button or key switch, located 1500 mm above floor level.

3 EXECUTION**3.1 INSTALLATION****General**

Requirement: Install overhead doors in conformance with the manufacturer's recommendations and as documented.

Preparation

Substrate: Before start of installation, check the alignment of substrates or framing and adjust if required.

Frames, guides and tracks

Requirement: Install frames, guides and tracks 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.

3.2 COMPLETION**Operation**

General: Make sure moving parts operate freely and smoothly, without binding or sticking, at correct tensions or operating forces and that they are lubricated where appropriate.

Safety: Make sure all safety features are operating.

Remote control devices: Make sure devices are programmed and operating.

Protection

Temporary coating: On or before the date for practical completion of the works, or before joining up to other surfaces, remove all traces of temporary coatings used for protection.

Warranties

General: Submit the manufacturer's published product warranties.

0455 DOOR HARDWARE**1 GENERAL****1.1 RESPONSIBILITIES****Performance**

Hardware specified generically: Provide hardware of sufficient strength and quality to perform its function, appropriate to the intended conditions of use, suitable for use with associated hardware, and fabricated with fixed parts firmly joined.

Operation: Make sure working parts are accurately fitted to smooth close bearings, without binding or sticking, free from rattle or excessive play, lubricated where appropriate.

Handling: Before supply, verify on site, the correct handling of hardware items.

1.2 INTERPRETATION**Abbreviations**

General: For the purposes of this worksection, the abbreviations given in AS 4145.1 Appendix D apply.

Definitions

General: For the purposes of this worksection, the general definitions given in AS 4145.1 Section 2 and Appendix E apply.

1.3 SUBMISSIONS**Execution details**

Door-by-door schedule: Submit a door-by-door hardware schedule.

- Information sources: This worksection and the contract drawings.

Re-use of recovered hardware: Submit a proposal describing the standard of cleaning, repair and testing of recovered items and the location where each is to be reused.

Key control system:

- New works: Submit details of the proprietary key control security system proposed by the lock manufacturer for locks required to accept a group key (master, grandmaster).
- Alterations and additions: Submit details to extend the existing key control security system for locks required to accept a group key.

Operation and maintenance manuals

Automatic door operators: Submit the installer's proposal for continuing maintenance after completion on an annual renewal basis.

Manual: Submit the manufacturer's published recommendations for use, care and maintenance of the hardware provided.

Records

Door hardware schedule: Submit an amended schedule, prepared by the door hardware supplier, showing changes to the contract door hardware schedule resulting from the following:

- Approval of a hardware sample.
- Acceptance of an equivalent to a specified proprietary item.

- A contract variation to a door hardware requirement.

Key coding system: Submit the lock manufacturer's record of the key coding system showing each lock type, number and type of key supplied, key number for re-ordering, and name of supplier.

Samples

Generic items: Submit samples of hardware items offered as meeting the description of items not specified as proprietary items.

Reconditioned items: Submit samples of hardware items offered as meeting the standard of cleaning, repair and testing of recovered items.

Subcontractors

Automatic door operators: Submit names and contact details of proposed supplier and installer.

Pressure floor mat: Submit names and contact details of proposed supplier and installer.

Warranties

Requirement: Submit the following:

- Hardware: Manufacturer's published product warranties.
- Automatic door operators.

2 PRODUCTS

2.1 GENERAL

Supply

Delivery: Deliver door hardware items, ready for installation, in individual complete sets for each door, as follows:

- Clearly labelled to show the intended location.
- In a separate dust and moisture proof package.
- Including the necessary templates, accessories fixings and fixing instructions.

Hardware specified generically: Hardware of the required strength and quality to perform its function, appropriate to the intended conditions of use, suitable for use with associated hardware, and fabricated with fixed parts firmly joined.

2.2 LOCKS AND LATCHES

General

Main entry doors: If a key lockable security door is not provided, provide a deadlock.

Other external doors: If a deadlock cannot be installed and a lockable security door is not provided, install a patio bolt lock.

Standard

General: To AS 4145.2.

Padlocks

Standard: To AS 4145.4.

Lock and latch classification

Rating systems: To AS 4145.1 Section 3.

Performance requirements: To AS 4145.2 Section 3.

2.3 HINGES

Butt hinge materials

Doors fitted with closers: Provide low friction ball bearing hinges.

Fire-resisting doors: To AS 1905.1.

Power transfer hinges: Do not load and install with other compatible hinges.

Lift-off doors: If toilet cubicles require lift-off doors, provide lift-off hinges and allow for door panel with sufficient clearance at the head allow door removal.

Timber solid core doors

Number of hinges: Determine the number of hinges required based on the nominated door leaf size and weight only. For other door leaf sizes or for doors with applied finishes, use the weight of the door to determine the number of hinges required. For a door leaf over 80 kg, use pivot hinges.

Size of hinges: Determine the size of the hinge based on the door leaf thickness:

- 35 to 43 mm thick door: 100 x 75 mm butt hinges with a minimum thickness of 2.5 mm.
- 44 to 55 mm thick door: 100 x 100 mm butt hinges with a minimum thickness of 2.5 mm.
- > 55 mm thick door: To the door by door hardware schedule.

Hinge pin: Supply fixed pins to hinges of doors opening out or designated as a security doors. For all other doors, provide loose pins.

Wide throw: If necessary, use wide throw hinges to achieve the required door swings in the presence of obstacles such as nibs, deep reveals and architraves.

Hinges for timber doors table

Nominal door leaf size (L x W x T) (mm)	Door leaf weight (kg)	Number of hinges
2040 x 400 x 35	≤ 19	2
2040 x 600 x 35	≤ 29	2
2040 x 720 x 35	≤ 35	3
2040 x 820 x 35	≤ 39	3
2040 x 920 x 35	≤ 44	3
2040 x 1020 x 35	≤ 49	4
2040 x 720 x 40	≤ 37	3
2040 x 820 x 40	≤ 42	3
2040 x 920 x 40	≤ 48	3
2040 x 1020 x 40	≤ 52	4
2040 x 720 x 50	≤ 45	3
2040 x 820 x 50	≤ 50	3
2040 x 920 x 50	≤ 57	3
2040 x 1020 x 50	≤ 68	4
2400 x 720 x 40	≤ 50	4
2400 x 820 x 40	≤ 52	4
2400 x 920 x 40	≤ 55	4
2400 x 1020 x 40	≤ 60	4
2400 x 1220 x 50	≤ 72	5
2040 x 920 x 70	≤ 88	Pivot hinges

Length (L) is the dimension along the knuckles, not including hinge tips, if any, and width (W) is the dimension across both hinge leaves when opened flat.

Aluminium doors

Application: Aluminium hinges for aluminium doors, or for doors of other materials in aluminium frames of a weight of 40 kg or less.

Hinges for aluminium doors table

Nominal hinge size (L x W x T) (mm)	Door leaf weight (kg)	Knuckles (minimum)	Screws/hinge leaf (minimum)
100 x 70 x 3	≤ 30	3	3
100 x 80 x 3.5	≤ 50	5	4
130 x 50 x 3.4	≤ 75	Interfold	3
Length (L) is the dimension along the knuckles, not including hinge tips, if any, and width (W) is the dimension across both hinge leaves when opened flat.			

2.4 ANCILLARIES**Bolts**

General: Barrel bolts, flush bolts and tower bolts with keepers, including lock plates, staples, ferrules or floor sockets.

Mortar guards

General: For steel door frame installations, provide mortar guards designed to allow the full extension of the lock tongue or similar devices and the correct operation of the locking mechanism.

Rebated doors

General: For mortice locks or latches to rebated doors, provide purpose-made rebated pattern items.

Strike plates

General: Use strike plates supplied with the locks or latches. Do not provide universal strike plates.

2.5 DOOR CONTROLLERS**Standard**

General: To AS 4145.5.

Performance

Requirement: Door controllers, pivots, floor or overhead door closers, and automatic door operators, suitable for the door type, size, weight, sliding action and swings required and the operating conditions, including wind and air conditioning pressure.

Automatic door operators

General: Complete automatic door operators for opening and closing doors, including door hanging (hinges, pivots or sliding gear) and electrical connection to distribution board.

Installation: Provide necessary recesses and core-holes, grout in components where required, and repair any damage. Provide cover plates for access to units in door heads, frames or transoms.

Automatic adjustable function: If the door opening angle or width is manually set below the maximum possible, under conditions of continuous traffic the doors must automatically creep to full opening, returning to reduced opening on the next cycle.

Radio remote door controllers: Provide a device, comprising a radio receiver and separate transmitter, for activating a motorised door operator

so as to open and close the door by remote radio signal.

Key switch: If there is no separate access to the enclosure, provide a key switch mounted externally for opening and closing the door from outside the enclosure without the transmitter. Provide two keys.

Light: Provide an internal light that turns on for not less than 2 minutes before switching off automatically.

Receiver: House within a wall unit incorporating a push-button switch permanently illuminated. Mount within the enclosure and connect to power.

Transmitter: Portable battery-powered unit sending a coded signal effective up to not less than 12 m from the receiver.

Pressure floor mats: Automatic door activating system consisting of a mat which when deflected by foot pressure operates a switch which activates the door or doors.

Closers

Hinged and pivot doors:

- Fire-resisting doors: Closers tested and certified for use as components of fire-resisting door assemblies:
 - . Standard: To AS 1905.1.

2.6 ELECTRONIC CONTROL DEVICES**General**

Requirement: Electric strikes, electric locks, drop bolts and/or similar devices to suit door construction and hardware.

Electromagnetic hold-open devices: To AS 1905.1 and AS 1670.1.

Fail-safe: Connect door control devices in a fail-safe mode to permit egress in the event of power failure.

Fail-secure: Connect door control devices in a fail-secure mode to prevent egress in the event of power failure.

Authorised products: Equipment listed in the ActivFire Register of Fire Protection Equipment.

Glass doors: Tumbler, drop bolts or magnetic holders.

Double leaf doors (solid frame): Electric strike or lock on the inactive leaf, connected to the door frame by concealed flexible wiring.

Activation

Activation device: Keypads, card readers or other activation devices located next to entry points.

External: Weatherproof (IP56) hoods or housings for external units.

Mounting height: 900 to 1100 mm from floor level and not less than 500 mm from internal corners.

2.7 KEYING**Temporary construction keys and cylinders**

Requirement: Provide one of the following:

- Loan cylinder: Install for construction locks and replace at practical completion.
- Construction keyed master key cylinder: Keep up-to-date records of keys issued including recipient's

name, company and contact details, date issued and date returned.

Delivery of keys

Number of keys: 3 sets of keys per dwelling.

Group keying

Keying control security system: If cylinder or pin-tumbler locks accept a group key (e.g. master key, maison key) provide to those locks a proprietary keying control security system.

Stamping: Stamp keys and lock cylinders to show the key codes and/or door number as scheduled.

Identification

Labelling: Supply each key with a purpose-made plastic or stamped metal label legibly marked to identify the key, attached to the key by a metal ring.

Key material

Lever locks: Malleable cast iron or mild steel.

Pin tumbler locks: Nickel alloy, not brass.

3 EXECUTION

3.1 INSTALLATION

General

Handing: Before supply, verify on site, the correct handing of hardware items.

Operation: Make sure working parts are accurately fitted to smooth close bearings, without binding or sticking, free from rattle or excessive play, lubricated where appropriate.

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.

Fasteners

Materials: Provide materials compatible with the item being fixed, and of sufficient strength, size and quality to perform their function.

- Concealed fixings: Provide a corrosion resistant finish to concealed fixings.
- Exposed fixings: Match exposed fixings to the material being fixed.

Security: Locate exposed fixings to lock furniture on the inside faces of external doors and on the inside faces of internal doors to lockable rooms.

Support: Provide appropriate back support (for example lock stiles, blocking, wall noggings and backing plates) for hardware fixings.

- Hollow metal sections: Provide backing plates drilled and tapped for screw fixing, or provide rivet nuts with machine thread screws. Do not use self-tapping screws or blind rivets.

Floor springs

General: Form a recess in the floor slab for the floor spring box and grout the box in place so that the cover plate is flush with the finished floor.

Hinges

Metal frames: Fix hinges using metal thread screws.

Timber doorsets: Install butt hinges in housings equal in depth to the thickness of the hinge leaf (except for hinges designed for mounting without housing), and fix with countersunk screws.

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.

Locksets and furniture: Provide as follows:

- Latch set with lever handles.
- Minimum 37 x 6 mm thick aluminium push bar, installed at 800 mm above the finished floor level.
- A triple action cylinder deadbolt mortice fitting lock with 2 keys.
- Restraining chain.

Closers: Provide heavy duty pneumatic door closers.

Keying: Locks keyed alike where multiple doors are fitted.

Seals: Mohair door seal to the bottom of the doors.

Marking: Mark the manufacturer's name to the top of the door, on the inside face.

3.2 COMPLETION

Adjustment

General: Leave the hardware properly adjusted with working parts in working order, and clean, undamaged, properly adjusted, and lubricated where appropriate.

Keys

Contractor's keys: Immediately before practical completion, replace or reset cylinders to which the contractor has had key access during construction to exclude the contractor's keys.

Product warranties

Warranty: Cover materials and workmanship in the form of interlocking warranties from the manufacturer or distributor and the installer.

0457 EXTERNAL SCREENS

1 GENERAL**1.1 RESPONSIBILITIES****Performance**

Requirement: Conform to the following:

- Plumb, level, straight and true within the building tolerances of the structural system.
- Undamaged and free of surface defects or distortions.
- Fixed or fastened to the building structure.
- Able to resist wind and other actions without vibration or permanent distortion.

1.2 STANDARDS**General**

Aluminium framed sunscreens, awnings and shutters:

- Stress analysis of members: To AS/NZS 1664.1 or AS/NZS 1664.2.

Horizontal screen loadings: To AS/NZS 1170.1.

Electrically operated external louvres and blinds:

- Drive motors: To AS/NZS 60335.2.97.

Access for maintenance: To AS 1657.

Glazing

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

Other glazing materials: To AS 1288.

Installation: To AS 1288.

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

1.3 INTERPRETATION**Abbreviations**

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

- BMS: Building Management System.
- PVC-U: Unplasticised polyvinylchloride.

1.4 SUBMISSIONS**Certification**

Sealant compatibility: Submit statements from all parties to the installation that certify the compatibility of sealants with screen components, finishes and all substrates.

Fire performance

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

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

Operation and maintenance manuals

Requirement: At completion, submit the screen manufacturer's recommendations for operation, care and maintenance.

Samples

General: Submit samples of the following:

- Sections proposed for frame members, louvres, accessories, cover panels and trim.
- Joints made, using proposed techniques.
- Colour samples of prefinished production material (e.g. anodised or thermoset powder coated extrusions or sheet, glazing, infill panel material or fabric), each at least 200 x 200 mm, showing the limits of the range of variation in the selected colour, if any, for each component of the screens specified.
- Accessory and hardware items documented descriptively or by performance (i.e. not proprietary items). Include handles, operators, controls, switches, sensors, motors, fixing clips, anchor brackets and attachments, fixings, gaskets and weather seals.

Labelling: Label each sample, giving the brand and product name, manufacturer's code reference, date of manufacture and intended building location.

Shop drawings

General: Submit shop drawings to a scale that best describes the detail, calculations and specifications conveying the following information:

- Layout of the screen assembly (sectional plans, vertical sections, and elevations of each building face where screens are to be installed).
- Full size sections of typical members including mullions, transoms, subheads, sills, subsills, louvres, infill panel material or fabric, beads, bearings, linkages, exposed fixings, sealant beads, glazing gaskets, splice plates, trays and cover strips, with notes specifying the proposed materials.
- Lubrication requirements for adjustable or operable screens.
- Method of assembly, including isometric or axonometric and exploded views of typical framing junctions, showing panel to panel joints (for modular systems).
- Method of installation, including the following:
 - . Location and magnitude of reactions to be accommodated by the support structure.
 - . Type and location of fasteners and other attachments to be cast or otherwise built into the building structure.
 - . Erection tolerances.
 - . Accurate locations and full size details of machined slots, keyholes and other penetrations in frame extrusions for lifting and installing the units.
 - . Junctions and trim to adjoining surfaces.
 - . Caulking and flashing.
 - . Locations of visible heads of fasteners.
- Provision for differential vertical or horizontal movements, including the following:
 - . Thermal expansion and contraction.
 - . Frame deflections.
- Details of motor and operating mechanism enclosures.

- Method of draining the assembly, including details showing the following:
 - . Pressure equalised drained joints.
 - . Location, number and size of weepholes.
- Connection points to rainwater or stormwater systems.
- Hardware, fittings and accessories including window cleaning restraints and visible heads of fasteners.
- Infill panel stiffening.
- Location and power requirements of motors, sensors and controls.
- Wiring diagrams of control systems BMS interface details.
- Scale drawings and descriptions of prototype external screens.

Subcontractors

General: Submit names and contact details of the proposed manufacturers and, if the manufacturer is not the installer, the installers recommended by the manufacturers.

Warranties

Requirement: Submit warranties as documented.

1.5 INSPECTION

Notice

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

- Fabricated screen assemblies at the factory ready for delivery to the site.
- Fabricated screen assemblies delivered to the site, before installation.
- Prototypes.
- Commencement of installation of screen assemblies.
- Completion of installation.

2 PRODUCTS

2.1 FIRE PERFORMANCE

Combustibility

Cladding: Tested to AS 1530.1.

Fire hazard properties

Bonded laminated materials: Tested to AS/NZS 1530.3. Fire hazard indices, as follows:

- Spread-of-Flame Index: 0.
- Smoke-Developed Index: ≤ 3 .

Awning, sunshade, canopy, blind or shading hood: Tested to AS/NZS 1530.3. Fire hazard indices, as follows:

- Spread-of-Flame Index: ≤ 9 .
- Smoke-Developed Index: ≤ 8 , if Spread-of-Flame index is > 5 .

2.2 MATERIALS GENERALLY

Structural steel

Design and materials: To AS 4100.

Welding: To the AS/NZS 1554 series.

Galvanizing: To AS/NZS 4680.

Wire rope cables

Materials: Stainless steel type 316 or galvanized steel.

Fabric

Supply: Supply fabric by a single manufacturer as part of a single batch.

Inspection: Check each roll of material for flatness, faults in the fabric and the coatings, by visual inspection in directional sunlight at a distance of 4 m and by passing the membrane over a uniformly illuminated surface.

Stitching: Use UV stabilised polyester thread with a minimum tensile strength of 180 N. Use lock type stitching with a twin needle machine.

Perimeter reinforcing: Reinforce the perimeter of each fabric panel with UV stabilised polyester rope, coated with PVC-U and incorporating pockets for the tension cables.

2.3 METAL FINISHES

Anodising

Standard: To AS 1231.

Thickness: ≥ 15 microns to 20 microns.

Hot-dip galvanizing

Minimum coating mass/thickness: To AS/NZS 4680.

Powder coating

Application to aluminium and aluminium alloy substrates for architectural applications: To AS 3715 and as appropriate AAMA 2603, AAMA 2604 and AAMA 2605.

Application to metal substrates other than aluminium for architectural applications: To AS 4506.

2.4 FIXED PANEL TYPE SCREENS

General

Requirement: Provide infill panel materials mounted in a metal perimeter frame or subframe as follows:

- To withstand imposed actions and wind actions for the location without failure or permanent distortion, and without panel flutter.
- To shed water without pooling.

Expansion joints

Requirement: Allow for expansion and contraction in continuous sections at spacings not exceeding the manufacturer's recommendations, or 6 m, whichever is the lesser.

Fixing: Provide a fixing system appropriate to the panel material that will retain the panel without distortion or dislocation.

Framing materials

Requirement: Frames fabricated from solid or hollow metal sections.

Fixing: Provide fastener brackets or arms mounted on the face of the building, and brace as necessary with stays, including tensile elements such as wire cables and turnbuckles.

2.5 LOUVRE TYPE SCREENS

General

Requirement: Provide louvre screen assemblies able to withstand the permissible-stress-design wind

pressure for that location without failure or permanent distortion of members, and without blade flutter.

Expansion joints

Requirement: Allow for expansion and contraction in continuous sections (e.g. continuous louvres, interlocking mullions) at spacings not exceeding those recommended by the manufacturer, or 6 m, whichever is the lesser.

Fixed metal louvres

Requirement: Metal louver blades mounted in a metal perimeter frame or subframe, or on carrier frames, installed horizontally or vertically.

Blades: Rolled or extruded metal, or extruded metal blades swaged together with cross bars to form self-supporting panels.

Adjustable louvres

Requirement: Adjustable louver system including louver blades clipped or fixed into blade holders pivoted to stiles or coupling mullions, linked together in banks, installed horizontally or vertically.

Operation: Provide an operating system, incorporating a locking or latching device for each bank of louvres.

Pergolas

Supports: Support wide horizontal louver assemblies on posts mounted on terraces and balconies to form pergolas. Maintain the integrity of waterproofing membranes when fixing posts or brackets to terraces and balconies.

2.6 EXTERNAL SHUTTERS

Aluminium framed shutters

Requirement: Provide aluminium extruded or folded box frame sections, mitred, staked and screwed at corners, and shutter blades.

Fixed shutter blades

Requirement: Fix shutter blades to the frames with concealed fixings.

Adjustable shutter blades

Requirement: Provide adjustable shutter blades to the frames, complete with operating bar or mechanism that rotates individual blades to the same angle and constrains them in the required position.

Hinged shutters

Requirement: Hinge shutters at the top or side, as documented. Provide a latch or lock on the frame opposite the hinge side.

Sliding shutters

Requirement: Provide matching aluminium head guide, sill runner, and frame stile sections.

Hardware: Nylon slide runners and finger pull handle. Provide pile weather stripping against sash where necessary to close gaps.

3 EXECUTION

3.1 FABRICATION

Aluminium fabrication and construction

Standard: To AS/NZS 1664.1 or AS/NZS 1664.2.

Fasteners

Requirement: Provide fasteners of sufficient strength and quality to perform their required function.

Joints

Requirement: Make accurately fitted tight joints so that neither fasteners nor fixing devices create pressure indentations that are visible on exposed faces. Where heads of fasteners are unavoidably visible, finish them to match the adjacent surface.

Protection

Corrosion protection: Provide protection against corrosion that may be caused in metals by products or processes normally employed on a building site or by normal atmospheric or other ambient conditions and by-products including rainwater, drinking and drinking water, airborne salt and airborne pollution.

Durability: Provide materials resistant to exposure to weather and UV radiation so that their colour, surface finish, flexibility and water resistance are maintained.

Temporary measures: Do not use adhesive tape, film or paper, or applied coatings liable to bond to the substrate, when exposed to sunlight or weather, as temporary measures to protect screen components during the course of the works. If temporary measures are used, remove all traces, particularly from contact mating surfaces before joining up.

Operation

Requirement: Provide moving parts which operate freely and smoothly, without vibration, rattling, binding or sticking, and at correct tensions or operating forces. Lubricate if appropriate.

3.2 WELDING

General

Quality: Provide finished welds descaled and free of surface and internal cracks, slag inclusion and porosity. Provide continuous welding unless permanently concealed.

Restrictions: Do not weld as follows:

- On site.
- On finished surfaces.
- Next to a finished surface or glass, unless the adjacent surface is protected from damage.

3.3 EMBEDDED FIXINGS

General

Fixing: Fix screens to the building structure by one of the following methods, and as documented:

- Fasteners cast into the concrete of the building structure. Do not displace reinforcement, when locating embedded items.
- Chemical fixings, expanding bolt sockets.
- Bolting or welding to brackets or structural framing.

Standard for embedment

For concrete: To AS 3600.

For masonry: To AS 3700.

Fixing brackets

Requirement: Provide fasteners and other methods of attachment of the screens to the structure with the following characteristics:

- Three-way adjustment to accommodate fabrication and construction tolerances.
- Provision for building movements while fixing the screens in their correct positions.
- Adequacy for structural design actions.

Protection

Cast-in items: Prevent the entry of concrete slurry into bolt holes, channels, and other openings for the fasteners. Fill the openings using an easily removed water repellent material before casting in.

Placement

Tolerance:

- Maximum deviation from correct position: 13 mm.

Fastener channels embedded parallel or perpendicular to the edge of a concrete structural member:

- Minimum length of embedded anchor: 200 mm.
- Minimum distance from the concrete edge to the nearest part of the anchor: 100 mm.

3.4 INSTALLATION**Installation tolerance**

Alignment:

- Maximum deviation of any member from its true alignment (plumb, level, or line of slope): 1:1000, up to a maximum of 10 mm in a continuous run of members in one direction.
- Maximum misalignment between adjoining members: 1 mm.

Position:

- Maximum deviation of any part from its true position: 10 mm

Marking

Requirement: Before the separate parts of the screens are delivered to the site, provide suitable and sufficient marks or other means for identifying each part, and for showing its correct location and orientation, when installed.

Reference lines and marks

Requirement: Provide on each floor, in agreed locations, accurate perimeter offset reference lines, plumb with corresponding lines on other floors, and height benchmarks.

Cleaning

Requirement: During erection, promptly remove foreign matter from the screens without damage to finishes. Do not use abrasive cleaners or acid.

3.5 COMPLETION**Cleaning**

Method: Clean all visible surfaces with soft clean cloths and clean water or approved cleanser, finishing with a clean cloth. Do not use abrasive or alkaline materials.

Warranties

Requirement: Cover materials and workmanship in the terms of the warranty from the manufacturer.

0461 GLAZING**1 GENERAL****1.1 RESPONSIBILITIES****Performance**

Thermal qualities: U-Value and Solar heat gain coefficient (SHGC) as documented.

1.2 STANDARDS**Glazing**

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

1.3 SUBMISSIONS**Certification**

Design: Submit an engineers' certificate confirming conformance to AS 1288.

Installation: Submit certification from the fabricator that the method of glazing, the selection of sealant systems and conditions next to the glass conform to the following:

- Compatible with the edge seal of insulating glass units (IGUs) and self-cleaning glass.
- Will not be detrimental to the long term structural performance, weathering capabilities and visual qualities of the glass.

Glazier's data: Submit the glazing subcontractor's statement certifying the following:

- A satisfactory thermal safety assessment.
- The assembled frame provides the required glazing clearances and tolerances, and maximum and minimum joint configurations, based on the bow, warp and kink characteristics of the required glass types, and is ready for glazing.

Execution details

Site glazing: If site glazing is intended, submit proposals.

Operation and maintenance manuals

Requirement: Submit manufacturers' published recommendations for in service use.

Products and materials

Safety glazing materials: Submit evidence of conformity to AS/NZS 2208 Appendix A.

Samples

General: Submit samples of glazing materials, each at least 200 x 200 mm, showing specified visual properties and the range of variation, if any, for each of the following:

- Tinted or coloured glass or glazing plastics.
- Surface modified or surface coated glass.
- Patterned or obscured glass or glazing plastics.
- Ceramic-coated glass.
- Wired glass.
- Insulating glass units.
- Mirror glass.

Shop drawings

Requirement: Submit shop drawings showing the following:

- Method of glazing
- Rebate depth.
- Edge restraint.
- Clearances and tolerances.
- Glazing gaskets and sealant beads.

1.4 INSPECTION**Notice**

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

- Glass products before they are installed.

2 PRODUCTS**2.1 GENERAL****Heat strengthening**

Requirement: Heat strengthen all glass that requires extra strength and thermal resistance.

Standard: To ASTM C1048.

Heat soaking

Requirement: All toughened and heat strengthened glass products.

Standard: To EN 14179-1.

Storage and handling

Storage: Store glass and glazing materials in a clean, dry area and unaffected by weather, to the manufacturer's recommendations. Protect from building materials and loose debris such as wet plaster, mortar, paint and welding splatter.

Handling: Handle glass to the manufacturer's recommendations.

2.2 GLASS**Performance**

Glass: Free from defects which detract from appearance or interfere with performance under normal conditions of use.

Glazing plastics: Free from surface abrasions, and warranted by the manufacturer for 10 years against yellowing or other colour change, loss of strength and impact resistance, and general deterioration.

Safety glazing materials

Standard: To AS/NZS 2208.

Type: Grade A to AS 1288.

Certification: Required.

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

Insulating glass units (IGUs)

Manufacture and installation: To AS 4666.

Glass thickness selection: To AS 1288.

2.3 GLASS IDENTIFICATION**Safety glazing materials**

Identification: Identify each piece or panel, to AS 1288.

2.4 GLAZING MATERIALS**General**

Requirement: Glazing materials including putty, glazing compounds, sealants, gaskets, glazing tapes, spacing strips, spacing tapes, spacers, setting blocks, shims and compression wedges appropriate for the conditions of application and required performance.

Primer

Compatibility: Apply the manufacturer's recommended primer to the surfaces in contact with sealant materials.

2.5 ANCILLARY COMPONENTS AND FITTINGS**Extruded gaskets and seals**

General: Provide seals, as documented.

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

- Rubber products (neoprene, ethylene propylene diene monomer (EPDM) or silicone rubber): To BS 4255-1.
- Flexible polyvinyl chloride (PVC): To BS 2571, E type compounds, colour fastness grade B.

Pile weather strips

Standard: To AAMA 701/702.

Material: Polypropylene or equivalent pile and backing, low friction silicone treated, ultraviolet stabilised.

Finned type: A pile weather seal with a central polypropylene fin bonded into the centre of the backing rod and raised above the pile level.

3 EXECUTION**3.1 GLASS PROCESSING****General**

Processing: Perform required processes on glass, including cutting, obscuring, silvering and bending. Form necessary holes, including for fixings, equipment, access openings and speaking holes. Process exposed glass edges to a finish not inferior to ground arised.

3.2 INSTALLATION**Glazing**

General: Install the glass as follows:

- Permanently fix in place each piece of glass to withstand the normal loadings and ambient conditions at its location without distortion or damage to glass and glazing materials.
- No transfer of building movements to the glass.
- Watertight and airtight for external glazing.

Temporary marking: Use a method which does not harm the glass. Remove marking on completion.

Toughened glass: Do not cut, work, or permanently mark after toughening. Use installation methods which prevent the glass making direct contact with metals or other non-resilient materials.

Heat absorbing glass: In locations exposed to direct sunlight, provide wheel cut edges free from damage or blemishes, with minimum feather.

Preglazing

Window assemblies and glazed doors: Supply inclusive of glazing, shop preglazed.

Curtain walls: Supply inclusive of glazing, shop preglazed.

Site glazing

External timber framed glazing: Glaze with putty.

3.3 COMPLETION

Replacement

Requirement: After replacing damaged glass, leave the work clean, polished, free from defects, and in good condition.

Cleaning

Method: Clean with soft clean cloths and clean water, finishing with a clean squeegee. Do not use abrasive or alkaline materials.

Extent: All frames and glass surfaces inside and out.

Warranties

Glazing subcontractor's warranty: Provide an undertaking conditional only on compliance with the manufacturers' recommendations for maintenance, to repair or replace glass and glazing materials that become defective or prove unsuitable for the nominated application; during the warranty period.

Glass manufacturer's warranty: Provide an undertaking, conditional only on compliance with the manufacturer's recommendation for installation and maintenance, to supply replacement glass units to the site for replacement of defective units defined as follows:

- IGU units: Units in which the hermetic seal has failed as evidenced by intrusion of foreign matter, or internal condensation at temperature above 2°C.
- Coated glass units (including coated super insulating glass units): Units in which the metallic coating shows evidence of manufacturing defects, including but not necessarily limited to cracking or peeling, as determined in conformance with ASTM C1048.

Toughened glass warranty: Provide a manufacturer's warranty certifying that toughened glass supplied for use in curtain walls has been subjected to a heat soaking process that has converted at least 95% of the nickel sulfide content to the stable beta-phase.

0467 GLASS COMPONENTS

1 GENERAL

1.1 STANDARDS

General

Materials and installation: To AS 1288.

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

1.2 SUBMISSIONS

Certification

Balustrade design: Submit a professional engineer's certificate confirming conformance with AS/NZS 1170.1 clause 3.6.

Sealant compatibility: Submit statements from all parties to the installation certifying the compatibility of sealants and glazing systems to all substrates.

Glazing: Submit certification from the fabricator, that the method of glazing, the selection of sealant systems and conditions next to the glass comply with the following:

- Not detrimental to the long term structural performance, weathering capabilities and visual qualities of the glass.
- Not cause delamination or other impairment to laminated glass during the service life.

Toughened glass: For each batch of glass, submit certification from the manufacturer of heat soaking.

Products and materials

Safety glazing materials: Submit evidence of conformity to AS/NZS 2208 Appendix A.

Samples

General: Submit samples, each at least 200 x 200 mm, showing specified visual properties and the range of variation, if any, for each of the following types of glass or glazing plastics:

- Mirror glass.
- Patterned or obscured glass.
- Ceramic-coated glass.
- Wired glass.

Shop drawings

Requirement: Submit shop drawings showing the following:

- Method of glazing.
- Rebate depth.
- Edge restraint.
- Clearances and tolerances.
- Glazing gaskets and sealant beads.
- Pocket fixing details for frameless glass balustrades.

Subcontractors

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

Warranties

Shower screens: Submit manufacturer's and installer's warranty on completion.

Balustrades: Submit manufacturer's and installers warranty on completion.

1.3 INSPECTION

Notice

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

- Glass components before they are installed.

2 PRODUCTS

2.1 GLASS

Performance

Glass: Free from defects which detract from appearance or interfere with performance under normal conditions of use.

Heat soaking

Requirement: All toughened and heat strengthened glass products.

Standard: To EN 14179-1.

Identification: Marked to EN 14179-1 or certified by the manufacturer to AS 1288 clause 3.8.2.

Safety glass

Standard: To AS/NZS 2208.

Type: Grade A to AS 1288.

Certification: Required.

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

2.2 GLAZING MATERIALS

General

Requirement: Glazing materials including putty, glazing compounds, sealants, gaskets, glazing tapes, spacing strips, spacing tapes, spacers, setting blocks, shims and compression wedges appropriate for the conditions of application and required performance.

Jointing materials

Requirement: Provide recommended jointing and pointing materials that are compatible with each other and with the contact surfaces and non-staining to finished surfaces. Do not provide bituminous materials on absorbent surfaces.

Elastomeric sealants

Sealing compound (polyurethane, polysulphide, acrylic): To ASTM C920 or ISO 11600.

Sealing compound (silicone): To ASTM C920 or ISO 11600.

Sealing compound (butyl): To ASTM C1311.

Primer

Compatibility: Apply the manufacturer's recommended primer to the surfaces in contact with sealant materials.

Control joints

Depth of elastomeric sealant: One half the joint width, or 6 mm, whichever is the greater.

Foamed materials (in compressible fillers and backing rods): Closed-cell or impregnated types that do not absorb water.

Bond breaking: Provide backing rods, and other back-up materials for sealants, that do not adhere to the sealant.

2.3 MIRRORS

Reflective surface

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

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

Venetian silvered mirror (one way vision glass): 15 mm wide silvered strips alternating with 3 mm wide clear strips.

Safety mirror

Type to AS 1288: Vinyl backed Grade A safety mirror.

Safety compliance: To AS/NZS 2208.

Solid backed annealed glass mirrors

Backing: 9 mm waterproof plywood.

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

2.4 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.

3 EXECUTION

3.1 GLASS PROCESSING

General

Processing: Perform required processes on glass, including cutting, obscuring, silvering and bending. Form necessary holes, including for fixings, equipment, access openings and speaking holes. Process exposed glass edges to a finish not inferior to ground arrised.

3.2 INSTALLATION

General

Requirement: Install the glass as follows:

- Permanently fix in place each piece of glass to withstand the normal loadings and ambient conditions at its location without distortion or damage to glass and glazing materials.

- No transfer of building movements to the glass.

Temporary marking: Use a method which does not harm the glass. Remove marking on completion.

Toughened glass: Do not cut, drill, edge-work, or permanently mark after toughening. Use installation methods which prevent the glass making direct contact with metals or other non-resilient materials.

Frameless installations: Join the vertical edges of adjacent glass panels with silicone jointing compound.

3.3 FIXING MIRRORS

Vinyl backed Grade A safety mirrors and solid backed annealed glass mirrors

Solid backed annealed glass mirrors:

- 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.

Screw fixing: Fix direct to wall plugs with dome-headed chromium-plated screws in each corner and at 900 mm maximum centres around perimeter. Provide polyethylene sleeves and washers to prevent contact between screw and glass. Do not over-tension the screws.

Frame fixing: Proprietary aluminium frames to mirror perimeter, corners mitred. If unbacked, bed glass edges in a continuous resilient gasket. Attach the frame to the substrate with concealed screw fixings. Seal the frame to the substrate with paintable sealant which will not react with the mirror coating. Do not allow the sealant to contact the mirror back.

Bead fixing: Rebated timber beads to mirror perimeter, corners mitred. If unbacked, bed glass edges in a continuous resilient gasket. Screw fix the beads to the substrate.

Clip fixing: Fix direct to wall plugs with chromium-plated fixed clip and spring clip fixings at 900 mm maximum centres around perimeter. If unbacked, provide polyethylene or cork washers to prevent contact between clips and mirror back.

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

3.4 GLAZED SHOWER SCREENS

Water shedding

Requirement: 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.

Sliding assemblies

Hanging: Hang the sliding sash on stainless steel or nylon sheaves on overhead channel track formed in the frame head, and fit nylon or equivalent bottom guides.

Hardware: Pull handles on both sides of sash, or of leading sash in multiple sash arrangements.

Fixing

Proprietary shower screens: To the manufacturer's recommendations.

3.5 COMPLETION

Cleaning

Method: Clean with soft clean cloths and clean water, finishing with a clean squeegee. Do not use abrasive or alkaline materials.

Extent: All frames and glass surfaces inside and outside.

Warranties

Shower screens: Manufacturer's warranty:

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

Balustrades: Manufacturer's and installers warranty:

0471 THERMAL INSULATION AND PLIABLE MEMBRANES

1 GENERAL

1.1 RESPONSIBILITIES

Performance

Requirements:

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

1.2 INTERPRETATION

Definitions

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

- Bio-soluble: A product that dissolves in bodily fluids and is quickly cleared from the lungs.
- Fibre batts: Flexible insulation supplied as factory cut pieces and composed of mineral wool (glass and rock fibre) or polyester fibre.
- Fire hazard properties: Terminology to BCA A5.5.
- Pliable building membrane: To AS/NZS 4200.1 and equivalent to sarking-type materials as defined in the NCC.
- Thermal insulation terminology: To AS/NZS 4859.1.
- Vapour permeable (breathable) membrane: A flexible membrane material, normally used for secondary waterproofing that allows for the transmission of water vapour.

1.3 SUBMISSIONS

Fire performance

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

Products and materials

Thermal insulation properties: Submit evidence of conformity to AS/NZS 4859.1 and AS/NZS 4859.2.

Warranties

Manufacturer's published product warranties: Submit on completion.

1.4 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the installed pliable membrane and insulation before covered up or concealed.

2 PRODUCTS

2.1 FIRE PERFORMANCE

Fire hazard properties

Insulation materials: Tested to AS/NZS 1530.3. Fire hazard indices as follows:

- Spread-of-Flame Index: ≤ 9 .

- Smoke-Developed Index: ≤ 8 if Spread-of-Flame Index > 5 .

Materials with reflective facing: Tested to AS/NZS 1530.3 and the recommendations of Appendix A6.

Pliable membranes: Flammability Index ≤ 5 tested to AS 1530.2.

2.2 INSULATION AND PLIABLE MEMBRANE MATERIALS

General

Mineral wool insulation: Bio-soluble and not listed as a hazardous material in the Safe Work Australia Hazardous Chemical Information System (HCIS).

