# Project name:
# Former Council Chambers, St Marys,
## Alterations and additions to existing entrance and toilet amenities

Description:
Demolish existing ramp, internal and external toilet amenities, store & Construct Entry with step and ramp and new accessible toilet amenity.

| Revision | Date | Approved by |
|---|---|---|
| Draft | 1/4/15 | RMC |
| | | |
| | | |

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**0131 PRELIMINARIES**

## 1 GENERAL

### 1.1 GENERAL

1. Drawing are not to be scaled
2. Work to figured dimensions only
3. All dimensions, levels, sewer and stormwater invert levels, door and structural member sizes are to be checked and verified by the builder on site prior to commencement of any work and prior to ordering of any material.
4. In case of discrepancies in the drawings, contact Council's Project Manager immediately prior to proceeding with any further work to receive clarification.
5. All work has to be carried out to meet the requirements of the most current Building Code (NCC) and relevant Australian Standards.
6. If Services Engineer's (Electrical, Hydraulic, mechanical) are required. Contractor to borne cost of the works.
7. Drawings are to be read in conjunction with Specification, drawings, and technical requirements.
8. Follow Structural Engineering drawings for all structural components.
9. Structural Engineer must inspect work if structural drawing/s are provided Cost of inspections to be borne by Contractor, copies to Structural Engineer Certification to be provide to Project Manager before practical completion unless otherwise noted.
10. If substitutions are required, contact Council's project Manager prior to placing order for approval.
11. Builder to verify suitability of all materials and fixtures proposed with manufacture and suitability prior to order. Follow instructions provided by manufacture.
12. All set-out dimensions to be verified on site prior to works commencing.

### 1.2 THE SITE

**Site restrictions**

Site limitations: Comply with any restrictions on the use of the site as imposed by Penrith City Council and other regulatory bodies.

Access: Access on to and within the site, use of the site for temporary works and construction including working and storage areas, location of offices, workshops, sheds road and parking is restricted to the areas as specified by Penrith City Council.

**Occupied premises**

General: For the parts of the site designated as occupied premises:

Allow occupants to continue in secure possession and occupancy of the premises for the required period.

Make available 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, by such means as temporary screens. Proposals: Submit details of proposed methods.

Purposed of submission: information only.

**Protection of persons and property**

Temporary works: Provide and maintain required barricades, guards, fencing shoring, temporary roadways, footpaths, signs, lighting, watching and traffic flagging.

Access ways and services: Do not obstruct or damage road ways and footpaths, drains and watercourse and other existing services in sue on or adjacent to the site. Determine the location of such services.

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

**Rectification**

Access and services: rectification immediately any obstructions or damage to roadways and footpaths, drains and watercourse 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 damaged to property which is to remain on or adjacent to the site, including adjoining property encroaching on the site and trees.

**Existing services**

General: attend to existing services as follows:

Dig- before you dig – investigation to be carried out prior to works commencing.

If the service is to be continued, repair, divert or relocate. Submit proposals.

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

If the serve if to be abandon, remove redundant parts and make safe

Proposals: Submit proposal for action to be taken with respect to existing services before starting this work. Minimise the number and duration of interruptions.

Purpose for submission: for review.

**Adjoining Property**

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

Revealed encroachments: If the work revealed unknown encroachments or adjoining properties on to the site or of existing site structures on to adjoining property, immediately seek instructions.

Record: For information

Inspect the properties with Council's Project Manager, owner of the adjoining property and its occupants, before commencing work.

Make detailed condition report of the existing conditions within the property, especially structural defect and other damage or defacement,

Arrange for at least 2 copies of each record, including photograph, drawings, and written description to be endorsed by the owner of the adjoining property or representative as evidence of the existing condition before work commences.

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

Purpose of submission: information only.

## 1.3 CONSTRUCTION PLANT

**Access:**

Access route: As required by Penrith City Council

**Parking:**

Use only designated parking areas as required by Penrith City Council.

No not obstruct disabled parking or access.

**Use of existing services**

General: Existing services may be used as temporary services for the performance of the contract.

**Temporary Services**

Connect water, sewer and electrical services. Pay all charges for connection and supply.

Disconnect temporary services and make good at the end of the project and after the handover of the new works.

**Project Sign board**

General: Provide project specific sign boarding

-Locate (generally) on the site fence.

- maintain in good condition

Remove on completion

- Information to contain 1) Name of Builder, 2) License number, 3) address, 4)telephone number

## 1.4 BUILDING THE WORKS

**Surveys**

Setting out: by registered Surveyor

Check Survey: by registered Surveyor

Final survey: by registered Surveyor

**Survey mark**

Definition: The term survey mark means 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 works.

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

Rectification: If the principal's survey marks are disturbed or obliterated, immediately give notice and rectify the disturbance or obliteration.

**Safety**

Accidents: Promptly notify the contract administrator or the occurrence of the following:

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

Accident reports: Submit reports of accidents

- Purpose of submission – information only.

**Contractor's representative**

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

**Subcontracting**

General: submit a complete list of proposed contractors and suppliers.

**Items supplied by Penrith City Council**

General: Items to be provided by Council are noted (by Council) within the architectural drawings.

These items are provided free of charge to the contractor for installation in the execution of the works. Unload and take delivery of the items, inspect them for defects. If defect are found advise. Return items unused. Items lost or damaged after delivery will need to be replaced at the cost of the Contractor.

## 1.5 COMPLETION OF THE WORKS

**Reinstatement**

General: Before the date of practical completion, clean and repair damaged caused by the installation or use of temporary work and restore existing facilities used during construction to original conditions.

**Adjoining property**

Evaluation: At practical completion, inspect adjacent properties/playing field (identified) with the Project Manager, owner and occupants of the properties, record any damage occurred since the pre-commissioning inspection.

**Removal of plant:**

General: Within 10 working days after practical completion, remove temporary works and construction plant no longer required. Remove the balance before the end of the defects liability period.

## 1.6 MISCELLANEOUS

**Contractor and owner to observe confidentially**

Publicity: Do not issue information concerning the project for publication to the media without prior written approval from Council.

**Compliance with law.**
Approvals from service authorities to be at the cost of the contractor including Work Health and Safety requirements. This document does not cover WHS requirements.

**0201 DEMOLITION**

## 2 GENERAL

### 2.1 RESPONSIBILITIES

**General**
Requirement: Carry out demolition, as documented.

### 2.2 STANDARD

**General**
Demolition: To AS 2601.

### 2.3 INTERPRETATION

**Definitions**
For the purposes of this work section, the following definitions apply:

- Demolition: The complete or partial dismantling of a building or structure, by pre-planned and controlled methods or procedures.
- Dilapidation record: The photographic record made before commencement of demolition work of the condition of the portion of the existing building being retained, adjacent buildings, and other relevant structures or facilities.
- Dismantle: The reduction of an item to its components in a manner to allow re-assembly.
- Recover: The disconnection and removal of an item in a manner to allow re-installation.

### 2.4 INSPECTION

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

- Site before demolition.
- Services before disconnection or diversion.
- Site after removal of demolished materials.
- Services after reconnection or diversion.

### 2.5 SUBMISSIONS

**Penrith City Council approvals**
Evidence of compliance: Before commencing demolition, submit evidence of the following:

- Certification that each person having access to the construction site has completed a WHS induction training procedure which is site-specific.
- Precautions necessary for protection of persons and property have been taken and suitable protective and safety devices provided to the approval of the relevant authority.
- Fees and other costs have been paid if required.

**Investigation and work plan**
Work plan: Submit the work plan before demolition or stripping work. Include the check list items appropriate to the project from AS 2601 Appendix A, and the following information:

- The method of protection and support for adjacent property.
- Locations and details of necessary service deviations and terminations.
- Confirmation of the sequence of work.
- Requirements of AS 2601 Section 2 Planning and execution.

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

**Hazardous materials**

IF hazardous materials have been identified or found:

Prepare a Hazardous substances management plan to AS 2601 clause 1.6. 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.

**Offsite disposal**

Disposal location: Submit the locations and evidence of compliance and receipts with the relevant authorities for the disposal of material required to be removed from the site.

**Records**

Dilapidation record: Submit a copy of the photographic dilapidation record to record site before works.

**Recycling**

Delivery location: Submit the name and address of the proposed recycling facility.

## 3 PRODUCTS

### 3.1 DEMOLISHED MATERIALS

**Demolished materials**

Ownership: Ownership of demolished materials is described in the **demolished material classes table**.

**Demolished material classes**

Ownership and implementation: Comply with the **demolished material classes table**.

**Demolished material classes table**

| Class | Requirement | Ownership |
|---|---|---|
| Recovered items for re-use in the works | Recover without damage items identified in the **Recovered items for re-use in the works schedule (found on drawing)** | Principal/proprietor |
| Demolished material for recycling off site | Demolish and deliver for recycling material identified in the **Demolished material for recycling off-site schedule (waste management plan)** | Contractor |
| Demolished for removal | Remove from the site demolished materials identified in the **Demolish for removal schedule**. Do not burn or bury on site<br>Transit: Prevent spillage of demolishing materials in transit | Contractor |

## 4 EXECUTION

### 4.1 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.

### 4.2 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 surfaces or adjoining buildings are exposed, provide temporary covers to prevent water penetration. Provide covers to protect existing plant equipment and materials intended for reuse.

**Dust protection**

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

**Security**

General: If a wall or roof is opened for alterations and additions, provide security against unauthorised entry to the building.

**Temporary screens**

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

Type: Timber framed screens sheeted with fibre cement and painted. Seal the junctions between the screens and the openings.

**Temporary access**

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

### 4.3 DEMOLITION – BUILDING WORKS

**Dilapidation record**

Purpose: Use the dilapidation record to assess the damage and making good arising out of demolition work.

Availability: Keep the records of the investigations on site and available for inspection until the date of practical completion of the contract.

**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.

**Explosives**

General: Do not use explosives.

### 4.4 DEMOLITION – BUILDING SERVICES

**General**

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

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

Recovered materials: Recover all components associated with the listed items. Minimise damage during removal and deliver to the locations scheduled.

**Re-used components**
General: Clean re-used components and test for compliance with current Australian Standards before returning to service. Provide results of compliance tests.

### 4.5 HAZARDOUS MATERIALS

**Identified hazardous materials**
Register: If Hazardous materials have been identified as present on site and a Hazardous materials register has been prepared and included with the tender documents.

**Hazardous materials removal**
Standard: To AS 2601 clause 1.6.2.

Procedure for asbestos removal if found: Refer to how to safety remove asbestos by Safe Work Australia.

### 4.6 COMPLETION

**Notice of completion**
General: Give at least 7 working days' notice of completion of demolition so that adjacent structures may be inspected following completion of demolition.

Making good: Make good any damage arising out of demolition work. Obtain written acceptance from the owner of each adjoining property of completeness and standard of making good.

**Temporary support**
General: Clear away at completion of demolition.

## 5 SELECTIONS

### 5.1 DEMOLITION

**Recovered items for re-use in the works schedule**

| Item | Location for re-use |
|---|---|
| Refer to drawing if identified. | Refer to drawing if identified. |
| | |
| | |

**Demolished material for recycling off-site schedule**

| Material |
|---|
| Refer to drawing if identified. |
| |
| |

**Demolish for removal schedule**

| Item |
|---|
| Refer to drawing if identified. |
| |
| |

# 0221 SITE MANAGEMENT

## 1 GENERAL

### 1.1 INTERPRETATION

**Definitions**

General: For the purposes of this work section the following definitions apply:

- Clearance authority: Any authority covering statutory requirements relating to the project and requiring clearances for work in that particular area.
- Clearances: A formal certificate, approval or condition issued by a statutory authority to allow work to be carried out in a particular area.
- Contamination of land: The presence of a substance in, on or under the land which is a designated hazardous material and/or is at a concentration above that which is normally found in that locality, such that there presents a risk of harm to human health or to the environment.
- Green and organic waste: Includes all food wastes, vegetative wastes from land clearing and pruning operations, biosolids produced from the treatment of liquid wastes, garden wastes and forestry waste (bark and saw dust) and paper and cardboard products.
- Environment: The physical factors of the surroundings of human beings including the land, waters, atmosphere, climate, sound, odours, tastes, the biological factors of animals and plants and the social factor of aesthetics.
- Environmental audits: A review of environment management practices, in particular the evaluation of a site for environmental liability.
- Environmental impact assessment: A method for predicting environmental impacts of a proposed development including minimising identified impacts.
- Environmental management plan (EMP): A plan describing the management of the environmental issues and considerations for the activity being undertaken. This applies to the design, construction and operation of the buildings and infrastructure.
- Pollution incident: An incident or set of circumstances during or as a consequence of which there is, or is likely to be a leak, spill or other escape of a substance as a result of which pollution has occurred, is occurring or is likely to occur.
- Weed: An invasive plant that degrades our natural areas, reduces the sustainability or affects the health of people and animals.

### 1.2 INSPECTION

**Notice**

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

- Enclosures to trees to be retained.
- Trees to be removed.

### 1.3 MANAGEMENT AND CONTROL

**Plans submitted by the contractor**

Implementation: Approved management plans if required specified on documents or Request for Tender.

**Management and control measures**

Implementation: Management and control measures documented if required specified on documents or Request for Tender.

### 1.4 SUBMISSIONS

**Submissions program**

Time for submissions: Prior to commencement on site.