Insulation

Standard: Thermal insulation materials to AS/NZS 4859.1:

- Cellulosic fibre (loose fill): To AS/NZS 4859.1 Section 4.
- Wool: To AS/NZS 4859.1 Section 5.
- Polyester (compressible): To AS/NZS 4859.1 Section 6.
- Mineral wool blankets and cut pieces (compressible): To AS/NZS 4859.1 Section 7.
- Rigid cellular foam insulation (EPS, PF, PIR, PUR and XPS): To AS/NZS 4859.1 Section 8.
- IR reflective (formed shapes and compressible with one or more external IR reflective surfaces): To AS/NZS 4859.1 Section 9.

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

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

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

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

Polyurethane (sprayed): To AS 1366.1 Table 2.

Wet processed fibreboard (softboard): To AS/NZS 1859.4.

Pliable building membranes

Standard: To AS/NZS 4200.1.

Vapour barrier:

- Vapour control classification: Class 1.
- Sarking membrane (other than walls and gables):
- Water control classification: Water barrier.
- Vapour permeable (breathable) membrane: Minimum class 4.

Fasteners and supports

General: Metallic-coated steel.

Mesh support to roof insulation

Welded safety mesh: To AS/NZS 4389.

3 EXECUTION

3.1 GENERAL

Bulk insulation

Requirement: To AS 3999 and BCA J1.2. or BCA 3.12.1.1, as appropriate.

Installation: Firmly butt together fibre blankets or batts, 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.

Glass Wool and Rock Wool insulation: Conform to the *ICANZ Industry code of practice for the safe use of glass wool and rock wool insulation*.

Pliable building membrane

Installation: To AS 4200.2 and BCA J1.2 or BCA 3.12.1.1, as appropriate.

3.2 FLOORS

Under suspended framed floors - bulk insulation

Product type: Fibre batts.

Installation: Fit tightly between framing members. If other support is not provided, staple nylon twine to the framing and stretch tight.

Under suspended framed floors – rigid insulation

Product type: Rigid cellular extruded sheets.

Over suspended framed floors

Product type: Rigid cellular extruded sheets.

Below concrete slab on ground

Product type: Rigid cellular extruded sheets.

Laying pattern: Stretcher bond, with edges tightly butted.

Damp-proof membrane: Lay over insulation.

Over concrete slab on ground

Product type: Rigid cellular extruded sheets.

Substrate preparation: Prepare substrates as follows:

- Clean and remove of any deposit or finish which may impair adhesion or location of insulation.
- Remove excessive projections.
- Voids and hollows > 10 mm with abrupt edges: Fill with a cement:sand mix not stronger than the substrate or weaker than the bedding.

Laying pattern: Stretcher bond, with edges tightly butted.

Fixing: Adhesive fixed directly to the concrete floor slab.

Under suspended concrete slab – rigid insulation

Product type: Rigid cellular extruded sheets.

Joints: Apply reinforced foil tape to all joints.

Under suspended concrete slab – bulk insulation

Product type: Fibre batts.

Fixing: Mechanical fasteners and support mesh or nylon twine.

3.3 WALLS

Framed walls – thermal break strips

Product type: Proprietary item.

Application: To steel framing with lightweight external cladding.

R-Value: ≥ 0.2 .

Screw fixing: Button head screws at 1 m centres.

Adhesive fixing: Wallboard adhesive walnuts at 1 m centres.

Framed walls – bulk insulation

Product type: Fibre batts.

Installation: Friction fit between framing members. If other support is not provided, staple nylon twine to the framing and stretch tight.

Masonry veneer cavity walls

Product: Rigid cellular insulation board.

Application: To steel or timber framing.

Installation: Horizontally with the tongue to the top edge, pushed over prefixed wall ties and held firmly against the wall frame. Keep boards clean and dry and free from mortar and grout. Do not bridge the cavity.

Fixing: Hex head screws at 450 mm centres.

Flashings: Install flashings before installing insulation panels. Prevent entry of water behind the insulation boards.

Full masonry cavity walls – inside cavity

Product: Rigid cellular insulation board.

Application: To the external face of the inner masonry leaf.

Installation: Horizontally with the tongue to the top edge and firmly against the inner masonry skin. Keep boards clean and dry and free from mortar and grout. Do not bridge the cavity.

Fixing: Proprietary plastic clips on pre-installed wall ties.

Flashings: Install flashings before installing insulation panels. Prevent entry of water behind the insulation boards.

Full masonry cavity walls – internal face

Product type: Rigid cellular extruded boards.

Application: To the internal face of internal masonry leaf.

Preparation of substrates: Conform to the following:

- Remove any deposit or finish which may impair adhesion.
- Remove excessive projections and fill voids and hollows with plaster.
- Maximum surface deviation from a 2400 mm straightedge: 6 mm.

Substrate correction: Skim plaster.

Installation: Apply boards horizontally with staggered vertical joints, all close butted and without crushing.

Fixing: Proprietary adhesive compatible with the insulation. Apply sufficient pressure to evenly distribute adhesive.

Vapour permeable (breathable) membrane

Application: Provide a vapour permeable membrane behind external facing material which does not provide permanent weatherproofing or which may be subject to condensation forming on the internal face, including the following:

- Boards or planks fixed vertically or diagonally.
- Boards or planks fixed in exposed locations where wind driven rain can penetrate the joints.
- Unpainted or unsealed cladding.

- Masonry veneer.

Installation: Run the vapour permeable membrane horizontally on the outer face of external wall framing, over the flashing, from the bottom plate up. Pull taut over the framing and fix to framing members. Seal across the wall cavity at the top.

Horizontal laps: At least 150 mm wide, lapped to make sure water is shed to the outer face of the membrane.

End or vertical overlaps laps: At least 150 mm wide made over framing.

Openings: Run the vapour permeable membrane over the openings and leave covered until windows and doors are installed. Cut the membrane on a 45° diagonal from each corner of the opening, fold the flaps inside and fix to the inside frame of the opening. If the membrane is used to provide a continuous air tight layer, seal all joints with pressure sensitive adhesive tape.

Fixing: Install as follows:

- Timber frames: Metallic-coated clouts, 20 mm long 6 to 8 mm staples or punched multi-point metallic-coated steel brads.
- Steel or aluminium frames: Hex head screws, with either 20 mm diameter washers or through hardboard strips.
- Plywood: Alternatives:
 - . Metallic-coated clouts, 20 mm long 6 to 8 mm staples or punched multi-point metallic-coated steel brads at minimum 300 mm centres.
 - . Water based contact adhesive with a 50% adhesive cover.

3.4 ROOFS

General

Location: The whole of the roof area including skylight shaft walls, except the following:

- Eaves, overhangs, skylights, vents and openings.
- Roofs to outbuildings, garages, and semi-enclosed spaces such as verandahs, porches and carports.

Mesh support to roof insulation

Locations: Provide support to the following:

- Sarking, vapour barrier or reflective thermal insulation membranes laid over roof framing members which are spaced at more than 900 mm centres.
- Blanket type thermal insulation laid over roof framing members as sound insulation to metal roofing.

Installing welded safety mesh: To AS/NZS 4389.

Pliable building membranes

Sarking membrane:

- Location: Provide sarking under tile and shingle roofing.

Vapour barrier:

- Installation: Lay over the roof framing with sufficient sag to allow the bulk insulation to achieve its full thickness. Overlap all edges 150 mm and seal all joints with pressure sensitive adhesive tape.

Metal roofs – thermal break strips

Product type: Proprietary item.

Application: To steel framing supporting metal sheet roof cladding.

R-Value: ≥ 0.2 .

Metal roofs – bulk insulation

Product: Fibre blankets or batts.

Installation:

- Batts: Fit tightly between framing members.
- Blanket for sound insulation: Install over the roof framing, reflective thermal insulation (if any), and mesh support, so that the blanket is in continuous contact with the underside of the metal roofing sheets.
- Combined blanket and reflective insulation: Lay facing reflective insulation face downwards over safety mesh.

Waterproof membrane roofs – IRMA/PMR types

Product type: Rigid cellular extruded sheets.

Preparation: Make sure membrane is clean and free of loose material.

Separation layer: Lay over membrane with edges lapped 300 mm and turned up at upstands and penetrations.

Installation: Lay insulation boards in brick pattern with shiplap edges pushed together firmly, cut neatly around penetrations and extend up upstands.

Cathedral ceiling insulation – metal roofing and roofing tiles

Product type: Rigid cellular extruded sheets.

Application: Over ceiling lining that has been fixed to rafters.

Installation: Lay insulation boards with their long edges at right angles to the rafters and with the tongue pointing up the slope. Start laying at eaves and progress towards the ridge. Secure temporarily by occasional nailing to the rafters, the permanent fixing is provided by the nails used to secure the counter battens to the rafters. Cut boards and tightly fit to abutments and penetrations. Seal gaps with polyurethane foam.

Ceiling insulation – bulk insulation

Product type:

- Framed ceilings: Fibre batts.
- Suspended ceiling: Fibre blanket.

Application: Over ceiling lining.

Installation:

- Batts: Fit tightly between framing members.
- Blankets: Butt joint and lay over ceiling panels or lining.

0511 LINING**1 GENERAL****1.1 TOLERANCES****Permitted deviations**

Bearing surface of finished framing:

- Gypsum lining: To AS/NZS 2589 clause 4.2.2.
- Other lining: 4 mm from a 1.8 m straightedge.

1.2 SUBMISSIONS**Fire performance**

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

Samples

Prefinished panels: Minimum 300 x 600 (wide) mm panel for each finish with associated trim.

Shop drawings

General: Submit shop drawings to a scale that best describes the detail, showing the following:

- Decorative panels: Showing panel set-out, large scale panel fixing details, attachment devices and other components.

Warranties

Lining materials: Submit the manufacturer's published product warranties.

1.3 INSPECTION**Notice**

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

- Substrate or framing before installation of linings.
- Finished surface of installation before applying:
 - . Sealer.
 - . Finish coatings or decorative papers.

2 PRODUCTS**2.1 GENERAL****Storage and handling**

Requirement: Dry and undamaged lining stacked in pallets horizontally on a smooth, level surface. Prevent distortion or moisture ingress.

Timber or fibreboard panels: Store off the ground in a well-ventilated area.

Handling: Do not drag sheets across each other or across other materials. Protect edges, corners and surface from damage.

Acclimatisation

Timber panels: Store on-site in final interior conditions for 2 to 3 weeks before installing. Do not install until the air conditioning system of the installation area is operating.

Certification

Timber based products: Label panels under the authority of a recognised certification scheme to *0185 Timber products, finishes and treatment*, as

applicable to the product. Locate the label on faces or edges which will be concealed in the works.

2.2 FIRE PERFORMANCE**Fire hazard properties**

Group number: To AS 5637.1.

2.3 PLASTERBOARD**General**

Standard: To AS/NZS 2588.

Minimum thickness: 10 mm.

2.4 FIBRE CEMENT**General**

Standard: To AS/NZS 2908.2.

Wall and ceiling linings: Type B category 2.

Minimum thickness: Conform to the following:

- Wall: 9 mm.
- Ceiling: 6 mm.

2.5 PLYWOOD AND BLOCKBOARD**General**

General interior use: To AS/NZS 2270.

Areas requiring moisture resistance: To AS/NZS 2271.

Visible surfaces with a clear finish: Veneer quality A.

Other visible surfaces: Veneer quality B.

Back/face veneer: Veneer quality C or D.

Presealed plywood: Plywood pre-sealed both sides and edges with a machine applied sealer.

2.6 PARTICLEBOARD**General**

Standard: To AS/NZS 1859.1.

2.7 WET PROCESS FIBREBOARD**General**

Hardboard, medium board and softboard: To AS/NZS 1859.4.

General purpose board

General purpose: Interior use generally.

Tempered (MR) board

Location: For areas with humid conditions or subject to occasional wetting.

Veneered general purpose board

Location: Timber veneer faced to one or both sides for decorative ceiling and wall lining.

Softboard

Location: Pinboards and insulation boards for roofing/ceiling, walls, partitions and doors.

2.8 DRY PROCESS FIBREBOARD (INCLUDING MEDIUM DENSITY FIBREBOARD)**General**

Standard: To AS/NZS 1859.2.

Melamine overlaid medium density fibreboard:

Medium density fibreboard (STD MDF) overlaid on both sides with low pressure melamine.

2.9 COATED STEEL

General

Standard: To AS 1397.

- Coating class interior: Z275.
- Coating class exterior: Z450.

2.10 ADHESIVES, SEALANTS AND FASTENERS

Adhesives

For wallboards: Gunnable synthetic rubber/resin based mastic contact adhesive formulated for bonding flooring and wallboards to a variety of substrates.

Sealants

Fire-resistance rated sealant: Non-hardening sealant, compatible with the materials to be sealed and having a fire-resistance rating equal to that of the building element it seals.

Acoustic sealant: Non-hardening sealant compatible with the materials to be sealed.

Fasteners

Steel nails: Hot-dip galvanized.

3 EXECUTION

3.1 CONSTRUCTION GENERALLY

Conditions

Commencement: Do not start lining work until the building or installation area is enclosed and weathertight, and all wet trades have been completed.

Substrates

Requirement: Plumb, level, in true alignment and to the lining manufacturer's recommendations.

Timber, steel framing and battened masonry: To AS/NZS 2589 clause 4.2.

Preparation: Before fixing linings, check and adjust the alignment of substrates or framing, if necessary.

Battens

General: Fix at each crossing with structural framing members, to solid walls or ceiling support. Provide wall plugs in solid substrates.

Ceiling linings

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

Accessories and trim

General: Provide accessories and trim as necessary to complete the installation.

Adhesives

General: Provide adhesive types appropriate for the purpose, and apply them so they transmit the loads imposed without causing discolouration of the finished surfaces.

Fire-resisting and acoustic installations

Sealing: Apply sealant to the manufacturer's recommendations and as follows:

- Around services pipes and penetrations.
- Electrical outlets and recessed lights: Line back and sides of fixture with plasterboard and seal around fixture junction with sealant.

- Around perimeter of lining panels: Provide continuous runs of sealant.

3.2 PLASTERBOARD LINING

Installation

Gypsum plasterboard and fibre reinforced gypsum lining: To AS/NZS 2589.

Level of finish and jointing: To AS/NZS 2589 clause 3.1.

Supports

General: Install timber battens or proprietary cold-formed galvanized steel furring channels as follows:

- Where framing member spacing exceed the recommended spacing.
- Where direct fixing of plasterboard is not possible, due to the arrangement or alignment of the framing or substrate.
- Where the lining is the substrate for tiled finishes.
- If required for penetrations for services, including mechanical grilles and lighting fixtures.
- If required to support fixtures.

Multiple sheet layers

Application: Fire-resistance rated and acoustic rated walls.

Joints: Fill and flush up all joints and fasteners in each layer and caulk up perimeters and penetrations before installing following layers. Stagger all sheet joints by minimum 200 mm.

Joints

Flush joints: Provide recessed edge sheets and finish flush using perforated paper reinforcing tape.

Butt joints: Make joints over framing members or provide back blocking.

External corner joints: Make joints over metallic-coated steel corner beads.

Dry joints: Provide square edged sheet and finish with a PVC-U joining section.

Control joints: Provide purpose-made metallic-coated control joint beads at not more than 12 m centres in walls and ceilings and to coincide with structural control joints.

Wet areas: Install additional supports, flashings, trim and sealants as required.

Joints in tiled areas: Do not apply a topping coat after bedding perforated paper tape in bedding compound.

3.3 FIBRE CEMENT LINING

Installation

Joints and layout: 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.

Supports

General: Install timber battens or proprietary cold-formed galvanized steel furring channels as follows:

- Where framing member spacing exceed the recommended spacing.

- Where direct fixing of fibre cement is not possible, due to the arrangement or alignment of the framing or substrate.
- Where the lining is the substrate for tiled finishes.
- If required for penetrations for services, including mechanical grilles and lighting fixtures.
- If required to support fixtures.

Fixing

Timber framed construction: Nail only or combine with adhesive.

Steel framed construction: Screw only or combine 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.

Masonry wall construction: Conform to the following:

- Direct fixing: Adhesive fix to the masonry except where lining forms a substrate for tiled finish.
- Furring channels: Fix using screw and/or adhesive.

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

- Ceiling battens: Fix at 600 mm maximum centres.

Wet areas: Do not use adhesive fixing alone.

Multiple sheet layers

Application: Fire-resistance rated and acoustic rated walls.

Joints: Fill and flush up all joints and fasteners in each layer and caulk up perimeters and penetrations before installing following layers. Stagger all sheet joints by minimum 200 mm.

Joints

Joint width:

- Butt joints: 1 to 2 mm.
- Expressed joints: 10 mm maximum.

Joint backing for expressed joints: Black self-adhesive polyurethane tape.

Flush joints: Provide recessed edge sheets and finish flush using perforated paper reinforcing tape.

External corner joints: Make joints over metallic-coated steel corner beads.

Dry joints: Provide square edged sheet and finish with a PVC-U joining section.

Control joints: Provide control joints to coincide with structural control joints and as follows:

- Walls: ≤ 7.2 m centres.
- Ceilings: To divide into bays not larger than 10.8 x 7.2 m.
- Soffit linings: To divide into bays not larger than 4.2 x 4.2 m or 5.6 x 3.6 m.
- Control joint beads: Purpose-made metallic-coated.
- Support: Provide framing parallel to the joint on each side. Do not fix the lining to abutting building surfaces.

Wet areas: Provide additional supports, flashings, trim and sealants as required.

Joints in tiled areas: Bed perforated paper tape in bedding compound. Do not apply a topping coat.

- Control joints: Not more than 4.2 m centres and space to suit joints required in tiling.
- Internal corners: Reinforce with metallic-coated steel angles. In corners subject to continuous moisture, flash over the angle and under the sheeting with continuous bitumen coated aluminium flashing.

3.4 TIMBER PANEL LINING

General

Installation: Set out in even panels with joints coinciding with framing members. Fit and fix panels and trim plumb, level and in true alignment of face and grain.

Fixing:

- Plywood and hardboard: Wallboard adhesive or pin fixed to timber frame, screw fixed to steel frame. Punch pin heads just below surface.
- Laminated plastic: Wallboard adhesive.

Plywood

Expansion joints: Provide a 2 to 3 mm gap at edges of linings and as follows:

- 2 to 3 mm gap at each panel joint, or
- 6 to 9 mm every 3.6 m, or
- 8 to 12 mm every 4.8 m.

Areas with an expected high level of internal moisture: Provide a gap of 4 to 6 mm every 1.2 m.

3.5 TRIM AND ACCESSORIES

General

Requirement: Provide trim such as beads, mouldings and stops to make neat junctions between lining components, finishes and adjacent surfaces.

Proprietary items: Provide complete with installation accessories.

Timber and MDF trim: Fix using full length so that trim is secure and without movement. Where nail or screw fixings are used, make sure fastener finishes sufficiently below face of trim so that stopping piece finishes flush with the face.

3.6 COMPLETION

General

Damaged or marked lining and components: Replace.

Exposed surfaces: Touch up shop applied finishes and restore damaged or marked areas.

Timber panels: If appearance is not uniform, replace panels.

Cleaning: Clean completed surfaces to remove irregularities and leave panels smooth and clean, to the manufacturer's recommendations. If required, sand with fine paper to remove irregularities and refinish panel surface.

- Debris and unused material: Remove from site.

Warranties

Requirement: At practical completion, submit warranties against defective materials and installation.

0522 PARTITIONS - FRAMED AND LINED**1 GENERAL****1.1 RESPONSIBILITIES****Performance**

Strength and stability: To remain stable, and without rattle and signs of deflection or permanent deformation under normal conditions of use, including the slamming of doors.

Serviceability: To support imposed dead loads, seismic loads, wind loads, including designated eccentric loads and not to deflect in excess of the following, where H is the height of the partition:

- The lesser of H/240 or 30 mm for partitions subjected to wind loads and lined with flexible material.
- The lesser of H/360 or 20 mm for partitions subjected to wind loads and lined with brittle materials.
- H/500 for eccentric loads.

1.2 TOLERANCES**Framed and lined partitions**

Finished framing: To AS/NZS 2589 clause 4.2.2.

1.3 SUBMISSIONS**Certification**

Installed partition: Submit a certificate from an independent testing authority as evidence that the partition system installed conforms to the documented weighted sound reduction index (R_w).

Fire performance

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

Fire-resistance level: Submit evidence of conformity to PRODUCTS, **FIRE PERFORMANCE, Fire-resistance of building elements.**

Products and materials

Manufacturer's data: Submit manufacturer's standard product literature for each partition type.

Type tests: Submit results as follows:

- Impact resistance.
- Pressure resistance.
- Surface indentation resistance.
- Weighted sound reduction index (R_w): To AS/NZS ISO 717.1.

1.4 INSPECTION**Notice**

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

- Set-out before installation.
- Partition framing before installation of linings and finishes.
- Framed and lined partitions ready to receive framed and glazed components.
- Completion of installation.

2 PRODUCTS

2.1 FIRE PERFORMANCE

Fire hazard properties

Group number: To AS 5637.1.

Fire-resistance of building elements

Fire-resistance level: Tested to AS 1530.4.

2.2 FRAMING

Light steel framing

General: Proprietary framing system of metallic-coated folded steel strip lipped studs and channel section top and bottom tracks and noggings.

Sections and members: To AS/NZS 4600.

Light timber framing

Timber species: Radiata pine.

Seasoning: Required.

Stress grade: F5 to AS/NZS 1748.1.

2.3 LINING

Plasterboard

Standard: To AS/NZS 2588.

Fibre cement

Standard: To AS/NZS 2908.2.

Wall and ceiling linings: Type B category 2.

Minimum thickness: 4.5 mm.

Accessories

General: Accessories necessary to complete the installation including the following:

- Corner beads.
- Stop beads.
- Shadowline.
- Control joints.
- Sheet metal and MDF partition end caps.

Adhesives

General: Provide adhesives of types appropriate to their purpose and substrates, applied to transmit the loads imposed without causing discolouration of finished surfaces.

Sealants

General: Sealant types appropriate for the partition's documented acoustic rating and fire-resistance level, and compatible with partition materials and building substrate.

2.4 AUTOCLAVED AERATED CONCRETE (AAC) PANELS

Product

Standard: To AS 5146.1.

Description: Lightweight concrete partition panels manufactured from a proprietary mixture of sand, lime and cement with a gas-forming additive, and with internal welded steel reinforcing mesh, cured in an autoclave.

Accessories

Requirement: Accessories to the manufacturer's recommendations for the AAC panel system including the following:

- Base angle.

- Deflection head track.
- Steel top hat.
- Mortar.
- Fire-resisting and acoustic rated sealant.
- Panel joint adhesive.

2.5 PLENUM BAFFLES

Application

Requirement: Plenum baffles that maintain documented fire-resistance level and acoustic performance of the partitions.

Types

Impregnated vinyl: Lead impregnated vinyl sheeting hung as a curtain from the slab soffit.

Plasterboard: Plasterboard sheets bonded together (if more than one layer).

Bulk insulation: Layers of bulk insulation batts compressed between the top of the partition and the slab soffit.

3 EXECUTION

3.1 PREPARATION

Substrate

General: Prepare the substrate to receive the partitions.

Carpet: Fix bottom tracks over polyethylene film. Prevent carpet threads from pulling if drilling or installing fasteners.

Protection

General: Protect existing work from damage during the installation and rectify any damage. Provide temporary coverings if required.

Set-out

General: Set out the partition grid on the centreline of framing members, and to coincide with the ceiling grid and other major building grid, as applicable.

3.2 INSTALLATION

Partition erection

General: Install partitions plumb, level, on their correct alignment, and firmly fixed.

Building movements: Provide clearances or deflection heads so that partitions are not damaged by structural building movements including long term slab deflection.

- If fire-resistance levels or acoustic ratings are required, provide a resilient foam or mastic seal with properties equal to those required for the partition.

Structural floor control joints

General: Do not run or fix partitions framing across control joints.

Acoustic rated partitions

General: Isolate the frames from floors, ceilings and vertical abutments with beads of non-hardening sealant compatible with the materials to be sealed.

Trim

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

Sealing fire-resisting and acoustic rated partitions

General: Apply sealant to the manufacturer's recommendations and as follows:

- Around services pipes and penetrations.
- Electrical outlets and recessed lights: Line back and sides of fixture with plasterboard and seal around fixture junction with sealant.
- Around perimeter of lining panels: Provide continuous runs of sealant.

3.3 LIGHT STEEL FRAMES**Tracks**

General: Conform to the following:

- Fix bottom tracks to floor substrate.
- Fix top wall tracks to suspended ceiling grid or as documented.
- Fix deflection head tracks to the structural soffit above.

Fixing to masonry: Provide masonry anchors of expansion or chemical grout type. Do not use explosive-driven fastenings.

Track fixing: Fix top and bottom tracks at 600 mm maximum centres generally, and 100 mm from ends. Splice plates at ends to maintain continuity and alignment.

Stud framing

General: Provide studs in single lengths without splices. Rotate intermediate studs into tracks for friction fixing. Screw fix jamb studs, corner studs and wall intersection studs to tracks.

Fixing: Fix noggings at 1350 mm maximum centres vertically and as required for skirtings and wet area lining. Make sure that faces of noggings and studs are accurately aligned.

Lintels: Install a stiffened top plate lintel for spans of 1800 mm or greater.

Curved partitions

Stud spacing: Conform to the sheeting manufacturer's recommendations for curved partitions.

Jambs

General: Install boxed double studs at jambs and heads to all openings.

Additional frame support

General: Provide frame support for fixing the following:

- Floor and wall mounted fixed joinery units, furniture and equipment.
- All wet area fittings and fixtures.
- All grabrails and handrails.

Timber nogging: Provide 240 x 40 mm timber nogging with proprietary stud fixing brackets for wall hung sanitary fittings.

Stud stiffening: Provide stud stiffening to support wall hung joinery units and equipment with:

- Full height close fitting timber inserts.
- Boxed steel lipped studs.

Stud service holes

General: Use factory pre-cut flared holes, or provide site cut holes punched or drilled on the centreline of the member and fit proprietary plastic bushes or grommets. Splice additional stiffening to studs if site cut service holes exceed 1/3 the depth of the member.

Metal separation

General: Isolate non-ferrous service pipes and accessories from the metal framing.

Earthing

Permanent earthing: Required.

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

Cavity walls

General: If bridging is nominated, follow the manufacturer's recommendations.

Staggered stud framed walls

General: Provide studs staggered at 300 mm centres set in oversized top and bottom plates so that each face has stud fixings at 600 mm centres.

3.4 LIGHT TIMBER FRAMES**Moisture content**

General: Do not install framing that does not meet the following values tested to AS/NZS 1080.1:

- Air conditioned buildings: 8 to 10%.
- Intermittently heated buildings: 10 to 12.5%.
- Unheated buildings: 12 to 15%.

Framing

General: Construct wall frames to AS 1684.4 Section 6, as appropriate for internal walls.

Double faced walls: Provide gauged timbers in studs, noggings and plates.

3.5 AUTOCLAVED AERATED CONCRETE (AAC) PANELS**Support framing**

General: Install deflection head track and base angle to building structure, with mechanical fasteners at maximum 600 mm centres.

Cutting

General: Cut panels as required for recommended clearance between top of panel and structural soffit, and where panels abut columns and adjacent construction.

Cut edges: Protect exposed reinforcing with anti-corrosion agent to manufacturer's recommendations.

AAC panel installation

Standard: To AS 5146.3.

General: Install panels to manufacturer's recommendations and as follows:

- Minimum 35 mm into the deflection head track.
- Secure into the base angle.
- Progressively apply panel adhesive to vertical joints between adjacent panels.
- Fit panels snugly together to fully bed adhesive.

Control joints

General: Minimum 10 mm wide control joints as follows:

- Spaced at maximum 6 m centres in continuous partition runs.
- Where AAC panels abut adjacent building elements.

Sealant

Locations: Install fire-resisting and acoustic sealant as documented and as follows:

- At both sides of deflection head track at junction with structural soffit.
- At all control joints.
- At services penetrations.

3.6 PLASTERBOARD LINING**Installation**

Gypsum plasterboard and fibre reinforced gypsum lining: To AS/NZS 2589.

Multiple sheet layers

Application: Fire-resisting and acoustic rated partitions.

Joints:

- Fill and flush up all joints and fixings in each layer and caulk up perimeters and penetrations before installing following layers.
- Stagger all sheet joints: Minimum 200 mm.

Joints and joint treatment

General: Install joint accessories as documented, in conformance with manufacturer's recommendations. Install plumb, level and true to line.

Flush joints: Use joint reinforcing tape bedded in joint compound with recessed edge sheets and finish flush.

Butt joints: Make joints over framing members or provide back blocking.

External corner joints: Bed purpose fabricated perforated metallic-coated steel corner beads in joint compound.

Ceiling junctions: Install purpose fabricated perforated metallic-coated steel shadowline to top of partition.

Sheet metal partition end caps: Provide purpose fabricated perforated metallic-coated steel end caps, sized for partition thickness and bedded in joint compound.

MDF end caps: Provide recessed edge sheets and finish flush using joint reinforcing tape and joint compound.

Dry joints: Use square edged sheet and finish with a PVC-U joining section.

Control joints: Provide purpose-made perforated metallic-coated control joint beads at not more than 12 m centres in partitions and to coincide with structural control joints. Bed in joint compound.

Wet areas: Provide additional supports, flashings, trim and sealants as required.

Joints in tiled areas: Bed reinforcing tape in joint compound. Do not apply a topping coat.

3.7 FIBRE CEMENT LINING**Installation**

General: Install as follows:

- Run sheets across the framing members.
- In flush jointed applications, stagger end joints in a brick pattern and locate joints on framing members, away from the corners of large openings.
- Provide supports at edges and joints.
- Do not fix to top and bottom plates or noggings.

Timber framing: Nail only or combined with adhesive.

Steel framing: Screw only or combined with adhesive.

Tiled and wet 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. Do not use adhesive fixing alone.

Multiple sheet layers

Application: Fire-resisting and acoustic rated walls.

Joints:

- Fill and flush up all joints and fixings in each layer and caulk up perimeters and penetrations before installing following layers.
- Stagger sheet joints: Minimum 200 mm.

Joints and joint treatment

General: Install joint accessories as documented, in conformance with manufacturer's recommendations. Install plumb, level and true to line.

Flush joints: Use joint reinforcing tape bedded in joint compound with recessed edge sheets and finish flush.

External corner joints: Bed purpose fabricated perforated metallic corner beads in joint compound.

Ceiling junctions: Install purpose fabricated perforated metallic-coated steel shadowline to top of partition.

Sheet metal partition end caps: Provide purpose fabricated perforated metallic-coated steel end caps, sized for partition thickness and bedded in joint compound.

MDF end caps: Provide recessed edge sheets and finish flush using joint reinforcing tape and joint compound.

Dry joints: Use square edged sheet and finish with a PVC-U joining section.

Control joints: Provide control joints to coincide with structural control joints and as follows:

- Walls: ≤ 7.2 m centres.
- Control joint beads: Purpose-made metallic-coated.
- Support: Provide framing parallel to the joint on each side. Do not fix the lining to abutting building surfaces.

Wet areas: Provide additional supports, flashings, trim and sealants as required.

Joints in tiled areas: Bed reinforcing tape in joint compound. Do not apply a topping coat.

- Control joints: At maximum 4.2 m centres and spaced to suit joints required in tiling.
- Internal corners: Reinforce with metallic-coated steel angles. In corners subject to continuous moisture, flash over the angle and under the sheeting with continuous bitumen coated aluminium flashing.

3.8 PLENUM BAFFLES

Baffles

General: Install plenum baffles tightly butted to building structure, service ducts, pipes and conduits and to the top of the partition or the top of the suspended ceiling directly above the line of the partition. Seal joints, penetrations and intersections and maintain the required acoustic performance.

Fire-resisting partitions

General: If a suspended ceiling of equivalent fire-resistance is not provided, either extend the partitions to the underside of the structural soffit or provide plenum baffles of equivalent fire-resistance level.

Acoustic rated partitions

General: If a suspended ceiling of equivalent sound insulation rating is not provided, either extend the partitions to the underside of the structural soffit or provide acoustic rated plenum baffles. The ceiling and baffle to provide a combined rating equivalent to the partition rating.

3.9 COMPLETION

Rectification

General: Correct any defects to joints, remove any excess joint compound, and leave the partition installation complete, clean and ready for the application of finishes.

0531 SUSPENDED CEILINGS – COMBINED

1 GENERAL

1.1 STANDARDS

General

Suspended ceilings: To AS/NZS 2785.

1.2 TOLERANCES

Suspension system

Flatness, twist, winding and bow: 1.5 mm deviation from a 1.5 m straightedge placed in any position.

Sheeted or flush ceiling system

Suspension system bearing surface for flush lined ceiling: To AS/NZS 2589 Table 4.2.2.

Suspended grid system deflection: To AS/NZS 2785 Table 3.4.4.

1.3 SUBMISSIONS

Fire performance

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

Fire-resistance level: Submit evidence of conformity to PRODUCTS, **FIRE PERFORMANCE**, **Fire-resistance of building elements**.

Operation and maintenance manuals

General: On completion, submit manufacturer's recommendations for the care and maintenance of the ceiling, and operating instructions for demounting, if applicable.

Products and materials

Type tests: Submit results as follows:

- Weighted suspended ceiling normalized level difference: To AS/NZS ISO 717.1.
- Weighted sound absorption coefficient: To AS ISO 11654, as tested to AS ISO 354.

1.4 INSPECTION

Notice

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

- The suspension system before the installation of ceiling units or lining.
- The ceiling assembly before the installation of fittings and site painting, if applicable.
- The completed ceiling.

2 PRODUCTS

2.1 GENERAL

Storage and handling

Requirement: Store suspended ceiling system and components in a dry and secure storage area, unaffected by weather.

2.2 FIRE PERFORMANCE

Fire hazard properties

Group number: To AS 5637.1.

Fire-resistance of building elements

Fire-resistance level: Tested to AS 1530.4.

2.3 SUSPENSION SYSTEM**Proprietary system**

Protective coatings for steel components: To AS/NZS 2785 Table F1.

2.4 LINING**Plasterboard and fibre cement sheeting**

Requirement: To 0511 Lining.

Sealants

Fire-resisting sealant: Non-hardening sealant compatible with the ceiling materials and documented fire-resistance level.

Acoustic sealant: Non-hardening sealant compatible with the ceiling materials and rated to R_w 65.

3 EXECUTION**3.1 CONSTRUCTION GENERALLY****Working environment**

General: Do not start work before the building is enclosed, wet work is complete and dry, and all work above the ceiling, including services, is complete.

Protection

General: Protect existing work from damage during the installation.

Partitions

General: If partitions are attached to the underside of the ceiling systems, include the partition mass in the seismic mass of the ceiling.

Stability

General: Install the ceilings level and fix to prevent looseness or rattling of ceiling components under normal conditions.

Structure-borne sound

General: Provide a ceiling system which does not amplify structure-borne sound. Provide suitable proprietary products or systems for reducing contact vibrations between structure and ceiling.

Control of movement

Abutments: Install the ceiling to allow for differential movement at abutting surfaces.

Alignment: Align ceiling control joints with structural control joints. Do not bridge structural control joints.

Prefinishes

General: Repair damaged prefinishes by recoating.

3.2 SUSPENSION SYSTEM**Suspension system**

Support members: Install support members as follows:

- Space as required by the loads on the system and the type of ceiling.
- Allow for the installation of services and accessories, including ductwork, light fittings and diffusers.
- Provide additional back support or suspension members for the fixing of services and

accessories to prevent distortion, overloading or excessive vertical deflection.

- Allow for access for maintenance of services.

Failure: Provide a ceiling system where failure of any one suspension point does not cause a progressive failure of the ceiling.

Height adjustment: Provide height adjustment with a length adjustment device at each suspension point, permitting length variation of at least 50 mm.

Grid members: If required, notch grid members at the junction with the perimeter trim to make sure the ceiling units lay flat on the perimeter trim.

Restriction: Do not attach the suspension system to the lip or flange of purlins.

Services

Support: Conform to the following:

- If the service has not been designed to accept the ceiling load, do not fix suspension members to services (e.g. ductwork).
- If services obstruct the ceiling supports, provide bridging and suspension on each side of the services.
- Do not support services terminals on ceiling units.

Bracing

General: Provide bracing to prevent lateral movement and to resist the imposed horizontal seismic force.

Bulkheads

General: Integrate bulkheads with the ceiling structure and brace to prevent lateral movement. If the ceiling is terminated at a bulkhead, provide for seismic requirements.

External suspended soffits

General: Support external suspended soffits on rigid members capable of carrying the loads from imposed actions. Install members to minimise any eccentricity, and carry the upward and downward loads from wind actions through to the supporting structure.

Fasteners

General: Provide concealed fasteners. If material supporting hangers is less than 3 mm thick, do not use screw fasteners.

3.3 PLASTERBOARD LINING**Installation**

Gypsum plasterboard and fibre reinforced gypsum plaster: To AS/NZS 2589.

Suspended flush ceilings: Fix using screw or screw and adhesive to ceiling members or support frame.

Multiple sheet layers

Application: Fire-resisting and acoustic rated ceilings.

Joints: Fill and flush up all joints and fixings in each layer and caulk up perimeters and penetrations before installing following layers. Stagger all sheet joints by minimum 200 mm.

Joints

Flush joints: Provide recessed edge sheets and finish flush using perforated paper reinforcing tape.

Butt joints: Make joints over framing members or otherwise provide back blocking.

External corner joints: Make joints over metallic-coated steel corner beads.

Control joints: Align lining control joints with structural control joints and as follows:

- Ceilings: At maximum 12 m centres.
- Control joint beads: Purpose-made metallic-coated.
- Location: If possible, position joints to intersect light fixtures, vents or air diffusers.

Wet areas: Install additional supports, flashings, trim and sealants, as required.

3.4 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.

Suspended flush ceilings: Screw or screw and adhesive fix to ceiling members or support frame.

Multiple sheet layers

Application: Fire-resisting and acoustic rated ceilings.

Joints: Fill and flush up all joints and fixings in each layer and caulk up perimeters and penetrations before installing following layers. Stagger all sheet joints by minimum 200 mm.

Joints

Flush joints: Provide recessed edge sheets and finish flush using perforated paper reinforcing tape.

External corner joints: Make joints over metallic-coated steel corner beads.

Dry joints: Provide square edged sheet and finish with a PVC-U joining section.

Control joints: Align lining control joints with structural control joints and as follows:

- Ceilings: To divide into bays not larger than 10.8 x 7.2 m.
- Soffit linings: To divide into bays not larger than 4.2 x 4.2 m or 5.6 x 3.6 m.
- Control joint beads: Purpose-made metallic coated.
- Support: Provide framing parallel to the joint on each side. Do not fix the lining to abutting building surfaces.
- Location: If possible, position joints to intersect light fixtures, vents or air diffusers.

Wet areas: Install additional supports, flashings, trim and sealants, as required.

3.5 ACCESS PANELS

Finish

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

Identification

General: Provide each access panel with an identification mark.

Non-demountable ceilings

General: Provide access panels supported and anchored to permit ready removal and refixing.

Reinforcement

General: Reinforce the back of the access panel to prevent warping and facilitate handling.

3.6 TRIM

General

Trim: Provide trim at junctions with other building elements and surfaces, including walls, beams and penetrations, consistent with the materials and finishes of the ceiling system.

Accessories

General: Provide accessories as part of the proprietary ceiling system necessary to complete the installation.

Plasterboard cornices

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

Fibrous plaster cornices and roses

Fixing: Pin or prop in place and fix with wet gypsum plaster and scrim straps over framing members.

Fire-resisting walls

Requirement: Seal to soffit with sealant with an equivalent fire-resistance level before fixing decorative cornices, if any.

3.7 COMPLETION

Spares

General: Provide spare matching ceiling components, as follows, and store the spare materials on site where directed:

- Supporting system: One spare supporting member (hanger or framework member) for every 100 members or part thereof of the same type installed in the ceiling.
- Accessories: One spare of each type for every 50 units or part thereof installed in the ceiling.

3.8 WARRANTIES

Warranties

Requirement: Provide warranties for materials and workmanship in the form of interlocking warranties from the supplier and the installer.

Form: Against failure of materials and execution under normal environment and conditions of use.

0551 JOINERY**1 GENERAL****1.1 STANDARDS****General**

Tactile indicators to stairs: To AS/NZS 1428.4.1.

1.2 TOLERANCES**General**

Requirement: Fabricate and install joinery items to substrates undamaged, plumb, level, straight and free of distortion.

Tolerances table

Property	Tolerance
Plumb and level	1:800
Offsets in flush adjoining surfaces	0.5 mm
Offsets in revealed adjoining surfaces	2 mm
Alignment of adjoining doors	0.5 mm
Difference in scribe thickness for joinery items centred between walls	2 mm
Doors centred in openings	0
Joints in finished surfaces	0

1.3 SUBMISSIONS**Operation and maintenance manuals**

General: Submit manufacturer's published recommendations for service use.

Products and materials

Manufacturer's data: Submit manufacturer's product data.

Proprietary items: Submit the manufacturer's standard drawings and details showing:

- Methods of construction.
- Assembly and fixing, with dimensions and tolerances.

Samples

General: Submit samples as follows:

- Boards: Two of each type, complete with finish and edge stripping.
- Joints: Two of each type.
- Typical hardware item: Two samples, showing each finish.
- Stone cladding: Provide three variants, two samples of each variant showing maximum variation.
- Timber veneer: Provide three variants, two samples of each variant showing maximum expected variation.
- Fabric: Two swatches of each type.
- Stainless steel items: Two of each type.
- Timber bench cupboard door: One sample, complete with hardware.
- Drawer front: One sample, complete with hardware.

- Timber stair, balustrade and handrail: One finished sample.

Clear finished timber: Submit samples as follows:

- Initial submission:
 - . Veneered board: Three samples each 600 x 600 mm for each species.
 - . Solid timber: Three samples each 40 x 19 x 600 mm for each species.
- Control sample: The approved selection from the initial submission.
- Finished sample: Cut the control sample in half and apply the finish to half the remaining area.

Shop drawings

General: Submit shop drawings to a scale that best describes the detail, showing the following:

- Overall dimensions.
- Materials, thicknesses and finishes of elements including doors, divisions, shelves and benches.
- Type of construction including mitre joints and junctions of members.
- Hardware type and location.
- Temporary bracing, if required.
- Procedures for shop and site assembly and fixing.
- Locations of benchtop joints.
- Stone benchtop layout including joint arrangement and penetrations.
- Locations of sanitary fixtures, stoves, ovens, sinks, and other items to be installed in the units.
- Relationship of fixture to adjacent building elements.
- Details of fabrication involving other trades or components.
- Proposals for the break-up of large items as required for delivery to the site.
- Proposed method of joining the modules of large items.

Timing: Before fabrication.

Subcontractors

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

1.4 INSPECTION**Notice**

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

- Shop fabricated or assembled items ready for delivery to the site.
- Openings prepared to receive assemblies.
- Site erected assemblies on completion of erection, before covering up by cladding and encasing.
- Surfaces prepared for, and immediately before, site applied finishes.
- Completion of installation.

2 PRODUCTS

2.1 DELIVERY AND STORAGE

General

Requirement: Deliver joinery units to site in unbroken wrapping or containers and store so that its moisture content is not adversely affected. Do not store in areas of wet plaster. Store in an adequately ventilated space away from heat and direct sunlight. Keep storage time to a minimum by delivering items only when required for installation.

2.2 JOINERY MATERIALS AND COMPONENTS

Visible work

Clear finished timber and veneer: Make sure all visible surfaces are free of branding, crayon or chalk marks and of blemishes caused by handling.

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 of milled timbers: Not less than the documented dimensions 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.

Visible surface with a clear finish: Veneer quality A.

Other visible surfaces: Veneer quality B.

Wet process fibreboard (including hardboard)

Standard: To AS/NZS 1859.4.

Particleboard

Standard: To AS/NZS 1859.1.

Melamine overlaid particleboard: Particleboard overlaid on both sides with low pressure melamine.

Dry process fibreboard (including medium density fibreboard)

Standard: To AS/NZS 1859.2.

Melamine overlaid medium density fibreboard: Medium density fibreboard (STD MDF) overlaid on both sides with low pressure melamine.

Decorative overlaid wood panels

Standard: To AS/NZS 1859.3.

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.

Stone facings

General: Provide stone or engineered stone slabs within the visual range of the approved samples. Repair mud veins or lines of separation that are integral to the selected pattern with resin fillers and back lining.

Splashbacks

Glass: Toughened safety glass to AS/NZS 2208.

Stainless steel: Type 304, No. 4 finish.

2.3 VENEERS

Timber veneer

Veneer quality: To AS/NZS 2270.

Grades (minimum requirement):

- Select grade, veneer quality A, for visible surfaces to have clear finish or to have no coated finish.
- General purpose grade, veneer quality B, for other visible surfaces.

Requirement: Provide veneers slip matched and flitch batched and falling within the visual range of the approved samples.

Vinyl veneer

Type: Proprietary unbacked vinyl fabric factory-bonded to the designated surface.

2.4 JOINERY ASSEMBLIES

General

Standard: To AS 4386.

Plinths

Material: Select from the following:

- Exterior general purpose plywood.
- High moisture resistant particleboard.
- High moisture resistant medium density fibreboard.

Thickness: 16 mm.

Fabrication: Form up with front and back members and full height cross members at not more than 900 mm centres.

Finish: High-pressure decorative laminated sheet.

Fasteners: Conceal with finish.

Installation: Scribe to floor and secure to wall to provide level platform for carcasses.

Carcasses

Material: Select from the following:

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

Thickness: 16 mm.

Joints: Select from the following:

- Proprietary mechanical connections.
- Dowels and glue.
- Screws and glue.
- Proprietary joining plates and glue.

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

- Spacing: 32 mm.

Fasteners: Conceal with finish.

Installation: Secure to walls at not more than 600 mm centres.

Drawer fronts and doors

Material: Select from the following:

- Melamine overlaid high moisture resistant particleboard.
- Melamine overlaid high moisture resistant medium density fibreboard.

Thickness: 16 mm.

Door size: Not exceeding 1.5 m² on face, with 2400 mm maximum height and 900 mm maximum width.

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.
- Piano hinges: Chrome plated steel, extending full height of doors.
- 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.

2.5 WORKING SURFACES

Laminated benchtops

Finish: High-pressure decorative laminated sheet.

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

Balance underside: Extend laminate to the undersides of benchtops.

Installation: Scribe to walls. Fix to carcass at least twice per 600 mm length of benchtop.

Joint sealing: Fill joint with sealant matching finish and clamp with proprietary mechanical connectors.

3 EXECUTION

3.1 JOINERY

General

Joints: Provide materials in single lengths whenever possible. If joints are necessary, make them over supports.

Framing: Frame and trim where necessary for openings, including those required by other trades.

Concealed surfaces: Prime surfaces concealed by substrates.

Deficiencies: Examine joinery units for completeness and remedy deficiencies.

Substrate: Damp clean and vacuum substrate surfaces that will be permanently concealed.

Acclimatisation

General: Acclimatise the joinery items by stacking in the in-service conditions with air circulation to all surfaces after the following are complete:

- Air conditioning operational.
- Lighting operational.
- Site drainage and stormwater works are complete.
- Space fully enclosed and secure.
- Wet work complete and dry.

Accessories and trim

General: Provide accessories and trim necessary to complete the installation.

Fasteners

Visibility: Do not provide visible fasteners except in the following locations:

- Inside cupboards and drawer units.
- Inside open units, in which case provide proprietary caps to conceal fixings.

Visible fasteners: Where fasteners are unavoidable on visible joinery faces, sink the heads below the surface and fill the sinking flush with a material compatible with the surface finish. In surfaces which are to have clear or tinted finish, provide matching wood plugs showing face (not end) grain. In surfaces which are to have melamine finish, provide proprietary screws and caps finished to match.

Fix joinery units to substrates as follows:

- Floor mounted units: 600 mm centres maximum.
- Wall mounted units: To each nogging and/or stud stiffener.

Fasteners: Screws with washers into timber or steel framing, or masonry anchors.

Adhesives

General: Provide adhesives to transmit the loads imposed and for the rigidity of the assembly, without causing discolouration of finished surfaces.

Finishing

Junctions with structure: Scribe, plinths, benchtops, splashbacks, ends of cupboards, kickboards and returns to follow the line of structure.

Joints: Scribe internal and mitre external joints.

Edge strips: Finish exposed edges of sheets with edge strips which match sheet faces.

Matching: For surfaces which are to have clear or tinted finish, arrange adjacent pieces to match the grain and colour.

Hygiene requirements: To all food handling areas and voids at the backs of units in all areas, seal all carcass and junctions wall/floor, and cable and pipe entries with silicone beads for vermin proofing. Apply water resistant sealants around all plumbing fixtures and make sure sealants are fit for purpose.

Benchtops

Installation: Fix to carcass at least twice per 600 mm length of benchtop.

Joint sealing: Fill joints with sealant matching the finish colour and clamp with proprietary mechanical connectors.

Edge sealing: Seal to walls and carcasses with a sealant, which matches the finish colour.

Splashbacks

Glass: Fix with non-acidic silicone adhesive. Apply at the rate recommended by the manufacturer.

Installation: 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 substrate.

Labelling

General: Permanently mark each unit of furniture with the manufacturer's name, on an interior surface.

3.2 TIMBER STAIRS

Set-out

General: Set out stair rod to give uniform risers and uniform treads respectively in each flight.

Fabrication

Closed strings: Trench for treads and risers.

Cut strings: Profile for treads and risers. Mitre riser ends.

Treads: Arris nosings to a pencil round. Return nosings at cut strings. Groove for riser tongue in closed rise stair. Set rise 19 mm back from nosing.

Nosing strip: To BCA D2.13 and BCA D2.14.

Top tread: Flush with finished floor, otherwise to match stair treads. Provide similar tread section as nosing to floor edges around stairwell.

Risers: Tongue to tread. Mitre to string in cut string stairs.

Installation

General: Glue joints in internal work. In closed rise stairs wedge treads and risers to strings. Plant 2 glue blocks behind each tread to riser junction. Trim floors to carry ends of stairs and around stair well.

Stair bolts (to open rise close string stairs): 8 mm diameter mild steel, one at each end and one at centre of flight, transversely between strings. Draw strings tight against ends of treads.

Fascia: Of depth sufficient to overlap 19 mm below ceiling, fixed to floor joists hard up under nosing.

Trim: Provide beads and mouldings as necessary, including a scotia or similar planted under the tread nosing against the risers and cut strings, a bead between wall strings and wall, and a bead behind the fascia over the ceiling finish.

Soffit lining: Fix to 38 x 38 mm nailing battens notched and nailed to the underside of treads and risers of closed riser stairs at the centre of flights and at each side.

3.3 TIMBER BALUSTRADES

General

Requirement: Provide balustrading to stair and landing, consisting of newels, handrail, balusters, and associated mouldings.

Newels

General: Halve and bolt to strings. Turn tops to detail.

Handrails

Installation: Install handrails on edge, Stubbing tenon to newels.

Bullnose arrises: 13 mm radius.

Balusters

Installation: Stub tenon to handrail at top and to tread or floor at bottom.

Spacing: At 100 mm centres.

3.4 TRIM

General

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

Fixing

To masonry walls: Screw with wall plugs at 600 mm centres maximum.

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

3.5 COMPLETION

Protection

Timber treads: Provide full timber or plywood casing.

Cleaning

Temporary coatings: On or before completion of the works, or before joining up to other surfaces, remove all traces of temporary protective coatings.

Requirement: Remove all dust, marks and rubbish from all surfaces and internal spaces. Clean and polish all self-finished surfaces such as anodised and powder coated metals, sanitary ware, glass, tiles and laminates.

0552 METALWORK - FABRICATED**1 GENERAL****1.1 RESPONSIBILITIES****Performance****Requirements:**

- Undamaged, plumb, level and straight or as documented.
- Free of surface defects or distortions or as documented.

1.2 STANDARDS**General**

Access for maintenance: To AS 1657.

Tactile indicators: To AS/NZS 1428.4.1.

1.3 TOLERANCES**General**

Requirement: ± 2 mm from design dimensions.

1.4 SUBMISSIONS**Execution details**

Welding procedures: Submit details of proposed welding procedures and risk mitigation before fabrication.

Welding dissimilar metals: Submit the following details:

- Type and thickness of materials to be welded.
- Proposed joint preparation and welding procedures.
- Proposed filler metal.
- Expected dilution (proportion of fused parent metal in the weld metal).

Operation and maintenance manuals

General: Submit manufacturer's published recommendations for service use.

Products and materials

Proprietary items: Submit the manufacturer's product data standard drawings and details showing:

- Methods of construction.
- Assembly and fixing, with dimensions and tolerances.

Stainless steel: For each batch of stainless steel supplied to the works, submit the certificate of conformance or test certificate to the applicable standard, as documented.

Stainless steel welding: Before fabrication commences, submit evidence of qualification of the welding procedure by testing to AS/NZS 1554.6 clause 4.7 or evidence of prequalification to AS/NZS 1554.6 clause 4.12.

Shop drawings

General: Submit shop drawings to a scale that best describes the detail, showing the following information:

- Overall and detail dimensions.

- Details of fabrication and components.
- Details of fabrication involving other trades or components.
- Information necessary for site assembly.
- Proposals for the break-up of large items as required for delivery to the site.
- Proposed method of joining the modules of large items.

Subcontractors

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

1.5 INSPECTION**Notice**

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

- Arrival of materials on site or in workshop.
- Shop fabricated or assembled items ready for delivery to the site.
- Commencement of shop or site welding.
- Site erected assemblies on completion of erection, before covering up by cladding and encasing.
- Steel surfaces prepared for, and immediately before, site applied finishes.

2 PRODUCTS**2.1 GENERAL****Storage and handling**

Requirement: Store and handle fabricated metalwork, as follows:

- Deliver to site in unbroken wrapping or packing.
- Store on a level base, away from uncured concrete and masonry and areas of wet plaster.
- Do not store in contact with other materials that may cause staining, denting or other surface damage.
- Use gloves when handling precoated finishes.
- Keep storage time to minimum by delivering items only when required for installation.

Marking

General: Provide suitable and sufficient marks or other means for identifying each member of site-erected assemblies, and for their correct setting out, location, erection and connection. Mark bolted connections to show the bolting category. Do not mark stainless steel by notching.

2.2 MATERIALS**Metals and components**

Performance: Provide metals and components in quantity, lengths and cross-sections of strength and stiffness suited to their required function, finish, fabrication and method of installation.

Fasteners

Materials: Provide fasteners in materials of structural and mechanical strengths and corrosion resistance at least equal to that of the lowest resistant metal in the connection.

To copper and copper alloys: Copper or copper-alloy fixing devices only.

To aluminium and aluminium alloys: Aluminium alloy or non-magnetic stainless steel fixing devices only.

To stainless steel: Appropriate stainless steel materials only.

3 EXECUTION

3.1 CONSTRUCTION GENERALLY

Aluminium structures

Standard: To AS/NZS 1664.1 or AS/NZS 1664.2.

Metals

Incompatible metals: Separate using concealed layers of suitable materials in appropriate thicknesses.

Fabrication

Workshop: Fabricate and pre-assemble items in the workshop wherever practicable.

Edges and surfaces: Keep clean, neat and free from burrs and indentations. Remove sharp edges without excessive radiusing.

Tube bends: Form bends in tube without deforming the cross section and the material thickness.

Colour finished work: Match colours of sheets, extrusions and heads of fasteners.

Thermal movement: Accommodate thermal movement in joints and fastenings.

Joints

General: Fit joints to an accuracy appropriate to the class of work. Finish visible joints made by cutting, drilling, welding, brazing or soldering using grinding, buffing or other methods appropriate to the class of work, before further treatment.

Self-finished metals: Free of surface colour variations, after jointing.

Joints: Fit accurately to a fine hairline or as documented.

Splicing

General: Provide structural members in single lengths.

3.2 WELDING AND BRAZING

Welding

Quality: Provide finished welds which are free of surface and internal cracks, welding slag, and porosity.

Site welds: Avoid site welding wherever possible. If required, locate site welds in positions for down hand welding.

Butt weld quality level: Not inferior to the appropriate level recommended in AS/NZS 1554.1 Section 6, AS/NZS 1554.6 Section 6 or AS 1665 Appendix A, as appropriate.

Brazing

General: Make sure brazed joints have sufficient lap to provide a mechanically sound joint.

Butt joints: Do not use butt joints for joints subject to load. If butt joints are used, do not rely on the filler material only.

3.3 STAINLESS STEEL FABRICATION

Welding stainless steel

Certification of welders: To AS 1796.

Riveting

General: Use only to join stainless steel sheet or strip less than 1 mm thick. Drill (not punch) the rivet hole, and drive the rivet cold. On completion, clean and passivate the riveted assembly.

Soldering

General: Do not solder stainless steel.

3.4 FIXED STEEL LADDERS

Assembly

Materials, design and construction: To AS 1657.

Fixing: Fix ladder stiles securely to the building structure at tops and bottoms of flights, and at intermediate points.

3.5 PIPE RAIL BALUSTRADES

Fabrication

Method: Welding.

Joints: Produce smooth unbroken surfaces at joints. Scribe the joints between posts and rails. Make end-to-end joints over an internal sleeve.

Bends: Make changes of direction in rails by evenly curved pipe bends.

Free ends: Seal the free ends of pipes with fabricated or purpose-made end caps.

Fixing to structure

General: Provide fabricated predrilled or purpose-made brackets or post bases, and attach the piping to the building structure with fixings, including bolts into masonry anchors, and coach screws or bolts into timber, of metal compatible with the piping.

Galvanizing

General: If possible, complete fabrication before galvanizing; otherwise apply a zinc-rich primer to affected joint surfaces.

Other protective coatings

General: Apply other protective coatings as documented and to the manufacturer's recommendations.

3.6 PROPRIETARY BALUSTRADES

General

Balustrades: A proprietary system, pre-assembled and fixed in place, comprising the following:

- Posts, rails and balusters.
- Infill frame and panels.
- Handrails, if required.

3.7 CORNER GUARDS

Guards

General: Where salient corners of the structure require protection from mechanical damage, provide metal corner guards as follows:

- Consisting of rolled angle sections or sections fabricated from metal sheet bent to the radius or angle of the corner.
- Fitting close to adjoining surface finishes.

- Solidly grouted up at the back as necessary to eliminate voids.
- Securely fixed by a method which does not cause distortion in the guard surface, and consists of either concealed built in lugs, or flush countersunk head fixings into appropriate anchors.

3.8 COMPLETION

Cleaning

Temporary coatings: On or before completion of the works, or before joining up to other surfaces, remove all traces of coatings used as temporary protection.

0572 MISCELLANEOUS FIXTURES AND APPLIANCES

1 GENERAL

1.1 SUBMISSIONS

Operation and maintenance manuals

General: Submit the manufacturers' data as follows:

- Recommendations for demounting and relocation.
- Recommendations for service use, care and maintenance.
- List of manufacturers and suppliers for replacement parts.

Products and materials

Manufacturer's drawings: Submit the manufacturer's standard drawings and details showing methods of construction, assembly and fixing, with dimensions and tolerances, connection method for all removable components.

Subcontractors

General: Submit names and contact details of proposed suppliers.

2 PRODUCTS

2.1 GENERAL

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

Type: Proprietary metal letter box with corrosion resistant, weatherproof body, weather protected letter slot, lockable hinged door, house or unit number, and accessories necessary for correct installation.

Standard: To AS/NZS 4253.

Waste bins

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

2.2 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.

Exhaust fans

Kitchen and bathroom: 200 mm diameter.

3 EXECUTION

3.1 GENERAL

Letterboxes

Requirement: Provide letterboxes to dwellings where Australia Post provides a postal service.

Single dwellings: Provide one letterbox for each dwelling conforming to the requirements of Australia Post.

Grouped and multiple dwellings: Provide banks of letterboxes conforming to the requirements of Australia Post.

Keys: Upon completion, provide 2 sets of keys per letterbox.

3.2 COMPLETION

Warranties

Requirement: Installer's warranty against defective workmanship or wrong installation.

0573 FIRE EXTINGUISHERS AND BLANKETS

1 SUBMISSIONS

Products and materials

Evidence of suitability: Submit evidence of suitability for use, to BCA A5.0, for all fire protection products.

1.1 EXTINGUISHERS

Standards

General: Portable fire extinguishers:

- General requirements: To AS/NZS 1841.1.
- Water: To AS/NZS 1841.2.
- Wet chemical: To AS/NZS 1841.3.
- Foam: To AS/NZS 1841.4.
- Powder: To AS/NZS 1841.5.
- Carbon dioxide: To AS/NZS 1841.6.
- Non-rechargeable: To AS/NZS 1841.8.

Selection and location: To AS 2444.

1.2 BLANKETS

Standards

Fire blankets: To AS/NZS 3504.

Selection and location: To AS 2444.

2 EXECUTION

2.1 COMPLETION

Maintenance

Fire extinguishers: To AS 1851.

Fire blankets: To AS 1851.

0574 WINDOW COVERINGS**1 GENERAL****1.1 SUBMISSIONS****Fire performance**

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

1.2 INSPECTION**Notice**

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

- Building locations or substrates prepared to receive window coverings before installation.

2 PRODUCTS**2.1 FIRE PERFORMANCE****Fire hazard properties**

Windows coverings: Tested to AS/NZS 1530.3.

2.2 MATERIALS**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.

2.3 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.

3 EXECUTION**3.1 INSTALLATION****General**

Requirement: Install window coverings using the manufacturer's fabricated mounting brackets, clips or tracks and other hardware. Install coverings plumb, level and true to line.

Fixing: Match exposed mounting hardware with colour and finish of adjacent track and/or wall architrave finish.

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

0611 RENDERING AND PLASTERING**1 GENERAL****1.1 RESPONSIBILITIES****Performance**

Requirements:

- Resistant to impacts expected in use.
- Free of irregularities.
- Consistent in texture and finish.
- Firmly bonded to substrates for the expected life of the application.
- Without obvious shrinkage cracks.
- As a suitable substrate for the nominated final finish.

1.2 INTERPRETATION**Abbreviations**

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

- CRF: Cement render – finish.
- CRM: Cement render – medium.
- CRS: Cement render – stronger.
- CRW: Cement render – weaker.
- GPF: Gypsum plaster – finish.

Definitions

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

- Base coat: A plaster coat applied before the application of the finish coat.
- Bonding treatment: A treatment of a substrate which improves adhesion of a plaster system.
- Finish coat (rendering and plastering): The final coat of a coating system.
- Finishing treatment (plastering): The treatment applied to a finish coat which may include processes and results.
- Plaster: A mixture of binders, aggregate and water which is applied to substrates in a plastic state and dries and cures to a hard surface which may subsequently be decorated:
 - . Cement plaster: Contains Portland cement as the principal binder.
 - . Gypsum plaster: Contains hydrated or anhydrous calcium sulfate as the principal binder.
- Plastering: The process of coating the framing or solid surfaces of a building with a plastic material which hardens and then may be decorated or remain self-finished.
- Plastering system: One or more coats of plaster and associated treatments comprising some or all of the following in sequence:
 - . Base coat 1 or 2.
 - . Bonding treatment.
 - . Finish coat.
 - . Finishing treatment.

- Render, rendering: Plaster, plastering, usually single coat and usually cement:lime:sand.
- Substrate: The surface to which a material or product is applied.

1.3 TOLERANCES

Tolerances table

Description	Alignment	Tolerance
Walls and other vertical structures	Vertical	6 mm in 2400 mm
Reveals sides	Vertical	3 mm in 1800 mm
Reveals head up to 1800 mm	Horizontal	3 mm in 1800 mm
Reveals head over 1800 mm	Horizontal	5 mm max
Reveals, piers, beams, wall stop ends up to 300 mm	Square	3 mm max
Reveals, piers, beams, wall stop ends over 300 mm	Square	5 mm max
Radius of corners	Round	Should not vary by more than $\pm 10\%$ over the length of the arris.

1.4 SUBMISSIONS

Samples

Sample panels: If sample panels are required, prepare complete with beads and other embedded items as follows:

- Size: 1200 x 2400 mm.

1.5 INSPECTION

Notice

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

- Sample panels ready for inspection.
- Substrates immediately before applying base coats.
- Finish treatments before decoration.

2 PRODUCTS

2.1 GENERAL

Storage and handling

General: Store materials in a dry, well-ventilated and secure storage area, unaffected by weather.

2.2 MATERIALS AND COMPONENTS

Accessories

Beads: Provide metal proprietary sections manufactured for fixing to substrates and/or embedding in the plaster to form and protect plaster edges and junctions.

Metal lath: Provide a proprietary product manufactured from raised expanded metal for use with plaster:

- Mass/unit area: 1.84 kg/m² or greater.
- Material thickness: 0.70 mm or greater.
- Mesh size: 9.5 x 28.6 mm.

Metallic-coatings to AS 1397: For beads or lath in cement plaster: To the **Corrosion resistance and durability table**.

Admixtures

Plasticisers or workability agents: Do not use in cement plasters.

Aggregates

Sand: Fine, sharp, well-graded sand with a clay content between 1% and 5% tested to AS 1141.12, and free from efflorescing salts.

Sand grading for base coat plaster table

Sieve size	Percent passing	
	Minimum	Maximum
4.75 mm	100	100
2.36 mm	90	100
1.18 mm	60	90
600 µm	35	70
300 µm	10	30
150 µm	0	5
75 µm	0	3

Plaster for autoclaved aerated concrete

General: Proprietary product manufactured for use with the wall system.

Bonding products

General: Proprietary products manufactured for bonding cement-based plaster to solid substrates.

Cement

Standard: To AS 3972.

Type: GP.

Colouring products

General: Provide proprietary products manufactured for colouring cement plaster.

Integral pigment proportion: 5% maximum weight of cement.

Cornice cement

General: Provide a proprietary product manufactured for use with the cornice.

Cornices

Cast plaster: Proprietary item.

Corrosion resistance and durability

Compliance: To the **Corrosion resistance and durability table** or provide proprietary products with metallic and/or organic coatings of equivalent corrosion resistance and as follows:

- Galvanize: To AS/NZS 4680.

Corrosion resistance and durability table

Atmospheric corrosivity category to AS 4312	Metal lath, beads and embedded items	Minimum cement content (mix type) above damp-proof course
C1 and C2	Galvanize after fabrication 300 g/m ² Stainless 316	CRW
	Powder coated aluminium	CRM
C3	Stainless 316 Powder coated aluminium	CRM
C4 and T ¹	Stainless 316 Powder coated aluminium	CRS
¹ Avoid organic coating in Category T zones.		

Curing products

General: Provide proprietary products manufactured for use with the plaster system.

Gypsum plaster

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

Lime

Limes for building: To AS 1672.1.

Lime putty

General: Prepare lime putty as follows:

- Stand dry hydrate of lime to AS 1672.1 and water for 24 hours or more without drying out.
- Stand quicklime and water for 14 days or more without drying out.

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 – Cement render, by volume

Mix type		Substrate	Upper and lower limits of proportions by volume		
			Cement	Lime	Sand
Single or multi-coat systems with integral finishing treatments Base coats in multi-coat systems with cement or gypsum finishes	CRS	Dense and smooth concrete and masonry	1 1	0 0.5	3 4.5
	CRM	Regular clay or concrete masonry	1 1	0.5 1	4.5 6
	CRW	Lightweight concrete masonry and other weak substrates	1 1	1 2	6 9
Second coat - Internal	CRF	Cement render base coats	1 1	1 2	6 9
Second coat - External	CRF	Cement render base coats	1 1	1 2	5 6

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	Cement render base coats	1 1	- -	1.5 2	- -

Mix proportion table – Gypsum finish coat, by weight

Gypsum plaster (kg)	Lime putty (kg)
17	25
34	50
51	75

Control joint products

General: Provide proprietary products manufactured for use with the plastering system and to accommodate the anticipated movement of the substrates and/or the plaster.

Water

General: Clean and free from any deleterious matter.

3 EXECUTION

3.1 PREPARATION

Substrates

General: Provide substrates as follows:

- Clean and free from any deposit or finish which may impair adhesion of plaster.
- If framed or discontinuous, support members in full lengths without splicing.
- If solid or continuous, remove excessive projections and fill voids and hollows with plaster stronger than the first coat and not weaker than the substrate.

Absorbent substrates: If suction is excessive, control it by dampening without over-wetting, and do not plaster substrates showing surface moisture.

Dense concrete: If not sufficiently rough to provide a mechanical key, roughen by scabbling or the like to remove 2 mm of the laitance and expose the aggregate before applying a bonding treatment.

Painted surfaces: Remove paint and hack the surface at close intervals.

Untrue substrates: If the substrate is not sufficiently true for conformity with the thickness limits for the plaster system, or has excessively uneven suction resulting from variations in the composition of the substrate, apply additional coats without exceeding the thickness limits for the substrate or system.

Beads

Location: Fix beads as follows:

- Angle beads: At all external corners.
- Drip beads: At all lower terminations of external plaster.
- Beads for control of movement: At all control joints.
- Stop beads: At all terminations of plaster and junctions with other materials or plaster systems.

Joints in beads: Provide dowels to maintain alignment.

Mechanical fixing to substrate: ≤ 300 mm centres.

Bonding treatment

General: If bonding treatment is required, throw a wet mix onto the background. Mix proportions to the following:

- Cement plaster (cement:sand): 1:2.
- Gypsum plaster (gypsum:sand): 1:2.

Curing: Keep continuously moist for 5 days or more and allow to dry before applying plaster coats.

Thickness: $\geq 3 < 6$ mm.

Embedded items

General: To the **Corrosion resistance and durability table**. If there are water pipes and other embedded items, sheath them to permit thermal movement.

Lath

Location: Provide lath as follows:

- Chases: If chases or recesses are 50 mm wide or greater, fix metal lath extending 75 mm or more beyond each side of the chase or recess.

- Metal and other non-porous substrates: Fix metal lath to provide a key.

Installation: Fix lath as follows:

- General: Run the long way of the mesh across supports with strands sloping downwards and inwards from the intended face of the plaster.
- Fixing: Mechanically fix at centres of 150 mm or less.
- Laps: Tie with 1.25 mm galvanized wire at centres of 150 mm or less. Do not stop edges of sheets at corners but bend around.
- On solid substrates: Space the lath 5 mm or more clear of the substrate.
- Support spacing: ≤ 400 mm.

3.2 APPLICATION

Plastering

Base coats: Scratch-comb each base coat in two directions when it has stiffened.

Metal lath: Press the plaster through the apertures of expanded metal lath and wings of beads.

Incidental work

General: Return plaster into reveals, beads, sills, recesses and niches. Plaster faces, ends, and soffits of projections in the substrate, such as string courses, sills, pilasters and corbels. Run neatly finished throating on soffits of external projections. Trim around openings. Plaster exposed internal surfaces of built-in cupboards.

Joining up

General: If joining up is required, make sure joints are imperceptible in the finished work after decoration.

Control joints

General: Provide joints in the finish to coincide with control joints in the substrate. Make sure the joint in the substrate is not bridged during plastering.

Size:

- Depth: Extend the joint right through the plaster and reinforcement to the substrate.
- Width: 3 mm, or the same width as the substrate joint, whichever is greater.

Damp-proof courses: Do not continue plaster across damp-proof courses.

Plastering on metal lath: Provide control joints to divide the plastering area into rectangular panels of 10 m² or less.

V-joints: Provide V-joints, cut right through the plaster to the substrate, at the following locations:

- Abutments with metal door frames.
- Abutments with other finishes.
- Junctions between different substrates.

Cornices

General: Accurately cut and mitre corners. Match and align ornament. Do not make butt joints in the length of a cornice unless required, or if full lengths are not available.

Installation: Butter edges, mitres and joins for the full length of the cornice with adhesive.

Mechanical fixing: If cornice projects across a ceiling 400 mm or more, provide additional mechanical fixing as follows:

- Fixing centres: ≤ 600 mm.

Plaster thickness table

Substrate	Cement render, total thickness of single or multi-coat work (mm)	Gypsum/lime plaster (mm)
Dense concrete walls	15 max	3 max
Dense concrete ceilings	9 max	3 max
Brickwork and blockwork	12 min	3 max
Lightweight concrete and blocks	12 min	3 max
Metal lath measured from the face of the lath.	18 min	3 max

Temperature

General: If the ambient temperature is less than 10°C or more than 30°C, make sure the temperature of mixes, substrates and reinforcement at the time of application are between 5°C and 35°C.

3.3 FINISHES

Finishing treatments

Plain even surfaces: Work the hardening plaster as follows:

- Bag: Rub the finish coat when set firm with a hessian bag or similar.
- Carborundum stone: Rub the finish coat when set hard with a carborundum stone to achieve a finish free from sand.
- Foam float: Float finish coat on application with a wood or plastic float to an even surface and finish with a foam float to achieve a fine sand textured finish.
- Steel trowel: Steel trowel finish coat to a smooth dense surface which is not glass-like and is free from shrinkage cracks and crazing.
- Wood or plastic float: Float the finish coat on application to an even surface with a wood or plastic float.

Ornamental patterned surfaces: Work the hardening plaster with a trowel or other tool.

Sprayed textured surfaces: Spray plaster onto a substrate using a purpose-designed machine.

Stippled textured surfaces: Work the hardening plaster with a stiff brush.

Rough thrown surfaces: Throw plaster onto a substrate or pebbles onto a plastic plaster base.

Specialist plaster finishes

Polymer modified render:

- Basecoat render: Proprietary polymer modified cementitious render supplied as a complete plastering system.

- Finish coats: Proprietary trowelled on coloured and textured polymer modified finish coats.

Polished plaster: In situ applied plaster system incorporating selected stone dust in a proprietary matrix producing a smooth polished surface with visual patterning.

Glass bead coatings: Glass beads bound in a proprietary matrix.

3.4 COMPLETION

Curing

General: Prevent premature or uneven drying out and protect from the sun and wind.

Keeping moist: If a proprietary curing agent is not used, keep the plaster moist as follows:

- Base coats and single coat systems: Keep continuously moist for 2 days and allow to dry for 5 days before applying further plaster coats.
- Finish coats: Keep continuously moist for 2 days.

0612 CEMENTITIOUS TOPPINGS**1 GENERAL****1.1 RESPONSIBILITIES****Performance****Requirements:**

- Consistent in level, finish, colour and texture.
- Free of discontinuities.
- Resistant to environmental degradation within the manufacturer's stated life span.
- Accommodating movement in the substrate between control joints.
- If floating, without edge curl.
- If bonded, without drummy areas.
- Without obvious shrinkage cracks.

1.2 STANDARDS**Slip resistance**

Classification: To AS 4586.

1.3 TOLERANCES**General**

Thickness: Deviation from the documented thickness:

- Thickness < 15 mm: ± 2 mm.
- Thickness $\geq 15 < 30$ mm: ± 5 mm.
- Thickness ≥ 30 mm: ± 10 mm.

Flatness: Maximum deviations from a straightedge laid in any direction on a plane surface:

- Class A: 4 mm from a 2 m straightedge.
- Class B: 6 mm from a 3 m straightedge.

1.4 SUBMISSIONS**Products and materials**

Manufacturer's data: Submit manufacturer's product data for the following:

- Admixtures.
- Bonding products.
- Colouring products.
- Curing products.
- Sealant products.
- Slip-resistant products.
- Surface treatment products.

Samples

General: If required, submit samples of the following products:

- Colouring products.
- Control joint products.
- Surface treatment products.

1.5 INSPECTION**Notice**

General: Give notice so that inspections may be made of the following:

- Substrates ready for laying of toppings.

- Sample panels ready for inspection.

2 PRODUCTS**2.1 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.

Separating layer

General: Provide a bond-breaker to separate the topping from the substrate, as documented.

Cement

Standard: To AS 3972.

- Type: SL.

Colouring products

General: Provide proprietary products manufactured for colouring cement toppings.

Integral pigment proportion: 10% maximum by weight of cement.

Concrete

Standard: To AS 1379.

Unreinforced topping: Normal-class.

Reinforced topping table

Exposure location	Strength grade	Cover to reinforcement
Internal and external greater than 50 km inland and non-industrial and non-tropical	N25	20 mm
External greater than 50 km inland and tropical and External near coastal (> 1 km < 50 km)	N32	30 mm
External coastal less than 1 km but not in the splash zone	N40	35 mm

Reinforcement

Standard: To AS/NZS 4671.

Mesh sizes for joint spacing as follows:

- SL 42: Up to 3 m internal, 2 m external.
- SL 62: Up to 6 m internal, 4 m external.

Curing products

General: Provide proprietary products manufactured for use with cement-based toppings and with the floor finish to be laid on the toppings.

Water

General: Clean and free from any deleterious matter.

Mixes

General: Provide pre-mixed concrete for toppings as follows, or alternatively select mix proportions to the **Mix proportion table**:

- Air entrainment: $\leq 3\%$.
- Nominal coarse aggregate size: $\leq 0.3 \times$ topping thickness.
- Slump: 80 mm.
- Standard strength grade: N25.

Water quantity: The minimum necessary to achieve full compaction and prevent excessive water being brought to the surface during compaction.

Mix proportion table

Mix type	Thickness (mm)	Upper and lower limits of proportions by weight		
		Cement	Fine aggregate	Coarse aggregate
Bonded – cement and sand	35	1 1	3 4.5	0 0
Bonded – fine concrete	40	1 1	3 3	1 2
Floating – fine concrete	100	1 1	3 3	1 2
Granolithic	Floors: 25 Skirtings: 13	1	2	1, of 2 mm - 3 mm
Separated – fine concrete	70	1 1	3 3	1 2

Slip resistance products

General: Provide proprietary products manufactured to improve the wet slip resistance of toppings.

- Silicon carbide granules:
 - . Granule size: $\geq 300 < 600 \mu\text{m}$.
- Silicon carbide two-part resin:
 - . Granule size: $\geq 300 \mu\text{m}$.

Surface treatment products

General: Provide proprietary products manufactured for use with cement-based toppings to change the characteristics of the surface of the finished topping.

2.2 CONTROL JOINTS**Control joint materials**

General: As documented.

Control joint strip: A proprietary expansion joint consisting of a neoprene filler sandwiched between plates with lugs or ribs for mechanical keying. Set flush with the finished surface.

Proprietary slide plate divider strip: An arrangement of interlocking metal plates grouted into pockets formed in the concrete joint edges.

Sealant: One-part self-levelling non-hardening mould-resistant, silicone or polyurethane sealant applied over a backing rod. Finish flush with the terrazzo surface.

- Floors: Trafficable, shore hardness greater than 35.

Backing rod: Compressible closed cell polyethylene foam with a bond-breaking surface.

3 EXECUTION**3.1 PREPARATION****Substrates**

General: Provide substrates as follows:

- Clean and free from any deposit which may impair adhesion of monolithic or bonded toppings.
- Remove excessive projections and voids and fill hollows with a mix not stronger than the substrate or weaker than the topping.

Substrates for bonded toppings

Hardened concrete: Roughen by scabbling or the like to remove 2 mm of the laitance and expose the aggregate.

Bond product: Before laying topping wash the substrate with water and provide a bonding product, or treat as follows:

- Keep wet for 2 hours or more.
- Remove surplus water and brush on neat cement or a clean slurry of cement and water.
- Place the topping while the slurry is wet.

3.2 APPLICATION**Installation**

General: Spread the mix and compact. Strike off, consolidate and level surfaces to finished levels.