Training program: Submit a program to familiarise staff regarding the site environmental management plan, environmentally sensitive areas and responsibilities if required noted in Request for Tender.

**Soil erosion and sediment control plan**

Plan: Submit a soil erosion and sediment control plan for approval and include the following details:

- Staging of operations and sequence of works.
- Diversion of upstream water around the site.
- Provision of temporary drains and catch drains.
- Application of diversion, dispersal and/or retention measures to concentrate flows to control and dissipate stormwater through the site without damage.
- Restoration of disturbed areas in progress with the works.

Areas: Include all site areas and access and haulage tracks, borrow pits, stockpile and storage areas and compound areas.

**Waste management plan**

Plan: Submit a waste management plan and identify major waste streams that will be generated during the contract including:

- Green waste and organic waste.
- Construction waste, including:
  - . Spoil.
  - . Demolition waste.
  - . Asphalt or bitumen.
  - . Concrete
  - . Metal.
- For each waste stream indicate:
  - . How and where the waste is to be re-used, recycled, stockpiled or disposed of.
- Indicate how the waste will be transported between the site and point of re-use, recycling, stockpiling, treating or disposal and who will be responsible.

Waste stream: Submit details of location, labelling and protection of separate skips for the identified waste stream.

**Emergency response**

Emergency response personnel: Provide staff member's names and contact details.

Response time: prior to commencement on site

## 2 EXECUTION

### 2.1 GENERAL

**Community liaison**

General: Contractor to advised Council (Project Manager) about new or changed construction activities which will affect access to, or disrupt the use of, neighbouring properties. Council will notify residence.

Notice: Contractor to notify within 14 working days unless the work is of an urgent nature with safety implications.

Notification content:

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

**Complaints**

Report: Within 1 working day of receiving a complaint about any environmental issue, including pollution, submit a written report detailing the complaint and action taken.

Register: Keep a register of all environmental complaints and action taken.

## 2.2 CONTROL AND PROTECTION

**Air quality control**

General: Protect adjoining owners, residents and the public against dust, dirt and water nuisance and injury. Use dust screens and watering to reduce the dust nuisance.

**Dewatering**

General: Keep earthworks free of water. Provide and maintain slopes, crowns and drains on excavations and embankments to make sure free drainage. Place construction, including fill, masonry, concrete and services, on ground from which free water has been removed. Prevent water flow over freshly laid work.

Disposal: Dispose of water off-site.

**Lighting of fires**

Prohibition: Do not light fires.

Monitoring: Measure vibration levels of the peak particle velocity to AS 2187.2.

Limits: Do not exceed the vibration or airblast overpressure recommended in AS 2187.2 Appendix J.

**Water quality**

Wash out: Make sure that wash out does not enter waterways or stormwater drains.

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

## 2.3 MANAGEMENT AND CONTROL MEASURES

**Soil erosion and sediment control plan**

Contractor to submit a diagrammatic illustration of proposed soil and sediment control prior to the works commencing on site.

Once works have completed restoration of disturbed

**Waste management plan**

Requirement: Establish major waste streams that will be generated during the contract including:

- Green waste and organic waste.
- Construction waste, including:
  - Spoil.
  - Demolition waste.
  - Asphalt or bitumen.
  - Concrete
  - Metal.
  - Paint materials and empty containers.
  - Office waste.
  - Kitchen waste.
  - Sewage effluent.
  - Hazardous materials.

Identification: Submit details of location, labelling and protection of separate skips for the identified waste stream.

## 2.4 TRUCK CONTAMINATION

**Truck contamination precautions**

Covers: Use tarpaulins to prevent the dropping of materials on public roads.

Washing: Wash the underside of all vehicles leaving the site as follows:

- Mud: Do not carry mud on to adjacent paved streets or other areas.
- Noxious plants: If noxious plants, as designated by the local authority, are present on the site ensure seeds are not carried on to adjacent paved streets or other areas.

## 2.5 MANAGEMENT AND CONTROL PLAN IMPLEMENTATION

**Approval**

Provide copy to Project Manager for Approval

**Implementation**

General: Implement the following approved management and control plans:

- Soil erosion and sediment control plan.
- Waste management plan.

## 2.6 TEMPORARY LANDSCAPE FENCING

**Fence dimensions**

Height: 1200 mm.

Maximum post spacing: 5000 mm.

**Components 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.

**Removal**

Completion: Remove the fence at the end of the planting establishment period.

## 2.7 TREE PROTECTION

**General**

Warning sign: Display a sign in a prominent position at each entrance to the site, warning that trees and plantings are to be protected during the contract. Remove on completion.

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

Protection measures program: Before commencement of earthworks.

**Standard**

General: Comply with the recommendations of those parts of AS 4970 which are referenced in this work section.

**Trees to be retained**

Extent: All trees NOT marked for removal.

**Tree protection**

Tree protection zone: To AS 4970 Section 3.

Tree protective measures: To AS 4970 Section 4.

Monitoring and certification: To AS 4970 Section 5.

**Work near trees**

Harmful materials: Keep the area within the dripline free of sheds and paths, construction material and debris. Do not place bulk materials and harmful materials under or near 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 the like 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 to be retained, give notice and obtain instructions. Open up excavations under tree canopies for as short a period as possible.

Hand methods: Use hand methods to locate, expose and cleanly remove the roots on the line of excavation. If it is necessary to excavate within the drip line, use hand methods such that root systems are preserved intact and undamaged.

Roots: Do not cut tree roots exceeding 50 mm diameter. Where it is necessary to cut tree roots, use means such that the cutting does not unduly 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 to excavations around tree roots. Place the backfill in layers of 300 mm maximum depth and compacted 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-steel vehicles under the tree dripline. If compaction occurs, give notice and obtain instructions.

Compaction protection: Protect areas adjacent the tree dripline. Submit proposals for an elevated platform to suit the proposed earthworks machinery.

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 covered by the drip line of all protected trees.

## 2.8 EXISTING SERVICES

### Location

Requirement: Before commencing earthworks, locate and mark existing underground services in the areas which 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

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

## 2.9 TREES TO BE REMOVED

### Designation

Extent: Refer to drawings if required.

Marking: Mark trees and shrubs to be removed as follows:

- Tags: if required refer to drawings.

## 2.10 SITE CLEARING

### Extent

General: Clear only the following site areas:

- Areas to be occupied by works such as structures, paving, excavation, regrading and landscaping.
- Other areas designated to be cleared.

Contractor's site areas: If not included within the areas documented above, clear generally 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 of 500 mm below subgrade under buildings, embankments or paving, or 300 mm below finished surface in unpaved areas. Backfill holes remaining after grubbing with sand material to prevent ponding of water. Compact the material to the relative density of the existing adjacent ground material.

Old works: Remove old works, including slabs, foundations, pavings, drains and access chambers covers found on the surface.

## 2.11 VERMIN

### Vermin management

Requirement: If noted on drawings, employ an approved firm of pest exterminators and provide a certificate from the firm stating that the completed building is free of vermin.

# 0223 SERVICE TRENCHING

## 1 GENERAL

### 1.1 RESPONSIBILITIES

**General**

Requirement: Provide trenching for underground services, as documented.

**Design**

Steel shoring and trench lining systems: To AS 4744.1.

Hydraulic shoring and trench lining equipment: To AS 5047.

### 1.2 STANDARDS

**General**

Earthworks: To AS 3798.

### 1.3 INTERPRETATION

**Abbreviations**

General: For the purposes of this work section the following abbreviations apply:

- CBR value: California Bearing Ratio value.

### 1.4 INSPECTION

**Notice**

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

- Service trenches excavated before laying the service.
- Services laid in trenches and ready for backfilling.

### 1.5 SUBMISSIONS

**General**

Extent: Submit a plan of trench works noting the location and type of service.

Notice: Advise proposed duration of open excavation.

Construction: Submit details of proposed equipment and method of excavation if required.

Stability: If shuttering and/or bracing of the sides of a trench is required for safety and stability, provide proposals.

Hazards: Identify WHS hazards that may be encountered with deep trenches including toxic gases and liquids.

Boring: Submit proposals if required 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.

**Off site disposal**

Disposal location: Submit the locations and evidence of compliance with the relevant authorities for the disposal of material required to be removed from the site.

## 2 PRODUCTS

### 2.1 FILL MATERIALS

**General**

Requirement: Provide fill materials including borrow or imported fill to **free from stones larger than 100mm maximum dimensions.**

## 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 units**

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 sub base: If present, saw cut along the trench set out lines.

**Grass**

Method: Neatly cut grass turf between trenches set out lines into 300 mm squares. If the grass is suitable for re-use, take up and store the turf and water during the storage period, otherwise remove and dispose of it off-site.

**Small plants, shrubs and trees**

Storage: If required for re-planting, take up small plants and store. Wrap the root ball 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 EXCAVATING

**Excavation**

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

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

**Trench widths**

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

**Trench depths**

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

Adjacent to footings: If excavation is necessary below the zone of influence of the underside of adjacent footings, give notice, and provide support for the footings as instructed.

**Obstructions**

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

Tree protection: To AS 4970.

**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**

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 backfill material.

## 3.4 TRENCH BACKFILL

**General**

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

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**Trees**

General: Backfill at trees, for a minimum 300 mm thickness, around tree roots with a topsoil mixture, placed and compacted in layers of 150 mm minimum depth to a dry density equal to that of the surrounding soil.

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

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

## 3.5 SURFACE RESTORATION

**Generally**

Reinstate existing surfaces removed or disturbed by trench excavation to match existing and adjacent materials.

# 0224 STORMWATER – SITE

## 1 GENERAL

### 1.1 RESPONSIBILITIES

**General**

Requirement: Provide stormwater drainage, as documented.

### 1.2 STANDARDS

**Stormwater drainage**

Standard: To AS/NZS 3500.3.

### 1.3 INTERPRETATION

**Definitions**

General: For the purposes of this work section the following definition applies:

- Pipe surround: Includes pipe overlay, pipe side support, side zone and haunch zone.

### 1.4 INSPECTION

**Notice**

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

- Concealed or underground services prior to being covered.
- Upon completion.

Results: Submit results from pre-completion leak testing.

Certification: Submit certificate stating that network is leak free upon completion.

## 2 PRODUCTS

### 2.1 MATERIALS

**Concrete and mortar**

Concrete: To AS 1379 and the following:

- Grade: N15.
- Cement: To AS 3972.
  - Type: GP, GL or GB.

Steel reinforcement:

- Bars and machine welded mesh: To AS/NZS 4671.

**Joints**

Solvent cement and priming fluid: To AS/NZS 3879.

**Type of pipes and fittings**

Fibre reinforced cement (FRC): To AS 4139 and the following:

- ≤ 450 mm diameter: Rubber ring joints to AS 4139.
- > 450 mm diameter: With a purpose machined internal spigot and socketsystem within the pipe wall.

Glass-reinforced polyester (GRP): To AS 3571.1.

Cast iron access chamber covers and frames: To AS 1830 or AS 1831, as appropriate.

Polyvinyl chloride (PVC): To AS/NZS 1254, AS/NZS 1260 or AS 1273, as appropriate.

Polyethylene (PE): To AS/NZS 4129, AS/NZS 4130, ISO 8770 or AS/NZS 2033, as appropriate.

Precast concrete: To AS/NZS 4058.

Rubber ring joints/elastomeric seals: To AS 1646.

Plastic pipe for subsoil drainage: To AS 2439.1.

Vitrified clay or ceramic: To AS 1741.

**Bedding material**

Bed and haunch zones: Provide granular material graded to AS 1141 series.

Conformance: Conform to the **Bedding material grading table**.

**Bedding material grading table**

| Sieve size (mm) | Weight passing % | |
|---|---|---|
| | Bed and haunch | Side zones |
| 75.0 | - | 100 |
| 19.0 | 100 | - |
| 9.5 | - | 50-100 |
| 2.36 | 50-100 | 30-100 |
| 0.60 | 20-90 | 15-50 |
| 0.30 | 10-60 | - |
| 0.15 | 0-25 | - |
| 0.075 | 0-10 | 0-25 |

**Filter material**

General: Provide filter materials consisting of natural clean washed sands and gravels and screened crushed rock conforming to AS/NZS 3500.3 clause 2.14.1.

## 2.2 GEOTEXTILES

**General**

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.

**Subsoil drainage**

Filter: Conform to AS/NZS 3500.3 clause 2.14.2.

## 2.3 PREFABRICATED PITS

**General**

Requirement: Provide precast or prefabricated pits in conformance with AS/NZS 3500.3 clauses 2.13.8 and 8.6.

**Metal access covers and grates**

Standard: To AS 3996.

## 2.4 STORMWATER DRAINAGE PUMPS

**General**

Standard: To AS/NZS 3500.3 Section 9.

Requirement: Conform to **Pumped discharge system** in the *Hydraulic pumps* work section.

# 3 EXECUTION

## 3.1 PIPING

**General**

Laying: Lay lengths separately with the barrel bearing evenly on the prepared bedding.

Sockets: Lay with sockets pointing upstream.

Cleaning: Clean pipe interior of dirt, debris, mortar and other foreign matter.

Protection: Provide temporary caps over the ends of incomplete sections to prevent the entry of foreign matter.

## 3.2 TOLERANCES

**General**

Requirement: Conform to the **Pipeline tolerances table**. These tolerances are conditional on falls to outlets being maintained and no part of a pipeline having less than the documented gradient.

**Pipeline tolerances table**

| | **Permissible angular deviation from the documented alignment** | **Permissible displacement from the documented positions** |
|---|---|---|
| Horizontal | 1:300 | 15 mm |
| Vertical | 1:500 | 5 mm |

## 3.3 STORMWATER DRAINS

**Location**

General: Provide stormwater drains to connect surface drains, subsoil drains and drainage pits to the outlet point or point of connection. Make sure that location of piping will not interfere with other services and building elements not yet installed or built. Subject to the preceding and documented layouts, follow the most direct route with the least number of changes in direction.

**Laying**

General: Lay in straight lines between changes in direction or grade with socket end placed upstream. If other pipes are adjacent, set each pipe true to line and complete each joint before laying the next pipe. If work is not continuous cap open ends to prevent entry of foreign matter.

**Identification**

General: Lay a detectable strip or plastic tape in the trench after pipe laying, testing and initial backfilling.

**Pipe underlay (bedding)**

General: Bed piping on a continuous underlay of bedding material, minimum 75 mm, maximum 150 mm thick after compaction. Grade the underlay evenly to the gradient of the pipeline.

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 maximum 200 mm loose thickness, and compact without damaging or displacing the piping.

**Trench backfill**

General: Backfill the remainder of the trench to the underside of the subgrade with fill material in conformance with the *Earthwork* work section.

**Lifting holes**

General: Seal lifting holes in all pipes with plastic preformed plugs or 3:1 (sand:cement) mortar, before the commencement of backfilling.

**Anchor blocks**

General: If necessary, to restrain lateral and axial movement of the stormwater pipes, provide anchor blocks at junctions and changes of grade or direction conforming to AS/NZS 3500.3 clause 8.10.

**Encasement**

General: As documented in the **Stormwater pipeline schedule**.

Location: Encase the pipeline in concrete at least 150 mm above and below the pipe, and 150 mm each side or the width of the trench, whichever is the greater.

## 3.4 SUBSOIL DRAINS

**General**

Requirement: Provide subsoil drains to intercept groundwater seepage and prevent water build-up behind walls and under pavements. Connect subsoil drains to surface drains or to the stormwater drainage system as applicable.

Piping: As documented in the **Subsoil pipeline schedule**.

Trench width: ≥ 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, where the pipe passes below the following elements:

- 100 mm below subgrade level of the pavement, kerb or channel.
- 100 mm below the average gradient of the bottom of footings.
- 450 mm below the finished surface of unpaved ground.

**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, minimum 75 mm, maximum 150 mm thick after compaction. Grade the underlay evenly to the gradient of the pipeline.

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 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 and channels.
- To within 150 mm of the finished surface of unpaved or landscaped areas.

**Geotextiles**

Marking: To AS 3705.

Laying: Place geotextile as documented.

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 polyester permeable socks capable of retaining particles 0.25 mm and greater. Securely fit or join the sock at each joint.

## 3.5 PITS

**Installation**

General: Prepare foundation, install pit and connect pipes, to manufacturer's recommendations.

Location: At junctions, changes of gradient and changes of direction of stormwater drains, as documented.

**Finish to in-situ exposed surfaces**

General: Provide a smooth, seamless finish, using steel trowelled render or concrete cast in steel forms.

Corners: Cove or splay internal corners.

**Metal access covers and grates**

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.

## 3.6 TESTING

**Pre-completion tests**

General: Before backfilling or concealing, carry out the following tests:

- Site stormwater drains and main internal drains: Air or water pressure test to AS/NZS 3500.3 Section 10.

Leaks: If leaks are found, rectify and re-test.

## 3.7 COMPLETION

**Cleaning**

General: Clean and flush the whole installation.

# 4 SELECTIONS

# 0274 CONCRETE PAVEMENT

## 1 GENERAL

### 1.1 STANDARDS

**Concrete**

Specification and supply: To AS 1379.

Materials and construction: To AS 3600.

### 1.2 INTERPRETATION

**Definitions**

General: For the purposes of this work section the definitions given in AS 1348 and the following apply.

- Absolute level tolerance: Maximum deviation from design levels.
- Ambient temperature: The air temperature at the time of mixing and placing of concrete.
- Average ambient temperature: Average value of the maximum and minimum ambient temperatures over the relevant period at a site.
- Concrete class:
  - Normal: Concrete which is specified primarily by a standard compressive strength grade and otherwise in conformance with AS 1379 clause 1.5.3.
  - Special: Concrete which 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.
- Early age: A mean compressive strength at 7 days exceeding the values shown in AS 1379 Table 1.2.
- Green concrete: Concrete which has set but not appreciably hardened.
- Relative level tolerance: Maximum deviation from a 3 m straightedge laid on the surface.
- Weather:
  - Cold: Ambient shade temperature less than 10°C.
  - Hot: Ambient shade temperature greater than 32°C.

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## 2 EXECUTION

### 2.1 GENERAL

**Preparation**

General: Trim the ground to suit the required thickness of the concrete and compact to a firm, even surface.

Prepare sub grade: Bind with sufficient sand to create a smooth surface free from hard projections. Wet the sand just before laying the underlay.

**Paving**

General: Place and compact concrete paving over a vapour barrier over the prepared ground surface.

**Grading**

General: Grade paving to even falls to drain away from buildings to drainage outlets without ponding. Minimum fall fro drainage 1:100

**Thickness**

Minimum: 125mm

**Curing**

General: Protect fresh concrete from premature drying and from excessive hot or cold temperatures.

Maintain the concrete at a reasonable constant temperature with minimum moisture loss for th curing period of 7 days, unless otherwise noted.

## 2.2 JOINTS

**Construction Joints**
General: Form tooled joist at maximum 2000mm spacing unless otherwise noted.

**Expansion Joints**
General: Cast-in 10mm thick bitumen impregnated fibreboard at maximum 6m spacing.

**Abutment with building**
General: Cast-in 10mm thick bitumen impregnated fibreboard at maximum 6m spacing.

## 2.3 FINISHING METHODS

**Broom finishing:**
Wood float and broom to an even textured transverse scored surface with steel tooled margins. On gradients steeper than 10% roughen the surface by scoring using a stiff brush or rake.

**Exposed Aggregate finish:**
Steel trowel to a smooth surface. After final set use clean water and brushes to remove the surface film or mortar until aggregate is uniformly exposed without under cutting of matrix.

**Sponge finish:**
After floating, produce an even textured sand finish by wiping the surface using a damp sponge.

**Pattern paving:**
After machine floating, apply a proprietary treatment producing an integral coloured and patterned surface.

# 0130 CONCRETE

## 1 GENERAL

### 1.1 STANDARDS

**General**
Formwork design and construction, formed surfaces: To AS 3610 and AS 3610.1.
Plywood framework: To AS 6669
Profiled steel sheeting including shear connectors: To AS 2327.1
Specification and supply of concrete: To AS 1379
Reinforced concrete construction: To AS 3600
Residential ground slabs and footings: To AS 2870

### 1.2 INTERPRETATION

**Definitions**
General: For the purposes of this work section 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 relevant period at a site.
- Weather:
  - Cold: Ambient shade temperature <10$^{o}$ C.
  - Hot: Ambient shade temperature > 30$^{o}$ C.

### 1.3 TOLERANCES

**Finishes**
Formed surface quality of surface finish: To AS 3610.1 Table 3.3.2 and the following:

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

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

**Flatness tolerance class table**

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

### 1.4 SUBMISSIONS

**Certification**
Formwork design certification: For other than profiled steel sheeting composite formwork, submit certification by a professional engineer experienced in formwork design verifying conformance of the design.
Formwork execution certification: Submit certification by a professional engineer experienced in formwork design and construction verifying conformance of the completed formwork, including the suitability of the framework for the documented surface finish class.
**Design**
Formwork: the design of the formwork other than profiled steel sheeting composite formwork is the contractor's responsibility.

## 2 PRODUCTS

### 2.1 MATERIALS

**Cement**
Standard: To AS 3972
Age: Less than 6 months old.
Storage: Store cement bags under the cover and above ground.
**Pre-mixed concrete supply**

Standard: To AS 1379 by the batch production process.
Maximum slump: 100 mm.
**Polymeric film underlay**
Vapour barriers and damp-proofing membranes: To AS 2870 clause 5.3.3.
**Curing compounds**
Curing compounds: To AS 3799

### 2.2 FORMWORK

**General**
Lost formwork: Free of timber or chlorines and not to impair the structural performance of the concrete members.
**Profiled steel sheeting composite formwork**
Material: Hot-dipped zinc-coated sheet steel to AS 1397
Minimum steel grade: G550.
Corrosion protection: As required.
Accessories: Adopt material and corrosion protection to match the profiled steel sheeting.
**Plywood framework**
Material: plywood sheeting to AS 6669
Grade: Use appropriate grade for the documented design dimensions, loading the surface quality.
Joints: Seal the joints consistent with the documented surface finish class.
Tolerances: To AS 3610.1 Section 3.

## 3 EXECUTION

### 3.1 POLYMERIC FILM UNDERLAY

**Location**
General: 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.

### 3.2 FORMWORK

**Preparation**
Cleaning: Before placing concrete, remove free water, dust, debris and stains form the formwork and the formed space.
Corners
Work above ground: Chamfer at re-entrant angles, and fillet at corners.
- Face of bevel 25 mm.

### 3.3 REINFORCEMENT

Supports
Proprietary concrete, metal or plastic supports: Provide chairs, spacers, stools, hangers and ties, 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 galvanised or zinc-coated reinforcement.

Spacing:
- Bars: < 60 diameters,
- Mesh: <800 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 the cast concrete, provide a plastic protective cap to each bar until it is cast into later work.
**Tying**
General: secure the reinforcement against displacement at intersections with either wire ties, or clips. Bend the ends of the wire ties away from nearby faces of formwork or unformed faces to prevent the ties do not project into the concrete cover.
**Minimum requirements**
Splices: Splice as follows:

- Mesh sheets: 225 mm
- Trench mesh: 500 mm.
- Bars: Greater of either 500 mm or 25x bar diameter
- Strip footing intersections and corners: Full width of intersecting reinforcement.
- Cover: To the **Minimum cover to reinforcement table.**

**Minimum cover to reinforcement table**

| Concrete element | Location | Minimum concrete strength (MPa) | Minimum cover to reinforcement (mm) |
|---|---|---|---|
| Unreinforced concrete | Generally | 20 | |
| | | | |
| Reinforced concrete | Unless noted otherwise below | 25 | 20 |
| | Exterior: temperate, near-coastal (1km to 50km) and on ground and protected by membrane (bottom cover) | 25 | 30 |
| | On ground and unprotected by membrane (bottom cover) | 25 | 40 |
| | Footings | 25 | 50 |
| | Exterior: tropical, near-coastal (1km to 50km) and in contact with fresh water | 32 | 40 |
| | Exterior: coastal (100 m to 1km) and permanently submerged in salt water | 40 | 45 |
| | Exterior: in tidal or splash zones | 50 | 50 |

## 3.4 CONCRETE

**Placing**

Method: Avoid segregation and loss of concrete, and minimise plastic settlement. Maintain a normally vertical and plastic concrete edge during placement.

Layers: 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 to fully compact the mix.

Vibrators: Do not allow vibrators to contact set concrete. Do not use vibrators to move concrete along the formwork. Avoid causing segregation by over-vibration.

**Rain**

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

**Pacing in cold weather**

Placing concrete: Maintain temperature of the freshly mixed concrete at 5$^{o}$C or more.

Formwork and reinforcement: Before and during placing maintain temperature at 5$^{o}$C or more.

Temperature control: Heat the concrete materials, other than cement, to the minimum temperature necessary so that the temperature of the placed concrete is within the documented limits.

**Placing in hot weather**

Placing concrete: maintain temperature of the freshly mixed concrete and 35$^{o}$C or less.

Formwork and reinforcement: Before an during placing maintain temperature at 35$^{o}$C or less.

Temperature control: Select one or more pf the following methods of maintaining the temperature of the placed concrete at 35$^{o}$C or less:

- Cover the horizontal transport containers.
- Spray the coarse aggregate using cold water prior to mixing.
- Use chilled mixing water.
- Evaporation control barriers: Erect barriers to protect the freshly placed concrete from drying winds.

## 3.5 CURING

**General**

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

- Curing: Cure continuously from completion of finishing until the total cumulative number of days or fractions of days, during which the air temperature in contact with the concrete is above 10°C, conforms to the following:
    - Fully enclosed internal surfaces: 3 days.
    - Other concrete surfaces: 7 days.
- End of curing period: Prevent rapid drying out at the end of the curing period.
- Protection: Maintain at a reasonable constant temperature with minimum moisture loss, during the curing period.

**Curing compounds**

Application: Provide a uniform continuous flexible coating without visible breaks or pinholes, which remains unbroken at least for 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.

**Cold weather curing**

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

**Hot weather curing**

Protection: Provide protection as follows:

- Immediately after finishing, either cover exposed surfaces using an impervious membrane or hessian kept wet until curing begins, or apply curing compound.

**Water curing**

Method: Select a method of ponding or continuously sprinkling water to prevent damage to the concrete surface during the required curing period.

## 3.6 JOINTS

**Construction plan**

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

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.