Monolithic toppings: Lay while concrete subfloor is plastic and the surface water is no longer visible.

Unbonded toppings: Lay separating layer.

Toppings over 50 mm thick:

- Lay in two layers of equal thickness.
- Place a layer of reinforcement between the topping layers. Lap reinforcement 200 mm and tie. Do not create four way laps.

Temperature control

General: Make sure that the temperature of mixes, substrates and reinforcement are not less than 5°C or greater than 35°C at the time of application.

Severe temperature: If the ambient shade temperature is greater than 38°C, do not mix topping.

3.3 SURFACE FINISHES**Finishing methods – primary finish**

Machine float finish:

- After levelling, consolidate the surface using a machine float.
- Cut and fill and refloat immediately to a uniform, smooth, granular texture.
- Hand float in locations inaccessible to the machine float.

Steel trowel finish: After machine floating finish as follows:

- Produce a smooth surface relatively free from defects using power tools.

- When the surface has hardened sufficiently, use steel hand trowels to produce the final consolidated finish free of trowel marks and uniform in texture and appearance.

Burnished finish: Continue steel trowelling until the concrete surface attains a polished or glossy finish, uniform in texture and appearance, and free from trowel marks and defects.

Wood float finish: After machine floating, produce the final consolidated finish free of float marks and uniform in texture and appearance using wood or plastic hand floats.

Broom finish: After machine floating draw a broom or hessian belt across the surface to produce a coarse even-textured slip-resistant transverse-scored surface.

Scored or scratch finish: After screeding, give the surface a coarse scored texture using a stiff brush or rake drawn across the surface before final set.

Sponge finish: After machine floating, obtain an even textured sand finish by wiping the surface using a damp sponge.

Exposed aggregate finish: After floating and when concrete has stiffened, wet the surface and scrub with stiff fibre or wire brushes, flushing continuously with clean water, until the aggregate is uniformly exposed. Rinse the surface with water.

Finishing methods – supplementary finish

Abrasive blast: After steel trowelling, abrasive blast the cured surface to provide texture or to form patterns without exposing the coarse aggregate using fine, hard, sharp, graded abrasive particles.

Coloured applied finish: After machine floating, apply a proprietary liquid or dry shake material to the manufacturer's recommendations, and trowel to achieve the required appearance.

Stamped and coloured pattern paved finish: Provide a proprietary finishing system.

Polished finish: After steel trowelling, grind the cured surface of the concrete.

Slip-resistant treatment

Surface treatment: Apply silicon carbide granules after floating and before the topping surface has set, and trowel into the surface so that the granules remain exposed.

Application rate: 1 kg/m² evenly distributed.

Slip-resistant treatment to stair treads and landings

Slip resistance treatment: Form two grooves and fill with a silicon carbide two-part resin.

Dimensions: 10 mm deep, 15 mm wide, length width of tread less 100 mm.

Position:

- First groove: Centre 35 mm from tread nose.
- Second groove: Centre 60 mm from step nose.

Surface colouring

General: Apply the colouring product after floating and before the topping surface has set and trowel into the surface so that it is even in colour.

Surface treatment

General: Apply the surface treatment after floating and before the topping surface has set.

3.4 CONTROL OF MOVEMENT

General

Requirement: Provide control joints as follows and as documented:

- Location:
 - . Over structural control joints.
 - . To divide complex room plans into rectangles.
 - . Around the perimeter of the floor.
 - . At junctions between different substrates.
 - . To divide large topping-finished areas into bays.
 - . At abutments with the building structural frame and over supporting walls or beams where flexing of the substrate is anticipated.
- Depth of joint: Right through to the substrate.
- Depth of elastomeric sealant: One half the joint width, or 6 mm, whichever is the greater.

Control joints to divide topping into bays: Provide joints using one of the following methods:

- Form in situ using square edge steel forms and trowelling a 3 mm radius to edges.
- Form a groove, extending at least one quarter the depth of the section, either by using a grooving tool, by sawing, or by inserting a premoulded strip.
- Install a control joint proprietary product, as documented.

3.5 JOINT ACCESSORIES

Weather bars

General: Provide a corrosion-resistant metal weather bar suitably fixed to the substrate. Locate directly below the centres of closed doors.

Floor finish dividers

General: Provide a corrosion resistant metal dividing strip suitably fixed to the substrate, at junctions with differing floor finishes and with the top edge flush to the finished floor. If changes of floor finish occur at doorways, make the junction directly below the centre of the closed door.

3.6 COMPLETION

Curing

General: Prevent premature or uneven drying out and protect from the sun and wind.

Curing: Use a curing product or, as soon as toppings have set sufficiently, keep them moist by covering with polyethylene film for seven days.

Joint sealant

General: If required, seal joints as follows:

- Formed joints: ≤ 25 mm deep with filler and bond-breaker.
- Sawn joints: Full depth of cut.

Protection

General: Protect finished work from damage during building operations.

0621 WATERPROOFING – WET AREAS**1 GENERAL****1.1 RESPONSIBILITIES****Performance**

Requirements:

- Grade to floor wastes, to dispose of water without ponding.
- Prevent moisture entering the substrate or adjacent areas.

1.2 STANDARDS**Waterproofing wet areas**

Standard: To AS 3740.

1.3 INTERPRETATION**Definitions**

General: For the purposes of this worksection the definitions given in AS 3740 and the following apply:

- Bond breaker: A system preventing a membrane bonding to the substrate, bedding or lining.
- Membranes (waterproof): Impervious barriers to liquid water which may be:
 - . Installed below floor finishes.
 - . Installed behind the wall sheeting or render and termed External.
 - . Installed to the face of the wall sheeting or render and termed Internal.
 - . Applied in liquid or gel form and air cured to form a seamless film.
 - . Applied in sheet form with joints lapped and sealed.
- Preformed shower base: A preformed, prefinished vessel (including integral upstands) installed as the finished floor of a shower compartment, and provided with a connection point to a sanitary drainage system.
- Shower tray: An internal or external liquid applied or sheet membrane system used to waterproof the floor and the wall/floor junctions of a shower area.
- Substrate: The surface to which a material or product is applied.
- Waterproof (WP): The property of a material that does not allow moisture to penetrate through it.
- Waterproofing systems: Combinations of membranes, flashings, drainage and accessories which form waterproof barriers and which may be:
 - . Loose-laid.
 - . Bonded to substrates.
- Water resistant (WR): The property of material that restricts moisture movement and will not degrade under conditions of moisture.
- Wet area: An area within a building supplied with a floor waste.

1.4 SUBMISSIONS**Products and materials**

Documentation: Submit copies of product manufacturer's:

- Product technical data sheets.
- Safety data sheets (SDS).
- Type tests certificates verifying conformance to AS/NZS 4858 Table 8.1.

Records

Placing records: Photographically record the application of membranes and information as follows:

- Date.
- Portion of work.
- Substrate preparation.
- Protection provided from traffic.

Samples

General: Submit 300 x 300 mm samples of each type of membrane.

Shop drawings

Submit shop drawings showing:

- Junctions with vertical surfaces and upstands.
- Junctions at perimeters.
- Drainage details.
- Control joints.
- Flashings.
- Penetrations.
- Corners.
- Terminations and connections.

1.5 INSPECTION**Notice**

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

- Substrate preparation completed.
- Secondary layers preparation completed.
- Before membranes are covered up or concealed.
- After flood testing, if applicable.

2 PRODUCTS**2.1 MEMBRANES****Standards**

Standard: To AS/NZS 4858.

Membrane systems

Requirement: Provide a proprietary membrane systems suitable for the intended internal wet area 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.

Water stop angles

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

Bond breakers

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

Material: Purpose made bond breaker tapes and closed cell foam backing rods or fillets of sealant.

Flashings

Requirement: Flexible waterproof flashings compatible with the waterproof membrane system.

Liquid membrane reinforcement

Requirement: Flexible fabric compatible with the waterproof membrane system.

Sealants

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

Adhesives

Requirement: Waterproof and compatible with host materials.

3 EXECUTION**3.1 PREPARATION****Substrates**

General: Make sure substrates are as follows:

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

Concrete substrates: Cure for more than 28 days.

External corners: Round or arris edges.

Moisture content

Requirement: Verify that the moisture content of the substrate is compatible with the water vapour transmission rate of the membrane system by testing to AS 1884 Appendix A.

Falls

Membrane directly under the floor finish: Make sure the fall in the substrate conforms to the fall documented for the finish.

Sheet substrate fastening

Requirement: Fasten or adequately fix to the supporting structure.

Control joints

Finishes: Align control joints in finishes and bedding with control joints or changes in materials in the substrate.

Water stop angles

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

Sizing: Size the vertical leg of the water stop angle to conform to the requirements of AS 3740.

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

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

Priming

Compatibility: If required, prime the substrates with compatible primer for adhesion of the membrane system.

Bond breakers

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

Sealant fillet bond breakers:

- Application: Form a triangular fillet or cove of sealant to internal corners within the period recommended by the membrane manufacturer after the application of the primer.
- Widths: 5 mm x 5 mm to vertical corners. 6 mm x 6 mm to 9 mm x 9 mm to horizontal corners.

Backing rod bond breakers: Retain in position with continuous length of tape pressed firmly in place against the surfaces on each side of the rod.

3.2 APPLICATION**Protection**

Damage: Protect membrane from damage during installation and for the period after installation until the membrane achieves its service characteristics that resist damage.

Extent of waterproofing

Waterproof or water resistant surfaces: To the requirements of BCA F1.7 for Class 2, 3 and 4 buildings, or BCA 3.8.1.2 for Class 1 buildings.

Sheet membrane joints

Bituminous sheet membranes:

- Side laps at least 75 mm.
- End laps at least 100 mm.

Synthetic rubber membranes:

- Factory-vulcanized laps at least 40 mm.
- Field side laps at least 50 mm for side laps.
- Field end-laps at least 100 mm for end laps.

PVC membranes:

- Factory welded laps at least 30 mm.
- Field-welded laps at least 75 mm.

Vertical membrane terminations

Upstands: At least 150 mm above the finished tile level of the floor or 25 mm above the maximum retained water level, whichever is the greater.

Anchoring: Secure sheet membranes along the top edge.

Edge protection: Protect edges of the membrane.

Flashings

Junctions between waterproof surfaces: Provide a bond breaker at internal corners behind flashings.

Junctions between waterproof surfaces and other surfaces: Provide a bead of sealant at the following junctions:

- Waterproof and water-resistant surfaces.
- Water-resistant and water-resistant surfaces.
- Water-resistant and non water-resistant surfaces.

Perimeter flashings: Provide continuous flashings to the full perimeter of waterproof areas at wall/floor junctions and to water stop angles.

Vertical flashings: Provide vertical corner flashings continuous across wall/wall junctions to at least 1800 mm above finished floor level.

Vertical liquid applied flashings:

- Return legs at least 40 mm on each wall.
- Overlap the vertical termination of the floor waterproofing membrane at least 20 mm.

Vertical sheet flashings:

- Return legs at least 50 mm on each wall.
- Overlap shower tray upstands at least 50 mm.
- Do not penetrate flashing with wall lining fasteners.

Reinforcement: At coves, corners and wall/floor junctions with gaps greater than 3 mm reinforce liquid applied membranes with reinforcement fabric tape recommended by the membrane manufacturer. Fold the tape in half lengthways and imbed it in the first flashing coat of membrane with one half of the tape on each side of the corner or joint. Apply a second coat of liquid membrane to seal the fabric.

Door jambs and architraves

Requirement: If the bottom of doorjambs and architraves do not finish above the floor tiling, waterproof their surfaces below tile level to provide a continuous seal between the perimeter flashing to the wall/floor junction and the water stop angle.

Drainage connections

Floor wastes: Provide floor wastes of sufficient height to accommodate the thickness of floor finishes and bedding at the outlet position. Position drainage flange to drain at membrane level. Turn membrane down 50 mm minimum into the floor waste drainage flanges, and adhere to form a waterproof connection.

Floor wastes in shower trays: Provide drainage of the tile bed and a waterproof connection between the tray and the drain.

Preformed drainage channels:

- With continuous drainage flanges: Provide a continuous waterproof connection between the membrane and the channel.
- Without drainage flanges: Provide continuous waterproofing under the channel and terminate the membrane at a floor waste with a recessed drainage flange.

Enclosed showers with hobs

General: Construct from masonry, concrete or corrosion-resistant metal. Fix securely to the floor,

seal against walls and make flush all gaps, joints and intersections before applying the membrane.

Autoclaved aerated concrete hobs: Do not use for external membrane systems. Prime before applying the membrane.

Internal membranes: Extend membrane over the hob and into the room at least 50 mm.

External membranes (hob located inside membrane tray): Dress membrane up outside of hob and finish at the underside of tiles capping the top of the hob.

Enclosed showers with step-downs

Levels: Conform to AS 3740 Figure 3.5 and as follows:

- Finish the highest level of the shower area at a level at least 15 mm below the finished floor level outside the shower.
- Extend the membrane at least 10 mm above the maximum retained water level in the area outside the shower or 150 mm above the finished floor level of the shower area, whichever is the greater.

With framed shower screens: Terminate the membrane directly below the floor tiles below the shower screen sill mounted on the upper level of the step-down. Support and adhere the membrane to a water stop angle fixed securely to the upper level substrate.

With frameless shower screens: Install the shower screen with the inside face flush with the step-down. Terminate the membrane outside the shower screen at least 1500 mm from the shower rose outlet on the wall. Support and adhere the membrane to a water stop angle fixed securely to the substrate. Finish membrane flush with the underside of tiles.

Enclosed hobless showers with framed shower screens

Requirement: Conform to AS 3740 Figure 3.6 and as follows:

- Turn the membrane up against a water stop angle fixed securely to the substrate directly below the shower screen sill.
- Size the angle so that the vertical leg finishes at least 5 mm above the level of the tiles.
- Support and adhere the membrane to the angle and finish it flush with the top of the vertical leg.

Enclosed hobless showers with trench drain located below screen

Framed or frameless shower screens: Install a water stop angle where the outer edge of the trench drain to the perimeter of the shower will be installed. Size the angle so that the vertical leg finishes at the underside of the tiles. Support and adhere the membrane over the water stop angle and terminate the membrane at floor wastes as described in **Drainage connections**. Install the trench drain with the shower screen located vertically above it.

Unenclosed showers

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

Baths

Junction of walls with baths: Conform to AS 3740 Figure 3.2 and as follows:

- Baths with integral upstands: Recess bath edges into walls or batten off wall lining sufficiently to allow water-resistant wall finishes to overlap the bath's integral perimeter upstands. Maintain the structural integrity of walls that are rebated.
- Baths without integral upstands or with showers over – rendered masonry walls: Form or chase a rebate in the render to receive the bath edge. Waterproof the wall above and below the rebate, including the rebate, and the floor area under the bath. Seal the edge of the bath into the rebate.
- Baths without integral upstands or with showers over – framed and lined walls: Form a rebate in the wall lining with a corrosion-resistant lipped channel to receive the bath edge. Waterproof the wall above and below the rebate, including the rebate, and the floor area under the bath. Seal the edge of the bath into the rebate.

Plinth-mounted insert baths and spas: Conform to AS 3740 Figure 3.2 and as follows:

- Line framed enclosures for insert baths.
- Form an upstand on the inside edge of the enclosure opening to receive the bath with an angle or compressible foam rod.
- Waterproof walls abutting the enclosure, the top of the plinth and the interior and exterior of the enclosure.
- After tiling the walls, outside of the enclosure and plinth top, install the bath with its downturn edge lip outside the upstand formed on the edge of the opening and seal the lip to the tiles.

Taps and spouts

Requirement: Waterproof penetrations for taps and spouts with proprietary flange systems or a sealant.

Provision for servicing: Install taps in a manner that allows tap washers or ceramic discs to be serviced without damaging the waterproofing seal.

Recessed soap holders

Construction: Support all faces of the recess and line with the same sheet material as the adjacent wall. Fall base of recess towards the shower area. Flash all junctions and waterproof all surfaces.

Curing of liquid applied systems

General: To the manufacturer's instructions.

Curing: Allow membrane to fully cure before tiling.

Overlaying finishes on membranes

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

Suitable materials: Conform to AS 3740.

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

3.3 TESTING

Flood test

Application: Perform a flood test before the installation of surface finishes.

Moisture content measurement method: Conform to AS 1884 Appendix A.

Set-up:

- Measure the wall/floor junction of adjacent spaces and the floor soffit below for dryness.
- Record the result for each area.
- Dam the doorway(s) and seal floor wastes and drainage outlets to allow 50 mm water level.
- Fill space with clean water and leave overnight.

Evaluation:

- Make a visual inspection after a minimum period of 2 hours of the wall/floor junction of adjacent spaces and of the floor soffit below for obvious water or moisture.
- Test the same areas for dryness and compare the results to the measurements taken before flooding.

Compliance:

- Evidence of water from the visual test: Failure.
- No visual evidence of water: Proceed with moisture measurements.
- Test results indicating an increase in moisture before and after flooding: Failure.

Records:

- Submit records of all flood tests.

3.4 COMPLETION

Protection

General: Keep traffic off membrane surfaces until bonding has set or for 24 hours after laying, whichever period is the longer.

Reinstatement: Repair or replace faulty or damaged work.

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.

0631 CERAMIC TILING**1 GENERAL****1.1 RESPONSIBILITIES****Performance**

Requirement:

- Consistent in colour and finish.
- Firmly bonded to substrates for the expected life of the installation.
- Set out with joints accurately aligned in both directions and wall tiling joints level and plumb.
- Direct all water flowing from supply points to drainage outlets without leakage to the substrate or adjacent areas.

1.2 STANDARDS**Tiling**

General: Conform to the recommendations of those parts of AS 3958.1 which are referenced in this worksection.

Slip resistance

Classification: To AS 4586.

1.3 TOLERANCES**Completed tiling**

Requirement: To the recommendations of AS 3958.1 clause 5.4.6.

1.4 SUBMISSIONS**Operation and maintenance manuals**

General: Submit a manual describing care and maintenance of the tiling, including procedures for maintaining the slip-resistance classification stating the expected life of the slip-resistance classification.

Products and materials

Product conformity: Submit evidence of conformity to the following:

- Marking and classification of tiles with regard to water absorption and shaping to AS ISO 13006.
- Marking and classification of tile adhesive to AS ISO 13007.1.
- Weighted normalised impact sound pressure level to AS ISO 717.2 as measured for the acoustic underlay as part of the entire tiling system.

Type tests: Submit results, as follows:

- Slip resistance of tiles.

Samples

General: Submit labelled samples of tiles, including fittings, accessories, grout and sealants, illustrating the range of variation in colour and finish.

Tests

Site tests: Submit results, as follows:

- Slip resistance of completed installation.
- Impact sound insulation.

1.5 INSPECTION**Notice**

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

- Substrate immediately before tiling.
- Trial set-outs before execution.
- Control joints before sealing and grouting.
- Grout and sealant colours before application.

2 PRODUCTS**2.1 UNDERLAY****Fibre cement underlay**

Standard: To AS/NZS 2908.2, Type B, category 2 minimum.

Thickness: 5 mm minimum.

Acoustic underlay

General: Provide proprietary product recommended by the manufacturer as compatible with the tiling system.

2.2 TILES AND ACCESSORIES**Tiles**

Standard: To AS ISO 13006.

Tactile ground surface indicators: To AS/NZS 1428.4.1.

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: Provide tile accessories which match the composition, colour and finish of the surrounding tiles.

2.3 ADHESIVES**General**

Standard: To AS ISO 13007.1.

Type

General: Provide adhesives compatible with the materials and surfaces to be adhered, and as documented.

Prohibited uses: Do not provide the following combinations:

- Cement-based adhesives on wood, metal, painted or glazed surfaces, gypsum-based plaster.
- Organic solvent-based adhesives on painted surfaces.
- Organic PVC-based adhesives and organic natural rubber latex adhesives in damp or wet conditions.
- PVA (polyvinyl acetate) based adhesives in wet areas or externally.

2.4 MORTAR**Materials**

Cement type to AS 3972: GP.

- White cement: Iron salts content $\leq 1\%$.
- Off-white cement: Iron salts content $\leq 2.5\%$.

Lime: To AS 1672.1.

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

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

Bedding mortar

Mix proportion (cement:sand), by volume: Select proportions from the range 1:3 to 1:4 for satisfactory adhesion. Provide minimum water.

Terracotta tiles: Use proprietary polymer modified mortar.

Mixing: To AS 3958.1 clause 2.15.

Water

General: Clean and free from any deleterious matter.

2.5 GROUT

Type

Cement based proprietary grout: Mix with water. Fine sand may be added as a filler in wider joints.

Terracotta tiles: Use proprietary polymer modified grout.

General purpose cement based grout: Mix with fine sand. Provide minimum water consistent with workability.

Mix proportions (cement:sand), by volume:

- For joints < 3 mm: 1:2.
- For joints ≥ 3 mm: 1:3.

Pigments

Pigments for coloured grout: Provide colourfast fillers compatible with the grout material. For cement-based grouts, provide lime-proof natural or synthetic metallic oxides compatible with cement.

2.6 CONTROL JOINTS

Control joint materials

Control joint strip: A proprietary control joint consisting of a neoprene core sandwiched between metal plates with lugs or ribs for mechanical keying. Set flush with the finished surface.

Proprietary slide plate divider strip: An arrangement of interlocking metal plates grouted into pockets formed in the concrete joint edges.

Sealant: One-part self-levelling non-hardening mould resistant, silicone or polyurethane sealant applied over a backing rod. Finish flush with the finished surface.

- Floors: Trafficable, shore hardness greater than 35.

Backing rod: Compressible closed cell polyethylene foam with a bond-breaking surface.

3 EXECUTION

3.1 SUBSTRATES

Drying and shrinkage

General: Before tiling, allow at least the following times to elapse (for initial drying out and shrinkage) for these substrates:

- Concrete slabs: 42 days.
- Concrete blockwork: 28 days.
- Toppings on slabs and rendering on brick or blockwork: A further 21 days.
- Rendering swimming pool shell: A further 21 days minimum.

3.2 PREPARATION

Standard

Preparation: To the recommendations of AS 3958.1 Section 4.

Ambient temperature

General: If the ambient temperature is less than 5°C or greater than 35°C , do not lay tiles.

Substrates without wet area membranes

General: Conform to the following:

- Clean off of any deposit or finish which may impair adhesion or location of tiles.
- If framed or discontinuous, support members are in full lengths without splicing.
- If solid or continuous:
 - . Remove excessive projections.
 - . Fill voids and hollows greater than 10 mm with abrupt edges with a cement:sand mix not stronger than the substrate or weaker than the bedding.
 - . Fill depressions less than 10 mm with a latex modified cementitious product and eliminate feathering by scabbling the edges.

Absorbent substrates: If suction is excessive, control it by dampening but avoid over-wetting and do not apply mortar bedding to substrates showing surface moisture.

Dense concrete: If not sufficiently rough to provide a mechanical key, roughen by scabbling or the like to remove 3 mm of the surface and expose the aggregate; then apply a bonding treatment.

Substrates with wet area membranes

General: Make sure substrates are as follows:

- Clean and free of any deposit or finish which may impair adhesion or location of tiles.
- Compatible with all components of the floor system.

3.3 FIXING UNDERLAY

Installation

Requirement: Lay in staggered (brick) pattern, perpendicular to the direction of the subfloor, with joints in the underlay not coinciding with joints in the subfloor. Fix with fasteners and fastener spacing to the manufacturers recommendations.

3.4 TILING GENERALLY

Cutting and laying

Cutting: Cut tiles neatly to fit around fixtures and fittings and at margins where necessary. Drill holes without damaging tile faces. Cut recesses for fittings such as soap holders. Rub edges smooth without chipping.

Laying: Return tiles into sills, reveals and openings. Butt up to returns, frames, fittings, and other finishes. Strike and point up beds where exposed. Remove tile spacers before grouting.

Variations

General: Distribute variations in hue, colour, or pattern uniformly, by mixing tiles or tile batches before laying.

Protection

Floor tiles: Keep traffic off floor tiles until the bedding has set and attained its working strength.

Cleaning: Keep the work clean as it proceeds and protect finished work from damage.

Bath ventilation

General: Ventilate the space below fully enclosed baths with at least 2 vermin proof ventilating tiles.

3.5 SETTING OUT

Tile joints

Joint widths: Set out tiles to give uniform joint widths within the following limits:

- Floors:
 - . Dry pressed tiles: 3 mm.
 - . Extruded tiles: 6 mm.
 - . Vitrified: 3 to 5 mm.
 - . Quarry tiles: 6 to 12 mm.
 - . Chemical resistant epoxy jointed tiling: 5 to 6 mm.
- Large and/or irregular floor tiles: 6 to 12 mm.
- Mounted mosaics: To match mounting pattern.
- Walls:
 - . Dry pressed tile: 1.5 mm.
 - . Extruded tile: 6 mm.

Joint alignment: Set out tiling with joints accurately aligned in both directions and wall tiling joints level and plumb.

Joint position: Set out tiles from the centre of the floor or wall to be tiled.

Margins

General: Provide whole or purpose-made tiles at margins where practicable, otherwise, set out to give equal margins of cut tiles. If margins less than half a tile width are unavoidable, locate the cut tiles where they are least conspicuous.

Fixtures

General: If possible, position tiles so that holes for fixtures and other penetrations occur at the intersection of horizontal and vertical joints or on the centre lines of tiles. Continue tiling fully behind fixtures which are not built in to the tiling surface. Before tiling make sure fixtures interrupting the tile surfaces are accurately positioned in their designed or optimum locations relative to the tile layout.

3.6 FALLS AND LEVELS

Grading

General: Grade floor tiling to even and correct falls to floor wastes and elsewhere as required. Make level junctions with walls. Where falls are not required, lay level.

Fall, general: 1:100 minimum.

Fall, in shower areas: 1:60 minimum.

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

3.7 BEDDING

Standard

Cement mortar: To AS 3958.1 clause 5.5.

Adhesive: To AS 3958.1 clause 5.6.

Preparation of tiles

Adhesive bedding: Fix tiles dry; do not soak.

Mortar bedding: Soak porous tiles in water for half an hour and then drain until the surface water has disappeared.

Terracotta tiles: Use pre-sealed tiles or apply a breathable sealer and lay dry. If a final sealed finish is selected, use a compatible laying sealer.

Bedding

General: Use bedding methods and materials which are appropriate to the tile, the substrate, the conditions of service, and which leave the tile firmly and solidly bedded in the bedding material and adhered to the substrate. Form falls integral with the substrate.

Thin adhesive beds

General: Provide only if the substrate deviation is less than 3 mm, tested with a 3 m straightedge. Cover the entire tile back with adhesive when the tile is bedded.

Thickness: 1.5 to 3 mm.

Thick adhesive beds

General: Provide on substrates with deviations up to 6 mm, tested with a 3 m straightedge, and with tiles having deep keys or frogs.

Nominal thickness: 6 mm.

Adhesive bedding application

General: Apply adhesive by notched trowel to walls and floors and direct to tiles if required, to provide evenly distributed coverage after laying as follows:

- Domestic internal walls: > 65%.
- Domestic internal floors: > 80%.
- Other wall and floors: > 90%.
- Wet areas and bench tops: 100%.

Pattern of distribution of adhesive: To the recommendations of AS 3958.1 clause 5.6.4.3. Verify by examining one tile in ten as work proceeds.

Wall tile spacers: Do not use spacer types that inhibit the distribution of adhesive.

Curing: Allow the adhesive to cure for the period nominated by the manufacturer before grouting or allowing foot traffic.

Mortar beds

For floor tiles: Either lightly dust the screeded bed surface with dry cement and trowel level until the cement is damp, or spread a thin slurry of neat cement, or cement-based thin bed adhesive, on to the tile back. Do not use mortar after initial set has occurred.

- Nominal thickness: 20 to 40 mm.

Thick reinforced beds: Place mortar bed in two layers, and incorporate the mesh reinforcement in the first layer.

3.8 CONTROL OF MOVEMENT**General**

Requirement: Provide control joints carried through the tile and the bedding to the recommendations of AS 3958.1 clause 5.4.5 and as follows:

- Floor location:
 - . Over structural control joints.
 - . To divide complex room plans into rectangles.
 - . Around the perimeter of the floor.
 - . At junctions between different substrates.
 - . To divide large tiled areas into bays.
 - . At abutments with the building structural frame and over supporting walls or beams where flexing of the substrate is anticipated.
- Wall location:
 - . Over structural control joints.
 - . At junctions with different substrate materials when the tiling is continuous.
 - . At vertical corners in shower compartments.
- Depth of joint: Right through to the substrate.
- Sealant width: 6 to 25 mm.
- Depth of elastomeric sealant: One half the joint width, or 6 mm, whichever is the greater.

3.9 GROUTED AND SEALANT JOINTS**Grouted joints**

General: Commence grouting as soon as practicable after bedding has set. Clean out joints as necessary before grouting.

Face grouting: Fill the joints solid and tool flush. Clean off surplus grout. Wash down when the grout has set. When grout is dry, polish the tiled surface with grout film remover and a clean cloth.

Edges of tiles: Grout exposed edge joints.

Epoxy grouted joints: Make sure tile edge surfaces are free of extraneous matter such as cement films or wax, before grouting.

Mosaic tiles

Grouting mosaics: If paper faced mosaics are to be bedded in cement mortar, pre-grout the sheeted mosaics from the back before fixing. After fixing, rub grout into the surface of the joints to fill any voids left from pre-grouting. Clean off surplus grout. When grout has set, wash down. If necessary, use a proprietary cement remover.

Sealant joints

General: Provide joints filled with sealant and finished flush with the tile surface as follows:

- Where tiling is cut around sanitary fixtures.
- At internal corners of walls in showers.
- Around fixtures interrupting the tile surface, for example pipes, brackets, bolts and nibs.
- At junctions with elements such as window and door frames and built-in cupboards.

Material: Anti-fungal modified silicone.

Width: 5 mm.

Depth: Equal to the tile thickness.

3.10 JOINT ACCESSORIES**Floor finish dividers**

General: Finish tiled floors at junctions with differing floor finishes with a corrosion-resistant metal dividing strip fixed to the substrate using mechanical fixings, with top edge flush with the finished floor. If changes of floor finish occur at doorways, make the junction directly below the closed door. Grout up underneath to provide continuous support.

Stepping: Less than 5 mm.

Adjustments

Requirement: Check that the height of the floor finish divider is sufficient for the topping and tile thickness. Adjust as required with a matching flat bar adhesive fixed to the divider angle.

Weather bars

General: Provide a corrosion-resistant metal weather bar under hinged external doors. Locate under the centres of closed doors.

3.11 TESTING**Completion tests**

Slip resistance of completed installation: To AS 4663.

3.12 COMPLETION**Cleaning**

General: Clean tiled surfaces using an appropriate tile cleaning agent, and polish.

Spare tiles

General: Supply spare matching tiles and accessories of each type for future replacement purposes. Store the spare materials on site.

Quantity: At least 1% of the quantity installed.

0651 RESILIENT FINISHES**1 GENERAL****1.1 STANDARDS****General**

Installation: To AS 1884.

1.2 SUBMISSIONS**Fire performance**

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

Operation and maintenance manuals

General: Submit manufacturer's published use, care and maintenance requirements for each type of finish.

Products and materials

Manufacturer's data: Submit the manufacturer's product data for each type of finish, and the manufacturer's recommendations for its application in the project including the following, as appropriate:

- Thickness and width of sheet or size of tile.
- Adhesive and jointing method.
- Resistance to wear, indentation, chemicals, light and fire.
- Flexibility and bending strength.

Type tests: Submit results, as follows:

- Slip resistance to AS 4586.

Subcontractors

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

Substrate acceptance

Applicator: Submit the installer's certification of the acceptability of the flooring substrate before commencing installation.

Tests

Site tests: Submit results, as follows:

- Site slip resistance test of completed installations.
- Surface pH test.
- Moisture content test.

Warranties

Requirement: For each type of resilient finish specified, submit the manufacturer and installer's warranty of the material, workmanship and application.

1.3 INSPECTION**Notice**

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

- Substrate immediately before fixing resilient finishes or underlay.
- Completed underlay, if any.
- Finished surface before applying sealers or polishes (if any).
- Completed installation.

2 PRODUCTS**2.1 FIRE PERFORMANCE****Fire hazard properties**

Critical radiant flux: Tested to AS ISO 9239.1.

2.2 UNDERLAYS**Cementitious**

General: Polymer modified cementitious smoothing and self-levelling compound.

Thickness: 3 mm minimum.

Fibre cement underlay

Standard: To AS/NZS 2908.2, Type B, category 2 minimum.

Thickness: 5 mm minimum.

Wet process fibreboard (hardboard) underlay

Standard: To AS/NZS 1859.4.

Classification: General purpose medium board, manufactured specifically as flooring underlay.

Thickness: 5.5 mm.

2.3 MOISTURE BARRIER**General**

Description: Water-based moisture barrier to the resilient finish and adhesive manufacturer's recommendations, if required.

2.4 ADHESIVES**General**

Requirement: To the resilient finishes manufacturer's recommendations.

2.5 SHEETS AND TILES**Edges of sheets and tiles**

General: Make sure edges are firm, unchipped and machine-cut accurately to size and square to the face, and that tile edges are square to each other.

Polyvinyl chloride (PVC)

Resilient floor covering, homogeneous: To EN ISO 10581.

Resilient floor covering, heterogeneous: To EN ISO 10582.

Resilient floor covering, jute or polyester felt backing: To EN 650.

Resilient floor covering, with foam layer: To EN 651.

Resilient floor covering, with particle based enhanced slip resistance: To EN 13845.

Resilient floor covering, semi-flexible polyvinyl chloride tiles: To EN ISO 10595.

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.

3 EXECUTION

3.1 SUBCONTRACTORS

General

Requirement: Use specialist installers recommended by the material manufacturers.

3.2 PREPARATION

Substrates

General: To AS 1884 Section 3.

Substrate tolerance table

Property	Length of straightedge laid in any direction	Max. deviation under the straightedge
Planeness	2 m	4 mm
Smoothness	150 mm	1 mm
Projections	50 mm	0.5 mm

Concrete substrates

Requirement: Do not start installation of the resilient finishes until the concrete substrate conforms to AS 1884 clause 3.1 and the adhesive and resilient finish manufacturers' recommendations.

Concrete substrate rectification: Conform to the following:

- Surface treatments: Mechanically remove any incompatible surface treatments, including the following:
 - . Sealers and hardeners.
 - . Curing compounds.
 - . Waterproofing additives.
 - . Surface coatings and contamination.
- Planeness, smoothness, projections: Remove projections and fill voids and hollows with a smoothing and self-levelling compound compatible with the adhesive. Allow filling or levelling compound to dry to manufacturer's recommendations.

Cleaning: Remove loose materials or dust.

Timber, plywood and particleboard substrates

Requirement: Do not start installation of the resilient finishes until the timber, plywood or particleboard substrate conforms to AS 1884 clause 3.2.

Timber, plywood and particleboard substrate rectification: Remove projections. If conformance to the **Substrate tolerance table** cannot be achieved, provide an underlay in brick pattern with joints avoiding substrate joints.

Cleaning: Remove oil, grease, traces of applied finishes and loose materials or dust.

Working environment

General: Do not start work before the building is enclosed, wet work is complete and dry, overhead work is complete and good lighting is available. Protect adjoining surfaces.

3.3 SHEET AND TILE INSTALLATION

Acclimatisation

Before installation: Remove flooring from the packaging and store not more than 5 boxes high in the laying area for at least 24 hours.

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 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.

Junctions

General: Scribe neatly up to returns, edges, fixtures and fittings. Finish flush with adjoining surfaces.

Rolling

General: If rolling is required, roll the finish in multiple directions before the adhesive sets.

Change of finish

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

Cleaning

General: Keep the surface clean as the work proceeds.

3.4 TILING

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.

3.5 SHEETING

Welded joints

Heat welding: After fixing, groove the seams using a grooving tool and weld the joints with matching filler rod, using a hot air welding gun. When the weld rod has cooled, trim off flush.

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 with a damp cloth.

Epoxy jointing: Join seams with epoxy adhesive.

3.6 VINYL STAIR FINISH

General

Preformed: Provide purpose-made vinyl stair finish combining riser, nosing and tread in the one element. Lay each step consecutively with the joint at the bottom of each riser.

Formed in situ: Fit the sheet vinyl to each tread, and to the riser above, in one piece, coved in the angle. Accurately scribe, cut and fit to stair nosings and perimeters.

3.7 JOINTS AND ACCESSORIES

Junctions

General: Finish junctions tapered to with adjoining surfaces. Where changes of floor finish occur at

doorways, locate the joint on the centreline of the closed door leaf.

Accessories

General: Provide purpose-made matching moulded accessories for nosings, coves, skirtings, edge cover strips and finishes at junctions, margins, and angles, if available. Otherwise, form accessories from the sheet material. Provide solid backing for radiused coves and nosings.

Edge strips

General: Provide edge cover strips at junctions with different floor finishes and to exposed edges.

Metal cover strip: Extruded tapered strip 25 mm wide, of the same thickness as the sheet or tile. Fix with matching screws to timber bases or to masonry anchors in concrete bases, at 200 mm maximum centres.

PVC cover strip: Feather edge strip matching the floor finish, fixed with contact adhesive.

Control joints

Location: Provide control joints as follows:

- Over structural control joints.
- At junctions between different substrates.

Depth of joint: Right through to the substrate.

Sealant width: 6 to 25 mm.

Depth of elastomeric sealant: One half the joint width, or 6 mm, whichever is the greater.

Control joint materials – sheet flooring

Proprietary slide plate divider strip: Provide interlocking metal plates grouted into pockets formed in the concrete joint edges to finish flush with the flooring surface.

Vinyl skirting

Feather edge: Moulded PVC skirting section.

Flat skirting: Flat PVC skirting section.

Fixing: Scribe as necessary. Mitre corners. Fix to walls with contact adhesive.

Minimum height: 100 mm.

Coved skirtings

Site formed coving: Carry the flooring material up over a profiled coving section to form the skirting and mitre and weld all joints. Make sure the radius of the coving section conforms to the floor finish manufacturer's recommendations for sheeting material and thickness.

3.8 COMPLETION

Protection of sheet materials

Finished floor surface: Keep traffic off floors for a minimum of 24 hours after laying or until bonding has set, whichever period is the longer. Avoid contact with water for minimum 7 days after laying.

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.

Spare materials

General: Supply spare matching resilient finishes and accessories of each type for future replacement

purposes. Store the spare materials on site where directed.

Quantity: At least 1% of the quantity installed.

0652 CARPETS**1 GENERAL****1.1 SUBMISSIONS****Fire performance**

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

Operation and maintenance manuals

Contents: Submit maintenance manuals with the following:

- A technical specification of the carpet installation.
- The manufacturer's recommendations for use, care and maintenance of the carpet to AS/NZS 3733.
- The names and address of the supplier and manufacturer of each component.

Products and materials

Manufacturer's documentation: Submit copies of the following data:

- Product technical data sheets.
- Safety data sheets (SDS) for adhesives.

Slip resistance classification: Submit evidence of conformity to documented requirements.

Type tests: Submit results of testing to PRODUCTS, **TESTS**, as evidence of conformity to documented requirements.

Samples

General: Submit labelled production run samples demonstrating the range of colour, pattern, texture and pile yarn available in each documented carpet type.

Sample size: Submit the following:

- Carpet: Manufacturer's standard swatch.
- Tiles: 4 x tile size.
- Edge strip, trims, extrusions, landing and stair nosings: Submit a 300 mm length of each type.
- Underlay: Submit one labelled sample at least 600 x 600 mm.
- Stitched seam: Submit one sample, minimum 1000 mm length.