**Slip joints**

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

## 3.7 FORMED SURFACES

**General**

Damage: Do not damage concrete works through premature removal of formwork.

**Curing**

General: If the 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.

**Surface repairs**

Method: If surface repairs are required, submit proposals.

## 3.8 UNFORMED SURFACES

**Surface finishes**

General: As documentation in the **Unformed surface finishes schedule**.

**Surface repairs**

Method: if surface repairs are required, submit proposals.

## 3.9 COMPLETION

**Formwork removal**

Extent: Remove framework, other than profiled steel sheeting composite formwork and lost formwork, including formwork in concealed locations.

Timing: Do not disturb formwork until concrete is hardened enough to withstand formwork movements and removal without damage.

Stripping times: Leave formwork for suspended structures in place after pouring concrete for the following periods:

- Vertical surfaces: 2 days
- Bottom surfaces: 7 days with shoring and backprops left in position for 21 days.

**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.

# 0315 CONCRETE FINISHES

## 1 GENERAL

### 1.1 RESPONSIBILITIES

**General**

Requirement: Provide finishes to formed and unformed concrete surfaces, as documented and as follows:

- Compatible with documented finishes.

### 1.2 STANDARDS

**General**

Formed surfaces: To AS 3610.1.

### 1.3 INTERPRETATION

**Definitions**

General: For the purposes of this worksection the following definition applies:

- Green concrete: Concrete which has set but not appreciably hardened.

### 1.4 INSPECTION

**Notice**

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

- Evaluation of the off-form finishes.
- Evaluation of surface finish.

### 1.5 TOLERANCES

**Formed surfaces**

Quality of the surface finish: To AS 3610.1 Table 3.3.2.

**Unformed surfaces**

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

**Flatness tolerance class table**

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

### 1.6 SUBMISSIONS

**Prototypes**

Test panels: Provide test panels to AS 3610.1 and as documented in the **Test panels schedule**.

Manufacture: Cast the panels using the formwork, concrete, compaction equipment, form release agents, curing and formwork removal methods which are to be used in the final work.

Storage: Once accepted, maintain the panels on site undamaged and protected from the weather, as reference prototypes for evaluation of completed work.

Surface treatment: Do not proceed with the related work until the acceptable range of surface treatments has been determined.

**Tests**

Slip resistance: Submit test results, as follows:

- Site slip resistance test of completed installation to AS 4663.

## 2 PRODUCTS

### 2.1 MATERIALS

**Surface hardeners, sealants and protectors**
Supply: If documented, provide proprietary products to the manufacturer's recommendations.

**Slip resistance treatment**
Slip resistance classification: To AS 4586.

## 3 EXECUTION

### 3.1 SURFACE MODIFIERS

**General**
Application: Apply to clean surfaces to the manufacturer's recommendations.

### 3.2 UNFORMED SURFACES

**General**
Surface finish: As documented (refer to drawings)

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.

Burnished finish: Continue steel trowelling until the concrete surface attains a polished or glossy finish, uniform in texture and appearance, and free of trowel marks and defects.

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.

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 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 a proprietary finishing system.

Polished finish: After steel trowelling, grind the cured surface of the concrete.

# 0331 BRICK AND BLOCK CONSTRUCTION

## 1 GENERAL

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### 1.1 STANDARDS

**General**
Materials and construction: To AS 3700, AS4773.1 and AS4773.2

### 1.2 INTERPRETATION

**Definitions**
General: For the purposes of this worksection the definitions in AS 3700 clause 1.5.2, AS/NZS 4455.1 and the following apply:

- Facework: Masonry intended to be exposed in a wall.

-

### 1.3 SUBMISSIONS

**Samples**
Face units: Submit face units of each type illustrating the range of variation available, including colour, texture, surface irregularities, defective arrises, and shape.

- Number of each type: 2.

## 2 PRODUCTS

### 2.1 DURABILITY

**General**
Exposure environment: to AS4773.1 clause 4.4

### 2.2 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 ≤ 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.

### 2.3 BUILT-IN COMPONENTS

**General**
Durability class of built-in components: To AS4773.1 tabled 4.1

**Steel lintels**
Angles and flats: To AS/4773.1 Table 4.1

Cold formed proprietary lintels: Designed to AS/NZS 4600.

Corrosion protection: To AS/NZS 2699.3.

Galvanizing: Do not cut after galvanizing.

**Wall ties**
Standard: To AS/NZS 2699.1.

Corrosion protection: To AS/NZS 2699.1.

**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.

## 3 EXECUTION

### 3.1 GENERAL

**Mortar mixing**
General: Measure volumes accurately to the documented proportions. Machine mix for at least six minutes.

**Protection from contamination**
General: Protect masonry materials and components from ground moisture and contamination.

**Bond**
Type: Stretcher bond.

**Building in**
Embedded items: Build in wall ties and accessories as the construction proceeds. If it is not practicable to obtain the required embedment wholly in 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:

- Additional clearance: To accommodate additional shrinkage of unseasoned floor timbers.
- Single storey frames and ground floor windows (not for slab on ground): 10 mm.
- Two storey frames and upper floor windows: 20 mm.

**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**
Solid and cored units: Lay on a full bed of mortar. Fill perpends solid. Cut mortar flush.

Face-shell bedded hollow units: Fill perpends solid. Cut mortar flush.

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.
- Thickness: 10 mm.

Cutting: Set out masonry with joints of uniform width and minimum cutting of masonry units.

**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

**Bearer piers**
Provide engaged or free standing unreinforced masonry piers to support at 1800mm maximum centres to the **bearer pier table**

**Berar Pier Table**

| Type | Minimum size (mm) |
|---|---|
| Engaged | 2310x110 bonded or tied to walls |
| Freestanding up to 1500mm high | 230x230 |
| Freestanding 1500 to 2700mm high | 350x350 |

**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.

**Air vent types**
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.
- Terra cotta: Perforated, 230 x 160 mm.

**Underpinning**
Requirement: Install underpinning while maintaining the building undamaged.

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: Provide 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**

Care: Do not close the cavity at the jambs of external openings.

**Wall ties connectors and accessories**

Protection: Install to prevent water passing across the cavity.

### 3.5 DAMP-PROOF COURSES

**Location**

General: Provide 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: 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: Provide 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. 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**

Location: Provide 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 perpends.

Maximum spacing: 1200 mm.

## 3.7 WALL TIES

**Location**

General: Space wall ties in conformance with AS 3700 clause 4.10 or AS 4773.2 clause 9.7 and clause 10.6, as appropriate, 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 fixings to AS 3566.1.
- To concrete: Masonry anchors.
- To steel frames: Screw fix to outer face of steel studs with fixings to AS 3566.1.

## 3.8 CONTROL JOINTS

**General**

Location and spacing: Provide contraction joints, expansion joints or articulation joints to AS 4773.2 Section 7

**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 rated control joints**

General: If a control joint occurs in an element of construction required to have a fire resistance rating, construct the control joint with fire stopping materials which maintain the fire resistance rating of the element.

Fire stopping: To AS 4072.1.

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## 3.9 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 to 30 min, and vibrate or rod to mix with the previous pour.

## 3.10 LINTELS

**Location**

General: Provide 1 lintel to each wall leaf as documented in the **Lintel schedule**.

**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.

## 3.11 CONNECTORS AND ACCESSORIES

**Slip joints**

General: Provide 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: Provide stabilising ties at control joints and abutting structural elements, including columns, beams and slab soffits.

Locations and details: To structural drawings.

## 3.12 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.

## 4 SELECTIONS

### 4.1 SCHEDULES

**Brick and block construction schedule**

| Property | NOTES (if specified noted on drawing) |
|---|---|
| Bricks and blocks: Name or type | As noted on the drawings |
| Bricks and blocks: Fire resistance level (FRL) | As noted on the drawings |
| Bricks and blocks: Work size (mm) | As noted on the drawings |
| Bricks and blocks: Category | As noted on the drawings |
| Bricks and blocks: Salt attack resistance category | As noted on the drawings |
| Bricks and blocks: Characteristic unconfined compressive strength (MPa) | As noted on the drawings |
| Bricks and blocks: Coefficient of contraction | As noted on the drawings |
| Bricks and blocks: Coefficient of expansion | As noted on the drawings |
| Bricks and blocks: Air vent units | As noted on the drawings |
| Bricks and blocks: Sill units | As noted on the drawings |
| Bricks and blocks: Threshold units | As noted on the drawings |
| Mortar: Cement | As noted on the drawings |
| Mortar: Colour | As noted on the drawings |
| Mortar: Mix proportions or mortar class | As noted on the drawings |
| Mortar: Sand | As noted on the drawings |
| Unit mortar joints: Bond | As noted on the drawings |
| Unit mortar joints: Depth (mm) | As noted on the drawings |
| Unit mortar joints: Shape or profile | As noted on the drawings |
| Built-in components: Durability class | As noted on the drawings |
| Built-in components: Damp-proof course type | As noted on the drawings |
| Built-in components: Flashings material | As noted on the drawings |
| Built-in components: Lintel type | As noted on the drawings |
| Built-in components: Weephole insect barriers | As noted on the drawings |
| Built-in components: Wall | As noted on the drawings |

| Property | NOTES (if specified noted on drawing) |
|---|---|
| ties | |
| Grout: Composition | As noted on the drawings |
| Grout: Compressive strength (MPa) | As noted on the drawings |
| Control joints: Backing rod | As noted on the drawings |
| Control joints: Primer | As noted on the drawings |
| Control joints: Sealant | As noted on the drawings |
| Control joints: Width (mm) | As noted on the drawings |

**Brick and block construction performance schedule for special masonry**

| Property | A | B | C |
|---|---|---|---|
| Durability test | | | |
| Compressive strength (MPa) | | | |
| Flexural strength | | | |

**Lintel schedule**

| Opening dimensions (mm) | Lintel type | Depth[1] (mm) | Width (mm) | Thickness (mm) |
|---|---|---|---|---|
| Refer to Structural Engineer Drawings. | | | | |

Note: Lintel length required is equal to sum of (opening dimension + 2x bearing at each end).

# 0344 STEEL – HOT-DIP GALVANIZED COATINGS

## 1 GENERAL

### 1.1 RESPONSIBILITIES

**General**

Requirement: Provide hot-dip galvanized coatings, as documented and as follows:

- Controls atmospheric corrosion to structural steelwork or steel products in the time to first maintenance.

### 1.2 CROSS REFERENCES

**General**

Requirement: Conform to the following worksection(s):

- *General requirements*.

### 1.3 STANDARDS

**General**

Coating: To AS/NZS 4680.

Coating on fasteners: To AS 1214.

Durability: To AS 2309 and AS/NZS 2312.

**Metal finishing**

Steel preparation methods: To AS 1627 series.

Coating mass/thickness minimum: To AS/NZS 4680.

Threaded fasteners coating mass/thickness minimum: To AS 1214 Table 2.

### 1.4 INSPECTION

**Notice**

Inspection: If specified, give notice so that inspection may be made of the following:

- Coating appearance and thickness, at the galvanizing plant

### 1.5 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 leads to difficulties during galvanizing, identify these and submit details for improvement.

**Tests**

Other tests: Submit results, as follows:

## 2 EXECUTION

### 2.1 GENERAL

**Care**

Dimensional change: If design and fabrication features of items to be galvanized are likely to lead to dimensional change or distortion, identify these and submit proposals for its minimisation.

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.

**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.

**Coating**

Threaded fasteners: To AS 1214.

**Structural sections**

Cold worked items: Except for hollow sections, anneal to 650°C before galvanizing.

Hollow sections: Provide seal plates with breather holes.

**Surface finish**

Standard: To AS/NZS 4680 clause 7.

Coating quality: Continuous, adherent, smooth or evenly textured and uniform, free from defects detrimental to the end use of the finished article, such as lumps, blisters, gritty areas, uncoated spots, acids and black spots, dross and flux.

- Silicon killed steels: Dull grey is acceptable.

Friction-type bolted connections: Treat coated contact surfaces to achieve the required design slip factor, without removing excessive coating thickness.

- Contact surface preparation: To GAA After-fabrication hot dip galvanizing Chapter 4.

Slip factor test: To AS 4100 Appendix J.

Surplus zinc on fastener threads: Remove.

**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 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 µm.
- Abrasive grade (range): 150 – 180 µm.
- Abrasive type - clean ilmenite or garnet.
- Blasting angle to surface: 45° maximum.
- Blast pressure (maximum): 275 kPa.
- Distance of nozzle from surface (range): 350 – 400 mm.
- Nozzle type: 10 – 13 mm minimum diameter venturi type.

## 2.2 TESTING

**Galvanizing tests**

Coating mass tests: To AS/NZS 4680 Appendix G.

Magnetic method: To AS 2331.1.3.

Coating thickness tests: To AS/NZS 4680 Appendix G.

- Test method: To AS/NZS 4680 clause 9 and AS/NZS 4680 Appendix G.

Test method: To AS/NZS 4680 Appendix G.

- Frequency of tests: To AS/NZS 4680 clause 9.2.
- Method: To AS/NZS 4680 Appendix G clause G5.

Testing authority: NATA registered galvanizing plant.

## 2.3 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 object.

Extent: Areas damaged by transport, site welding, site flame cutting, site handling, or erection.

Method: To AS/NZS 4680 clause 8.

# 0345P DULUX STEEL PROTECTIVE PAINT COATINGS

## 1 GENERAL

### 1.1 RESPONSIBILITIES

**General**

Requirement: Provide Dulux protective paint coatings, as documented and as follows:

- Control corrosion to structural steelwork and steel products in the time to first scheduled maintenance.

### 1.2 COMPANY CONTACTS

**DuluxGroup/Dulux technical contacts**

Architects and Specifiers' Hotline: 13 23 77.

Website: www.duluxprotectivecoatings.com.au/contact-us.

### 1.3 STANDARDS

**General**

Surface preparation and coating: Conform to the recommendations of AS/NZS 2312.

**Site testing of protective coatings**

Test methods: To AS 3894.

### 1.4 MANUFACTURER'S DOCUMENTS

**Technical manuals**

Duspec Product Data Sheets, MSDS, paint system selection: www.duspec.com.au

### 1.5 INTERPRETATION

**Abbreviations**

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

- ACA : Australasian Corrosion Association.
- DFT: Dry Film Thickness.
- ITP: Inspection and Test Plan.
- MSDS: Material Safety Data Sheet.
- NACE : National Association of Corrosion Engineers (USA).
- µm: Micron ($10^{-6}$m).
- SSPC : The Society for Protective Coatings (USA).

**Definitions**

General: For the purposes of this worksection the definitions given in AS/NZS 2310 and the following apply:

- Coating contractor: The protective coatings application contractor conducting the on or off site coating application works.
- Coating manufacturer: Dulux Protective Coatings.
- ITP: A series of formal Inspection and Test Plans, prepared by the coating contractor to reflect the specific inspection and testing that will be carried out on the surface preparation, coating application and the record keeping tasks to be undertaken.
- MSDS: The formal Material Safety Data Sheet, prepared in conformance with Worksafe Australia's requirements and distributed by the coating manufacturer to provide information on the safe handling, storage, personal protective equipment requirements, use and disposal of a coating product.

### 1.6 QUALITY ASSURANCE

**General**

Standard: Applicator Quality Assurance system to AS/NZS ISO 9001.

Applicator's quality assurance officer: Nominate a qualified NACE Certified Coating Inspector or a ACA Certified Coatings Technician under direction of a NACE inspector.

Records: Maintain records:

- Access: Have records available for inspection.

Verification: Nominate an independent NACE Certified Coating Inspector to carry out quality audits.

Defects: Provide written inspector reports.

### 1.7 INSPECTION

**Notice**

Inspection: Give notice so that inspection (if required) may be made of the following:

. Before installation on site.

### 1.8 SUBMISSIONS

**Execution details**

Detailing of structural steelwork: If design and fabrication features of the items to be coated may lead to difficulties, advise before commencing surface preparation.

Removal of deleterious materials: Submit advice on suitability of marking paints, and removal of materials deleterious to coating processes such as grease, oil and paint.

Repair of coating damage: If the protective coating is damaged, submit a repair coating proposal, based on the coating manufacturer's technical data sheet, that will make sure that the full corrosion protection ability of the system is reinstated.

Final coat reinstatement: If required due to variance, submit proposals for reinstatement of the visible final coating system to match the original coating system samples.

**Maintenance paint coating systems**

Existing systems: Itemise areas of corrosion, damage and other degradation.

Recoating systems: Supply coating systems for maintenance painting of previously coated items and structural elements, including surface preparation, as documented in the **Protective paint coating schedule**.

**Quality**

ITPs: Submit for each proposed coating system.

Quality supervisor: Submit the name and the experience record of the person nominated to oversee the implementation of the ITPs.

**Records**

General: Prepare and maintain records of all surface preparation and coating application works as follows:

- Standard: To AS 3894.10, AS 3894.11, AS 3894.12, AS 3894.13 and AS 3894.14.
- Reference the relevant parts of the ITPs, and record conformance.

**Samples**

Painting and coating colour: Submit a 400 x 400 mm sample of the finished product for each different coating system.

Retention: Retain half of each sample for comparison during coating application.

**Subcontractors**

Requirement: Submit proof of currency of the applicator's Environmental Operating Licence.

**Warranties**

General: Submit details of the proposed warranty terms, form and period. If separate warranties are offered by the manufacturer and the applicator, make sure they are interlocking.

## 2 PRODUCTS

### 2.1 GENERAL

**Product substitution**

Other products: Conform to **PRODUCTS**, **GENERAL**, **Substitutions** in the *General requirements* worksection.

**General**

Care: Handle, store, mix and apply all protective coatings in conformance with Dulux recommendations.

Original containers: Deliver coating products to site in the manufacturer's labelled and unopened containers.

Ambient temperature range for storage: 15°C to 25°C.

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.

**Proprietary products**

Substitution: Dulux paint products and specified coatings systems have been selected for this project and unauthorised product substitution will jeopardise or void the Warranties.

**Material safety data sheets (MSDS)**

Requirement: Keep on site copies of all relevant DuluxMSDS's and technical datasheets.

## 3 EXECUTION

### 3.1 GENERAL

**General**

Product warnings: Conform to the requirements and recommendations of Dulux Protective Coatings Product Data and MSDS's.

Qualifications: All work is to be completed by suitably qualified professionals holding TAFE or other recognised qualifications.

### 3.2 PROTECTION

**Surroundings**

Protection: Prevent the release of abrasive, overspray or paint waste debris to air, ground or to any watercourse. Repair or clean affected surrounding areas.

Damage: Prevent damage to other assets, services or equipment.

**Contamination**

Coating contamination: Prevent contamination of coatings from abrasive or other foreign matter.

Surfaces: Prevent contamination of coated surfaces which are not yet dry from blasting dust, abrasive or surface preparation debris.

**On site storage**

General: Store in a cool shady place.

Sunlight: Protect coating materials from direct sunlight before mixing or adding the converter (catalyst).

**Post application care**

General: Provide protection to 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. Adopt soft packaging, carpet strips or other deformable materials between all coated items.

Water ponding: Stack coated items to prevent water ponding.

### 3.3 SURFACE PREPARATION

**General**

Defects: Remove all surface defects, including cracks, laminations, deep pitting, weld spatter slag, burrs, fins, sharp edges and other defects before the preparation of the surface to be coated.

Temporary welds: Grind flush temporary welds.

Site welding: Where possible avoid site welding.

Porous, skip or stitch welds: Not acceptable.

Edges: De-burr and round all edges to a 2 mm radius.

Surface contaminants: Remove surface contaminants such as oil, grease, dirt and loose particles, using an alkaline oil emulsifier/ degreaser to AS 1627.1.

Surface preparation: Prepare surfaces to the required finish to AS 1627.1, AS 1627.2, AS 1627.4, AS 1627.5, AS 1627.6 and AS 1627.9.

Surface cleaning: Remove spent abrasive from the surface by blowing with clean, dry air and/or by vacuum cleaning.

Bolts: Provide washers at heads and nuts at replacement bolts.

**Surface preparation for atmospheric steel**

General: Conform to the following requirements:

- Wash and degrease all surfaces to be coated in conformance with AS 1627.1 with a free-rinsing, alkaline detergent, such as Gibson F310B or Gamlen CA No. 1 in conformance with the manufacturer's written instructions and all safety warnings.
- Wash with fresh potable water and remove all soluble salts are in conformance with AS 3894.6 Methods A and D.
- Grind all sharp edges with a power tool to a minimum radius of 2 mm.
- Power tool clean welds to AS 1627.2 Class 2 to remove roughness. Remove filings, preferably by vacuum or compressed air.
- Abrasive blast clean all steel surfaces to be painted in conformance with AS 1627.4 to visual standard AS 1627.9 Class 2.5 (equivalent to ISO 8501-1, Sa 2.5: Very Thorough Blast-Cleaning). Use a non-metallic medium that will generate a surface profile of 35 to 65 µm, as tested to AS 3894.5 Method A.
- Commence application within 4 hours of abrasive blast cleaning or before surface becomes contaminated, otherwise repeat abrasive blasting step.
- Stripe coat welds, bolts, boltholes and all edges with primer before application of full primer coat nominated in **PROTECTIVE PAINT COATING SYSTEMS.**
- Before application, make sure that the surface is free of contaminants including oil, grease, dirt, dust, salt and any other deleterious materials that will interfere with coating performance.

**Treatment of on-site welding**

On-site welding: If on site welding is performed, adopt the following procedure:

- Remove weld spatter.
- Power tool clean welds to AS 1627.2 Class 2 to remove roughness. Remove filings, preferably by vacuum or compressed air.
- Prime welds immediately with the nominated primer before contamination can re-occur. Make sure that the primer overlaps the sound adjacent coating by between 25 mm and 50 mm.
- Apply intermediate and topcoats over the primed welds to match the surrounding coating system, overlapping the sound adjacent coating by between 25 mm and 50 mm.

**Preparing galvanized and aluminium surfaces**

Remove grease, oil and other solvent-soluble contaminants by wiping with mineral turpentine or white spirit. Finally wipe with a clean solvent. Allow to dry and proceed with the next operation immediately. Abrade surfaces to a medium coarse type finish to provide an adhesion key.

**Preparing zinc primed surfaces**

If present, remove zinc salts from zinc primers. Remove grease, oil and other solvent-soluble contaminants by wiping with mineral turpentine or white spirit. Finally wipe with a clean solvent. Allow to dry and proceed with the next operation immediately.

**Shop priming**

Dust off and apply a coat of primer, according to the technical specification.

**Site coating**

General: High pressure fresh water wash down all surfaces. Lightly sand down primer/intermediate coats, which have been shop applied, before site application of next coat.

### 3.4 PREPARATION ASSESSMENT

**General**

Conformance: All areas of any item must meet the required cleanliness standard.

**Abrasive blast cleaning**

Assessment: To AS 1627.4 and ISO 8501-1.

- Class 2.5.

**Power tool cleaning**

Assessment: To AS 1627.2 and ISO 8501-2.

- Class 2.

**Hand tool cleaning**

Visual assessment: To ISO 8501-2.

- Class 1.

**Surface profile**

General: To AS 3894.5.

Profile grade: To AS 3894.5 Method A.

**Surface dust from abrasion**

General: To AS 3894.6 Method C.

**Chloride level testing**

Test: To AS 3894.6 Method A.

Maximum allowable chloride levels: 50 mg/$m^2$.

Conformance: If this level is exceeded, rewash the affected surface area using fresh water until the chloride level is within acceptable limits. Pressure washing or steam cleaning is also acceptable before re-testing and re-abrasive blasting.

Timing of testing: Early in the blasting work so that removal procedures can be initiated before the blasting is completed.

**Wet film thickness**

Method of measurement: To AS 3894.3, Appendix C using an approved wet film gauge continuously during application.

**Dry film thickness**

Method of measurement: To AS 3894.3, clause 10.

Extent: All surfaces at the completion of each of the prime, intermediate and finish coats, in particular include areas of the structure which are difficult to paint, are masked by structure, or areas where double coating or light coating is likely due to the shape of the substrate.

Number of measurements: Perform a sufficient number of readings to make sure a representative account for the DFT compliance of the coated areas tested.

Deduction: If testing the DFT of coatings 150 µm and less, deduct the effect of the measured surface profile from all DFT readings.

Single readings: Single reading requirements are as follows:

- The average of 5 point readings for each 10 $m^2$ area of coating surface should not be outside the specified coating thickness range.
- No single point reading in any 10 $m^2$ should be less than 80% of the specified minimum coating thickness. However, where three readings are averaged to produce a point reading, an individual reading may be less than 80% of the minimum coating thickness.
- Check any single reading that is greater than 150% of the specified DFT with three additional readings within 50 mm of the original reading. If these three readings average not greater than 150% of the specified DFT, take the averaged readings as the point reading. If greater than 150%, reject the DFT in that area.

Rectification: Re-work areas rejected, using surface preparation and coatings in the same manner and order as the original work.

Defects including under thickness and over thickness: Mark with school grade chalk, adhesive inspection labels or masking tape. Do not use crayon, paint or spirit based ink pens.

### 3.5 MIXING

**General**

Mixing: Mix coatings thoroughly. All containers larger than 4 litres are to be mixed using powered agitators driven by air motors.

Multi-component coatings: Combine multi-component coatings as whole pack units. If partial mixing is proposed, submit details.

Thinners: If addition of thinners is proposed, conform to the Dulux Product Data Sheet for the specified product.

Colour consistency: If colour consistency is required, before the addition of the curing agent or converter and before coating application, pre-mix the components of coating products that have been tinted to make sure colour uniformity.

## 3.6 COATING APPLICATION

**General**

General: Conform to the Dulux Product Data Sheets and the Dulux specification.

Painting and coating colour: Verify all project finish colours with the retained samples.

**Final surface preparation or coating application**

Limits: If the following climatic/substrate conditions are present do not apply coating:

- The relative humidity is above 85%.
- The substrate temperature is less than 3°C above the dewpoint.
- The ambient air temperature is below 5°C or above 40°C.
- The substrate temperature is below 10°C or above 45°C.
- The surface to be coated is wet or damp.
- Where the full prime coat application cannot be carried out before the specified cleanliness of the surface deteriorates.
- For external or site applied coatings:
  - The weather is clearly deteriorating or unfavourable for application or curing.
  - High wind conditions.
- The surface preparation standard has not been achieved.
- The time between surface blast cleaning and the commencement of coating exceed 4 hours.
- Visual tarnishing or black spots develop on the surface of the metal.