Penetrations: Submit one production carpet sample with a penetration access cut as documented in **EXECUTION, INSTALLATION - CARPET.**

Sample installation: Lay a sample area of each type of carpet with underlay, minimum 10 m², including accessories, and 3000 mm of typical seam.

Subcontractors

General: Submit name and contact details of proposed suppliers and installers.

Substrate acceptance: Submit evidence of installer's acceptance of the subfloor/substrate before commencing installation.

Tests

Moisture content and alkalinity of subfloor/substrate: Submit test report as evidence of conformity to **PREPARATION, Substrate.**

Warranties

General: Submit the manufacturer's product warranties.

1.2 INSPECTION**Notice**

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

- Each batch of material upon delivery.
- Substrate immediately before fixing underlay.
- Fixings, edge strips, and underlay installed ready to lay carpet.
- Completed carpet after cleaning and before covering for protection.

2 PRODUCTS**2.1 GENERAL****Storage and handling**

Requirement: Store on a flat, clean, dry, well ventilated and secure storage area, elevated above the subfloor and unaffected by weather.

2.2 FIRE PERFORMANCE**Fire hazard properties**

Critical radiant flux: Tested to AS ISO 9239.1.

2.3 CARPET**Carpet**

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

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

Tolerances

Requirement: To AS/NZS 1385.

Batching

Requirement: In a single area and for each documented type, quality, or colour, use carpet from one manufacturing batch and dye lot.

Antimicrobial treatment

Requirement: Non-metallic, colourless, odourless, positively charged polymer applied during manufacturing to form a molecularly bonded surface to resist bacteria and mould growth.

Insect resistance

Requirement: Carpets and underlays comprising materials either inherently resistant to insect attack or treated against insect attack by moth and carpet beetle, by application of insect resist agents (IRA) to the yarn during wet processing at the manufacturing stage.

Insect resist treatment of wool: Application Level 4 to the recommendations of Woolmark Specification CP-4.

Stain and soil resistance

Requirement: Carpet with one or more of the following:

- Fluoro-treatments: Fluorochemical soil and liquid repelling chemical treatment applied during manufacturing.

- Stain blockers: Colourless acid-based dye stainblocker applied to dyed fibres.

2.4 CARPET TILES

General

Type: Non-stick, non-curling tiles capable of being taken up without damage and then re-laid in different positions.

Marking: On the back, showing manufacturer's instructions or directional arrow for laying.

Tolerances

Requirement: Conform to the following:

- Dimensional tolerance: 0.2%.
- Squareness: Maximum difference of 2 mm between lengths of diagonals.

Sustainable carpet tile backing

Re-usable backing: Proprietary vinyl backing to carpet tiles capable of separation and recycling in new carpet tiles.

2.5 UNDERLAYS

Application

Performance: To AS 2455.1 clause 1.5.2.

Fibre cement hard underlay

Standard: To AS/NZS 2908.2.

Thickness: 5 mm minimum.

Wet process fibreboard (hardboard) underlay

Standard: To AS/NZS 1859.4.

Classification: General purpose medium board, manufactured specifically as flooring underlay.

Thickness: 5.5 mm.

Soft underlay

Standard: To AS 4288.

2.6 OTHER MATERIALS

Adhesives

General: Compatible with the floor covering material, and suitable for bonding it to the subfloor to AS 2455.1 clause 1.5.3.

Friction compound: Suitable for holding carpet tiles in position without permanent sticking.

Hot-melt adhesive tapes

General: Commercial grade glass fibre and cotton thermoplastic adhesive-coated tape 60 mm wide on a 90 mm wide metal foil base and backed with silicone-coated release paper.

Preformed carpet grippers

General: Architectural plywood carpet grippers with 3 rows of corrosion-resistant angled pins of length appropriate to the carpet type to AS 2455.1 clause 1.5.4.

Size (minimum): 33 mm wide x 7 mm thick.

Location: At edges, except where edge strips are used. Provide double grippers to edges where recommended by the manufacturer.

Edge strips

Type: Heavy duty edge strip appropriate to the floor covering type (tackless or adhesive fixed), capable where necessary of accommodating different levels of adjacent floor finishes.

Form: Metal moulding or extrusion, with vinyl inserts.

Location: At exposed edges of the carpet, and at junctions with differing floor finishes or finishes of a different thickness. Where edge strips occur at doorways, locate the junctions directly below the closed door.

3 EXECUTION

3.1 PREPARATION

General

Pre-installation requirements: To AS 2455.1 Section 2.

- Carpet tiles: Pre-laying requirements including access panel floors to AS 2455.2 clause 4.

Working environment: Do not start work before the building is enclosed, wet work is complete and dry, overhead work is complete and good lighting is available.

Protection: Protect adjoining surfaces.

Substrates

General: Conform to the following:

- To AS 2455.1 or AS 2455.2, as appropriate.
- Clean and free of any deposit or finish which may impair adhesion or location and functioning of control joints.
- Free of any imperfections, including ridges, indentations and projections which may adversely affect the installed carpet.

Concrete substrate rectification: Remove projections, grind as necessary and fill voids and hollows with a levelling compound compatible with the adhesive to achieve the required tolerance.

Timber substrate rectification: Remove projections. If conformance with the **Substrate tolerance table** cannot be achieved, fix a hard underlay in brick pattern. Make sure joints do not coincide with substrate joints.

Moisture content: Do not start installation unless:

- Concrete: The moisture content and alkalinity of the concrete has been tested to AS 2455.1 Appendix B and the values in AS 2455.1 Appendix B and AS 2455.2 Appendix B as appropriate have been obtained.
- Timber, plywood or particleboard substrates: The moisture content of the substrate has been tested to AS 1080.1 for timber and particleboard or AS/NZS 2098.1 for plywood and values are obtained as follows:
 - . Air conditioned buildings: 8 to 10%.
 - . Intermittently heated buildings: 10 to 12.5%.
 - . Unheated buildings: 12 to 15%.

Alkalinity: Do not start installation unless:

- Concrete: The alkalinity of the concrete has been tested to AS 2455.1 Appendix B and the values in AS 2455.1 Appendix B and AS 2455.2 Appendix B as appropriate have been obtained.

Fixtures: Remove door stops and other fixtures, and refix in position undamaged on completion of the

installation. Make sure fixings penetrate substrate and are stable.

Substrate tolerance table

Property	Length of straightedge laid in any direction	Max. deviation under the straightedge
Flatness Class B	3 m	6 mm
Smoothness	150 mm	1 mm
Planar	2000 mm	4 mm

3.2 INSTALLATION - CARPET

General

Requirement: To AS 2455.1 Section 3 and the manufacturer's recommendations.

Setting out

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

Partition layout: Confirm that permanent partitions have been installed before starting carpet laying.

Seaming methods

Woven carpet: Machine or hand sew. Do not provide glued taped seams unless selvages are woven to suit and recommended by manufacturer.

Tufted carpet: Seam with hot-melt adhesive tape.

Seam sealing: Apply appropriate seam sealer to each cut edge.

Cutting laid carpet

Method: If penetrations through laid carpet are necessary for electrical, telephone or other outlets, cut the carpet either by cross cutting or by cutting rectangular or circular openings.

Cutting holes in concrete floors: Protect the carpet and remove concrete particles and dust on completion. Replace the cut carpet over the opening without any signs of fraying or other damage, and fix with a peel-up adhesive, or resew.

3.3 INSTALLATION - CARPET TILES

General

Installation: To AS 2455.2 and the manufacturer's recommendations.

3.4 STAIRS AND LANDINGS

Installation

General: To AS 2455.1 clause 3.10.

Concrete stairs

Fixing: Adhesive method.

Laying method: Apply the floor covering continuously to the treads and risers.

Timber stairs

Closed risers:

- Fixing: Tackless method, with a gripper strip in each angle between treads and risers.
- Laying: Apply the floor covering continuously to the treads and risers.

Open risers:

- Fixing: Adhesive.
- Laying: Wrap the carpet around the tread and neatly butt join beneath the nosing if a separate

nosing is required, or if not, in the centre of the underside of the tread.

3.5 COMPLETION

Cleaning

Requirement: Progressively clean the work.

Remove waste, excess materials and adhesive.

Final cleaning: When the installation is complete, clean the carpet as necessary to remove extraneous matter, marks and soiling and to lift the pile where appropriate.

Protection

Requirement: Provide fabric drop sheets. Do not use plastic sheeting. If wheeled traffic is to follow carpet installation, protect with hardboard sheets butted and fixed with adhesive tape.

0654 ENGINEERED PANEL FLOORING

1 GENERAL**1.1 RESPONSIBILITIES****Performance**

Requirement: Provide floating flooring systems to substrates as follows:

- Appropriately smooth and flat for the intended use.
- Form the pattern required.
- With the timber content of the panel at its equilibrium moisture content.

1.2 SUBMISSIONS**Fire performance**

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

Products and materials

General: Submit the following:

- Floor product manufacturer's detailed handling and installation recommendations.
- Product technical data sheets.

Samples

General: Submit samples of each timber flooring product illustrating the range of variation in colour and figure.

Tests

Site tests: Submit results, as follows:

- Moisture content test.

1.3 INSPECTION**Notice**

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

- Subfloor immediately before flooring.
- Trial set-out before execution.
- Control joints before fitting skirting.

2 PRODUCTS**2.1 GENERAL****Storage and handling**

General: Deliver panel flooring to site in unbroken wrapping or packs. Store in dry conditions, a minimum 100 mm above the subfloor. Do not store on the subfloor until the moisture content of the subfloor is suitable for the installation of the floor. Do not store in areas with wet plaster or paint.

Formaldehyde emission class

Requirement: Maximum E1 or E₁.

2.2 FIRE PERFORMANCE**Fire hazard properties**

Critical radiant flux: Tested to AS ISO 9239.1.

2.3 UNDERLAYS**Moisture protection underlay**

Floating floor vapour barrier: Minimum 200 micron thick high-impact resistant polyethylene film.

Adhesive fix floor vapour barrier: Compatible with the subfloor, adhesive and flooring material and to the flooring material manufacturer's recommendations.

Acoustic underlay

General: Resilient underlay fixed with compatible adhesive.

2.4 ADHESIVES**General**

Requirement: Compatible with the subfloor and flooring material and to the flooring material manufacturer's recommendations.

Ventilation: Provide ventilation, appropriate for moisture curing.

2.5 ENGINEERED PANEL FLOORS**Flooring panels**

General: As documented.

Recycled timber: Re-sawn and finished to eliminate weathering stains and expose fresh timber.

3 EXECUTION**3.1 PREPARATION****Subfloor**

Cleaning: Remove loose material and dust and any deposits or finishes that may impair adhesion or location and functioning of control joints.

Rectification: Conform to the following:

- Solid or continuous subfloors: Remove excessive projections and fill voids and hollows with a self-smoothing levelling compound compatible with the flooring including any adhesive.
- Plywood and particleboard subfloors: If required to achieve a smooth finish, sand joints between sheets.
- Existing timber flooring subfloors: Remove cupping, rough material and surface finishes by rough sanding.

Flatness: Conform to the following:

- Adhesive fix floors: Not greater than 3 mm deviation of the surface under a 3 m straight edge laid in any direction.
- Floating floors: Not greater than 3 mm deviation of the surface under a 1 m straight edge laid in any direction.

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%.

Conformance: Confirm that the moisture content of the timber flooring products, as delivered, is similar to the moisture content of the subfloor as measured on site. If not, allow for acclimatisation.

Acclimatisation

General: Acclimatise the flooring by stacking it in the in-service environment for a minimum period of two weeks with air circulation to all surfaces, after the following construction operations are complete and monitor progress:

- Air conditioning operational.
- Lighting operational.
- Site drainage and stormwater works are complete.
- Space fully enclosed and secure.
- Wet work complete and dry.

Vapour barrier

General: Lay high-impact resistant polyethylene film over the concrete subfloor. Lap 300 mm, seal the laps with pressure-sensitive tape and return up the vertical surfaces and trim at the level of the flooring.

3.2 INSTALLATION

Room environment

General: During fixing and stabilising, operate the heating system of radiant heated or air conditioned rooms at 1.5°C above normal maximum temperature.

Trial set-out

General: Prepare a trial panel set-out to each area, as follows:

- Maximise the size of equal margins of cut panels.
- Locate control joints.

Laying engineered panel floors

Method: To the manufacturer's recommendations.

Performance for adhesive fixing: Spread adhesive and lay boards to achieve the following:

- Contact between panel and adhesive: 75%. Verify by lifting and examining 1 panel in 20.
- Clamp starting and finishing rows to prevent sideways movement.
- Avoid clusters of end joints.
- Make sure adhesive does not bleed through at joints.
- Remove excess adhesive progressively before initial cure.
- Hold down in contact with the adhesive over night to achieve a complete cure.
- If pins or nails are used as well as adhesive for panels, punch below the surface without bruising. Fill holes to match the panels.

Control joints: Provide control joints as follows:

- Against vertical building elements: 12 mm wide, cork filled.
- To divide floors into maximum dimensions of 6 m: 4 mm wide silicone sealant filled.

3.3 TESTING

Substrate tests

Moisture content of concrete: Test subfloors for suitability for the installation of flooring to AS 1884 Appendix A.

- Maximum relative humidity: To AS 1884 Appendix A3.1.2 and A3.1.3.

Moisture content of timber, plywood and particleboard subfloors: To AS/NZS 2098.1 for plywood and AS/NZS 1080.1 for timber and particleboard.

3.4 COMPLETION

Protection

General: Provide protection as follows:

- Floors: With used carpet taped at all joints. Do not cover with sheet plastic.
- Stair treads: Full timber or plywood casing.

0655 TIMBER FLOORING**1 GENERAL****1.1 RESPONSIBILITIES****Performance**

Requirements:

- Appropriately secured.
- Appropriately smooth and flat for the intended use.
- Pattern as required.
- Structurally adequate.
- Suitable for the applied finish.

1.2 SUBMISSIONS**Certification**

Certificate: Submit a supplier's certificate (which may be included on an invoice delivery docket or packet label) verifying conformance to grading, species and board size and noting moisture content range.

Inspection: If neither branding nor certification is adopted, submit a report by an independent inspecting authority verifying conformance.

Fire performance

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

Samples

General: Submit samples of each timber flooring type illustrating the range of variation in colour and figure.

Tests

Site tests: Submit results, as follows:

- Moisture content test.

1.3 INSPECTION**Notice**

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

- Subfloor and any subfloor space before the floor laying.
- Trial set-out before execution.
- Control joints before fitting skirting.
- Completed installation before the application of coated finishes.

2 PRODUCTS**2.1 GENERAL****Storage and handling**

General: Deliver timber flooring to site in unbroken wrapping or packs. Store in dry conditions a minimum 100 mm above the subfloor. Do not store on the subfloor until the moisture content of the subfloor is suitable for the installation of the floor. Do not store in areas of wet plaster or paint.

Adhesive

Requirement: Compatible with the subfloor and flooring material and to the flooring material manufacturer's recommendations.

Ventilation: Provide ventilation appropriate for moisture curing.

Acoustic underlay

General: Resilient underlay fixed with compatible adhesive.

2.2 FIRE PERFORMANCE**Fire hazard properties**

Critical radiant flux: Tested to AS ISO 9239.1.

2.3 SHEET FLOORING**Plywood**

Standard: To AS/NZS 2269.0.

Plywood formaldehyde emission class to AS/NZS 2269.0: Class E₁.

Surface grade: CD.

Bond: Type A to AS/NZS 2754.1.

Particleboard

Particleboard: To AS/NZS 1860.1, Class 1.

Particleboard formaldehyde emission class to AS/NZS 1860.1: Class E₁.

2.4 STRIP FLOORING**New hardwood**

Standard:

- Product specification: To AS 2796.1.
- Grading: To AS 2796.2.

New softwood

Standard:

- Seasoned cypress pine: To AS 1810.
 - . Grade: 1.
- Softwood – pinus ssp: To AS 4785.2.
 - . Grade: Appearance.
- Softwood – other: To AS 4785.2.
 - . Grade: Select.

Recycled timber

Standard: To FWPA PN06.1039.

- Product requirements: To Section 3.
- Grading: To Section 5.1.

Identification

General: Identify timber using branding or certification.

- Branding: Brand timber under the authority of a recognised product certification scheme to *0185 Timber products, finishes and treatment*, as applicable to the product. Locate the brand mark on faces which will be concealed in the works.
- Provide certification from the recognised product certification scheme to *0185 Timber products, finishes and treatment*, as appropriate.

3 EXECUTION

3.1 PREPARATION

Subfloor

Cleaning: Remove loose material and dust and any deposits or finishes that may impair adhesion or location and functioning of control joints.

Rectification: Conform to the following:

- Solid or continuous subfloors: Remove excessive projections and fill voids and hollows with a self-smoothing levelling compound compatible with the flooring including any adhesive.
- Plywood and particleboard subfloors: If required to achieve a smooth finish, sand joints between sheets.
- Particleboard subfloors with adhesive fixed flooring: Rough sand to remove wax layer.
- Existing timber flooring subfloors: Remove cupping, rough material and surface finishes by rough sanding.

Flatness of concrete subfloor:

- Floors laid on plywood or battens: Not greater than 3 mm deviation of the surface under a 1.5 m straightedge laid in any direction.
- Floors laid by direct adhesive fix: Not greater than 3 mm deviation of the surface under a 3 m straightedge laid in any direction.

Flatness of joist and sheet flooring subfloor:

- Not greater than 3 mm deviation of the surface under a 1.5 m straightedge laid in any direction.

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 or particleboard flooring 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%.

Conformance: Confirm that the moisture content of the timber flooring products, as delivered, is similar to the moisture content of the subfloor as measured on site. If not, allow for acclimatisation or provide additional expansion joints.

Acclimatisation

General: Acclimatise the flooring by stacking it in the in-service environment for a minimum period of two weeks with air circulation to all surfaces, after the following construction operations are complete and monitor progress:

- Air conditioning operational.
- Lighting operational.
- Site drainage and stormwater works are complete.
- Space fully enclosed and secure.

- Wet work complete and dry.

3.2 SUPPORT FIXING - SHEET FLOORING

Battens for sheet flooring on concrete slabs

Framing fixed direct: Fix seasoned battens to the concrete slab in conformance with the **Sheet flooring battens table** so that their top surfaces are aligned.

- Battens: 70 x 35 mm seasoned timber.
- Spacing of fasteners: < 900 mm.

Vapour barrier under battens: 200 µm high-impact resistant polyethylene film. Lap 300 mm, seal the laps with pressure-sensitive tape and return up the vertical surfaces and trim at the level of the flooring.

Sheet flooring battens table

Plywood stress grade	Plywood sheet thickness mm	Batten spacing mm
F14	12.5	450
F11	18.5	600
F14	17	600

3.3 SUPPORT FIXING – STRIP FLOORING

Battens for strip flooring on concrete slabs

General: Make sure support members are in full lengths.

Framing fixed direct: Fix seasoned battens to the concrete slab so that their top surfaces are aligned.

- Battens: 70 x 35 mm seasoned timber or 60 x 19 mm high density hardwood.
- Spacing of fasteners: < 900 mm.

Vapour barrier under battens: 200 µm high-impact resistant polyethylene film. Lap 300 mm, seal the laps with pressure-sensitive tape and return up the vertical surfaces and trim at the level of the flooring.

Battens for strip flooring on steel joists

General: Fix seasoned battens along the steel joists with countersunk screws so that their top surfaces are aligned.

- Batten size: Minimum 35 mm thick.
- Spacing of fasteners: < 600 mm.

Strip flooring battens table

Strip flooring timber (average species density)	Standard	Grade	Flooring thickness	Batten spacing for flooring type	
				Butt jointed	End matched
Cypress	AS 1810	Grade 1	19	510	410
		Grade 2	20	510	410
Australian hardwood	AS 2796.1	Select	19	630	500
		Medium feature - Standard	19	570	450
Softwood: Slash pine	AS 4785.1	Select and standard	19	510	410
Softwood: Other pinus species		Select and standard	19	470	350
Softwood: Araucaria (Hoop pine)		Manufacturer grade	20	510	410

3.4 FIXING SHEET FLOORING

Sheet flooring batten fixed on concrete slabs

General: Fix plywood to the battens so that their top surfaces are aligned.

Installation: Lay the length of the sheets at right angles to the supports. Stagger the end joints and locate them centrally over supports. If sheets are not tongue and grooved provide noggings or trimmers to support the edges.

Fixing to battens:

- Mechanically fixed only: 150 mm along ends, 300 mm on intermediate battens.
- Adhesive/mechanically fixed: Continuous 10 mm adhesive bead and mechanical fixings at 300 mm.
- Adhesive fixed only: Continuous 10 mm adhesive bead with downward pressure during curing.

Plywood control joints: Provide joint widths as follows:

- Against vertical building elements: 10 mm.
- Between sheets: 6 mm.
- Between tongue and groove sheets: Hand pressure assembly.

Sheet flooring adhesive fixed on concrete slabs

Vapour barrier: A liquid applied membrane compatible with the adhesive system.

Plywood: Apply a sealant to the underside compatible with the adhesive.

Strip flooring: Fix sheets in a stretcher bond or at 45° to the floor board direction.

Adhesive and mechanical fixing:

- Mechanical fixing centres: 300 mm from edges and at 600 x 600 mm.

- Adhesive beads: 10 mm diameter and at 450 x 450 mm.

Adhesive fixed only: Apply adhesive with a notched trowel to the manufacturer's recommendations. Provide downward pressure during curing.

Plywood control joints: Provide joint widths as follows:

- Against vertical building elements: 10 mm.
- Between sheets: 6 mm.

Sheet flooring mechanically fixed on concrete slabs

Strip flooring: Fix sheets in a stretcher bond or at 45° to the floor board direction.

Mechanical fixing: 100 mm from edges and 550 mm centres along grain and 500 mm centres across grain.

Plywood control joints: Provide joint widths as follows:

- Against vertical building elements: 10 mm.
- Between sheets: 6 mm.

Sheet flooring fixed on joists

Installation: Lay the length of the sheets at right angles to the supports so that their top surfaces are aligned. Stagger the end joints and locate them centrally over joists. If sheets are not tongue and grooved provide noggings or trimmer joists to support the edges.

Fixing centres: Maximum 300 mm on each support.

Particleboard and plywood sheet flooring:

- Timber joists and battens: Adhesive and mechanically fix.
- Steel joists: Fix with countersunk self-drilling winged screws.

3.5 FLOOR FIXING

Room environment

General: Fix flooring in the average in-service environment. During fixing operate the heating system of radiant heated or air conditioned rooms at 1.5°C above normal maximum temperature.

Adhesive

Strip flooring: Use a polyurethane elastomeric adhesive in addition to mechanical fixing as follows:

- Continuously supported flooring: 4 mm beads at 300 mm spacing at right angles to run of flooring.
- Intermittently supported flooring: 6 to 10 mm bead along each joist or batten.

Strip flooring fixed by direct adhesion: Spread adhesive over subfloor in conformance with manufacturer's recommendations, to provide a full bed of adhesives.

Mechanical fixing

General: Make sure the boards are in contact with the subfloor at the time of fixing, particularly where boards are machine nailed. If nails are to be less than 12 mm from ends of boards, pre-drill nail holes 0 to 1 mm undersize.

Top nailing: For boards of 65 to 135 mm cover width, use two nails.

Secret fixing: Do not use boards of more than 85 mm cover width, and use one staple or cleat skewed at 45°.

Sinking: Punch nails 3 mm below finished surfaces and fill the sinking flush with a material tinted to match the darker tone of the flooring which is compatible with the floor finish.

Control joints

Perimeters: Provide 10 mm wide expansion joints against vertical building elements.

Strip flooring: For floors greater than 6 m wide select from the following:

- Partially cramp strip flooring to allow a 1 mm gap every 600 mm or 1.5 mm every metre.
- Divide floors into maximum widths of 6 m with expansion joints 12 mm wide filled with cork.

Strip flooring

General: Blend floor boards from more than one pack to distribute the colour range and grade features throughout the floor.

Installation: Lay in straight and parallel lines with each board firmly butted to the next and firmly in contact with the subfloor. If laid over joists or battens cramp sufficient only to bring the boards together and no more than 800 mm of flooring at any one time. With secret fixing do not cramp more than one board at a time.

Fixing to softwood joists, or battens: Apply adhesive in addition to mechanical fixing.

Strip flooring on sheet flooring:

- On joists or battens: Nail through sheeting to joists or battens or secret fix into sheeting only.
- Direct fix to concrete slab: Secret fix only, with adhesive as follows:
 - . Boards up to 85 mm wide: A continuous adhesive bead at 90° to board length midway between fixing points.
 - . Boards 85 to 135 mm wide: A full adhesive bead.

Set-out: Locate joints in boards so that they are evenly distributed as follows:

- General: Staggered randomly and at least 450 mm apart.
- Butt joints: Centrally on supports.
- End-matched joints: Not adjacent within the same span between joist/battens.
- Minimum number of spans across supports: 2.

Strip flooring fixed by direct adhesion

Vapour barrier: A liquid applied membrane compatible with the adhesive system.

Installation:

- Lay in straight and parallel lines with each board firmly butted to the next and firmly bedded on the adhesive on the subfloor.
- Temporarily or permanently hold floor boards in position with pins, nails or weights.
- Hold down in contact with the adhesive during curing.
- If pins or nails are used to permanently position floor boards, punch below the surface without

bruising. Fill holes to match the darker floor boards.

3.6 TESTING

Substrate tests

Moisture content of concrete: Test subfloors for suitability for the installation of flooring to AS 1884 Appendix A.

- Maximum relative humidity: To AS 1884 Appendix A3.1.2 and A3.1.3.

Moisture content of timber, plywood and particleboard subfloors: To AS/NZS 2098.1 for plywood and AS/NZS 1080.1 for timber and particleboard.

3.7 COMPLETION

Protection

General: Provide protection as follows:

- Floors: With hardboard taped at all butt joints. Do not cover with sheet plastic.
- Stair treads: Full timber or plywood casing.

Spare flooring products

General: Supply an extra 5% of flooring products, to be stored on site as spares.

0671 PAINTING**1 GENERAL****1.1 RESPONSIBILITIES****Performance****Requirement:**

- Consistent in colour, gloss level, texture and dry film thickness.
- Free of runs, sags, blisters, or other discontinuities.
- Paint systems which are fully opaque or at the documented level of opacity.
- Clear finishes at the level of transparency consistent with the product.
- Fully adhered.
- Resistant to environmental degradation within the manufacturer's stated life span.

1.2 STANDARDS**Painting**

General: To the recommendations of those parts of AS/NZS 2311 referenced in this worksection.

1.3 INTERPRETATION**Definitions**

General: For the purposes of this worksection the definitions given in AS/NZS 2310 and the following apply:

- Gloss: The optical property of a surface, characterised by its ability to reflect light specularly.
- Gloss unit: Numerical value for the amount of specular reflection relative to that of a standard surface under the same geometric conditions.
- Levels of gloss finish: When the specular direction is 60 degrees, surfaces with the following specular gloss reading is defined as follows:
 - . Full gloss: Over 85 gloss units.
 - . Gloss: Over 50 and up to 85 gloss units.
 - . Semi-gloss (satin): Over 20 and up to 50 gloss units.
 - . Low gloss (low sheen): Over 5 and up to 20 gloss units.
 - . Flat finish (matt): Up to 5 gloss units.
- Opacity: The ability of a paint or textured and membrane coating to obliterate the colour difference of a substrate.
- Paint or coating system: A product in liquid form, which when applied to a surface, forms a dry film having protective, decorative or other specific technical properties.
- Primer, prime coat: The first coat of a painting system that helps bind subsequent coats to the substrate and which may inhibit its deterioration.
- Sealer: A product used to seal substrates to prevent the following:
 - . Materials from bleeding through to the surface.

- . Reaction of the substrate with incompatible top coats.
- . Undue absorption of the following coat into the substrate.
- Substrate: The surface to which a material or product is applied.
- Undercoat: An intermediate coat formulated to prepare a primed surface or other prepared surface for the finishing coat.

1.4 SUBMISSIONS**Products and materials**

General: Submit the following at least 3 weeks before the paint is required:

- Paint brand name and product range quality statement.
- Safety data sheets (SDS) showing the health and safety precautions to be taken during application.
- The published recommendations for maintenance.

Samples

Clear finish coatings: Submit labelled samples of timber or timber veneer matching those to be used in the works as follows:

- Label for identification and prepare, putty, stain, seal and coat, as documented.
- Size: Minimum 500 x 500 mm.

Opaque coatings: Submit labelled samples of each coating system, on representative substrates, showing surface preparation, colour, gloss level, texture, and physical properties.

Wet samples

General: Submit two clearly labelled, 500 mL samples of each type of coating required to be tested.

Subcontractors

Specialist applicators: Submit name and contact details of proposed specialist applicators.

1.5 INSPECTION**Notice**

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

- Opaque finishing stages:
 - . Completion of surface preparation.
 - . After application of final coat.
- Clear finishing stages:
 - . Before surface preparation of timber.
 - . Completion of surface preparation.
 - . After application of final coat.

2 PRODUCTS**2.1 GENERAL****Storage and handling**

General: Store materials not in use in tightly covered containers in well-ventilated areas with temperatures maintained at the manufacturer's recommendations.

2.2 PAINTING MATERIALS

Standards

Paint types: To AS/NZS 2311 Table 4.2 and the following:

- Metal primer - general purpose for iron and steel: To AS/NZS 3750.19.
- Metal primer - latex for metallic zinc surfaces: To AS 3730.15.
- Metal primer - solvent borne for ferrous metallic surfaces : To AS 3730.21.
- Metal primer - zinc-rich organic for iron and steel: To AS/NZS 3750.9.

Combinations

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

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

Putty and fillers

Material: To the recommendations of the paint system manufacturer, suitable for the substrate and compatible with the primer.

Tinting

General: Provide only products which are colour tinted by the manufacturer or supplier.

Toxic ingredients

General: To the *Poisons Standard (SUSMP)* Part 2 Section 7.

3 EXECUTION

3.1 PREPARATION

Order of work

Other trades: Before painting, complete the work of other trades as far as practicable within the area to be painted, except for the installation of fittings, floor sanding and laying flooring materials.

Clear finishes: Complete clear timber finishes before commencing opaque paint finishes in the same area.

Protection

General: Before painting, clean the area and protect it from dust contamination. Use drop sheets and masking agents to protect surfaces, including finished surfaces and adjacent finishes, during painting.

Fixtures and furniture: Remove door furniture, switch plates, light fittings and other fixtures before painting, and conform to the following:

- Labelling and storage: Attach labels or mark fixtures using a non-permanent method, identifying location and refixing instructions, if required. Store and protect against damage.

Difficult to remove fixtures: Where removal is impractical or difficult, apply surface protection before substrate preparation and painting.

Substrate preparation – generally

General: Prepare substrates to receive the documented paint system.

Cleaning: Clean down the substrate surface. Do not cause damage to the substrate or the surroundings.

Filling: Fill cracks and holes with fillers, sealants, putties or grouting cements as appropriate for the finishing system and substrate, and sand smooth:

- Clear finish: Provide filler tinted to match the substrate.

Clear timber finish systems: Prepare the surface so that its attributes will show through the clear finish without blemishes, using methods including the following:

- Removal of bruises.
- Removal of discolourations, including staining by oil, grease and nailheads.
- Bleaching where necessary to match the timber colour sample.
- Puttying.
- Fine sanding, with the last abrasive no coarser than 220 grit, so that there are no scratches across the grain.

Treated surfaces: If surfaces have been treated with preservatives or fire retardants, make sure the paint system is compatible with the treatment and does not adversely affect its performance.

Exposed steel in coastal areas

Requirement: Before painting, including before applying primers and sealers, clean exposed surfaces to the recommendations of AS/NZS 2312 Section 4.

Unpainted surfaces

Standard: To AS/NZS 2311 Section 3.

Cleaning external surfaces

Sound external surfaces other than timber: Remove dirt, grease, loose and foreign matter, efflorescence and mould by water blasting or steam cleaning without damaging the surface. Remove remaining loose material with hand tools. Use sanding blocks to preserve the arrises of masonry and stone details.

Efflorescence: Eliminate the source of salt and water before cleaning. Allow surface to dry for 15 to 30 days before repainting.

New masonry: Allow 30 days for the masonry to cure and pH level to stabilise before painting.

3.2 PAINTING SYSTEMS

General

Number of coats: Except where one or two coat systems are documented, each paint system consists of at least 3 coats.

New unpainted interior surfaces

Standard: To AS/NZS 2311 Table 5.1.

New unpainted exterior surfaces

Standard: To AS/NZS 2311 Table 5.2.

Specialised painting systems

Standard: To AS/NZS 2311 clause 5.2. Provide the following final coats:

- High build textured or membrane finishes for concrete and masonry: Paint reference number B38 using products conforming to the AS 4548 series.

- Two-pack gloss pigmented polyurethane: Paint reference number B44.
- Two-pack epoxy: Paint reference number B29.
- Two-pack water based epoxy: Paint reference number B29A.

Exposed steel in coastal areas

Standard: To AS/NZS 2312 Table 6.3 for the appropriate durability.

3.3 APPLICATION**Exposed steel in coastal areas**

Requirement: Immediately before application of each subsequent paint coat, clean painting surface to remove any soluble salts and contamination which are likely to affect the performance of subsequent paint coatings.

Paint application: To the recommendations of AS/NZS 2312 Section 5 and the paint manufacturer.

Paint coating systems: Conform to the recommendations of AS/NZS 2312 Section 6.

Light levels

General: ≥ 400 lux.

Substrate moisture content

Requirement: Use a moisture meter to demonstrate that the moisture content of the substrate is at or below the recommended maximum level for the type of paint and the substrate material.

Paint application

Standard: To AS/NZS 2311 Section 6.

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

Painting conditions

General: Unless the paint is recommended for such conditions, do not paint under the following conditions:

- Dusty conditions.
- Relative humidity: $> 85\%$.
- Surface temperature: $< 10^{\circ}\text{C}$ or $> 35^{\circ}\text{C}$.

Priming timber before fixing

General: Apply one coat of wood primer, and 2 coats to end grain, to the back of the following before fixing in position:

- External fascia boards.
- Timber door and window frames.
- Bottoms of external doors.
- Associated trims and glazing beads.
- Timber board cladding.

Spraying

General: If the paint application is by spraying, use conventional or airless equipment which conforms to the following:

- Satisfactorily atomises paint being applied.
- Does not require paint to be thinned beyond the maximum amount recommended by the manufacturer.
- Does not introduce oil, water or other contaminants into the applied paint.

Paint with known health hazards: Provide personal protection, masking, ventilating and screening facilities to AS/NZS 4114.1 and AS/NZS 4114.2.

Sanding

Clear finishes: Sand the sealer using abrasives no coarser than 320 grit without cutting through the colour. Take special care with round surfaces and edges.

Repair of galvanizing

Cleaning: For galvanized surfaces which have been subsequently welded, power tool grind to remove all surface contaminants, including rust and weld splatter. Prime affected area immediately after cleaning.

Primer: Type 2 organic zinc-rich coating for the protection of steel to AS/NZS 3750.9.

Tinting

General: Tint each coat of an opaque coating system so that each has a noticeably different tint from the preceding coat, except for top coats in systems with more than one top coat.

Services

General: Paint all new services and equipment, including those in plant rooms, if not embedded, except chromium, anodised aluminium, GRP, PVC-U, stainless steel, non-metallic flexible materials and normally lubricated machined surfaces.

Proprietary items: Repaint only if damaged.

Windows

Operation: Make sure opening windows function correctly before and after painting.

Doors

Drying: Maintain door leaf in the open position during drying. Do not allow door hardware or accessories to damage the door finish during the drying process.

Wet paint warning

Notices: Place in a conspicuous location and do not remove until the paint is dry.

3.4 COMPLETION**General**

Protection and masking: Remove masking and protection coverings before paint has dried.

Cleaning: On completion of painting, remove splatters from adjacent finished surfaces by washing, scraping or other methods which do not scratch or damage the surface.

Reinstatement: Repair, replace or refinish any damage, including works of other trades. Touch up new damaged paintwork or misses only with the paint batch used in the original application.

Fixtures: Refix removed and undamaged fixture in the original location, make sure they are properly fitted and in proper working order.

Disposal of paint and waste materials.

Requirement: Conform to requirements of the local government authority.

0673 POWDER COATINGS**1 GENERAL****1.1 STANDARDS****General**

Application to aluminium and aluminium alloy substrates for architectural applications: To AS 3715 and AAMA 2603, AAMA 2604 and AAMA 2605 as appropriate.

Application to metal substrates other than aluminium for architectural applications: To AS 4506.

1.2 INTERPRETATION**Definitions**

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

- Powder coating: The process of preparing, applying, fusing and curing a thermoset powder coating material to a substrate:
 - . Thermoset powder coating: A mixture of finely ground particles of pigment and resin sprayed on to a prepared substrate. Charged powder particles adhere to electrically grounded surfaces until heated and fused into a smooth coating in a curing oven.
 - . Polyester powder coating: Uses an enhanced polyester resin.
 - . Fluoropolymer powder coating: Uses PTFE (poly tetra fluoro ethylene) for aluminium substrates.
- Substrate: The surface to which a material or product is applied.

1.3 SUBMISSIONS**Products and materials**

Coating manufacturer: Submit the following details at least 3 weeks before fabrication:

- Recommended coating system for the nominated service condition.
- Brand name.
- Storage and handling recommendations.
- Product data sheets.
- Maintenance recommendations.

Samples

Powder coating samples: Submit samples of each coating system on representative substrates, showing surface preparation, colour, gloss level, texture, and physical properties.

Subcontractors

Specialist applicators: Submit name and contact details of proposed specialist applicators as registered by the coating manufacturer.

Warranties

General: Submit the coating manufacturer's warranties, as documented.

2 EXECUTION**2.1 PREPARATION****Substrate pre-treatment**

Powder coating to aluminium: To AS 3715 Appendix G.

Powder coating to metals, other than aluminium: To AS 4506 Appendix I.

2.2 COATING PROPERTIES**Coating performance**

Powder coating to aluminium: To AS 3715, AAMA 2604 or AAMA 2605.

Powder coating to metals other than aluminium: To AS 4506 Section 2.

2.3 COMPLETION**Cleaning**

Aluminium architectural applications: Clean completed assembly to AS 3715 Appendix C.

Metal, other than aluminium, architectural applications: Clean completed assembly to AS 4506 Appendix D.

0702 MECHANICAL**1 GENERAL****1.1 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.

2 PACKAGED AIR CONDITIONING**2.1 AIR CONDITIONING DESIGN****Standards**

Ducted air conditioners: To AS/NZS 3823.1.2.

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

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.

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.

2.2 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.

2.3 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.

2.4 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.

Vibration isolation

General: Provide to each assembly at least four mountings, located to give uniform deflection under the applied load.

Isolation efficiency: $\geq 95\%$.

Suspended units:

- Suspended from lightweight structures: Metal spring or rubber-in-shear isolation mountings with at least 25 mm static deflection. Provide each mounting with a levelling screw and locknut.
- Suspended from heavyweight structure: Double deflection neoprene or rubber in shear mountings static deflection greater than or equal to 15 mm.

Floor mounted units: Mount on neoprene waffle pads.

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.

2.5 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.

2.6 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.

3 FANS

3.1 DESIGN

Fan efficiency

Requirement: Provide fans with efficiencies to BCA J5.4.

Centrifugal fans

Requirement: Select fans so the air flow can be increased $\geq 10\%$ above the rate documented as follows:

- Against the corresponding increased system resistance as installed.
- Without unstable operation.
- Without motor change.
- By speed change alone.

Axial flow fans

Requirement: Select fans so the air flow can be increased not less than 5% above the documented rate as follows:

- Against the corresponding increased system resistance as installed.
- Without motor change.
- Without unstable operation.
- By pitch angle change alone.