Exception: Preliminary blast or other surface preparations may be performed in conditions that are outside the limits, provided the final surface preparation and all coating applications are undertaken under the limited conditions.

Prior coating: Before the spray application of each coating stripe coat by brush method all edges, welds, seams, rivets bolts and boltholes (including slots). Prime the underlying surfaces of replacement bolting, washers and nuts before installation.

Procedure: Conform to the order shown in **PROTECTIVE PAINT COATING SYSTEMS**.

Timing: Conform to the minimum and maximum recoat intervals and curing times.

Detail: Stripe coat all welds, bolt holes, corners and difficult to spray areas by brushing in with the prime coat and intermediate coat material before the full coating application.

Subsequent coats: Make sure that before any subsequent coating layer is applied, the surface condition of the preceding coat is complete and correct in all respects, including its DFT achievement, cleanliness, freedom from defects. These are detailed on the Dulux Protective Coating specification. Depending on the applicators chosen method additional coats may be required to achieve the nominated minimum DFT.

Conformance: To AS/NZS 2312 for the specified film thickness of individual coats.

Correction: Correct any defect in a coating layer before the subsequent coating layer is applied.

**Protection**

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 before the coating has cured to a sufficient degree so as to be unaffected.

## 3.7 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 edges.

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 and rinse with fresh water, followed by abrading and ensuring that edges of sound paint are feathered. Then coat the area with the appropriate intermediate and finishing coat materials.

Areas damaged to 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 specified 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 discernable 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 Dulux Protective Coating system within 4 hours of blast cleaning or in any case before visual tarnishing of the steel occurs.

Cleaning: Provide, at no additional cost, surface treatment as follows:

- Surfaces left longer than four hours: Re-blast cleaning before coating.
- Surfaces that develop visual tarnishing (red rust or black spots) at any time before coating: Wash down with fresh potable water then blast clean before coating. There are commercially available chloride reducing solutions that may assist.

### 3.8 COMPLETION

**General**

Joints: On completion, seal all joints and mating surfaces with a suitable polyurethane sealant.

## 4 SELECTIONS

### 4.1 SCHEDULES

**Protective paint coating schedule, refer to drawing.**

### 4.2 PROTECTIVE PAINT COATING SYSTEMS

There are decorative finish options for architectural and structural steel. The most common coating types are:

**Gloss polyurethane**

**INLAND AS/NZS 2312 Category A and B: Polyurethane**

| Location | Primer | Second Coat | Third Coat | Duspec No. |
|---|---|---|---|---|
| Interior non-decorative | 75 µm DULUX® Durepon® P14 | Nil | Nil | DI1117 |
| Interior decorative | 75 µm DULUX® Durepon® P14 | 75 µm DULUX® Weathermax® HBR | Nil | SI3132 |
| Exterior non-decorative equivalent to AS/NZS 2312 PUR2 | 75 µm DULUX® Durepon® P14 | 75 µm DULUX® Weathermax® HBR | Nil | SI3132 |
| Exterior decorative equivalent to AS/NZS 2312 PUR2 | 75 µm DULUX® Durepon® P14 | 75 µm DULUX® Weathermax® HBR | Nil | SI3132 |

**COASTAL AS/NZS 2312 Category C, D and E: Polyurethane**

| Location | Primer | Second Coat | Third Coat | Duspec No. |
|---|---|---|---|---|
| Interior non-decorative | 75 µm DULUX® Zincanode® 402 | Nil | Nil | SI2770 |
| Interior decorative | 75 µm DULUX® Zincanode® 402 | 75 µm DULUX® Weathermax® HBR | Nil | DI0539<br>DI1156 |
| Exterior non-decorative equivalent to AS/NZS 2312 EHB4 | 75 µm DULUX® Zincanode® 402 | 200 µm DULUX® Duremax® GPE MIO | Nil | SI2837 |
| Exterior decorative | 75 µm DULUX® | 200 µm DULUX® | 75 µm DULUX® | SI1398 |

| Location | Primer | Second Coat | Third Coat | Duspec No. |
|---|---|---|---|---|
| equivalent to AS/NZS 2312 PUR5 | Zincanode® 402 | Duremax® GPE MIO | Weathermax® HBR | |

**Micaceous Iron Oxide (MIO)**
**INLAND AS/NZS 2312 Category A and B: Micaceous iron oxide**

| Location | Primer | Second Coat | Third Coat | Duspec No. |
|---|---|---|---|---|
| Interior non-decorative | 75 µm DULUX® Luxaprime® ZP | Nil | Nil | SI2580 |
| Interior decorative | 75 µm DULUX® Luxaprime® ZP | 50 µm DULUX® Ferrodor® 810 | Nil | DI1136<br>DI1125 |
| Exterior non-decorative equivalent to AS/NZS 2312 ALK2 | 75 µm DULUX® Luxaprime® ZP | Nil | Nil | DI1136<br>If exposed this product will chalk |
| Exterior decorative equivalent to AS/NZS 2312 ALK6 | 75 µm DULUX® Luxaprime® ZP | 50 µm DULUX® Ferrodor® 810 | 50 µm DULUX® Ferrodor® 810 | SI1485<br>If in a traffic area change to SI1395 |

**INLAND AS/NZS 2312 Category D, E and F: Micaceous iron oxide**

| Location | Primer | Second Coat | Third Coat | Duspec No. |
|---|---|---|---|---|
| Interior non-decorative | 75 µm DULUX® Zincanode® 402 | Nil | Nil | SI2770 |
| Interior decorative | 75 µm DULUX® Zincanode® 402 | 100 µm DULUX® Ferreko® 3 | Nil | SI1400 |
| Exterior non-decorative equivalent to AS/NZS 2312 EHB4 | 75 µm DULUX® Zincanode® 402 | 200 µm DULUX® Duremax® GPE MIO | Nil | SI2837 |
| Exterior decorative equivalent to AS/NZS 2312 PUR5 | 75 µm DULUX® Zincanode® 402 | 125 µm DULUX® Duremax® GPE MIO | 125 µm DULUX® Ferreko® 3 | SI1398 |

**Epoxy acrylic**
**INLAND AS/NZS 2312 Category A and B: Epoxy acrylic**

| Location | Primer | Second Coat | Third Coat | Duspec No. |
|---|---|---|---|---|
| Interior non-decorative | 75 µm DULUX® Durepon® P14 | Nil | Nil | DI1117 |
| Interior decorative | 75 µm DULUX® Durepon® P14 | 60 µm DULUX® Acrathane® IF | Nil | SI1433 |
| Exterior non-decorative equivalent to AS/NZS 2312 ACC2 | 75 µm DULUX® Durepon® P14 | 60 µm DULUX® Acrathane® IF | Nil | SI1433 |
| Exterior decorative equivalent to AS/NZS 2312 ACC2 | 75 µm DULUX® Durepon® P14 | 60 µm DULUX® Acrathane® IF | Nil | SI1433 |

**COASTAL AS/NZS 2312 Category C, D and E: Epoxy acrylic**

| Location | Primer | Second Coat | Third Coat | Duspec No. |
|---|---|---|---|---|

| Location | Primer | Second Coat | Third Coat | Duspec No. |
|---|---|---|---|---|
| Interior non-decorative | 75 µm DULUX® Zincanode® 402 | Nil | Nil | SI2770 |
| Interior decorative | 75 µm DULUX® Zincanode® 402 | 60 µm DULUX® Acrathane® IF | Nil | DI0539<br>DI1102 |
| Exterior non-decorative equivalent to AS/NZS 2312 EHB4 | 75 µm DULUX® Zincanode® 402 | 200 µm DULUX® Duremax® GPE MIO | Nil | DI0539<br>DI1115 |
| Exterior decorative equivalent to AS/NZS 2312 ACC6 | 75 µm DULUX® Zincanode® 402 | 200 µm DULUX® Duremax® GPE MIO | 60 µm DULUX® Acrathane® IF | SI1399 |

**Green buildings using a gloss finish**
**INLAND AS/NZS 2312 Category A and B: Steel protection and decoration for green buildings**

| Location | Primer | Second Coat | Third Coat | Duspec No. |
|---|---|---|---|---|
| Interior non-decorative | 75 µm DULUX® Zincanode® 402 | Nil | Nil | SI2770 |
| Interior decorative | 75 µm DULUX® Zincanode® 402 | 40 µm DULUX® Aquanamel®<br><br>VOC < 75 g/L | Nil | DI0539<br>DD1282 |
| Exterior non-decorative equivalent to AS/NZS 2312 IZS2 | 75 µm DULUX® Zincanode® 402 | Nil | Nil | SI2770<br>If exposed this product will chalk |
| Exterior decorative equivalent to AS/NZS 2312 IZS2 | 75 µm DULUX® Zincanode® 402 | Nil | 125 µm DULUX® Weathermax HBR MIO | SI1398 |

**COASTAL AS/NZS 2312 Category C, D and E: Steel protection and decoration for green buildings**

| Location | Primer | Second Coat | Third Coat | Duspec No. |
|---|---|---|---|---|
| Interior non-decorative | 75 µm DULUX® Zincanode® 402 | Nil | Nil | SI2770 |
| Interior decorative | 75 µm DULUX® Zincanode® 402 | 40 µm DULUX® Aquanamel®<br><br>VOC < 75 g/L | Nil | DI0539<br>DD1282 |
| Exterior non-decorative equivalent to AS/NZS 2312 IZS2 | 75 µm DULUX® Zincanode® 402 | Nil | Nil | SI2770<br>If exposed this product will chalk |
| Exterior decorative equivalent to AS/NZS 2312 IZS2 | 75 µm DULUX® Zincanode® 402 | 200 µm DULUX® Duremax® GPE MIO | 125 µm DULUX® Weathermax HBR MIO | SI1398 |

**Green Buildings using a Micaceous Iron Oxide (MIO) finish.**
**INLAND AS/NZS 2312 Category A and B: Steel Protection and Decoration for "Green Buildings" Using a Micaceous Iron Oxide (MIO) Finish**

| Location | Primer | Second Coat | Third Coat | Duspec No. |
|---|---|---|---|---|
| Interior non-decorative | 75 µm DULUX® | Nil | Nil | SI2770 |

| Location | Primer | Second Coat | Third Coat | Duspec No. |
|---|---|---|---|---|
| | Zincanode® 402 | | | |
| Interior Decorative | 75 µm DULUX® Zincanode® 402 | Nil | Nil | Need to confirm colour to conform with Green Building |
| Exterior Non-Decorative Equivalent to AS/NZS 2312 IZS2 | 75 µm DULUX® Zincanode® 402 | Nil | Nil | SI2770 |
| Exterior Decorative Equivalent to AS/NZS 2312 IZS2 | 75 µm DULUX® Zincanode® 402 | 200 µm DULUX® Duremax® GPE MIO | 125 µm DULUX® Weathermax HBR MIO | SI1398 |

**COASTAL AS/NZS 2312 Category C, D and E: Steel Protection and Decoration for "Green Buildings" Using a Micaceous Iron Oxide (MIO) Finish**

| Location | Primer | Second Coat | Third Coat | Duspec No. |
|---|---|---|---|---|
| Interior Non-Decorative | 75 µm DULUX® Zincanode® 402 | Nil | Nil | SI2770 |
| Interior Decorative | 75 µm DULUX® Zincanode® 402 | 125 µm DULUX® Weathermax HBR MIO | Nil | Need to confirm colour to conform with Green Building |
| Exterior Non-Decorative Equivalent to AS/NZS 2312 IZS2 | 75 µm DULUX® Zincanode® 402 | Nil | Nil | SI2770 If exposed this product will chalk |
| Exterior Decorative Equivalent to AS/NZS 2312 IZS2 | 75 µm DULUX® Zincanode® 402 | 200 µm DULUX® Duremax® GPE MIO | 125 µm DULUX® Weathermax HBR MIO | SI1398 |

**Industrial silicone enamel**

**INLAND AS/NZS 2312 Category A and B: Industrial silicone enamel**

| Location | Primer | Second Coat | Third Coat | Duspec No. |
|---|---|---|---|---|
| Interior non-decorative | 75 µm DULUX® Luxaprime® ZP | Nil | Nil | SI3145 |
| Interior decorative | 75 µm DULUX® Luxaprime® ZP | 50 µm DULUX® Duraflex™ 2 | Nil | SI3146 |
| Exterior non-decorative equivalent to AS/NZS 2312 ALK2 | 75 µm DULUX® Luxaprime® ZP | Nil | Nil | SI3145 |
| Exterior decorative equivalent to AS/NZS 2312 ALK4 | 75 µm DULUX® Luxaprime® ZP | 50 µm DULUX® Duraflex™ 2 | Nil | SI3146 |

# 0382 LIGHT TIMBER FRAMING

## 1 GENERAL

### 1.1 RESPONSIBILITIES

**General**

Requirement: Provide light timber floor, wall and roof framing, as documented.

### 1.2 STANDARDS

**General**

Framing: To AS 1684.2, AS 1684.3 or AS 1684.4, as appropriate.

Design: To AS 1720.1.

### 1.3 INSPECTION

**Notice**

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

- Timber work after erection but before it is covered.

### 1.4 TOLERANCES

**Floors**

Maximum deviation from a 3 m straightedge laid in any direction on the floor framing: 5 mm.

**Walls**

General: Conform to the **Walls tolerances table**.

**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 2 m straightedge laid in any direction on a surface.<br>2. Features: Conspicuous horizontal or vertical lines including external corners, parapets, reveals, heads, sills. | |

### 1.5 SUBMISSIONS

**Certification**

General: 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 and wall and roof frame member sizes: A schedule of proposed member sizes, certified as meeting stated project requirements for span, spacings, loadings and deflections.
- Species and stress grade.
- Moisture content at time of manufacture.
- Preservative treatment, if any.

Preservative treatment: Submit a test certificate from an independent testing authority confirming that the required preservative retention has been achieved.

**Materials**

Identification:

- Certification: Submit a supplier's certificate (which may be included on an invoice or delivery docket) verifying that the timber complies with the specification, including moisture content.

- Inspection: Submit the inspection authority's certificate verifying that the timber complies with the specification.

Moisture content: Submit records of moisture content.

CCA treated timber: If proposed, provide details of treatment.

**Shop drawings**

General: Submit shop detail drawings certified by a professional engineer stating that the design has been carried out to AS 1684 and AS 1720.1 requirements for the configurations and loadings. Include the following:

- Prefabricated roof trusses:
  - . 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:
  - . 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 the proposed manufacturer.

## 2 PRODUCTS

### 2.1 TIMBER

**Identification**

Method: Identify timber using branding, certification or both.

Branding: Brand structural timber, under the authority of a recognised product certification program applicable to the product. Locate the brand mark on faces or edges which will be concealed in the works. For timbers not covered by the branding provisions of Australian standards or regulations for which branding is required, include the following data:

- 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 program.
- The applicable standard.

Certification: Forest certification, chain of custody and product labelling to the *Timber products, finishes and treatment* worksection.

**Fascias and barge boards**

Hardwood: To AS 2796.1.

Seasoned cypress pine: To AS 1810.

Softwood: To AS 4785.1.

Preservation treatment: To the *Timber products, finishes and treatment* worksection.

### 2.2 SHEET PRODUCTS

**Structural plywood**

Standard: To AS/NZS 2269.0.

Bond: Type A to AS/NZS 2754.1 (Int).

**Veneer**

Veneer quality to visible surfaces: CD (minimum) to AS/NZS 2269.0.

**Identification**

Branding: To AS/NZS 2269.0.

Brand mark: Locate the brand mark on faces or edges which will be clearly visible for certification inspections and concealed in the works.

### 2.3 COMPONENTS

**Nail plated joined beams**
Standard: To AS 4446.

Type: Proprietary composite member made up by butt and horizontally joining timber with pressed in nail plates.

**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 the *Adhesives, sealants and fasteners* worksection.

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.

### 2.4 RECONSTITUTED STRUCTURAL TIMBER PRODUCTS

**Wet-processed fibreboard (including hardboard)**
Standard: To AS/NZS 1859.4.

## 3 EXECUTION

### 3.1 TRANSPORT AND DELIVERY

**General**
Handling and protection: Do not distort or damage timber or timber products.

Moisture content: Maintain the equilibrium moisture content of seasoned timber.

**Protection from weather**
General: Provide temporary protection for members until permanent covering is in place.

### 3.2 WALL FRAMING

**Additional support**
General: Provide additional support in the form of noggings, trimmers and studs for fixing lining, cladding, hardware, accessories, fixtures and fittings as required.

Maximum spacing of noggings: 1350 mm centres.

**Vermin barriers**
General: 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.

**Damp-proof course**
General: Provide damp-proof courses under the bottom plate of stud walls built off slabs or masonry dwarf walls, as follows to AS/NZS 4200.1:

- 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 of damp-proofing 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 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.

**Nailing plates**

General: Where timber joists, rafters or purlins bear on or into steel members, provide nailing plates to transfer the design loads, bolted to the steel member at 500 mm maximum centres and 100 mm maximum from the end of the nailing plate.

**Nailing plates**

General: Where timber joists, rafters or purlins bear on or into steel members, provide 50 mm thick nailing plates bolted to the steel member at 500 mm maximum centres.

**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 nailed to each rafter.

Roof space: If a water container or heater is located in the roof space, provide a support platform to AS/NZS 3500.4 clause 5.5.

Additional support: Provide a frame member behind every joint in fibre cement sheeting or lining.

**Anti-ponding boards**

Standard: To AS/NZS 4200.2.

## 3.4 TRUSSES

**Fabrication**

Camber: Camber bottom chord upward.

Overhangs: Free from spring or splits.

**Marking**

General: Permanently mark each truss to show:

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

**Installation**

Nail plated prefabricated roof trusses: To AS 4440.

Support: Support trusses on bottom chord at two points only, unless designed for additional support.

Plumb: Within 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: Over internal non-load bearing walls, provide minimum vertical clearance of 10 mm plus ceiling batten depth, if any. Use bracing methods which allow for the design vertical movements.

## 3.5 COMPLETION

**Tightening**

General: Tighten bolts, screws and other fixings so that joints and anchorages are secure at the date of practical completion.

# 0421 ROOFING – COMBINED

## 1 GENERAL

### 1.1 RESPONSIBILITIES

**General**

Requirement: Provide a roofing system and associated work, as documented and which satisfies the product performance requirements.

### 1.2 PERFORMANCE

**Ambient climatic conditions**

Design rainfall intensity (mm/h) to AS/NZS 3500.3:

**Roof access (refer to drawing)**

### 1.3 INSPECTION

**Notice**

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

- Roof supports.
- Those parts of the roofing, sarking, vapour barrier, insulation and roof plumbing installation which will be covered up or concealed.

### 1.4 SUBMISSIONS

**Installation**

Seamed roofing: Submit evidence of experience with non-ferrous roof installation.

**Warranties**

Requirement: Submit the following:

Roofing materials: Submit the manufacturer's published product warranties.

## 2 PRODUCTS

### 2.1 COMPONENTS

**Fasteners**

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

Fastenings to timber battens: Provide fastenings just long enough to penetrate the thickness of the batten without piercing the underside.

**Profiled fillers**

Type: Purpose-made closed cell polyethylene foam profiled to match the roofing profile.

Location: Provide profiled fillers under flashings to the following:

- Ridges.
- Eaves.
- Lapped joints in roof sheeting.

**Safety mesh**

Standard: To AS/NZS 4389.

### 2.2 SHEET METAL ROOFING

**Standards**

Design, installation and materials: To AS 1562.1.

Stainless steel: To ASTM A240/A240M.

**Fixing components**

Requirement: To AS 2334 for clout nails and AS 3566.1 for self-drilling screws, with durability not less than roofing materials.

### 2.3 SEAMED SHEET METAL ROOFING

**Type**
Description: Seamed sheet metal roofing laid on flush finished continuous plywood decking over an underlayer and separation layer.

**Plywood decking**
Surface grade: DD to AS/NZS 2269.0.

Bond: Type A.

Thickness: 19 mm.

**Underlayer**
Description: Self-adhesive, rubberised asphalt/polyethylene waterproofing membrane.

**Separation layer**
Description: Fire-resisting mat of a nylon core of fused entangled filaments.

### 2.4 ROOF PLUMBING

**General**
Standard: To AS/NZS 3500.3.

General: Provide the flashings, cappings, gutters, rainwater heads, outlets and downpipes necessary to complete the roof system.

**Materials**
Metal rainwater goods: To AS/NZS 2179.1.

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

**Flashings and cappings**
Standard: To AS/NZS 2904.

Material and colour: Match roof sheeting.

Rib notching: Match roof sheeting.

**Ridge and barge cappings**
Material and colour: Match roof sheeting.

**Eaves gutters**
Material and colour: Match roof sheeting.

Matching fascia/barge: If the selected eaves gutter is a proprietary high front pattern forming part of a combined system of gutter, fascia and barge, provide the matching proprietary fascias and barge cappings to roof verges and edges.

## 3 EXECUTION

### 3.1 STORAGE AND HANDLING

**Sheet metal and metal tile roofing**
Storage: Store metal roofing materials away from uncured concrete and masonry, on a level base. Do not store materials in contact with other materials which may cause staining, denting or other surface damage.

Handling: Handle roofing materials as follows:

- Use gloves when handling 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.

### 3.2 INSTALLATION

**Protection**
General: Keep the roofing and rainwater system free of debris and loose material during construction, and leave them clean and unobstructed on completion. Repair damage to the roofing and rainwater system.

Touch up: If it is necessary to touch up minor damage to prepainted metal roofing, do not overspray onto undamaged surfaces.

**Thermal movement**

Requirement: Provide for thermal movement in the roof installation and the structure, including movement in joints and fastenings.

**Pan type sheets**

Removal: 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 either of the following methods:

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

**Tolerances**

Sheet metal: To AS 1562.1 clause 4.2.

Shingles, shakes and slate: To AS 4597 clause 3.2.

Tiles: To AS 2050 clause 3.2.

## 3.3 SHEET METAL ROOFING

**Roof sheet installation**

Eaves: Treat ends of sheets as follows:

- Generally: Close off ribs at tops and bottoms of sheets by mechanical means or with purpose-made fillers or end caps.
- At gutters: Project sheets 50 mm into gutters.

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

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

## 3.4 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.
- Provide pre-cut notched eaves flashing and bird proofing where necessary.
- Close off ridges with purpose-made ridge fillers of closed cell polyethylene foam.

**Ridge and barge**

Capping: Finish off along ridge and verge lines with purpose-made ridge capping or barge rolls.

**Sprung curved ridge**

General: Lay the roofing sheets in single lengths from eaves to eaves by naturally curving the sheets over the ridge.

Ridge: Seal side laps at the ridge and extend the sealant to the point where the roof pitch equals the recommended pitch of the roofing profile.

**End laps**

General: If end laps are unavoidable, and the sheet profile is not suitable for interlocking or contact end laps, construct a stepped type lap.

## 3.5 ROOF PLUMBING

**Jointing sheet metal rainwater goods**

Butt joints: Make joints over a backing strip of the same material.

Soldered joints: Do not solder aluminium or aluminium/zinc-coated steel.

Sealing: Seal fasteners and mechanically fastened joints. Fill the holes of blind rivets with silicone sealant.

**Flashings**

Installation: Flash roof junctions, upstands, abutments and projections through the roof. Preform to required shapes if possible. Notch, scribe, flute or dress down as necessary to follow the profile of adjacent surfaces. Mitre angles and lap joints 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 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**

General: Prefabricate box gutters. Form stop ends, downpipe nozzles, bends and returns. Dress downpipe nozzles into outlets. Provide overflows to prevent back-flooding.

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.

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.

Expansion joints in guttering longer than 30 m: Provide as follows:

**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.

## 3.6 COMPLETION

**Cleaning**

Remove: Excess debris, metal swarf, solder, sealants and unused materials.

Clean off: Exposed metal surfaces that interfere with uniform weathering or oxidisation.

Replace: Materials that have been damaged or deteriorated.

Roof plumbing: Clean out spoutings, gutters and rainwater pipes after completion of roof installation.

**Maintenance manual**

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.

# 0431 CLADDING – COMBINED

## 1 GENERAL

### 1.1 RESPONSIBILITIES

**General**

Requirement: Provide lightweight external wall cladding and associated work, as documented.

### 1.2 INTERPRETATION

**Abbreviations**

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

- AAC: Autoclaved aerated concrete.
- CFC: Compressed fibre cement.
- EIFS: External insulated finishing system.

### 1.3 INSPECTION

**Notice**

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

- Framing, sarking, vapour barrier and insulation before they are covered up or concealed.

### 1.4 SUBMISSIONS

**Maintenance manual**

General: Submit manufacturer’s published use, care and maintenance requirements.

**Samples**

Finish: Submit samples of the cladding material showing the range of variation available.

**Subcontractors**

Seamed sheet metal cladding: Submit evidence of experience with non-ferrous cladding installation.

**Tests**

Type tests: Submit results as follows:

- Metal cladding general tests: Cladding and fastenings to AS 1562.1 for resistance to wind pressure.
- Metal cladding in cyclonic regions to AS/NZS 1170.2: Cladding and fastenings to AS 1562.1 clause 5.6.
- Fibre cement cladding: Sheeting and fastenings to AS/NZS 1562.2 for resistance to wind forces.

**Warranties**

Requirement: Submit the following:

Cladding materials: Submit the manufacturer's published product warranties.

### 1.5 TOLERANCES

**Permitted deviations**

Metal sheet cladding: To AS 1562.1 clause 4.2.

Other sheet cladding: 5 mm from a 1.8 m straightedge.

Cladding panels: To manufacturer's recommendations.

Plank cladding: 5 mm from a 1.8 m straightedge.

Pre-assembled cladding systems: To manufacturer's recommendations.

## 2 PRODUCTS

### 2.1 SHEET METAL CLADDING

**Standards**

Design and installation: To AS 1562.1.

Stainless steel: To ASTM A240/A240M.

## 2.2 SEAMED SHEET METAL CLADDING

**Type**
Description: Seamed sheet metal roofing laid on flush finished continuous plywood decking over an underlayer and separation layer.

**Plywood sheeting**
Surface grade: DD to AS/NZS 2269.0.

Bond: Type A.

Thickness: 19 mm.