Fans with multi-speed motors

Requirement: Conform to the following:

- Two speed fans: Provide fans selected to perform duties documented.
- Fans with 3 or more speeds and single phase fans with adjustable speed control: Provide fans selected to achieve the duty documented at a speed not more than 80% of highest speed.

3.2 CENTRIFUGAL FANS – IN-LINE

General

Requirement: Non-overloading power characteristics.

Casings

Casing types: Rectangular or circular with spigot or flanges for duct mounting, with construction as follows:

- Steel: Metallic-coated steel sheet, spot welded. Brush and prime spot welds with zinc-rich organic primer to AS/NZS 3750.9.
- Glass reinforced plastic (GRP) or plastic: Moulded GRP or impact resistant plastic with integral support foot.

Access to impellers up to 350 mm diameter: Provide fan manufacturer's standard fast clamps both sides of the fan to permit removal of the impeller-motor assembly or fan as a whole.

Impellers

Requirement: Backward inclined or forward curved style, as documented.

Construction: Metallic-coated steel, extruded aluminium or polypropylene.

Balance: Balance impellers statically and dynamically.

Electrical

Motors: Direct mounted to impellers with minimum thermal class 155 (F) insulation to IEC 60085.

Bearings: Sealed for life bearings with a minimum rating fatigue life of 40 000 hours at 40°C ambient.

Overload protection: Provide manual reset current overload protection to AS/NZS 60335.2.80.

Electrical connection: Terminal box external to fan casing and wired to fan motor.

3.3 AXIAL FLOW FANS**General**

Requirement: Non-overloading power characteristics.

Casing

Type: Tubular, flanged at each end, constructed from mild steel, fully welded, hot-dip galvanized after fabrication.

Impellers

Requirement: Aerofoil section blades constructed from cast aluminium alloy or glass reinforced plastic.

3.4 ROOF MOUNTED FANS**Types**

General: Centrifugal, mixed flow, aerofoil axial or propeller.

Axial flow and propeller: Conform to **AXIAL FLOW FANS**.

Mixed flow fans:

- Impeller: Mixed flow with rotating parts vibration isolated from the unit casings by suitable resilient mountings.
- Arrangement: Position the motor above the impeller to allow servicing from above the roof.

Housing

Requirement: House fans in compact bases fitted with weathering skirts and a hinged or removable weatherproof cowl with bird screen.

Material: UV stabilised ABS, polypropylene, polyethylene, glass-fibre reinforced polyester or

steel, hot-dip galvanized (HDG) after manufacture, as documented.

Vertical discharge

Requirement: Weatherproof galvanized steel, plastic or aluminium backdraft dampers where the weather may enter when units are stopped.

Backdraft damper closure: Counterweighted or electrically driven.

Motors

Bearings: Sealed for life or grease-packed, fitted with lubrication lines extending through roof cowls. Provide bearings with a minimum rating fatigue life of 40 000 hours. Provide access to grease relief ports.

Minimum degree of protection: IP55.

3.5 WINDOW/WALL FANS**Housing**

Requirement: Provide the following:

- Isolating mountings.
- Discharge cowls with birdmesh guards.
- Backdraft shutters constructed from lightweight nylon or aluminium blades, arranged to gravity close when fans are not operating.

3.6 INSTALLATION**Duct connections**

Flexible connections: Provide flexible connections to prevent transmission of vibration to ductwork. If under negative pressure, make sure that flexible connection does not reduce fan inlet area. If necessary, provide spacer pieces between fans and flexible connections.

0802 HYDRAULIC**1 HYDRAULIC SYSTEMS****1.1 STANDARDS****General**

Plumbing and drainage: To AS/NZS 3500.0, AS/NZS 3500.1, AS/NZS 3500.2, AS/NZS 3500.3, AS/NZS 3500.4 and the PCA.

Copper pipe and fittings-installation and commissioning: To AS 4809.

Gas: To AS/NZS 5601.1.

Microbial control: To AS/NZS 3666.1, AS/NZS 3666.2 and the recommendations of SA/SNZ HB 32.

Authorised products

Authorised products: Listed in the WaterMark Product Database, unless otherwise required by the Network Utility Operator.

Labelling

Water efficiency labelling: Provide products conforming to and labelled to the Water Efficiency Labelling Scheme (WELS).

1.2 INTERPRETATION**Abbreviations**

General: For the purposes of this worksection the following abbreviation applies:

- LPG: Liquefied petroleum gas.

1.3 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.

1.4 INSPECTION**Notice**

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

- Excavated surfaces.
- Concealed or underground services.

1.5 INSTALLATION**Accessories**

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

Isolating valves: In addition to valves required to meet statutory requirements, provide valves to allow safe isolation of parts of the system, with minimum inconvenience to the building occupants, in event of leaks or maintenance.

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.

Movement compensation

Compensation: Arrange piping and wiring crossing building expansion joints so that moment in the joint does not cause damage.

1.6 PIPING**Finishes**

Exposed piping: 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.
- Externally and steel piping and iron fittings internally: Paint.
- In concealed but accessible spaces (including cupboards and non-habitable enclosed spaces): Leave copper and plastic unpainted except for identification marking. Prime steel piping and iron fittings.

Valves: Finish valves to match connected piping.

2 SANITARY FIXTURES**2.1 PRODUCTS****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: Double bowl with drainer on each side and single tap hole.

Sink size: As documented on drawings.

3 WATER HEATERS

3.1 GENERAL

Water heaters

Location: Locate water heaters where they can be maintained or replaced without damaging adjacent structures, fixtures or finishes.

Isolating valves: Provide isolation valves to water heaters.

3.2 ELECTRIC STORAGE WATER HEATERS

Description

General: Proprietary automatic electrically heated water heater including connections, controls and fittings.

Standards

General: To AS/NZS 4692.1.

Energy performance: To AS/NZS 4692.2.

Tariff

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

3.3 GAS STORAGE WATER HEATERS

Description

General: Proprietary automatic gas-fired water heater including connections, controls and fittings.

Standards

Installation: To AS/NZS 5601.1.

Heater design and construction: To AS/NZS 5263.1.2 and AS/NZS 4552.2. If a flue damper is available for the water heater supplied, provide one.

Energy performance: To AS/NZS 4552.2.

3.4 SOLAR WATER HEATERS

Description

General: Proprietary automatic water heater comprising solar collector and storage container and including connections, controls and fittings.

Standards

General: To AS/NZS 2712.

3.5 HEAT PUMP WATER HEATERS

Description

General: Proprietary automatic water heater comprising self-contained reverse cycle heating system and storage container, including connections, controls and fittings.

Standards

General: To AS/NZS 2712.

Safety: To AS/NZS 60335.2.40.

Performance evaluation: To AS/NZS 5125.1.

3.6 INSTANTANEOUS WATER HEATERS

Description

General: Provide heaters as documented.

4 TANKS

4.1 STANDARDS

General

Materials in contact with water for human consumption: To AS/NZS 3500.1 clause 2.3.

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

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

4.2 SUBMISSIONS

Warranties

Manufacturer's warranty: Submit the tank manufacturer's warranty. Include a copy of the warranty in the operation and maintenance manual.

4.3 PRODUCTS

Accessibility

Interior: Arrange tanks so the interior is accessible for inspection and cleaning. Arrange internal features to permit effective cleaning.

Support

Requirement: Provide structural support to withstand the weight of the tank when full without deformation or excessive settling.

4.4 BLADDER TANKS

General

Type: Proprietary plastic bladder type.

Material: Reinforced polymer conforming to AS 2070, resistant to puncture and microbial attack.

4.5 METALLIC-COATED STEEL TANKS

Construction

Materials: Conform to the following:

- Top and sides: Metallic-coated steel with polymer film to AS 2070 on the inside and prepainted on the outside.
- Base: Metallic-coated steel with polymer film to AS 2070 on inside and outside.
- Plinth: Provide a plinth under the whole area of the tank.

4.6 POLYETHYLENE TANKS

General

Standard: To AS/NZS 4766.

4.7 ABOVE GROUND TANK INSTALLATION

General

Restraint: Restrain the tank to prevent movement, when empty, caused by wind and other loads.

Base: 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.

Foundations

Requirement: Provide foundations for the tanks that are flat, level with irregularities less than 2 mm in any 1 m but no more than 6 mm in any 3 m, measured laterally or diagonally.

Intermittent supports: Continuous across the width of the tank and spaced to manufacturer's recommendations.

Polyethylene tanks

Support: Trim and compact the ground and place a level bed of sand at least 50 mm thick.

Coated steel tanks

Support: Fully support the tank on a self-draining timber or concrete base.

Corrosion protection:

- 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

Support: Locate on level base free from sharp objects. Install with manufacturer's supporting frame.

Relief: Provide over-pressurising relief and air vent.

4.8 COMPLETION

Cleaning

Cleaning: Wash and flush tanks to remove manufacturing and other contaminants.

5 STORMWATER – BUILDINGS

5.1 GENERAL

Standards

General: To AS/NZS 3500.3.

5.2 STORMWATER DRAINS

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

Termination: Select from the following:

- Termination over pit: Stop downpipe 100 mm above the ground level and discharged into grated pit. Do not connect directly into stormwater pipes.
- Direct connection: Bring downpipes out from the building at a suitable angle and level so the downpipe enters the underground drain at the finished level of the surrounding area. Turn up branch pipelines with bends to meet the downpipe, finishing horizontally 50 mm (nominal) above finished ground or pavement level. Seal joints between downpipes and drains.

5.3 SUBSOIL DRAINS

General

Requirement: Provide subsoil drains to intercept groundwater seepage and prevent water build-up behind walls and under floors and pavements. Connect subsoil drains to surface drains or to the stormwater drainage system as applicable.

Trench width: Minimum 450 mm.

Trench floor: Grade the trench floor evenly to the gradient of the pipeline. If the trench floor is rock, correct any irregularities with compacted bedding material.

Pipe depth: Provide the following minimum clear depths, measured to the crown of the pipe, below the following elements:

- Formation level of the pavement, kerb or channel: 100 mm.
- Average gradient of the bottom of footings: 100 mm.
- Finished surface of unpaved ground: 450 mm.

Jointing

General: At junctions of subsoil pipes provide tees, couplings or adaptors to AS 2439.1.

Pipe underlay (bedding)

General: Bed piping on a continuous underlay of bedding material, at least 75 mm thick after compaction. Lay the pipe with one line of perforations at the bottom.

Bedding thickness: Minimum 75 mm, maximum 150 mm, after compaction.

Chases: If necessary, form chases to prevent projections such as sockets and flanges from bearing on the trench bottom or underlay.

Pipe surrounds

General: Place the material in the pipe surround in layers, of a maximum 200 mm loose thickness, and compact without damaging or displacing the piping.

Depth of overlay:

- To the underside of the bases of overlying structures such as pavements, slabs and channels.
- To within 150 mm of the finished surface of unpaved or landscaped areas.

Geotextile

Requirement: Provide polymeric fabric formed from plastic yarn composed of at least 85% by weight propylene, ethylene amide or vinylidene chloride and containing stabilisers or inhibitors which provide resistance to deterioration due to ultraviolet light.

Marking: To AS 3705.

Protection: Provide heavy duty protective covering. Store clear of the ground and out of direct sunlight. During installation, do not expose the filter fabric to sunlight for more than 14 days.

Filter socks

General: Provide permeable polyester socks, capable of retaining particles 0.25 mm and greater. Securely fit or join the sock at each joint.

5.4 PITS

Finish to in situ exposed surfaces

General: Provide a smooth, seamless finish, using steel trowelled render or concrete cast in steel forms.

Location: At junctions, changes of gradient and changes of direction of stormwater drains, as documented.

Metal access covers and grates

Standard: To AS 3996.

Cover levels: Top of cover or grate, including frame:

- In paved areas: Flush with the paving surface.
- In landscaped areas: 25 mm above finished surface.
- Gratings taking surface water runoff: Locate to receive runoff without ponding.

5.5 TESTING**Pre-completion tests**

General: Before backfilling or concealing, carry out the following tests to AS/NZS 3500.3 Section 9:

- Downpipes within buildings: Air or water pressure test.
- Site stormwater drains and main internal drains: Air or water pressure test.
- Rising mains from pumped discharge: Water pressure test.

Leaks: If leaks are found, rectify and re-test.

5.6 COMPLETION**Cleaning**

General: Clean and flush the whole installation.

6 WASTEWATER**6.1 GENERAL****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.

6.2 PRODUCTS**Material selection**

Environmental conditions: Provide materials capable of withstanding the operational environmental conditions. Select and install to manufacturers' recommendations.

Dissimilar materials: Connect dissimilar materials using adapters to Network Utility Operator requirements and manufacturer's recommendations.

Rubber banded sleeves: Do not provide.

6.3 FLOOR WASTES**General**

Requirement: Provide each floor waste with a trap constructed of the material specified for the sanitary plumbing system. Fit off each riser with a chromium plated brass grating finished flush with the surrounding floor finish. If the floor surfaces are vinyl, provide gratings and outlets designed to permit the vinyl to be turned down into the outlet and the grating clamped down onto the surface.

Waterproofing: Make sure all penetrations through floors and finishes up to the edge of grates are fully waterproof.

Priming: Provide priming of floor wastes. If floor wastes cannot be primed via fixture, provide priming valves to maintain the water seal to AS/NZS 3500.2.

6.4 SANITARY PLUMBING**Order of work**

Requirement: Start drain laying at the downstream end of the drainage system (at the connection point to site infrastructure), not the upstream end. Confirm invert levels with building elements before starting to lay drains.

Expansion joints

Location: Provide expansion joints where pipes cross seismic or movement joints in the building, and from the building to below ground outside the building.

Inspection openings

Location: Provide inspection openings at each upstream end of branch and main drains, change of direction, entry to stacks and to AS/NZS 3500.2. Provide inspection openings complete with access riser brought up to finished floor levels. If access risers are located in tiled floor areas or surfaces with similar finishes, provide anti-slip inspection covers with neoprene gas tight sealing rings.

Size: Provide inspection openings that allow full access to the waste pipe.

Vertical stacks: Provide a removable access gate opening of size equal to the diameter of the pipe approximately 600 mm above finished floor level. If the stack is concealed behind a wall or duct, provide a hinged access panel in the wall or duct with finish to match the surface in which it is installed.

Tundishes

Location: Provide suitably sized, trapped tundishes to collect condensate wastes from mechanical equipment, as documented. Connect tundishes to nearest waste or floor drain. Connect tundish waste to floor wastes, wastes or drains and provide traps and vents where necessary.

Charging: If tundishes are not provided with a constant discharge from equipment and are connected directly to the sanitary plumbing system or drainage system, provide a trap seal primer valve to ensure that the trap of the tundish is charged at all times.

Vent pipes

Requirement : Provide upstream and downstream vents to AS/NZS 3500.2.

Location: Locate vents at least 6 m from any air intake or grille and at least 3 m from exhaust discharges.

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

Terminations: Provide vent cowls of the same material as the vent pipe.

Wet area floors

General: Where drainage connections pass through wet area floors, terminate 4 mm below the substrate surface.

6.5 SEWAGE TREATMENT

Septic tanks and interceptor tanks

Standard: To AS/NZS 1546.1.

Effluent disposal: To AS/NZS 1547.

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*.

Tank requirements and size: 1 x 1200 mm diameter and 1 x 1500 mm diameter concrete septic tanks.

Lid type: Trafficable.

Installation of apparatus for sewage treatment: To the *Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974 (WA)*.

Drains from floor level to septic tanks: Run in 100 mm sewer pipe.

I/O junctions: Bury connectors and junction boxes.

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).

6.6 COMPLETION

Cleaning

General: On completion clean and flush the whole installation.

7 COLD AND HEATED WATER

7.1 GENERAL

Standards

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

Copper pipe: To AS 4809.

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.

7.2 PRODUCTS

Backflow prevention devices

Standard: To AS/NZS 2845.1 and AS 2845.2.

Pressure drop: Select for lowest pressure drop compatible with the required functions.

Thermostatic mixing valves

Standard: To AS 4032.1.

Requirement: Provide thermostatic mixing valves that automatically control the temperature at the mixed outlet to a preselected temperature and suitable for the number of outlets served by the individual valve.

Controls: Include the following:

- A temperature sensitive automatic control that maintains temperature at the preselected setting and rapidly shuts down the flow if either the supply system fails, or if the normal discharge water temperature is exceeded.

- Hot water flush facility.

Wall box: If documented, house the thermostatic mixing valve in a stainless steel recessed wall box with a hinged door and keyed lock.

Water meters

Standard: To AS 3565.4.

Installation: To the requirements of the Network Utility Operator.

Sub water meters: Provide sub water meters as documented.

7.3 PIPING

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.

7.4 COMPLETION

Charging

Completion: On completion of installation, commissioning, testing and disinfection, fill the system with water, turn on control and isolating valves and the energy supply and leave the water supply system in full operational condition.

Thermostatic mixing valves

Field testing: To AS 4032.3.

8 FUEL GAS

8.1 STANDARDS

Reticulated gas systems

General: To AS/NZS 5601.1.

Gas equipment

Standard: To AS 3645.

Industrial and commercial gas-fired appliances

General: To AS 3814.

Steel mains and services

Maximum operating pressure not more than 1050 kPa: To AS/NZS 4645.2.

Flue cowl

General: To AS 4566.

8.2 PIPING

Concealment

General: If practicable, install piping so that it is concealed within service ducts or non-habitable enclosed spaces and does not appear on external walls. Otherwise, provide metal piping mounted on metal brackets and provide metal cover plates at penetrations.

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.

8.3 LPG STORAGE SYSTEMS

Tank LPG storage

Tank colour: White.

Certificate holders: Provide a galvanized steel pipe, one end fitted with a brass plug, one end threaded and fitted with a threaded brass cap. Weld to the tank support member.

Cylinder LPG storage

Fittings: Supply cylinders with regulators which have AGA/ALPGA approval.

Hoods

General: Provide a weatherproof protective steel cover to the valve and regulators of 450 L capacity cylinders, together with hinge pins, padlock and key.

Function: For storage of current storage system approval and test certificates.

Marking: Mark the threaded cap with the phrase LPG CERTIFICATES.

Notices and signs

General: Required.

8.4 MANUALS

Operation and maintenance manuals

Requirement: Prepare manuals to include recommendations for the operation, care and maintenance of gas appliances, storage tanks, valves, regulators and their associated fittings.

8.5 COMMISSIONING

General

Requirement: On completion of installation and testing, turn on isolating and control valves, and purge and charge the system.

Purging: Conform to the recommendations of AS/NZS 5601.1 Appendix D.

Appliances: Commission appliances. Conform to the recommendations of AS/NZS 5601.1 Appendix O.

Charging

Requirement: Immediately before the date of practical completion, fully charge the system with gas.

LPG systems: Fill gas storage containers and replace gas used in testing.

9 RAINWATER STORAGE SYSTEMS

9.1 GENERAL

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.

10 GREYWATER SYSTEMS

10.1 STANDARDS

General

Requirement: To AS/NZS 3500.1.

Sanitary plumbing and sanitary drainage: To AS/NZS 3500.2.

Design and installation: To the recommendations of SA HB 326.

10.2 GREYWATER TREATMENT SYSTEMS

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.

0902 ELECTRICAL

1 GENERAL

1.1 INTERPRETATION

Abbreviations

General: For the purposes of this worksection the abbreviations given below apply:

- WAER: *WA Electrical Regulations*.
- RCD: Residual Current Device.

Definition

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

- Telephony: Speech and low band frequencies (= 100 kHz).

2 ELECTRICAL SYSTEMS

2.1 STANDARDS

Electrical services

Requirement: To AS/NZS 3000, unless otherwise documented.

Electrical installations

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

Selection of cables: To AS/NZS 3008.1.1.

Degrees of protection (IP code): To AS 60529.

Electromagnetic compatibility (EMC): To the AS/NZS 61000 series.

Communications systems: To AS/CA S008, AS/CA S009, AS/NZS 11801.1 and AS/NZS ISO/IEC 14763.2.

2.2 SUBMISSIONS

Certification

General: Submit the following:

- Certification of conformance with AS/NZS 3000, for electrical services.
- Certification of conformance with the applicable code or standard.
- Telecommunications cabling: Submit product and installation certification for the installation.

Products and materials

Data: Submit technical data for all items of plant and equipment, including the following:

- Assumptions.
- Calculations.
- Model name, designation and number.
- Capacity of all system elements.
- Country of origin and manufacture.
- Materials used in the construction.
- Size, including required clearances for installation.
- Certification of compliance with the applicable code or standard.
- Technical data schedules corresponding to the equipment schedules in the contract documents. If

there is a discrepancy between the two, substantiate the change.

- Manufacturers' technical literature.
- Type-test reports.
- Single line diagram(s), including fault levels at switchboards, cable size and type.
- Switchboard layouts.

Lighting: Submit technical data on the following:

- Luminaires.
- Lamps.
- Ballasts.
- Power factor correction equipment.
- Lighting control systems.
- All accessories.

Telecommunications cabling: Submit technical data including the following:

- System design parameters: Performance.
- Voice and/or data transfer rate.
- Cable type and characteristics.
- Segregation requirements for EMI/EMR.
- Maximum length of cables.
- Cross-connect type and characteristics.
- Cross-connect block.
- Patch cords.
- Fibre optic terminations.
- Patch panel module.
- Cable management for racks.
- Rack.
- Fly leads.

Emergency evacuation lighting: Submit technical data for each type of luminaire and exit sign including the following:

- Maximum luminaire spacing for a given mounting height.
- Luminaire classification to AS/NZS 2293.3.
- Central battery and charger performance test reports, including discharge and charging characteristics.

Samples

Lighting: Submit samples of all luminaires and accessories complete with lamp, control gear and three core flex and plug.

Emergency evacuation lighting: Submit samples of all luminaires and exit signs.

Shop drawings

Lighting: Submit shop drawings for the following:

- Lighting columns.
- Lighting column mounting bases.
- Non-proprietary luminaires.
- Non-standard fixing brackets.

Telecommunications cabling: Submit the following:

- Layouts of equipment racks.
- Cross-connect layout.
- Cabling diagram for complete system.
- Cable management system.

2.3 INSPECTION

General

Requirement: Conform to *0171 General requirements*.

3 LOW VOLTAGE POWER SYSTEMS

3.1 PERFORMANCE

Network supply

General: Liaise with the electricity distributor and provide network connection, as documented.

Program: Schedule the works and statutory inspections to suit the construction program.

Prospective fault current: Determine, from the electricity distributor, the prospective fault current and fault protection requirements.

Supply system: 400 V, 3-phase, 4-wire, 50 Hz, multiple earth neutral (MEN) system.

Distribution system

General: Provide power distribution system elements, as documented.

3.2 SURGE PROTECTION DEVICES (SPD)

General

Requirement: Provide all mode metal oxide varistor based series connected SPD to protect equipment in racks and cabinets, as documented.

Standard: To AS 4262.1 and AS 4262.2.

Surge rating (I_{max}): ≥ 20 kA (8/20 μ s) phase to neutral and 10 kA neutral to earth.

Voltage protection level (U_p):

- < 600 V at 3 kA.
- 700 V at 500 A.

Visual indicator: Provide visual indication of SPD status.

Enclosure and installation: House SPD in an electrical switchboard or panel and protect with a suitable rated circuit breaker equal to or less than the load current rating of the SPD.

3.3 CONNECTION OF MAINS POWER SUPPLY

Network cable and point of attachment

Connection to network supply: Run aerial network operator's service cable to the private pole or as shown on drawings, to the WAER.

Point of attachment for service cable: Provide private pole or as shown on drawings, to the WAER.

Pole mounted point of attachment: Provide 12 mm galvanized round steel hook assembly welded to a steel private pole for supporting and connecting aerial network cable at the site boundary to the WAER.

Power run-in

Supply to dwelling for multiple dwellings projects: Provide cabling to switchboard and underground run-in power from the main switchboard to each dwelling.

Maximum cable span:

- Standard service bracket: 30 m.

- Long span raiser bracket: 30 m.

Consumers mains

Requirement: Provide consumers mains, associated services and all necessary fault and overload current protection equipment to AS/NZS 3000 Section 3 and the WAER.

Protected consumers mains: Provide short circuit and overload protection, where required by the electricity distributor.

Private poles

General: Conform to WAER and the electricity distributor's requirements for the following:

- Weld on 12 mm round steel hooks.
- Construction, height and position of power pole.
- Points of attachment of aerial distribution such as brackets and anchor blocks.

Private pole location: As shown on drawings.

Pole: 125 (internal diameter) x 4.8 mm (thick) galvanized steel.

Pole footing: 450 x 450 x 1200 mm (deep) mass concrete.

Pole height: 6 m above finished ground level with bottom end protruding minimum 100 mm through the bottom of the footing.

Metering

Retail: Provide metering to the requirements of the WAER and as documented.

Private: Provide private metering, as documented.

Photovoltaic metering: As documented.

Private poles: If required, mount pole on concrete bases to the WAER and install electrical mains at the centre of the pole and in underground conduits.

- 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.

3.4 WIRING SYSTEMS

General

Requirement: Provide wiring and site cable reticulation systems appropriate to the installation conditions and the function of the load. Include the following:

- Underground services.
- Above-ground services.
- In-building services.

Type: Re-wireable system.

Neutral conductors: Same size as the corresponding active conductors. Rate the neutral conductor size for the maximum harmonic currents.

3.5 POWER CABLES

Standards

Polymeric insulated cables: To AS/NZS 5000.1.

Aerial cables:

- Copper conductors: To AS 1746.

- Aluminium conductors: To AS 3607 or AS 1531.

Cable

Requirement: Select multi-stranded copper cables.

Default insulation: V-75.

Default sheathing: 4V-75.

Minimum size: Conform to the following:

- Lighting subcircuits: 1.5 mm².
- Power subcircuits: 2.5 mm².
- Submains: 6 mm².

Voltage drop: Select final subcircuit cables within the voltage drop parameters dictated by the route length and load.

Fault loop impedance: Provide final subcircuit cables to satisfy the requirements for automatic disconnection under short circuit and earth fault/touch voltage conditions.

Underground residential distribution (URD) systems: Cables to AS/NZS 4026.

Distribution cables: To AS/NZS 4961.

Colours

Conductor colours: For fixed wiring cables, provide coloured conductor insulation or at least 150 mm of close fitting coloured sleeving at the termination points of each conductor.

Active conductors in single phase circuits: Red.

Active conductors in polyphase circuits:

- A phase: Red.
- B phase: White.
- C phase: Blue.

Sheath: White.

Cable installation

Classifications: To AS/NZS 3013.

Handling cables: Report damage to cable insulation, serving or sheathing.

Stress: Do not use installation methods that exceed the cable's pulling tension. Use cable rollers for cable installed on tray/ladders or in underground enclosures.

Straight-through joints: Unless unavoidable due to length or difficult installation conditions, run cables without intermediate straight-through joints.

Cable joints: Locate in accessible positions in junction boxes and/or in pits.

Individual wiring of extra-low voltage circuits: Tie together at regular intervals.

Rewirability: Provide conduits as necessary to allow wiring replacement without structural work or the removal of cladding, lining, plaster or cement render.

Tagging

General: Identify multicore cables and trefoil groups at each end with stamped non-ferrous tags clipped around each cable or trefoil group.

Marking

General: Identify the origin of all wiring by legible indelible marking.

Submains and final sub-circuits

Installation: Provide the following:

- Cables with diameter less than 13 mm: Run in conduit, cable ducts or support on cable trays or ladders.
- Single core cables of 3 phase circuits : Install unenclosed single core cables of diameter greater than 13 mm laid on cable tray in trefoil (RWB) or quadfoil (RWB) groups.
- Cables for lighting systems: Run in conduit, cable ducts, suspend on catenary systems or support on cable trays or ladders.
- Accessible concealed spaces: Install thermoplastic insulated and sheathed cables.
- Inaccessible concealed spaces: Install cable in PVC-U conduit.
- Roof spaces: Install cable below heat insulation and sarking. If not protected from high ambient roof space temperatures by thermal insulation, derate the cables, to AS/NZS 3008.1.1 Table 27, for an assumed ambient temperature of 55°C.
- Accessible ceiling voids: Support and enclose cables on ceiling surfaces or ceiling suspension systems.
- Plastered or rendered masonry: Install cable in PVC-U conduit.
- Double sided face brick partition: Install cable in PVC-U conduit installed within the brick wall by slotting bricks or using any pathways provided in the brick.
- Stud framed walls with bulk insulation: Install cables in PVC-U conduit.
- Stud framed walls without bulk insulation: Thermoplastic insulated and sheathed cables allowing rewirability.
- Horizontal cable trays or ladders: Fix cables using proprietary nylon cable ties or straps, cable saddles or clips at 2000 mm intervals.
- Vertical cable risers: Fix cables using proprietary nylon cable ties or straps, cable saddles or clips at 1000 mm intervals.
- Plant rooms: Install cable in heavy duty PVC-U conduit or on tray, cable ladder or in duct.

3.6 EARTHING

Earthing systems

Protective earthing system with a multiple earth neutral (MEN) connection: To AS/NZS 3000 Section 5 and as documented.

Earth electrodes

General: Provide electrodes to AS/NZS 3000 clause 5.3.6.

Bonding

General: Provide equipotential bonding to AS/NZS 3000 clause 5.6.

Earth and bonding clamps

General: Provide proprietary earthing and bonding clamps.

Standard: To AS 1882.

3.7 ELECTRICAL ACCESSORIES

General

Style: Provide accessories of the same style and from the same manufacturer, as documented.

Socket outlets - generally

Standards:

- General: To AS/NZS 3112.
- Industrial: To AS/NZS 3123.

Socket outlet properties: Provide sockets conforming to the following or as documented:

- Type: Integral switched socket outlet.
- Material: High impact plastic.
- Size: Standard single gang.
- Current rating: 10 A.
- Pin arrangement: Mount outlets with the earth pins at the 6 o'clock position.

Plastic switched socket outlets

Colour: White electrical.

Mounting configuration: Horizontal.

Ironclad socket outlets

Type: Integral switched socket outlet.

Material: Diecast metal or cast iron.

Colour: Grey.

Weatherproof socket outlets

Colour: Grey.

Combined RCD switched socket outlets

Type: Integral RCD unit with double switched socket outlet.

Colour: White electrical.

RCD trip current: Conform to the following:

- General light and power: 30 mA Type II to AS/NZS 3190.
- Patient treatment areas: 10 mA Type I to AS/NZS 3190, as documented.

Multi-switch socket outlets on grid mounted panels

Type: Separate switch and socket outlets grid mounted on propriety or custom designed panels.

Material: As documented.

Colour: As documented.

Panel finishes: As documented.

Plugs – 230 volt

Requirement: Insulated type to AS/NZS 3112 with integral pins.

230 volt combination switch and permanently connected cord outlet

Type: Three terminal flush mounted switch and flex-lock insert assembly.

Colour: White electrical.

Neon Indicator: Provide neon indicator.

Flex-lock assembly: Match and securely grip the size and type of flexible cable used.

Mounting configuration: Horizontal.

Permanently connected equipment

General: Provide final subcircuit to permanently connected equipment, as documented.

Isolating switch: Locate adjacent to equipment.

Mounting:

- Internal installations: Flush mount.
- External installations: Weatherproof surface mounted.

Coordination: Coordinate with equipment supplier.

Wall/ceiling mounted equipment: Conceal final cable connection to equipment.

Isolating switches

Standard: To AS/NZS 3133.

Emergency stop switches

Standard: To AS/NZS IEC 60947.5.5.

Type: Mushroom head with latch and twist releaser.

3-phase outlets

Standard: To AS/NZS 3123.

Type: Surface mounted Integral switched socket outlet with flap lid on the outlet.

Material: High impact plastic.

IP rating: IP56.

Size: To suit current rating and pin configuration nominated in the project documents.

Colour: Grey.

Current rating: 5 pin, 20 A, 400 V a.c.

Switch mechanism: Rotating type.

Pin arrangement: Five round pins mounted with earth pins at the 6 o'clock position, neutral pins in the centre and the red, white and blue phases in a clockwise sequence when viewed from the front of the outlet.

Plug: Provide a matching plug top for each outlet.

Air conditioning

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.

Installation

General: Install accessories and conceal cabling in walls in conformance with the following:

- Rendered masonry partition: Flush wall box, with conduit chased into wall.
- Double sided face brick partition: Vertically mounted flush wall box, with conduit concealed in cut bricks.
- Face brick external cavity wall: Flush wall box, with thermoplastic insulated cables in conduit run in cavity and tied against inner brick surface, or thermoplastic sheathed cables run in cavity.
- Stud partition: Flush plate secured to proprietary support bracket or wall box.
- Fire walls: Flush wall box, with conduit built into wall. Provide additional fire protection around wall boxes, where necessary to maintain fire-resistance rating.

Location: Confirm final location of all outlets and equipment on site, before installation.

Spacing from adjacent horizontal surface: ≥ 75 mm to the centre of accessory socket.

Default mounting heights to centre of accessory plate:

- Outlets: 300 mm.

- Switches and controls: 1100 mm.

Accessories: Flush mounted, except in plant rooms.

Common face plates: Mount adjacent flush mounted accessories under a common faceplate.

Restricted location: Do not install wall boxes across junctions of wall finishes.

Surface mounting: Proprietary mounting blocks.

Installation of ceiling mounted accessories

Connections for appliances: Flush mounted outlets on the ceiling next to support brackets.

Mounting: Mount appliances independent of ceiling tiles and suspended ceiling suspension system. Fix directly to concrete slab or to roof structure above ceiling.

Connections for fixed equipment: Provide concealed permanent connections.

Fixing: For equipment and appliances heavier than 30 kg, provide support through the suspended ceiling to the building structure. Brace appliances that have excessive bending moments, are heavy or vibrate, to prevent horizontal movement.

3.8 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.

4 POWER GENERATION – PHOTOVOLTAIC

4.1 SYSTEM DESCRIPTION

System components

Requirement: Incorporate the following:

- Photovoltaic array.
- Regulator.
- Battery system.
- Inverter.
- Connection to low voltage power system.

4.2 STANDARDS

General

Requirement: For the purpose of this worksection, the following standards relating to stand-alone systems are also applicable to network connected systems:

- Stand-alone power systems: To AS/NZS 4509.1 and AS/NZS 4509.2.
- Grid connected systems: To AS/NZS 4777.1 and AS/NZS 4777.2.
- IEC 61836.

4.3 PHOTOVOLTAIC MODULE

General

Selection: To AS/NZS 4509.2, AS/NZS 5033 and as documented.

Array

Encapsulation: Required.

Toughened glass: Required.

Protection rating: \geq IPX6.

Integral bypass diode protection: Required.

Cells

Type: Crystalline.

Standard: To IEC 61215-1-1.

Efficiency: \geq 12%.

4.4 REGULATOR

General

Selection: To AS/NZS 4509.2 and as documented.

Function: Charge cycle control including:

- Low battery voltage disconnect.
 - Pulse width modulation.
 - \geq 3 step series regulation.
- Display: LCD display of:
- Battery voltage.
 - Charge current.
 - Ampere hours in and out.
 - Load current.

Alarms: Visible and audible low and high battery voltage alarms.

Transient protection: Required.

4.5 BATTERY SYSTEM

General

Selection: To meet the documented performance.

Blocking diodes: Required.

Service life: \geq 10 years.

Standards

General: To AS 2676 and AS 4086.1.

4.6 INVERTER

General

Selection: To meet the documented performance.

Waveform: True Sine wave.

Waveform quality: To AS/NZS 4777 series.

Voltage regulation: \pm 8%.

Harmonic distortion of output current: $<$ 4%.

Frequency regulation: \pm 1%.

Efficiency: \geq 90% at 10% load.

Protection: Overload, short circuit and transient required.

Automatic no-load shutdown: Required.

Display:

- Output power.
- Grid stability.

Standards

General: To AS/NZS 4777.2.

Synchronisation

Requirement: Self commutation modules which automatically synchronise the inverter supply frequency and phase angle to the low voltage network or other embedded generator system.

4.7 CONTROL SYSTEM

Control panel

General: Provide photovoltaic system control panels, switchgear and controlgear assemblies as documented.

4.8 PHOTOVOLTAIC METERING

General

Requirement: Provide photovoltaic metering equipment to meter the energy that is exported back to the grid to the requirements of the electricity distributor.

5 SWITCHBOARDS – PROPRIETARY

5.1 SYSTEM DESCRIPTION

General

Requirement: Provide proprietary switchboards for the following, as documented:

- Main switchboard.
- Distribution boards.

5.2 STANDARDS

General

Standards: To AS/NZS 3000, and AS/NZS 3439.3 or AS/NZS 61439.3.

5.3 PRODUCTS

Switchboard connectors

Type: Front connected.

Enclosure

Default material: Metallic-coated sheet steel.

Separation

Default: Form 1.

Metering

Retail: To the requirements of the electricity retailer and the electricity distributor.

Private: As documented.

Photovoltaic metering: As documented.

Main switchboard main switches

Spare capacity: Provide at least 25% spare capacity in the ratings main switch/isolators.

Busbars

General: Incorporate proprietary insulated busbar systems for the interconnection of isolators, circuit breakers and other circuit protective devices.

Busbar fault rating: Rated to meet the prospective fault current for 1 second or a minimum rating of $\geq 18\text{kA/second}$, whichever is the greater.

Spare capacity

Default spare poles: $\geq 20\%$.

Main switchboard incoming busbar: $\geq 25\%$.

Earthing

General: Make provision for the connection of the communications earth terminal (CET) at switchboard earth bar to AS/CA S009.

Doors

General: Provide lockable doors with a circuit card holder unless enclosed in cupboards or in an area which is not readily accessible to the public.

IP rating

Default rating: IP42 minimum.

Weatherproof: IP56 minimum.

Finishes

External and interior: To the manufacturer's standard colour.

Supporting structure

Assemblies:

- Wall mounted: $\leq 2\text{ m}^2$.
- Floor mounted: $> 2\text{ m}^2$.

Ventilation

General: Required to maintain design operating temperatures at full load.

Cable entries

General: Neatly adapt one or more cable entry plates, if fitted, to accept incoming cable enclosure. Provide the minimum number of entry plates to leave spare capacity for future cable entries. Do not run cables into the top of weatherproof assemblies.

Single core cables: Pass separately through non-ferrous gland plates. Do not provide ferrous metal saddles.

Cable enclosures

Requirement: Continue cable enclosures to or into assemblies and fit cable entry plates so that the IP rating of the assembly and the fire-resistance level of the cable are maintained.

Cable supports

Requirement: Support or tie mains and submains cables within 200 mm of terminations. Provide cable supports suitable for stresses resulting from short circuit conditions.

6 SWITCHBOARD COMPONENTS**6.1 DESIGN****Statutory authority's equipment**

General: Liaise with the electricity distributor about the installation and coordinate with their protective and control equipment.

6.2 REQUIREMENTS**General**

Selection: To AS/NZS 3000 clause 1.7 and Section 2.

Rated duty: Uninterrupted.

Rated making capacity (peak): $\geq 2.1 \times$ fault level (r.m.s.) at assembly incoming terminals.

Utilization category: To AS/NZS IEC 60947.1 clause 4.4 and the recommendations of Annex A.

- Circuits consisting of motors or other highly inductive loads: At least AC-23.
- Other circuits: At least AC-22.

Coordination: Select and adjust protective devices to discriminate under overload, fault current, and earth fault conditions.

Enclosure: IP4X minimum.

6.3 SWITCH-ISOLATOR AND COMBINATION FUSE-SWITCH UNITS**General**

Standard: To AS/NZS IEC 60947.1 and AS 60947.3.

Poles: 3.

Operation: Independent manual operation including positive ON/OFF indicator.

Shrouding: Effective over range of switch positions.

Fault make/fault break switch-isolators

Rated breaking capacity: To AS 60947.3 Table 3.

Rated short-time withstand current: As defined in AS/NZS IEC 60947.1 clause 4.3.6.1 and the manufacturer's recommendation for the prospective fault current conditions.

Rated short-circuit making capacity: As defined in AS/NZS IEC 60947.1 clause 4.3.6.2, to conform to the manufacturer's recommendation for the prospective fault current conditions.

Rated short-circuit breaking capacity: To AS/NZS IEC 60947.1 clause 4.3.6.3 and the manufacturer's recommendation for the prospective fault current conditions.

Load make/load break switch-isolators

Rated making and breaking capacity: As defined in AS/NZS IEC 60947.1 clause 4.3.5 to conform to AS 60947.3 Table 3 and the manufacturer's recommendations for the prospective fault current conditions.

Rated short-time withstand current: As defined in AS/NZS IEC 60947.1 clause 4.3.5, to conform to the manufacturer's recommendation for the current conditions.

6.4 OVERLOAD AND FAULT PROTECTION GENERALLY**General**

Requirement: Provide overload and fault protection devices, including full discrimination and cascade protection, and grade with the electricity distributor's incoming supply protection system and the downstream site protection devices.

6.5 MOULDED CASE AND MINIATURE CIRCUIT BREAKERS

General

Moulded case breakers: To AS/NZS IEC 60947.1 and AS/NZS IEC 60947.2.

Miniature circuit breakers: Interrupting capacity classification to AS/NZS 60898.1 or AS/NZS 3111.

- For general building services: Type C.
- For motor protection: Type D.

Operation: Independent manual operation including positive ON/OFF indicator.

Trip type: Conform to the following:

- Moulded case breakers: Adjustable thermal, fixed magnetic.
- Miniature circuit breakers: Fixed thermal and fixed magnetic.

Isolation facility: Required.

Current limiting: Moulded case breakers required.

Mounting: Mount circuit breakers so that the ON/OFF and current rating indications are clearly visible with covers or escutcheons in position. Align operating toggles of each circuit breaker in the same plane.

Clip tray chassis: For miniature overcurrent circuit breakers, provide clip tray assemblies capable of accepting single, double or triple circuit breakers and related busbars. Provide moulded clip-on pole fillers for unused portions.

Utilisation category: Moulded case breakers:

- Final subcircuits category: Category A.
- Mains and submains: Category B.

Trip settings: Set as documented, seal, and label.

Interchangeable trip units: Connect trip units so that trip units are not live when circuit breaker contacts are open.

Fault current limiting circuit breakers: Select breaker frame sizes from one manufacturer's tested range of breakers to give cascade and discrimination protection within the switchboard and downstream switchboards as required.

6.6 RESIDUAL CURRENT OPERATED CIRCUIT BREAKERS (RCBO)

General

Residual current operated with overcurrent protection type: To AS/NZS 61009.1.

Type: Type I.

Default tripping current: 10 mA.

6.7 PROTECTION OF POWER AND LIGHTING CIRCUITS

General

Requirement: 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 documented, install on a separate RCBO circuit.
- Where ceiling sweep fans are documented, install on a separate RCBO circuit.
- Where external lighting circuits are documented, install on separate RCBO circuits.

Labelling

Label circuits with permanently marked labels.

7 LIGHTING

7.1 STANDARDS

General

Energy efficiency for ballasts and lamps: To AS/NZS 4783.2.

Minimum energy performance standards (MEPS)

General: To AS 4782.2, AS/NZS 4783.2, AS 4934.2.

Self-ballasted lamps: To AS 4847.2.

7.2 PROPRIETARY LUMINAIRES

General

Requirement: Provide proprietary luminaires complete with lamps, luminaire control equipment, lighting control equipment, and accessories as documented. Provide lamps of the same type from the same brand and country of manufacture.

Self-ballasted lamps: To AS/NZS 60968 and AS/NZS 60969.

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.

7.3 FLUORESCENT LAMPS

Standards

Fluorescent lamps: To AS/NZS 4782.1 and AS 4782.2.

Compact fluorescent lamps: To AS/NZS 4847.1 and AS 4847.2.

Single capped fluorescent lamps: To AS/NZS 60901.

Properties

CCT: 4000 K.

Colour rendering: Group 1B to AS/NZS 1680.1.

Linear and circular lamp type: T8 (26 mm diameter) or T5 (16 mm diameter), linear lamps, triphosphor, TL84, as documented.

Compact fluorescent lamps types: Four-pin, non-integrated type.

7.4 FLUORESCENT LAMP BALLASTS

Linear and circular lamp types

General: Provide electronic fluorescent lamp ballasts for fluorescent lamp lighting systems selected for compatibility with the lamp and control method.

Electronic fluorescent lamp ballasts: Conform to the following:

- To AS/NZS 61347.2.3 and AS/NZS 60929.
- Current total harmonic distortion: < 15%.
- Soft start.
- Number of ballasts: Provide separate ballasts for each lamp or integral dual ballasts as an alternative for dual lamp fittings.

Ballast performance measurement – fluorescent lamps: To AS/NZS 4783.1.

CFL lamp types

General: Provide electronic fluorescent lamp ballasts for CFL lighting systems selected for compatibility with the lamp and control method.

Electronic fluorescent lamp ballasts: To AS/NZS 61347.2.3 and AS/NZS 60929.

Current total harmonic distortion: < 15%.

Number of ballasts: Provide separate ballasts for each lamp or integral dual ballasts as an alternative for dual lamp fittings.

Ballast performance measurement – fluorescent lamps: To AS/NZS 4783.1.

Fluorescent lamp power factor correction

General: Provide power factor correction on all luminaires to a minimum power factor of 0.9 lagging.

7.5 ELV VOLTAGE TRANSFORMERS OR ELV SWITCH POWER SUPPLIES

General

Requirement: Provide separate ELV transformers for each ELV lamp.

Standard: To AS/NZS 4879.1, AS/NZS 4879.2 and AS/NZS 61558.1.

7.6 LIGHT-EMITTING DIODES (LEDs) LUMINAIRES

Light-emitting diode

Colour: CRI > 80.

CCT: 3000K.

7.7 CONTROL GEAR ENCLOSURE

General

Requirement: Provide controlgear support enclosure within the body of the luminaire, except where remotely mounted controlgear is documented or required by the manufacturer.

Enclosures and controlgear mounting assemblies: Provide heat dissipation facilities to dissipate heat from the luminaire.

Controlgear enclosure: Form a barrier against direct contact with live parts of the controlgear and the area of the luminaire containing the lamp and lamp support holders.

Separate controlgear enclosures: If separate controlgear enclosures external to the luminaire are required, conform to the above requirements.

Fixing: Screw fixed.

7.8 WIRING

External flexible cords

Recessed luminaires: Provide flexible cord in conformance with the following:

- Length: ≥ 1.5 m.
- Cross sectional area: 0.75 mm^2 .
- Type: 3-core V75 (minimum) PVC/PVC, connected to a 10 A 3-pin moulded plug to AS/NZS 3112 or multi-pin plug, as documented.

7.9 LIGHTING CONTROL

General

Requirement: Provide the following as documented:

- Lighting switches.
- Dimmers.
- Automatic control systems.

Digital control system

General: Provide a proprietary, microprocessor-based system to control lighting under automatic and user interface control, as documented.

Motion sensor controls

Requirement: Provide to external light fittings at the front and rear of dwellings.

7.10 SUPPORTS

General

Requirement: Install luminaires on proprietary supports by means of battens, trims, noggings, roses and packing material.

Suspended luminaires

Rods: Steel pipe suspension rods fitted with gimbal joints.

Chains: Electroplated welded link chain.

Levelling wire: Stainless steel.

Levelling: Adjust the suspension system length so that the lighting system is level and even.

Horizontal tolerance: ± 3 mm between luminaires within the same area.

Surface mounted luminaires

General: Fit packing pieces to level luminaires and prevent distortion of luminaire bodies. Provide packing strips to align end to end luminaires.

Fixing: Conform to the following:

- Generally: Provide 2 fixings at each end of fluorescent luminaires.
- Luminaires less than 150 mm: A single fixing at each end in conjunction with 1.6 mm backing plates may be used.
- Provide battens and support for the fitting.
- Do not direct fix into plasterboard.

Recessed luminaires

General: Install recessed luminaires in trimmed openings in the suspended ceiling.

7.11 COMPLETION**General**

Requirement: Before the date of practical completion carry out the following:

- Verify the operation of all luminaires.
- Adjust aiming and controls for all luminaires under night time conditions.
- Replace lamps which have been in service for a period greater than 50% of the lamp life as published by the lamp manufacturer.

8 TELECOMMUNICATIONS CABLING**8.1 SYSTEM DESCRIPTION****General**

Requirement: Provide a passive telecommunications cabling network system as documented and as follows:

- Network connection.
- Campus distributor.
- Campus cabling.
- Building distributor.
- Backbone cabling.
- Floor distributors.
- Consolidation points.
- Telecommunications outlets.
- Patching.

System performance

Application class: To AS/NZS 11801.1 clause 6.3.1 Class E.

Balanced system: To AS/NZS 11801.1 clause 8.2.1 (data/voice) Category 6.

Fibre system class: To AS/NZS 11801.1 clause 8.3.

System warranty: 15 years minimum.

Surge protection devices (SPD)

General: Provide surge protection devices to protect equipment in racks and cabinets to LOW VOLTAGE SYSTEMS, **SURGE PROTECTION DEVICES**.

8.2 STANDARDS**General**

Authorities: To the requirements of the Australian Communications and Media Authority (ACMA).

Cabling products: To AS/CA S008, AS/NZS 11801.1 and AS 11801.2.

Installation of cabling: To AS/CA S009, AS/NZS 11801.1, AS/NZS 3084, SA/SNZ HB 252 and AS/NZS ISO/IEC 14763.2.

Installation of small office/home office cabling: To AS/CA S009, AS 11801.2, AS 11801.4 and AS/NZS ISO/IEC 14763.2.

Cable management and documentation: To AS/NZS 3085.1.

8.3 NETWORK CONNECTION**External network**

Requirement: Conform to the Australian Government's policy document

Telecommunications infrastructure in new developments.

Communication carriers: Liaise with each external communications carrier and determine the services and site access requirements for the network connection.

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.

8.4 BUILDING ENTRANCE FACILITIES**Campus distributor (CD)**

Standard: To AS/NZS 11801.1 and AS 11801.2.

Network termination device

Requirement: Provide network termination device for the termination of external carrier cables and facilities. Provide separate frames as required for each external communications' carrier and for copper and optical fibre cables.

Degree of protection for external BD/CDs: To AS 60529.

8.5 DISTRIBUTORS**General**

Requirement: Provide the Building Distributors (BD) and Floor Distributors (FD) for voice and data to AS/NZS 11801.1 and as documented for the termination of campus and building backbone cable systems and the horizontal cable distribution systems.

Equipment requirements: Provide cable termination racks, patch panels, equipment mounting racks for servers and routers complete with power outlets as documented.

Copper cable termination distributors

General: Provide Krone insulation displacement termination frames for the termination of copper backbone and horizontal cable services.

Certification: Provide vendor certification (including the warranty period) for the integrated voice/data copper cabling systems.

Equipment racks

Dimension and type: Conform to the following:

- Equipment racks: 19 inch wide industrial type, or 600 mm or 800 mm wide RUs:
 - . ≤ 18 RU: Wall mounted, 600 mm depth.
 - . > 18 RU: Floor mounted, 800 mm or 1000 mm depth.
- Patch panels – Copper CAT 6 cables: 800 mm wide and 800 mm deep.
- Patch panels – Optical fibre cables: 800 mm wide and 800 mm deep.
- Server racks: 600 mm wide and 1000 mm deep.

Access location: Front, sides or rear.

Cable tray: Locate within outer cabinet void.

Doors: Provide transparent safety glass, lockable doors.

Power provision: Minimum 1 socket outlet for every 3 rack units on vertical rail.

Cable management: Provide as follows:

- 1 module for every 2 patch panels.
- 1 module for each fibre termination panel.
- Location: Vertically, on both sides of the panel.

Provisions for active equipment: 25% minimum, 1 fixed shelf for every 4RU of active equipment space.

Ventilation: Fan assisted.

Earthing: CES earth bar required.

Fixing: Conform to the following:

- Floor mounted: Firmly fix to floor, bolt together multiple racks using standard kit accessories.
- Floor/Wall mounted: Firmly fix to floor and wall.

Cross connect patch panels (copper cables)

General: Provide cross connect patch panels as documented.

Terminations: Terminate directly to the modular connector.

Fixed terminations:

- Rear terminals: Connect to 45° IDC punch down type.
- Front terminals: Connect to RJ45 modular connector.

Patch cords: Terminate cord ends with appropriate registered jacks.

Optical fibre termination panels

Requirement: Provide rack mounted termination frames for the termination of optical fibre backbone and horizontal cable services.

Certification: Provide vendor certification, including the warranty period, for the optical fibre cabling systems.

Break out trays: Provide fibre optic cable break out trays at each group of fibre optic cable terminations.

Loom cables: Neatly loom cables and lay stripped cables into the break out tray.

Secure cables: Make sure that cables are secured by the sheath and that there is no stress on the fibre optic cores.

Cross connect patch panels (optical fibre cables)

Requirement: Provide optical fibre cross connect patch panels as documented for both single and multicore optical fibre cables.

Cable management

Record book: Provide a record book at each cross-connect.

Location: Secure log books in each distribution frame records holder.

Identification, labelling, and record documentation: To AS/NZS 3085.1.

8.6 CABLES

Copper

Standard: To AS/CA S008, AS/CA S009, AS/NZS 11801.1, AS 11801.2 and AS/NZS ISO/IEC 14763.2.

Campus and building voice backbone cables: Multicore CAT 3 UTP cable as documented or to suit the voice outlet density at each building or floor distributor, with 30% spare capacity allowance.

Horizontal cabling voice and data: CAT 6 UTP cabling to each floor outlet.

Balanced system cables: UTP.

Cable end length: Provide a 5 m cable loop at each end of the cable.

Optical fibre

Standard: To IEC 60793-2-10.

Campus and building backbone cables:

- Default multimode type: 6 core multi-mode OM3 50/125 µm.
- Default single mode type: single core 9/125 µm.

Length: Provide not less than 1000 mm spare at each end.

Component type: SC.

Safe practices: To AS/NZS 2967.

External

Standard: Water penetration resistance to IEC 60794-1-2.

8.7 TELECOMMUNICATIONS OUTLETS

General

Outlets: Provide RJ45 8 way modular jacks, mounted on 6-way faceplate. Provide for up to three modular voice or data outlets on the each faceplate with three spaces for identification inserts.

Pinouts: T568A to AS/NZS 11801.1 and AS 11801.2.

8.8 FLY LEADS

General

Type: Stranded.

Length: 1200 mm.

Quantity: Provide fly leads to 50% of outlets installed.

8.9 PATCH CORDS

General

Type: Stranded.

Length: 900 mm.

Quantity: 100% of outlets installed.

Termination: Registered jacks.

8.10 WIRELESS ACCESS POINT (WAP)

General

Requirement: Provide WAPs as documented, cabled to patch panels in the nearest FD.

Compatibility: ISO/IEC 8802-11 and IEEE 802.11.

LAN port: 100 Mbps.

Modes: Wireless access point, point-to-point bridge, point-to-multi-point wireless bridge, wireless client and wireless repeater.

Power over ethernet: Required.

Location: Install in ceiling voids distributed around the site buildings and determine the number and location by a site survey using the wireless network to confirm full site coverage.

8.11 ENGINEERING SERVICES

General

Requirement: Provide cabling systems, as documented.

8.12 CABLE INSTALLATION

Installation

Requirement: To the manufacturers' recommendations.

Crossover: Install cables neatly and without crossovers between cables.

Loom size: Loom cables into groups not exceeding 50 cables, and hold looms in place using reusable cable ties at least 20 mm wide. Do not exert compressive force on the cables when installing cable straps.

Cable separation

Separation for safety: To AS/CA S009, and by at least 150 mm.

Fluorescent luminaires: Maintain a clearance of more than 300 mm.

External cables

Requirement: To ACIF C524.

8.13 TELECOMMUNICATIONS OUTLET INSTALLATION

Installation

Mounting: Flush mount.

Style, material and colour of plates: To match adjacent power and switch plates.

Horizontal cabling termination: Terminate Category 6 cabling to the rear of the outlet modular jack with insulation displacement connections forming a gas tight joint. Arrange cable pairs at each jack conforming to AS/NZS 11801.1 Fig 15.

8.14 EARTHING SYSTEM

General

Standard: To AS/CA S009 Section 20.

Communication earth system (CES)

Requirement: Provide a communications earth terminal (CET) adjacent to each electrical switchboard. Connect the CET to the local protective earth (PE) system at the switchboard.

Distributor: Provide an earth bar within each distributor and connect to the local CET.

Interconnections: Verify that there are no interconnections between the lightning protective earthing system and the telecommunications earthing system.

8.15 COMPLETION

Cable management

General: Before the date for practical completion, submit log books for each distribution frame with details of cable terminations and provisions for recording cable, line and jumper information.

9 TELEVISION DISTRIBUTION SYSTEMS

9.1 SYSTEM DESCRIPTION

General

Requirement: Provide a television distribution system suitable for the reception and distribution of analogue and digital television, video, radio and sound signals as documented.

Network connection: Where documented, arrange with the network operator(s) for the connection of their cable or satellite network. Conform to the network operators' requirements.

Designer: Network operator's Approved Design Partner.

Survey: Confirm location and height of Free-to-air (FTA) antenna by on-site measurements.

Performance requirements

General: To AS/NZS 1367.

Capacity: Provide the distribution system with the installed capacity to accommodate 30% additional outlets.

Single dwelling installations with separate television distribution systems

General: Provide a television distribution system for each dwelling comprising:

- FTA TV antenna and mounting brackets.
- R6 coaxial 75 ohm cable system.
- Wall outlet sockets, as documented.
- A distribution splitter where multiple outlets are required.

Masthead amplifier: Provide wideband amplifier where TV signal is below the satisfactory performance levels.

Multiple dwelling installations requiring an MATV distribution system

General: Provide an MATV distribution system comprising:

- FTA TV Antenna and mounting brackets.
- Coaxial 75 ohm cable system.
- Masthead and distribution amplifiers.
- Wall outlet sockets, as documented.

Capacity of MATV distribution system: To accommodate 30% additional outlets.

9.2 SYSTEM COMPONENTS AND PERFORMANCE

Signal sources

Free-to-air (FTA) antennae system: Provide a digital compatible FTA antennae system terminating at the premises cabling interface complying with AS 1417.

Mast Installation: Carry site survey to determine the height and location of the antenna(e).

- Structure and installation: Conform to AS 1417.

Network operator: Provide for the connection of the network operator's system terminating at the premises cabling interface as documented.

Local signal source: Provide television input sockets at the premises cabling head-end for the distribution of in-house television channels .

Service entry

General: Provide service entry facilities to suit signal sources, head end equipment and distribution systems.

Head end equipment

General: Provide head end equipment to suit signal sources, distribution systems and documented performance.

Surge protection devices (SPD)

General: Provide surge protection devices to protect final equipment in racks and cabinets to LOW VOLTAGE POWER SYSTEMS, **SURGE PROTECTION DEVICES.**

Distribution system

General: Provide a MATV cabling distribution network from the head end equipment for Free-to-air to each network distribution tap.

FTA distribution taps: Provide FTA distribution taps.

Network distribution taps: For systems designed for more than one network operator provide individual distribution taps for each network operator. Co-locate the taps with FTA taps in groups to facilitate selected connection or changes to outlet feeders.

Location: Group all equipment as documented.

Coaxial cables

General: R6, 75 ohm, quad coaxial cable.

Trunk cables: Use RG11, 75 ohm, quad coaxial cables for trunk cables between head end equipment and taps or where high losses are experienced when using R6 cables.

Outlets

Quantity: Provide as follows:

- Smaller dwellings (with single family room): One outlet to each dwelling unit from the distribution tap(s).
- Larger dwellings (with family room and lounge room): Two outlets to each dwelling unit (1 to lounge and 1 to family room) from the distribution tap(s).

Distribution outlets: "F" type coaxial cable termination sockets.

Multiple services: Where required, provide separate sockets for each source and service.

Mounting height: 200 mm above floor.

Service cabinets

Requirement: As required for the housing of television distribution equipment at documented locations.

Construction: Aluminium, weatherproofed to suit the documented location, with dustproof door seals and fitted with keyed alike locks, as documented.

Colour: As documented.

Power outlets: 10 amp, 240 volt GPO's of sufficient quantity to power the equipment mounted in the cabinet.

10 EMERGENCY EVACUATION LIGHTING

10.1 SYSTEM DESCRIPTION

General

Requirement: Provide single point monitored emergency lighting and exit signs, as documented.

10.2 SINGLE-POINT SYSTEM LUMINAIRES

General

Visual indicator lights: Provide a red indicator, readily visible when the luminaire is in its operating location, which indicates that the battery is being charged.

Inverter system: Provide protection of the inverter system against damage in the event of failure, removal or replacement of the lamp, while in normal operation.

Local test switches: Provide a momentary action test switch, accessible from below the ceiling, on each luminaire to temporarily disconnect the mains supply and connect the battery to the lamp.

Common test switches: Provide a common test switch on the local distribution board which disconnects main supply to the luminaires and tests for discharge performance and automatically reverts to normal operating mode after testing.

Monitored system

Data connection: Provide internal monitoring facilities and provision for the connection of data cabling to a central monitoring computer.

Batteries

Type: Lead-acid or nickel-cadmium batteries capable of operating each lamp at its rated output continuously for at least 2 hours during commissioning tests and 1.5 hours during subsequent tests.

Battery life: At least 3 years when operating under normal conditions at an ambient temperature of between 10°C and 40°C and subject to charging and discharging at 6 monthly intervals.

Marking: Indelibly mark each battery with its date of manufacture.

10.3 SINGLE POINT SYSTEM

Power supply

General: Provide an unswitched active supply to each luminaire and exit sign, originating from the test switch control panel.

Data monitoring

General: If a monitoring system is documented, provide a data cable system from each single-point luminaire and connect to the monitoring computer.

11 ELECTRONIC SECURITY AND ACCESS CONTROL

11.1 SYSTEM DESCRIPTION

System components

Requirement: Provide the following components:

- Remote monitoring system.
- Access control system.

- Intruder detection system.
- Closed circuit television system.
- Intercom system.

11.2 STANDARDS

Intruder alarm systems

General: To AS/NZS 2201.1.

Alarm transmission system: To AS/NZS 2201.5.

Internal detection devices: To AS 2201.3.

Wireless systems: To AS 2201.4.

CCTV systems

General: To AS 4806.2.

Remote monitored systems: To AS 4806.4.

11.3 SECURITY SYSTEMS

Alarm system panels or processors

Capacity: Provide separate sectors for each nominated internal zone, and for normally-closed and normally-open perimeter zones.

Sector time delay: Provide adjustable time delay entry/exit for each sector, with adjustment range 0 to 30 s.

Batteries and chargers:

- Sealed battery: Provide a sealed battery and charger system contained within each control panel with capacity as documented.

Uninterruptible power supply

General: Provide a dedicated uninterruptible power supply and connect to the security systems.

Capacity: At least 15 minutes, for the complete system in normal operation.

Activation devices

Activation devices: Provide keypads, cards, card readers and other activation devices for access control and intruder alarm systems as documented.

External: Provide weatherproof (IP56) hoods or housings for external units.

Default mounting height: 1100 mm from floor level.

External audible and visual alarms

General: Provide a corrosion-resistant weatherproof metal enclosures containing sirens and blue strobe lights. Fix in locations not readily accessible without a ladder.

Anti-tamper devices

Requirement: Provide anti-tamper devices to control panels, external equipment, control and activating devices, and access control devices.

Function: To register an instantaneous alarm if covers are removed or vital wiring is disconnected.

Remote monitoring

Monitoring system: Provide a monitoring system in the alarm panel or processor for transmission of alarms and monitoring of the system by parties responsible for attending to alarms.

11.4 ACCESS CONTROL

Access control processors or panels

Capacity: Provide separate entry/exit control modules for each designated access point.

Users: Program the system to match the number of authorised users with unique access codes.

Time zones: At least 4 per day, with provision for weekends and public holidays.

Door control devices

General: Provide electric strikes, electric locks, drop bolts, or similar devices as documented to suit door construction and hardware.

Monitoring: Provide lock status and door position monitoring of door control devices.

Fail-safe: Connect door control devices in a fail-safe mode to permit egress in the event of power failure.

Authorised products: Provide equipment listed in the ActivFire Register of Fire Protection Equipment.

Glass doors: Provide tumbler, drop bolts or magnetic holders.

Double leaf doors (solid frame): Provide an electric strike or lock on the fixed leaf, connected to the door frame by concealed flexible wiring.

Vehicle control

Vehicle access control: Provide vehicle access control system combining connection to vehicular doors and boom gates, and interconnection to the main access control system.

Exit loop detection: Provide a buried loop detection system adjacent to the exit point to activate boom gates or vehicular doors on approach by a vehicle. Connect so that doors or gates close after a pre-set time.

Interlock: Provide a photoelectric beam safety interlock.

Interlock function: To prevent door or gate from closing until the vehicle has cleared the exit point.

Push-buttons and readers: Where practicable, provide direct wall mounting for push-buttons or readers; otherwise provide a robust mounting bollard and extension arm.

Default mounting height: 1000 mm from floor level.

Reed switches: Provide heavy duty reed switches on both sides of vehicle doors to generate a door closed indication at the control panel.

Intercom

Base station: Provide intercom base station, interconnected with the individual local stations. Include speakers and microphones.

Entry station construction: Wall mounted flush stainless steel panel.

Weatherproofing: IP56.

Dial: Digital push-button type.

Schedule: Provide a weatherproof (IP56) schedule holder and card identifying individual local stations. Locate next to the base station intercom panel.

Local station: Provide wall mounted intercom local stations, interconnected with the base stations and external entry points.

Internal station type: Surface mounted, removable handset type.

Operation: Provide an audible tone device to indicate that the individual station is being called, and a press-to-talk switch so that the entry station

can communicate with the internal station only when the switch is held down.

Door control: Provide integral momentary action door release switches to operate the door release or opening mechanisms at each external entry point.

11.5 SITE VIDEO MONITORING

CCTV system

General: Provide a closed circuit television system monitoring and recording the areas/spaces as documented.

CCTV cameras

Selection: Provide cameras selected to provide coverage of designated areas and to enable persons within the field of view to be readily distinguishable on monitors under all ambient night and day lighting conditions.

Motorised cameras: Provide camera drives which provide remote control of camera rotation and tilt, and of lens focal length.

External cameras: Provide corrosion-resistant weatherproof housings for cameras located externally, which allow cameras to perform to manufacturer's specification.

Fixing: Provide mounting brackets and hardware which rigidly fix cameras, monitors and accessories to buildings or structures.

CCTV monitors

General: Provide LCD colour monitors compatible with the security system, and provide fixing brackets and hardware for wall-mounted and ceiling-mounted monitors.

CCTV recording system

General: Provide CCTV recording hardware and software systems which store data from each camera in an industry standard compressed digital format.

Functionality: Provide the following:

- Index according to events.
- Fast search.
- Frame by frame search.
- Frame printing.
- Zoom and pan within a recorded frame.
- Back up daily to off-site storage.

Minimum data storage: 30 days.

CCTV video switching system

General: Provide switching software which enables each camera to be directed to a specific monitor or for cameras to be scanned sequentially at predetermined intervals to a specific monitor and which, on receipt of an alarm signal, interrupts the scanning sequence and switches to the relevant security zones.

11.6 EQUIPMENT POWER SUPPLY

Mains supplies

Permanent power supply: Provide permanent power supply to the following:

- Intruder alarm panels and access control panels including sub panels.

- Electric door strike local panels or control equipment.
- Intercom stations.
- CCTV monitors and cameras.

Marking: Label the switchboard circuit breaker from which power for the security systems is obtained as follows:

SECURITY SYSTEM - Do not switch off.

Interconnection to other services

General: Provide functions and equipment to allow the interconnection to other systems. Provide and connect wiring to the designated services.

Lifts: Arrange for installation and connection of lift readers and associated equipment.

1002 FIRE SERVICES**1 FIRE SERVICES SYSTEMS****1.1 STANDARDS****Electrical fire services**

Requirement: To AS/NZS 3000, unless otherwise documented.

Fire detection and alarms: To AS 1670.1, AS 1670.5, AS 4428.1, AS 4428.16, AS 7240.2, AS 7240.4 and AS 7240.13.

Emergency warning and intercommunication: To AS 1428.5, AS 1670.4, AS 1670.5, AS 4428.4, AS 4428.16, AS ISO 7240.24 and AS 60849.

Wiring fire and mechanical performance classification: To AS/NZS 3013.

Degrees of protection (IP code): To AS 60529.

Electromagnetic compatibility (EMC): To the AS/NZS 61000 series.

Communications systems: To AS/CA S008, AS/CA S009, AS/NZS 11801.1 and AS/NZS ISO/IEC 14763.2.

1.2 SUBMISSIONS**Design documentation**

Hydrants: Submit the following:

- Hydraulic calculations: Submit hydraulic calculations of the hydrant systems to AS 2419.1.
- Calculation method: Use commercially available software written and validated to conform to AS 2419.1.
- Drawings: Based on the calculations, submit drawings showing the most hydraulically advantaged and disadvantaged hydrants to AS 2419.1.

Products and materials

Evidence of suitability: Submit evidence of suitability for use, to BCA A5.0, for all fire protection products.

2 HYDRANTS**2.1 FIRE HYDRANT SYSTEMS****General**

Plumbing and water supply: To AS/NZS 3500.1.

Hydrants: To AS 2419.1.

2.2 VALVES**Isolating valves**

Below-ground metal seated isolating valves: To AS/NZS 2638.1.

Below-ground resilient seated isolating valves: To AS/NZS 2638.2.

Pressure reducing valve stations

Requirement: If required by AS 2419.1 to limit system pressure, provide pressure reducing valves to AS 4118.1.8. Provide isolating valves, pressure gauges and pressure tappings on each side of each pressure reducing valve.

2.3 FIRE HYDRANTS**General**

Upstand assemblies: DN100 hot-dip galvanized steel.

Internal hydrants: Single headed.

External hydrants: Double headed.

Fire hydrant valves

Standard: To AS 2419.2.

Requirement: Provide fire hydrant valves, as follows:

- To the requirements of the local fire brigade.
- Copper alloy construction.
- Matching non-ferrous dust cap and non-ferrous chain.

2.4 INSTALLATION**General**

System: To AS 2419.1.

Valves: Locate valves to permit satisfactory operation and maintenance.

Isolating valves: Provide isolating valves to AS 2419.1 clause 8.7 and as documented.

Ring mains: To AS 2419.1 clause 8.6 and as documented.

Pressure gauges: Provide pressure gauges at the hydraulically most disadvantaged fire hydrant in the installation and each pressure zone.

Proving test facilities

Requirement: Provide facilities to verify that the system flows and pressures meet AS 2419.1.

Flow sensor: Low loss pitot type averaging sensor, with 2 flared isolating valves for connection of pressure lines and stainless steel wetted parts.

Installation: Install to the manufacturer's recommendation for installation, connection and valving. Provide manufacturers recommended straight lengths of pipe upstream and downstream of tapping point. Mount in the piping using an adaptor bushing and welding boss.

Performance:

- Accuracy: Within $\pm 1.5\%$ over the range of flow anticipated.
- Stability: Within $\pm 0.125\%$ over five years.
- Repeatability: $\pm 0.1\%$.

2.5 COMPLETION**General**

System: To AS 2419.1.

Flush: Before testing, flush the piping system with clean water to AS 2419.1. Flush until the piping has been thoroughly cleaned out. Operate the system until all foreign matter has been removed.

Hydrostatic test: Test the piping system to AS 2419.1. Maintain the test pressure for the minimum time required to AS 2419.1 or longer if necessary to complete the inspection of the system under test.

Baseline data

Requirement: Provide baseline data to AS 1851 and AS 2419.1.

3 HOSE REELS

3.1 FIRE HOSE REELS

General

Standard: To AS/NZS 1221.

Product certification: Required, to AS/NZS 1221 clause A3.

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

Type: Swivel hose guide.

Fire hose reel cabinets

Requirement: Provide fire hose reels in cabinets, as documented.

Construction: Form from machine-folded sheet metal with returns on free edges.

Material: Metallic-coated sheet steel minimum 1.6 mm thick.

Finish: Full gloss, solvent-borne, interior and exterior or an equivalent factory-applied coating system.

Doors: Provide doors with locks and signage to AS 2441.

External cabinets degree of protection: \geq IP44.

3.2 WATER SUPPLY

General

Supply: Provide water supply, as documented.

Backflow prevention: Provide backflow prevention to AS/NZS 3500.1 Section 4.

Service trenches: To 0223 *Service trenching*.

3.3 INSTALLATION

Fire hose reels

Standard: To AS 2441.

Protection from damage: To AS 2441.

Below-ground resilient seated isolating valve: To AS/NZS 2638.2.

3.4 COMPLETION

General

Procedure: To AS 2441 clause 12.

Baseline data

Requirement: Provide baseline data to AS 1851.

4 DETECTION AND ALARMS

4.1 SYSTEM

General

System type: Addressable.

Interface: Emergency warning and intercommunications system.

4.2 CONTROL AND INDICATING EQUIPMENT

Standards

General: To AS 7240.1 and AS 7240.2.

Air-handling fire mode control panels: To AS 4428.7.

Alarm investigation facility (AIF): To AS 4428.10.

Alarm signalling equipment: To AS 4428.6.

Power supply units: To AS 4428.5 and AS 7240.4.

Fire brigade panel: To AS 4428.3.

Routing equipment: To AS 7240.21.

Wire-free alarm zone circuits: To AS ISO 7240.25.

Fire detection control and indicating equipment (FDCIE) and mimic panels

General: Provide metal cubicle-type enclosures, as documented.

Isolation

Isolating facilities: Provide on FDCIE to allow testing without the transmission of alarm signals to the fire brigade.

Capacity

Spare zones: 50% minimum allowing for the addition of plug-in circuit cards.

Surge protection devices (SPD)

General: Provide surge protection devices to protect equipment in racks and cabinets to LOW VOLTAGE SYSTEMS, **SURGE PROTECTION DEVICES**.

4.3 DETECTORS

Type

Requirement: Provide detector type, as documented and as follows:

- Areas generally: Optical beam smoke detectors mounted on plug-in bases.
- Hot areas: Fixed temperature integral heat detector/alarm unit type.

Standards

Smoke alarms: To BCA Spec E2.2a.

Carbon monoxide (CO) fire detectors: To AS 7240.6.

Duct sampling units: To AS 1603.13 and AS 7240.22.

Heat detectors: To AS ISO 7240.5.

Point type smoke detectors: To AS 7240.7 and AS 1603.2.

Integral heat detector/alarm units: To AS 1603.3.

Integral smoke detector/alarm units: To AS 3786.

Multi-sensor fire detectors: To AS 7240.15.

Multi-point aspirated smoke detectors: To AS 1603.8.

Optical beam smoke detectors: To AS 1603.7.

Remote indicators: To AS 1603.15.

Visual warning devices: To AS 1603.11.

Self-indicating detectors

General: Provide a light emitting diode mounted in a clearly visible position, which illuminates whenever detector operation causes an alarm condition to register on the FDCIE. Provide self-indicating devices which, if faulty, will not render the detector inoperative under fire conditions.

Mounting positions of light emitting diodes: Conform to the following:

- Visible detectors: On the outside of the detector or its base.

- Detectors concealed above ceilings: On the underside of the ceiling immediately below the detector.
- Detectors in other concealed spaces: On a visible panel close to the entry to the concealed space housing the detector.
- Remote indicators: To AS 1603.15.

Installation

General: Install detectors so they can be easily inspected and tested in situ, and readily withdrawn from service.

Integral smoke detector/alarm units: To AS 1670.6.

4.4 MANUAL CALL POINTS**General**

Standard: To AS 1603.5 and AS ISO 7240.11.

Type: Flush mounted break glass type.

Mounting: Mounted 1350 mm above floor level.

4.5 EXTERNAL ALARM INDICATION**General**

Requirement: Provide red flashing VWD strobe to AS 1670.1 clause 3.8.

Standards

Bell circuits: To AS 4428.1.

Strobe lights: To AS 1603.11.

Power supply

To the strobe light and not more than 2 others: From the fire detection control and indicating equipment battery power supply.

To additional strobe lights: From the mains supply. Provide appropriate interface relays, operated by the fire detection control and indicating equipment.

4.6 MAGNETIC DOOR HOLDERS**General**

Requirement: Provide electromagnetic door holders, as documented.

Control facilities

Standard: To AS 1670.1 clause 3.19.

Signals: Ancillary control device circuits and connections for automatically controlling and releasing magnetic door holders to operate the relevant doors under fire alarm conditions.

4.7 AIR HANDLING SYSTEMS**Fire fan control panels (FFCP)**

Standard: To AS 1668.1 and AS 1670.1.

Signals: Provide fire detection and alarm signals for the fire fan control panel (FFCP).

4.8 SMOKE DETECTION IN BUILDINGS THAT DO NOT REQUIRE A FIRE ALARM TO AS 1670**General**

Requirement: Provide smoke detection system conforming to BCA Spec E2.2a.

Connection: To mains power, conforming to AS/NZS 3000, clause 4.6.

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.

Installation: To the manufacturer's recommendations.

5 EMERGENCY WARNING AND INTERCOMMUNICATION**5.1 STANDARDS****General**

Intercommunication system: To AS 1670.4, AS 1670.5, AS 1428.5, AS 4428.4 and AS 4428.16.

Sound system: To AS 1670.4, AS ISO 7240.24 and AS 60849.

5.2 SOUND SYSTEM**Loudspeakers**

Standard: To AS 7240.24.

Ceiling speakers: Requirements, as follows:

- 200 mm maximum diameter.
 - 5 W minimum rated capacity.
 - Minimum frequency response: 150 Hz - 10 kHz +/- 3 dB.
 - Minimum SPL: 89 dB at 1 m per watt at 1 kHz.
 - Rated input voltage: 100 V.
 - 1.25 W minimum tapping setting.
 - To have grille, matching ceiling colour.
- Horn Speaker: Requirements, as follows:
- 200 mm maximum diameter at open end.
 - 10 W minimum rated capacity.
 - Minimum frequency response: 300 Hz – 10 kHz +/- 3 dB.
 - Minimum SPL: 100 dB at 1m per watt at 1 kHz.
 - Rated input voltage: 100 V.
 - 5 W minimum tapping setting.

Mounting: Securely fix to building elements.

Flush mounting: Required in suspended ceilings.

Wall mounting: 150 mm below finished ceiling level to top of speaker enclosure.

5.3 INTERCOMMUNICATION SYSTEM**Warden intercom points (WIP)**

Connection: Provide separate circuits for each WIP handset.

Conferencing switching facilities: Permit the initiation of conference calls, between up to 5 warden intercom points, from any emergency control panel.

Lift cars: Provide a terminal block outside the lift motor room. Cable from the terminal block to central

control equipment. Provide a WIP handset in each emergency lift car.

REFERENCED DOCUMENTS

The following documents are incorporated into this worksection by reference:

AGA/ALPGA		Australian Gas Association/Australian Liquefied Petroleum Gas Association
NOHSC 2002	2005	National code of practice for the safe removal of asbestos 2nd edition
NOHSC 2018	2005	Code of Practice for the Management and Control of Asbestos in Workplaces
AS/CA S008	2010	Requirements for customer cabling products
AS/CA S009	2013	Installation requirements for customer cabling (Wiring Rules)
AS ISO 354	2006	Acoustics - Measurement of sound absorption in a reverberation room
AS ISO 717		Acoustics - Rating of sound insulation in buildings and of building elements
AS/NZS ISO 717.1	2004	Airborne sound insulation
AS ISO 717.2	2004	Impact sound insulation
AS/NZS ISO 817	2016	Refrigerating systems - Refrigerant classification
AS 1012		Methods of testing concrete
AS 1012.1	2014	Sampling of concrete
AS 1012.2	2014	Preparing concrete mixes in the laboratory
AS 1012.8.1	2014	Method for making and curing concrete - Compression and indirect tensile test specimens
AS 1012.8.2	2014	Method for making and curing concrete - Flexure test specimens
AS 1012.8.4	2015	Method for making and curing concrete - Drying shrinkage specimens prepared in the field or in the laboratory
AS 1012.9	2014	Compressive strength tests - Concrete, mortar and grout specimens
AS 1012.11	2000	Determination of the modulus of rupture
AS 1012.13	2015	Determination of the drying shrinkage of concrete for samples prepared in the field or in the laboratory
AS 1074	1989	Steel tubes and tubulars for ordinary service
AS/NZS 1080		Timber - Methods of test
AS/NZS 1080.1	2012	Moisture content
AS 1110		ISO metric hexagon bolts and screws - Product grades A and B
AS 1110.1	2015	Bolts
AS 1110.2	2015	Screws
AS 1111		ISO metric hexagon bolts and screws - Product grade C
AS 1111.1	2015	Bolts
AS 1111.2	2015	Screws
AS 1112		ISO metric hexagon nuts
AS 1112.1	2015	Style 1 - Product grades A and B
AS 1112.2	2015	Style 2 - Product grades A and B
AS 1112.3	2015	Product grade C
AS 1112.4	2015	Chamfered thin nuts - Product grades A and B
AS 1141		Methods for sampling and testing aggregates
AS 1141.11.1	2009	Particle size distribution - Sieving method
AS 1141.12	2015	Materials finer than 75 µm in aggregates (by washing)
AS 1141.22	2008	Wet/dry strength variation
AS 1141.52	2008	Unconfined cohesion of compacted pavement materials
AS 1160	1996	Bitumen emulsions for construction and maintenance of pavements
AS/NZS 1163	2016	Cold-formed structural steel hollow sections
AS/NZS 1167		Welding and brazing - Filler metals
AS/NZS 1167.1	2005	Filler metal for brazing and braze welding
AS/NZS 1170		Structural design actions
AS/NZS 1170.1	2002	Permanent, imposed and other 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/NZS 1221	1997	Fire hose reels
AS 1231	2000	Aluminium and aluminium alloys - Anodic oxidation coatings
AS 1237		Plain washers for metric bolts, screws and nuts for general purposes
AS 1237.1	2002	General plan
AS/NZS 1252		High-strength steel fastener assemblies for structural engineering - Bolts, nuts and washers
AS/NZS 1252.1	2016	Technical requirements
AS/NZS 1252.2	2016	Verification testing for bolt assemblies
AS 1288	2006	Glass in buildings - Selection and installation
AS 1289		Methods of testing soils for engineering purposes
AS 1289.3.6.1	2009	Soil classification tests - Determination of the particle size distribution of a soil - Standard method of analysis by sieving
AS 1289.4.2.1	1997	Soil chemical tests - Determination of the sulfate content of a natural soil and the sulfate content of the groundwater - Normal method
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 1289.5.3.2	2004	Soil compaction and density tests - Sand replacement method using a sand pouring can, with or without a volume displacer
AS 1289.5.3.5	1997	Soil compaction and density tests- Determination of the field dry density of a soil - Water replacement method
AS 1289.5.4.1	2007	Soil compaction and density tests - Compaction control test - Dry density ratio, moisture variation and moisture ratio
AS 1289.5.4.2	2007	Soil compaction and density tests - Compaction control test - Assignment of maximum dry density and optimum moisture content values
AS 1289.5.6.1	1998	Soil compaction and density tests - Compaction control test - Density index method for a cohesionless material
AS 1289.5.7.1	2006	Soil compaction and density tests- Compaction control test - Hilf density ratio and Hilf moisture variation (rapid method)
AS 1289.6.1.1	2014	Soil strength and consolidation tests - Determination of the California Bearing Ratio of a soil - Standard laboratory method for a remoulded specimen
AS 1319	1994	Safety signs for the occupational environment
AS 1324		Air filters for use in general ventilation and airconditioning
AS 1324.2	2003	Methods of test
AS/NZS 1328		Glued laminated structural timber
AS/NZS 1328.1	1998	Performance requirements and minimum production requirements
AS 1345	1995	Identification of the contents of pipes, conduits and ducts
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/NZS 1385	2007	Textile floor coverings - Metric units and commercial tolerances for measurement
AS/NZS 1390	1997	Cup head bolts with ISO metric coarse pitch threads
AS/NZS 1393	1996	Coach screws - Metric series with ISO hexagon heads
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 1418		Cranes (including hoists and winches)
AS 1418.18	2001	Crane runways and monorails
AS 1420	2008	ISO metric hexagon socket head cap screws
AS 1428		Design for access and mobility
AS/NZS 1428.4.1	2009	Means to assist the orientation of people with vision impairment - Tactile ground surface indicators
AS 1428.5	2010	Communication for people who are deaf or hearing impaired
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 1530.1	1994	Combustibility test for materials
AS 1530.2	1993	Test for flammability of materials
AS/NZS 1530.3	1999	Simultaneous determination of ignitability, flame propagation, heat release and smoke release
AS 1530.4	2014	Fire-resistance tests for elements of construction
AS 1531	1991	Conductors - Bare overhead - Aluminium and aluminium alloy
AS/NZS 1546		On-site domestic wastewater treatment units
AS/NZS 1546.1	2008	Septic tanks
AS/NZS 1546.2	2008	Waterless composting toilets
AS 1546.3	2017	Secondary treatment systems
AS/NZS 1547	2012	On-site domestic wastewater management
AS/NZS 1554		Structural steel welding
AS/NZS 1554.1	2014	Welding of steel structures
AS/NZS 1554.3	2014	Welding of reinforcing steel
AS/NZS 1554.6	2012	Welding stainless steels for structural purposes
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 1594	2002	Hot-rolled steel flat products
AS 1603		Automatic fire detection and alarm systems
AS 1603.2	1997	Point type smoke detectors
AS 1603.3	2018	Heat alarms
AS 1603.5	1996	Manual call points
AS 1603.7	1996	Optical beam smoke detectors
AS 1603.8	1996	Multi-point aspirated smoke detectors
AS 1603.11	2018	Visual warning devices
AS 1603.13	2018	Duct sampling units
AS 1603.15	2002	Remote indicators
AS 1604		Specification for preservative treatment

AS 1604.1	2012	Sawn and round timber
AS/NZS 1604.2	2012	Reconstituted wood-based products
AS/NZS 1604.3	2012	Plywood
AS/NZS 1604.4	2012	Laminated veneer lumber (LVL)
AS/NZS 1604.5	2012	Glued laminated timber products
AS 1627		Metal finishing - Preparation and pretreatment of surfaces
AS 1627.1	2003	Removal of oil, grease and related contamination
AS 1627.2	2002	Power tool cleaning
AS 1627.5	2003	Pickling
AS 1657	2018	Fixed platforms, walkways, stairways and ladders - Design, construction and installation
AS/NZS 1664		Aluminium structures
AS/NZS 1664.1	1997	Limit state design
AS/NZS 1664.2	1997	Allowable stress design
AS 1665	2004	Welding of aluminium structures
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 1670		Fire detection, warning control and intercom systems - System, design, installation and commissioning
AS 1670.1	2018	Fire
AS 1670.4	2018	Emergency warning and intercom systems
AS 1670.5	2016	Special hazard systems
AS 1670.6	1997	Smoke alarms
AS 1672		Limes and limestones
AS 1672.1	1997	Limes for building
AS/NZS 1680		Interior and workplace lighting
AS/NZS 1680.1	2006	General principles and recommendations
AS/NZS 1680.2.4	2017	Industrial tasks and processes
AS 1684		Residential timber-framed construction
AS 1684.2	2010	Non-cyclonic areas
AS 1684.3	2010	Cyclonic areas
AS 1684.4	2010	Simplified non-cyclonic areas
AS 1720		Timber structures
AS 1720.1	2010	Design methods
AS 1720.2	2006	Timber properties
AS 1720.4	2006	Fire-resistance for structural adequacy of timber members
AS 1720.5	2015	Nailplated timber roof trusses
AS 1725		Chain-link fabric fencing
AS 1725.1	2010	Security fences and gates - General requirements
AS 1726	2017	Geotechnical site investigations
AS 1742		Manual of uniform traffic control devices
AS 1742.2	2009	Traffic control devices for general use
AS 1746	1991	Conductors - Bare overhead - Hard-drawn copper
AS/NZS 1748		Timber - Solid - Stress-graded for structural purposes
AS/NZS 1748.1	2011	General requirements
AS 1769	1975	Welded stainless steel tubes for plumbing applications
AS 1774		Refractories and refractory materials - Physical test methods
AS 1774.36	2019	Determination of resistance to explosive spalling
AS 1789	2003	Electroplated zinc (electrogalvanized) coatings on ferrous articles (batch process)
AS 1796	2001	Certification of welders and welding supervisors
AS/NZS 1801	1997	Occupational protective helmets
AS 1810	1995	Timber - Seasoned cypress pine - Milled products
AS/NZS 1841		Portable fire extinguishers
AS/NZS 1841.1	2007	General requirements
AS/NZS 1841.2	2007	Specific requirements for water type extinguishers
AS/NZS 1841.3	2007	Specific requirements for wet chemical type extinguishers
AS/NZS 1841.4	2007	Specific requirements for foam type extinguishers
AS/NZS 1841.5	2007	Specific requirements for powder type extinguishers
AS/NZS 1841.6	2007	Specific requirements for carbon dioxide type extinguishers
AS/NZS 1841.8	2007	Specific requirements for non-rechargeable type extinguishers
AS 1851	2012	Routine service of fire protection systems and equipment
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 1860		Particleboard flooring
AS/NZS 1860.1	2017	Specifications
AS 1860.2	2006	Installation
AS 1882	2002	Earth and bonding clamps
AS 1884	2012	Floor coverings - Resilient sheet and tiles - Installation practices
AS 1897	2016	Fasteners - Electroplated coatings
AS 1905		Components for the protection of openings in fire-resistant walls
AS 1905.1	2015	Fire-resistant doorsets
AS 1905.2	2005	Fire-resistant roller shutters
AS/NZS 2032	2006	Installation of PVC pipe systems

AS 2047	2014	Windows and external glazed doors in buildings
AS 2049	2002	Roof tiles
AS 2050	2018	Installation of roof tiles
AS 2070	1999	Plastics materials for food contact use
AS 2082	2007	Timber - Hardwood - Visually stress-graded for structural purposes
AS/NZS 2098		Methods of test for veneer and plywood
AS/NZS 2098.1	2006	Moisture content of veneer and plywood
AS 2150	2005	Hot mix asphalt - a guide to good practice
AS 2157	1997	Cutback bitumen
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 2201.3	1991	Detection devices for internal use
AS 2201.4	1990	Wire-free systems installed in client's premises
AS/NZS 2201.5	2008	Alarm transmission systems
AS/NZS 2208	1996	Safety glazing materials in buildings
AS/NZS 2269		Plywood - Structural
AS/NZS 2269.0	2012	Specifications
AS/NZS 2270	2006	Plywood and blockboard for interior use
AS/NZS 2271	2004	Plywood and blockboard for exterior use
AS/NZS 2272	2006	Plywood - Marine
AS/NZS 2293		Emergency lighting and exit signs for buildings
AS/NZS 2293.3	2018	Emergency luminaires and exit signs
AS 2303	2018	Tree stock for landscape use
AS/NZS 2310	2002	Glossary of paint and painting terms
AS/NZS 2311	2017	Guide to the painting of buildings
AS/NZS 2312		Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings
AS 2312.1	2014	Paint coatings
AS/NZS 2312.2	2014	Hot dip galvanizing
AS/NZS 2327	2017	Composite structures - Composite steel-concrete construction in buildings
AS 2334	1980	Steel nails - Metric series
AS 2419		Fire hydrant installations
AS 2419.1	2017	System design, installation and commissioning
AS 2419.2	2009	Fire hydrant valves
AS 2423	2002	Coated steel wire fencing products for terrestrial, aquatic and general use
AS/NZS 2425	2015	Bar chairs in reinforced concrete - Product requirements and test methods
AS 2439		Perforated plastics drainage and effluent pipe and fittings
AS 2439.1	2007	Perforated drainage pipe and associated fittings
AS 2441	2005	Installation of fire hose reels
AS 2444	2001	Portable fire extinguishers and fire blankets - Selection and location
AS 2455		Textile floor coverings - Installation practice
AS 2455.1	2019	General
AS 2455.2	2019	Carpet tiles
AS/NZS 2465	1999	Unified hexagon bolts, screws and nuts (UNC and UNF threads)
AS/NZS 2588	2018	Gypsum plasterboard
AS/NZS 2589	2017	Gypsum linings - Application and finishing
AS 2601	2001	The demolition of structures
AS/NZS 2638		Gate valves for water works purposes
AS/NZS 2638.1	2011	Metal seated
AS/NZS 2638.2	2011	Resilient seated
AS/NZS 2648		Underground marking tape
AS/NZS 2648.1	1995	Non-detectable tape
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 2676		Guide to the installation, maintenance, testing and replacement of secondary batteries in buildings
AS 2688	2017	Timber and composite doors
AS/NZS 2699		Built-in components for masonry construction
AS/NZS 2699.1	2000	Wall ties
AS/NZS 2699.2	2000	Connectors and accessories
AS/NZS 2699.3	2002	Lintels and shelf angles (durability requirements)
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 2753	2018	Adhesives - for bonding gypsum plaster linings to wood and metal framing members
AS/NZS 2754		Adhesives for timber and timber products
AS/NZS 2754.1	2016	Adhesives for manufacture of plywood and laminated veneer lumber (LVL)
AS 2758		Aggregates and rock for engineering purposes
AS 2758.1	2014	Concrete aggregates
AS 2758.2	2009	Aggregate for sprayed bituminous surfacing
AS 2758.5	2009	Coarse asphalt aggregates
AS/NZS 2785	2000	Suspended ceilings - Design and installation

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 2832		Cathodic protection of metals
AS 2832.1	2015	Pipes and cables
AS 2845		Water supply - Backflow prevention devices
AS/NZS 2845.1	2010	Materials, design and performance requirements
AS 2845.2	2010	Registered air gaps and registered break tanks
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 2967	2014	Optical fibre communication cabling systems safety
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 3013	2005	Electrical installations - Classification of the fire and mechanical performance of wiring system elements
AS/NZS 3084	2017	Telecommunications installations - Telecommunications pathways and spaces for commercial buildings
AS/NZS 3085		Telecommunications installations - Administration of communications cabling systems
AS/NZS 3085.1	2004	Basic requirements
AS/NZS 3111	2009	Approval and test specification - Miniature overcurrent circuit-breakers
AS/NZS 3112	2017	Approval and test specification - Plugs and socket-outlets
AS/NZS 3123	2005	Approval and test specification - Plugs, socket-outlets and couplers for general industrial application.
AS/NZS 3133	2013	Approval and test specification - Air break switches
AS/NZS 3190	2016	Approval and test specification - Residual current devices (current-operated earth-leakage devices)
AS/NZS 3439		Low-voltage switchgear and controlgear assemblies
AS/NZS 3439.3	2002	Particular requirements for low-voltage switchgear and controlgear assemblies intended to be installed in places where unskilled persons have access for their use - Distribution boards
AS/NZS 3500		Plumbing and drainage
AS/NZS 3500.0	2003	Glossary of terms
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/NZS 3504	2006	Fire blankets
AS 3565		Meters for water supply
AS 3565.4	2007	In-service compliance testing
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 3583		Methods of test for supplementary cementitious materials for use with portland cement
AS 3583.13	1991	Determination of chloride ion content
AS 3600	2018	Concrete structures
AS 3607	1989	Conductors - Bare overhead aluminium and aluminium alloy - Steel reinforced
AS 3610		Formwork for concrete
AS 3610.1	2018	Specifications
AS 3645	2017	Essential requirements for gas equipment
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/NZS 3666.2	2011	Operation and maintenance
AS/NZS 3666.3	2011	Performance-based maintenance of cooling water systems
AS/NZS 3666.4	2011	Performance-based maintenance of air-handling systems (ducts and components)
AS/NZS 3678	2016	Structural steel - Hot-rolled plates, floorplates and slabs
AS/NZS 3679		Structural steel
AS/NZS 3679.1	2016	Hot-rolled bars and sections
AS/NZS 3679.2	2016	Welded I sections
AS 3700	2018	Masonry structures
AS 3705	2012	Geotextiles - Identification, marking, and general data

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 3730.6	2006	Solvent-borne - Interior/exterior - Full gloss enamel
AS 3730.15	2006	Primer - Latex - For metallic zinc surfaces
AS 3730.21	2006	Primer - Solvent-borne - For ferrous metallic surfaces
AS/NZS 3733	2018	Textile floor coverings - Cleaning maintenance of residential and commercial carpeting
AS 3735	2001	Concrete structures retaining liquids
AS 3740	2010	Waterproofing of domestic wet areas
AS 3743	2003	Potting mixes
AS/NZS 3750		Paints for steel structures
AS/NZS 3750.9	2009	Organic zinc-rich primer
AS/NZS 3750.13	1997	Epoxy primer (two pack)
AS/NZS 3750.14	1997	High-build epoxy (two-pack)
AS/NZS 3750.16	1998	Waterborne primer and paint for galvanized, zinc/aluminium alloy-coated and zinc-primed steel
AS/NZS 3750.19	2008	Metal primer - General purpose
AS/NZS 3750.20	2008	Anticorrosive metal primer - Solvent borne - Lead and chromate free
AS/NZS 3750.21	2008	Undercoat - Solvent borne
AS/NZS 3750.22	2008	Full gloss enamel - Solvent borne
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 3814	2015	Industrial and commercial gas-fired appliances
AS 3818		Timber - Heavy structural products - Visually graded
AS 3818.2	2010	Railway track timbers
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 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 3996	2019	Access covers and grates
AS 3999	2015	Bulk thermal insulation - Installation
AS/NZS 4026	2008	Electric cables - For underground residential distribution systems
AS 4032		Thermostatic mixing valves - Materials, design and performance requirements
AS 4032.1	2005	Thermostatic mixing valves - Materials, design and performance requirements
AS 4032.3	2004	Requirements for field testing, maintenance or replacement of thermostatic mixing valves, tempering valves and end of line temperature control devices
AS 4046		Methods of testing roof tiles
AS 4046.9	2002	Determination of dynamic weather resistance
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 4072		Components for the protection of openings in fire-resistant separating elements
AS 4072.1	2005	Service penetrations and control joints
AS 4086		Secondary batteries for use with stand-alone power systems
AS 4086.1	1993	General requirements
AS 4100	1998	Steel structures
AS/NZS 4114		Spray painting booths, designated spray painting areas and paint mixing rooms
AS/NZS 4114.1	2003	Design, construction and testing
AS/NZS 4114.2	2003	Installation and maintenance
AS 4118		Fire sprinkler systems
AS 4118.1.8	1999	Components - Pressure-reducing valves
AS 4145		Locksets and hardware for doors and windows
AS 4145.1	2008	Glossary of terms and rating system
AS 4145.2	2008	Mechanical locksets for doors and windows in buildings
AS 4145.3	2001	Mechanical locksets for windows in buildings
AS 4145.4	2002	Padlocks
AS 4145.5	2011	Controlled door closing devices (EN 1154:1997, MOD)
AS/NZS 4200		Pliable building membranes and underlays
AS/NZS 4200.1	2017	Materials
AS 4200.2	2017	Installation requirements
AS/NZS 4253	1994	Mailboxes
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 4262		Telecommunication overvoltages
AS 4262.1	1995	Protection of persons
AS 4262.2	1999	Protection of equipment
AS/NZS 4266		Reconstituted wood-based panels - Methods of test
AS/NZS 4266.1	2017	Base panels
AS 4288	2003	Soft underlays for textile floor coverings
AS 4312	2008	Atmospheric corrosivity zones in Australia
AS/NZS 4357		Structural laminated veneer lumber
AS/NZS 4357.0	2005	Specifications
AS 4373	2007	Pruning of amenity trees
AS 4386	2018	Cabinetry in the built-in environment - Commercial and domestic
AS/NZS 4389	2015	Roof safety mesh
AS 4397	2007	Electroplated coatings of zinc on steel fasteners with imperial threads
AS/NZS 4402	2015	Hexagon head tapping screws
AS/NZS 4403	2015	Slotted pan head tapping screws
AS/NZS 4404	2015	Slotted countersunk (flat) head tapping screws (common head style)
AS/NZS 4405	2015	Slotted raised countersunk (oval) head tapping screws (common head style)
AS/NZS 4406	2015	Cross-recessed pan head tapping screws
AS/NZS 4407	2015	Crossed-recessed countersunk (flat) head tapping screws (common head style)
AS/NZS 4408	2015	Crossed-recessed raised countersunk (oval) head tapping screws
AS/NZS 4409	2015	Hexagon washer head tapping screws
AS/NZS 4410	2015	Hexagon flange head tapping screws
AS 4419	2018	Soils for landscaping and garden use
AS 4428		Fire detection, warning, control and intercom systems - Control and indicating equipment
AS 4428.1	1998	Fire
AS 4428.3	2010	Fire brigade panel
AS 4428.4	2016	Intercommunication systems for emergency purposes
AS 4428.5	1998	Power supply units
AS 4428.6	2018	Alarm signalling equipment
AS 4428.7	1999	Air-handling fire mode control panel
AS 4428.10	1998	Alarm investigation
AS 4428.16	2015	Emergency warning control and indicating equipment
AS 4440	2004	Installation of nailplated timber roof trusses
AS 4446	1999	Manufacture of nailplate-joined timber products
AS 4454	2012	Composts, soil conditioners and mulches
AS/NZS 4455		Masonry units, pavers, flags and segmental retaining wall units
AS/NZS 4455.1	2008	Masonry units
AS/NZS 4455.2	2010	Pavers and flags
AS/NZS 4455.3	2008	Segmental retaining wall units
AS/NZS 4491	1997	Timber - Glossary of terms in timber related Standards
AS/NZS 4505	2012	Garage doors and other large access doors
AS 4506	2005	Metal finishing - Thermoset powder coatings
AS 4509		Stand-alone power systems
AS/NZS 4509.1	2009	Safety and installation
AS/NZS 4509.2	2010	System design
AS/NZS 4534	2006	Zinc and zinc/aluminium-alloy coatings on steel wire
AS/NZS 4548		Guide to long-life coatings for concrete and masonry
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 4566	2005	Flue cowls - Gas appliances
AS 4586	2013	Slip resistance classification of new pedestrian surface materials
AS/NZS 4600	2018	Cold-formed steel structures
AS/NZS 4645		Gas distribution networks
AS/NZS 4645.2	2018	Steel pipe systems
AS 4654		Waterproofing membranes for external above-ground use
AS 4654.1	2012	Materials
AS 4654.2	2012	Design and installation
AS 4663	2013	Slip resistance measurement of existing pedestrian surfaces
AS 4666	2012	Insulating glass units
AS/NZS 4667	2000	Quality requirements for cut-to-size and processed glass
AS/NZS 4671	2001	Steel reinforcing materials
AS 4678	2002	Earth-retaining structures
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 4750	2003	Electroplated (zinc) coatings on ferrous hollow and open sections
AS/NZS 4766	2006	Polyethylene storage tanks for water and chemicals
AS/NZS 4777		Grid connection of energy systems via inverters
AS/NZS 4777.1	2016	Installation requirements
AS/NZS 4777.2	2015	Inverter requirements
AS/NZS 4782		Double-capped fluorescent lamps - Performance specifications

AS/NZS 4782.1	2004	General (IEC 60081:2000, MOD)
AS 4782.2	2019	Minimum Energy Performance Standard (MEPS)
AS/NZS 4783		Performance of electrical lighting equipment - Ballasts for fluorescent lamps
AS/NZS 4783.1	2001	Method of measurement to determine energy consumption and performance of ballasts lamp circuits
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/NZS 4791	2006	Hot-dip galvanized (zinc) coatings on ferrous open sections, applied by an in-line process
AS/NZS 4792	2006	Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or a specialized process
AS 4806		Closed circuit television (CCTV)
AS 4806.2	2006	Application guidelines
AS 4806.4	2008	Remote video
AS 4809	2017	Copper pipe and fittings - Installation and commissioning
AS/NZS 4847		Self ballasted lamps for general lighting services
AS/NZS 4847.1	2010	Test methods - Energy performance
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/NZS 4859.2	2018	Design
AS/NZS 4879		Performance of transformers and electronic step-down convertors for ELV lamps
AS/NZS 4879.1	2008	Test method - Energy performance
AS/NZS 4879.2	2010	Minimum Energy Performance Standards (MEPS) requirements
AS 4934		Incandescent lamps for general lighting service - Test methods
AS 4934.2	2011	Minimum energy performance standards (MEPS) requirements
AS/NZS 4961	2003	Electric cables - Polymeric insulated - For distribution and service applications
AS 4970	2009	Protection of trees on development sites
AS/NZS 5000		Electric cables - Polymeric insulated
AS/NZS 5000.1	2005	For working voltages up to and including 0.6/1 kV (1.2) kV
AS 5007	2007	Powered doors for pedestrian access and egress
AS/NZS 5033	2014	Installation and safety requirements for photovoltaic (PV) arrays
AS 5039	2008	Security screen doors and security window grilles
AS 5040	2003	Installation of security screen doors and window grilles
AS 5101		Methods for preparation and testing of stabilized materials
AS 5101.4	2008	Unconfined compressive strength of compacted materials
AS/NZS 5125		Heat pump water heaters - Performance assessment
AS/NZS 5125.1	2014	Air source heat pump water heaters
AS/NZS 5131	2016	Structural steelwork - Fabrication and erection
AS/NZS 5141	2018	Residential heating and cooling systems - Minimum applications and requirements for energy efficiency, performance and comfort criteria.
AS 5146		Reinforced autoclaved aerated concrete
AS 5146.1	2015	Structures
AS 5146.3	2018	Construction
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 5218	2018	Acoustic performance of windows and doors - Methods of test
AS/NZS 5263		Gas appliances
AS/NZS 5263.1.2	2016	Gas fired water heaters for hot water supply and/or central heating
AS 5488		Classification of Subsurface Utility Information (SUI)
AS/NZS 5601		Gas installations
AS/NZS 5601.1	2013	General installations
AS 5604	2005	Timber - Natural durability ratings
AS 5637		Determination of fire hazard properties
AS 5637.1	2015	Wall and ceiling linings
AS 6669	2016	Plywood - Formwork
AS 7240		Fire detection and alarm systems
AS 7240.1	2018	General and definitions
AS 7240.2	2018	Fire detection control and indicating equipment (ISO 7240-2:2017, MOD)
AS 7240.4	2018	Power supply equipment (ISO 7240.4:2017, MOD)
AS ISO 7240.5	2018	Point-type heat detectors
AS 7240.6	2017	Carbon monoxide fire detectors using electro-chemical cells
AS 7240.7	2018	Point type smoke detectors using scattered light, transmitted light or ionization (ISO 7240.7:2018, MOD)
AS ISO 7240.11	2018	Manual call points
AS 7240.13	2006	Compatibility assessment of system components

AS 7240.15	2018	Point type fire detectors using smoke and heat sensors (ISO 7240.15:2014,MOD)
AS 7240.21	2006	Routing equipment
AS 7240.22	2018	Smoke-detection equipment for ducts (ISO 7240-22:2017, MOD)
AS ISO 7240.24	2018	Fire alarm loudspeakers
AS ISO 7240.25	2015	Components using radio transmission paths
AS ISO 9239		Reaction to fire tests for floor coverings
AS ISO 9239.1	2003	Determination of the burning behaviour using a radiant heat source
AS ISO 11654	2002	Acoustics - Rating of sound absorption - Materials and systems
AS 11801		Information technology - generic cabling for customer premises
AS/NZS 11801.1	2019	General requirements (ISO/IEC 11801-1:2017, MOD)
AS 11801.2	2019	Office premises (ISO/IEC 11801-2:2017,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 ISO/IEC 14763		Information Technology - Implementation and operation of customer premises cabling
AS/NZS ISO/IEC 14763.2		2014 Planning and installation
AS 60034		Rotating electrical machines
AS 60034.1	2009	Rating and performance (IEC 60034-1, Ed 11(2004) MOD)
AS 60034.11	2009	Thermal protection
AS 60034.12	2009	Starting performance of single-speed three-phase cage induction motors
IEC 60331		Tests for electric cables under fire conditions
AS/NZS IEC 60331.1	2017	Circuit integrity Test method for fire with shock at a temperature of at least 830 °C for cables of rated voltage up to and including 0.6/1.0 kV and with an overall diameter exceeding 20 mm
AS/NZS IEC 60331.2	2017	Circuit integrity Test method for fire with shock at a temperature of at least 830 °C for cables of rated voltage up to and including 0.6/1.0 kV and with an overall diameter not exceeding 20 mm
AS/NZS 60335		Household and similar electrical appliances - Safety
AS/NZS 60335.2.40	2019	Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers
AS/NZS 60335.2.80	2016	Particular requirements for fans
AS/NZS 60335.2.97	2017	Particular requirements for drives for rolling shutters, awnings, blinds and similar equipment (IEC 60335-2-97 Ed 2.1, IDT)
AS 60529	2004	Degrees of protection provided by enclosures (IP Code)
AS/NZS 60598		Luminaires
AS/NZS 60598.1	2017	General requirements and tests (IEC 60598-1, Ed. 8.0 (2014) MOD)
AS 60849	2004	Magnetic field strength in audio-frequency induction loops for hearing aid purposes
AS/NZS 60898		Electrical accessories - Circuit-breakers for overcurrent protection for household and similar installations
AS/NZS 60898.1	2004	Circuit-breakers for a.c. operation
AS/NZS 60901	2003	Single-capped fluorescent lamps - Performance specifications
AS/NZS 60929	2005	A.C. supplied electronic ballasts for tubular fluorescent lamps - Performance requirements
AS/NZS IEC 60947		Low voltage switchgear and controlgear
AS/NZS IEC 60947.1	2015	General rules
AS/NZS IEC 60947.2	2015	Circuit-breakers
AS 60947.3	2018	Switches, disconnectors, switch-disconnectors and fuse-combination units (IEC 60947-3:2015 (ED. 3.2) MOD)
AS/NZS IEC 60947.4.1	2015	Contactors and motor-starters - Electromechanical contactors and motor-starters
AS/NZS IEC 60947.5.5	2000	Control circuit devices and switching elements - Electrical emergency stop device with mechanical latching function
AS/NZS 60968	2001	Self ballasted lamps for general lighting services - Safety requirements (IEC 60968:1988, MOD)
AS/NZS 60969	2001	Self ballasted lamps for general lighting services - Performance requirements
AS/NZS 61000		Electromagnetic compatibility (EMC)
AS/NZS 61008		Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCBs)
AS/NZS 61008.1	2015	General rules ((IEC 61008-1, Ed. 3.2 (2013) MOD)
AS/NZS 61009		Residual current operated circuit-breakers with integral protection for household and similar uses (RCBOS)
AS/NZS 61009.1	2015	General rules (IEC 61009-1, Ed. 3.2 (2013) MOD)
AS/NZS 61347		Lamp controlgear
AS/NZS 61347.2.3	2016	Particular requirements for a.c. supplied electronic ballasts for fluorescent lamps
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)
AS/NZS 61558		Safety of power transformers, reactors, power supply units and combinations thereof
AS/NZS 61558.1	2018	General requirements and tests. (IEC 61558-1:Ed 3 MOD)
SA/SNZ HB 32	1995	Control of microbial growth in air-handling and water systems of buildings
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
SA HB 326	2008	Urban greywater installation handbook for single households

ACCC SS	2014	Competition and Consumer (Corded Internal Window Coverings) Safety Standard
ACIF C524	2013	External Telecommunication Cable Networks. Industry Code
ACMA		Australian Communications and Media Authority (ACMA)
Aus Gov Telecom	2015	Telecommunications infrastructure in new developments - A new approach to competition
ActivFire		ActivFire Register of Fire Protection Equipment
BCA 3.1.4.4	2019	Acceptable construction - Site preparation - Termite risk management - Durable notices
BCA 3.4.4	2019	Acceptable construction - Framing - Structural steel members
BCA 3.10.6	2019	Attachment of decks and balconies to external walls of buildings
BCA 3.9.2	2019	Acceptable construction - Safe movement and access - Barriers and handrails
BCA 3.12.1.1	2019	Acceptable construction - Energy efficiency - Building fabric - Building fabric thermal insulation
BCA 3.8.1.2	2019	Acceptable construction - Health and amenity - Wet areas and external weatherproofing - Wet areas
BCA Schedule 5	2019	Schedule 5 Fire-resistance of building elements
BCA A5.0	2019	Governing requirements - Documentation of design and construction - Suitability
BCA A5.5	2019	Governing requirements - Documentation of design and construction - Fire hazard properties
BCA B1.4(i)(ii)	2019	Structure - Structural provisions - Determination of structural resistance of materials and forms of construction
BCA C2.13	2019	Fire resistance - Compartmentation and separation - Electricity supply system
BCA C3.15	2019	Fire resistance - Protection of openings - Openings for service installations
BCA Spec C3.4	2019	Fire resistance - Fire doors, smoke doors, fire windows and shutters
BCA D2.13	2019	Access and egress - Construction of exits - Goings and risers
BCA D2.14	2019	Access and egress- Construction of exits - Landings
BCA D2.24	2019	Access and egress - Construction of exits - Protection of openable windows
BCA Spec E1.8	2019	Services and equipment - Fire control centres
BCA Spec E2.2a	2019	Services and equipment - Smoke detection and alarm systems
BCA F1.7	2019	Health and amenity - Damp and weatherproofing - Water proofing of wet areas in buildings
BCA J1.2	2019	Energy efficiency - Building fabric - Thermal construction - General
BCA J5.4	2019	Energy efficiency - Air-conditioning and ventilation systems - Fan systems
CMAA PE01	2010	Permeable interlocking concrete pavements - Design and construction guide
FWPA PN06.1039	2008	Interim industry standard – Recycled timber – Visually graded recycled decorative
GAA Galvanizing	2012	After fabrication hot dip galvanizing
ICANZ	2003	Industry code of practice for the safe use of glass wool and rock wool insulation
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
NOHSC 2003	1989	National Code of Practice for the safe handling of timber preservatives and treated timber
NOHSC 3007	1989	Guidance Note for the Safe Handling of Timber Preservatives and Treated Timber
RMS T276	2012	Foreign materials content of recycled crushed concrete
SUSMP	2019	Poisons Standard (SUSMP)
Safe Work Australia		Hazardous chemical information system
SA TS 102	2016	Structural steel – Limits on elements added
WA Gov Act No. 036	2007	Waste Avoidance and Resource Recovery Act 2007
WA Gov Act No. 074	1995	Local Government Act 1995
WA Gov Act No. 087	1986	Environmental Protection Act 1986
WA Gov Act No. 101	1984	Occupational Safety and Health Act 1984
WA Gov Act No.34	1911	Health (Miscellaneous Provisions) Act 1911
WA Gov S.R. Clearing	2004	Environmental Protection (Clearing of Native Vegetation) Regulations
WA Gov S.R. Environ	1987	Environmental Protection Regulations
WA Gov S.R. Health	1974	Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations
WA Gov S.R. Landfill	2002	Environmental Protection (Rural Landfill) Regulations
WA Gov S.R. Pesticides	2011	Health (Pesticides) Regulations
WA Gov S.R. Safety	1996	Occupational Safety and Health Regulations 1996 (WA)
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)
WA Gov Act No. 024	2011	Building Act 2011
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
BS 8313	1997	Code of practice for accommodation of building services in ducts
AAMA 701/702	2011	Voluntary specification for pile weatherstripping and replaceable fenestration weatherseals
AAMA 2603	2017	Voluntary specification, performance requirements and test procedures for pigmented organic coatings on aluminium extrusions and panels
AAMA 2604	2017	Voluntary specification, performance requirements and test procedures for high performance organic coatings on aluminium extrusions and panels

AAMA 2605	2017	Voluntary specification, performance requirements and test procedures for superior performing organic coatings on aluminum extrusions and panels
ASTM A240/A240M	2018	Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
ASTM A276/A276M	2017	Standard Specification for Stainless Steel Bars and Shapes
ASTM A554	2016	Standard Specification for Welded Stainless Steel Mechanical Tubing
ASTM C171	2016	Standard specification for sheet materials for curing concrete
ASTM C534/C534M	2019	Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form
ASTM C920	2018	Standard Specification for Elastomeric Joint Sealants
ASTM C1048	2018	Standard specification for heat-strengthened and fully tempered flat glass
ASTM C1311	2014	Standard Specification for Solvent Release Sealants
ASTM D1248	2016	Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable
IEEE 802	2014	Standard for local and metropolitan area networks: overview and architecture
IEEE 802.11	2016	Wireless LAN medium access control (MAC) and physical layer (PHY) specifications
EN 650	2012	Resilient floor coverings. Polyvinyl chloride floor coverings on jute backing or on a polyester felt backing or on polyester felt with polyvinyl chloride backing. Specification
EN 651	2011	Resilient floor coverings. Polyvinyl chloride floor coverings with foam layer. Specification
EN ISO 10581	2013	Resilient Floor Coverings - Homogeneous poly(vinyl chloride) floor covering - Specifications (ISO 10581:2011)
EN ISO 10582	2018	Resilient Floor Coverings - Heterogeneous poly(vinyl chloride) floor covering - Specifications
EN ISO 10595	2012	Resilient floor coverings. Semi-flexible/ vinyl composition (VCT) poly(vinyl chloride) floor tiles. Specification
EN 12878	2014	Pigments for the colouring of building materials based on cement and/or lime. Specifications and methods of test
EN 13055	2016	Lightweight aggregates
EN 13845	2017	Resilient floor coverings - Polyvinyl chloride floor coverings with particle based enhanced slip resistance - Specification
EN 14179		Glass in buildings - Heat soaking thermally toughened soda lime silicate safety glass
EN 14179-1	2016	Definition and description
IEC 60085	2007	Electrical insulation - Thermal evaluation and designation
IEC 60793		Optical fibres
IEC 60793-2-10	2019	Product specifications - Sectional specification for category A1 multimode fibres
IEC 60794		Optical fibre cables
IEC 60794-1-2	2017	Generic specification - Cross reference table for optical cable test procedures
IEC 61215-1	2016	Terrestrial photovoltaic (PV) modules - Design qualification and type approval - Test requirements
IEC 61215-1-1	2016	Special requirements for testing of crystalline silicon photovoltaic (PV) modules
IEC 61836	2016	Solar photovoltaic energy systems - Terms, definitions and symbols
ISO/IEC 8802		Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements
ISO/IEC/IEEE 8802-11	2018	Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications
ISO 10580	2010	Resilient, textile and laminate floor coverings - Test method for volatile organic compound (VOC) emissions
ISO 10816		Mechanical vibration - Evaluation of machine vibration by measurements on non-rotating parts
ISO 10816-3	2009	Industrial machines with nominal power above 15 kW and nominal speeds between 120 r/min and 15 000 r/min when measured in situ
ISO 11600	2002	Building construction - Jointing products - Classification and requirements for sealants
ISO 20816		Mechanical vibration - Measurement and evaluation of machine vibration
ISO 20816-1	2016	General guidelines



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