**Underlayer**
Description: Self-adhesive, rubberized asphalt/polyethylene waterproofing membrane.

**Separation layer**
Description: Fire-resisting mat of a nylon core of fused entangled filaments.

Profile: Roll form sheeting into pan profiles for forming into seamed joints.

**Accessories**
Solder: 40% tin: 60% lead soft solder.

Flux: Z-04-S.

Sealant: 100% natural cure non-acid based silicone rubber to match roofing.

Fixings: Provide starter clips, fixing clips and fastenings as recommended by the roofing system supplier.

## 2.3 FIBRE CEMENT CLADDING

**Fibre cement**
Standard: To AS/NZS 2908.2.

Cladding, eaves and soffit linings: Type A Category 3 (modulus of rupture ≥ 7 MPa).

Compressed cladding: Type A Category 5 (modulus of rupture ≥ 18 MPa).

- Edges: Square.

**Sheet cladding**
General: Provide a proprietary system of single faced fibre cement sheets.

Arrangement: Set out in even panels with joints coinciding with framing.

Sheet thickness: 6 mm.

Joints, corners and edges: PVC-U extrusion.

**Eaves and soffit lining**
Sheets: Single faced fibre cement.

Sheet thickness: 4.5 mm.

Joints: PVC-U extrusion.

## 2.4 COMPRESSED FIBRE CEMENT CLADDING

**Flat panels**
General: Smooth even edges free of imperfections such as chips, cut to suit the layout, allowing for a joint gap 10 mm wide between panels.

**Framing**
Cladding support system: Metallic-coated steel:

**Screws**
General: To the cladding manufacturer's recommendations.

# 3 EXECUTION

## 3.1 CONSTRUCTION GENERALLY

**Substrates or framing**
Requirement: Before fixing cladding, check the alignment of substrates or framing and adjust if necessary.

**Fixing**
Method: Nail to timber framing, screw to steel framing.

**Accessories and trim**
Requirement: Provide accessories and trim necessary to complete the installation.

**Fixing eaves and soffit lining**
Nailing: 150 mm centres to bearers at maximum 450 mm centres.

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

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

**Proprietary systems or products**
Product fixing: Fix proprietary systems to the manufacturer's recommendations.

## 3.2 SHEET METAL CLADDING

**Cladding sheet installation**
Swarf: Remove swarf and other debris as soon as it is deposited.

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

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

## 3.3 SEAMED SHEET METAL CLADDING

**Plywood decking**
Installation: Lay the length of the sheets at right angles to the supports. Stagger the end joints and locate them centrally over framing members. If panels are not tongue and grooved, provide noggings or trimmer joists to support the edges.

Fixing: 300 mm centres to each support:

- Timber: Adhesive and nail.
- Steel: Metallic-coated self drilling/tapping screws with the heads finishing below the surface.

Control joints: 12 mm gap at abutting building elements.

**Fabrication**
Off site: Basic trays.

Minimum bending radius: 1.75 mm.

**Fixing**
Method: Fix pans to the deck with concealed clips at 250 mm maximum centres.

**Seams**
Walls: Single angle standing seams.

## 3.4 COMPRESSED FIBRE CEMENT (CFC) CLADDING

**Joints - CFC backed**
Horizontal joints: Epoxy bond a backing strip of compressed fibre cement, 4.5 mm thick, to the rear face of the panel. Seal the joint with a 8 mm triangular section epoxy fillet.

Vertical joints: CFC backing strip as for horizontal joints. Seal the joint gap with two continuous beads of sealant, or with a twin-bulb neoprene gasket.

**Joints - Colorbond backed**
Horizontal joints: Proprietary Colorbond steel backing strip fixed to the rear face of the panel with adhesive tape horizontal gasket. Seal the joint with a 3 mm epoxy fillet.

Vertical joints: Proprietary top hat framing and adhesive gasket.

**Intermediate supports - CFC backed**
Fixing: At intermediate supports, fix through a 4.5 mm thick CFC packing strip, epoxy bonded to the rear face of the panels.

**Intermediate supports - top hat backed**
Fixing: Screw fix to proprietary top hat intermediate frame.

**Fixing**

Drilling: Predrill oversized holes with proprietary drill bits for screw fixings. Countersink so that the top of the screw is 2 to 3 mm below the surface.

Fixing centres: To the cladding manufacturer's recommendations.

Finish: Stop screw heads with epoxy filler smoothed and levelled upon application and sanded flush after curing.

## 3.5 COMPLETION

**Warranties**

Warranty: 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.

# 0453 DOORS AND ACCESS PANELS

## 1 GENERAL

### 1.1 INTERPRETATION

**Definition :**

General: For the purpose of this work section the following definition applies:

Door set: An assembly comprising a door or doors and supporting frames, guides and tracks including the hardware and accessories necessary for satisfactory operation.

## 2 PRODUCTS

### 2.1 DOOR FRAMES

**Pressed metal non fire rated doors**

All non-rated frames are made out of 1.1mm Zinc Anneal, unless otherwise specified.

### 2.2 DOORS

**Construction**

Door thickness:

Generally: 35mm Solid core

External doors and doors over 900mm wide: 40mm (solid core)

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

**Tolerance**

Squareness: The difference between the lengths of the diagonals of the doors: maximum 3mm. twist the difference between perpendicular measures taken from diagonal corners: maximum 3mm

Nominal size (mm):

- Height: +/- 2mm
- Width: +2, -0.

**Security screen doors**

Standard: To AS5039

### 2.3 ANCILLARY MATERIALS

**Flashing**

Standard: To AS/NSZ 2904

## 3 EXECUTION

### 3.1 GENERAL

**Security screen door**

Standard: To AS5040

**Ceiling access**

General: Trim an opening and provide a loose access panel of minimum size 600x400mm

**Priming**

General: prime timber door leaves on top and bottom edges before installation.

### 3.2 FRAMES

**General**

Frames; Install the frame as follows:

- Plumb, level straight and true.

- Fixed or anchored to the building structured
- Isolate from any building loads, caused by structural deflection or shortening.
- To manufacturers specifications

## 0454 OVERHEAD DOORS

### 1 GENERAL

#### 1.1 STANDARD

**General :**
Garage doors: To AS/NZS 4504.

### 2 EXECUTION

#### 2.1 INSTALLATION

**Frames**
Requirement: Install frames a 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 substrate and imposed loads.
- Isolate from any building loads, including loads caused by structural deflection or shortening.

## 0455 DOOR HARDWARE

### 1 PRODUCTS

#### 1.1 COMPONENTS

**Hinges**
Requirement: Provide 4 hinges for internal and external doors

**Hinges size (steel)**
Requirement: 100x75x2.5mm

**Locksets**
Internal doors: refer to drawing –door schedule

External doors: refer to drawing - door schedule

Gates: refer to drawing – door schedule

Security flyscreen: refer to drawing - door schedule

**Keying**
Requirement: Key doors alike, unless otherwise noted.

### 2 EXECUTION

#### 2.1 INSTALLATION

**Supply**
General: Supply (unless otherwise noted) and install door hardware items, an individual complete set for each door.

- Clearly labelled to show the intended location.
- In a separate dust and moisture proof package.
- Include necessary templates, fixings, and fixing instructions.
-

**Mounting height**
Door lockset mounting height: refer to drawing - door schedule

**Locks:**
Cylinders fix vertically and with consistent key alignment.

**Door stops:**
Fixing on door, skirting of wall, unless otherwise noted. Ensure door stop location to prevents the door or door furniture striking the wall or other surfaces.

**Fasteners:**
Materials: Provide materials compatible with the item being fixed and or sufficient strength, size and quality to perform their function.

Concealed fixings: Provide corrosion resistant finishes to concealed fixings.

Exposed fixings: match exposed fixings to the material being fixed.

Security: Locate exposed back support (for example lock stiles, blocking, wall noggings and back plates) for hardware fixings.

**Hinges:**
Metal frames: Fixed hinges using metal thread screws.

**Accessible toilet door to be provided with standard MLAK locking system** (unless otherwise noted)
Confirm with Council on additional lock requirements if any.

The MLAK lock system should operate smoothly to be usable by persons with disabilities.

**In use indicator:**
In use indicators to be provided to **all** toilet doors.

In an emergency, the latch mechanism shall be operable from the outside.

Type and location of In Use Indicator - Refer to drawing – door schedule.

**Keying:**
Keyed alike: key alike all locks unless otherwise noted.

Master key: Contact Penrith City Council

Special keys: MLAK key for Accessible toilet.

# 0471 THERMAL INSULATION AND PLIABLE MEMBRANE

## 1 GENERAL

### 1.1 INTERRETATION

**Definition:**

General: For the purpose of this worksection the following definition applies:

-Pliable building membrane: To AS/NSZ 4200.1 and equivalent to sarking – type material in the NNC.

Requirement: Key doors alike, unless otherwise noted.

## 2 PRODUCTS

### 2.1 MATERIALS

**Insulation**

Cellulosic fibre (loose fill): To AS/NZS 4859.1 Section 5

Mineral wool blankets and cut pieces: To AS/NZS 4859.1 Section 8

Polyester: To AS/NZS 4859.1 Section 7

Polyisocyanurate (ridge cellular PC/PIR): To AS 1366.2

Polystyrene (extruded rigid cellular RC/PS-E): To AS1366.4

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

Polyrethane (ridge cellular RC/PUR): To AS1366.1

Reflective thermal insulation: To AS/NZS 4859.1, Section 9.

Wool: To AS/NZS 4200.1

**Pliable membrane**

Standard: To AS/NZS 4200.1

## 3 EXECUTION

### 3.1 GENERAL

**Bulk insulation**

Standard: To AS3999

General: make sure fibre batts or blankets are firmly butted with no gaps as follows

- Access openings and vents: No not obstruct
- Lighting fittings: To AS/NZS 3000 clause 4.5
- Electrical cables: To AS3999 Clause 2.6

**Pliable membrane**

Standard: To AS/NZS 4200.2

### 3.2 ROOF INSULATION

**Pliable membrane**

Sarking membrane:

- Locate sarking under tiles and shingles roofing.

Vapour barrier:

- Installation: Lay over the roof framing with sufficient sag to allow for bulk insulation to achieve its full thickness. Overlap all edges 150mm and seal all joints with pressure sensitive adhesive tap.

**Metal roofs – bulk insulation**

Product type: Fibre blankets or batts.

Insulation:

- Batts: Fit tightly between framing members.
- Blanket for sound insulation: Install over 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.

**Ceiling insulation – bulk insulation**

Product type: Fibre batts.

Installation: Fit tightly between framing members.

# 0552 METALWORK - FABRICATED

## 1 GENERAL

### 1.1 RESPONSIBILITIES

**General**

Requirement: Provide metal fixtures that are:

- Undamaged, plumb, level and straight.
- Free of surface defects or distortions.

### 1.2 STANDARDS

**General**

Access for maintenance: To AS 1657.

Tactile indicators: To AS/NZS 1428.4.1.

### 1.3 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.
- 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.

### 1.4 SUBMISSIONS

**Execution**

Welding procedures: Submit details of proposed welding procedures 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).

Fastenings to aluminium (including aluminium alloys): Stainless steel or aluminium.

**Installation of proprietary items**

General: Submit the manufacturer’s standard drawings and details showing:

- Methods of construction.
- Assembly and fixing, with dimensions and tolerances.

**Maintenance manual**

General: Submit manufacturer’s published recommendations for service use.

**Materials**

Manufacturer’s data: Submit manufacturer's published product data including standard drawings and details.

Stainless steel: For each batch of stainless steel supplied to the works, submit the certificate of compliance or test certificate specified in the applicable standard.

**Shop drawings**

General: Confirm on site all dimensions and submit shop drawings if required, showing the following information:

- 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.

**Shop drawing certification**
General: Submit drawings to Council for approval by Council appointed Structural Engineer

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

## 2 PRODUCTS

### 2.1 MATERIALS AND COMPONENTS

**Metals and components**
Performance: Provide metals in sections of strength and stiffness suited to their required function, finish and method of fabrication.

## 3 EXECUTION

### 3.1 CONSTRUCTION GENERALLY

**Aluminium structures**
Standard: To AS/NZS 1664.1 or AS/NZS 1664.2.

**Metals**
Performance: Provide metals so that they transmit the loads imposed and ensure the rigidity of the assembly without causing deflection or distortion of finished surfaces.

Incompatible metals: Separate using concealed layers of suitable materials in appropriate thicknesses.

**Fasteners**
Performance: Provide non-galvanic corrosion fasteners.

Materials: Provide fasteners in materials of mechanical strength and corrosion resistance at least equal to that of the lowest resistant metal joined.

To copper and copper alloys: Provide copper or copper-alloy fixing devices only.

To aluminium and aluminium alloys: Provide aluminium alloy or non-magnetic stainless steel fixing devices only.

To stainless steel: Provide appropriate stainless steel materials only.

**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 visibly deforming the cross section.

Colour finished work: Match colours of sheets, extrusions and heads of fasteners.

Thermal movement: Accommodate thermal movement in joints and fastenings.

Tolerances: ± 2 mm from design dimensions.

**Joints**
General: Fit joints to an accuracy appropriate to the class of work. Finish visible joints made by 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.

**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.

**Splicing**
General: Provide structural members in single lengths.

### 3.2 WELDING AND BRAZING

**General**
Quality: Provide finished welds which are free of surface and internal cracks, slag inclusion, 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 1665 Appendix A.

**Brazing**

General: Ensure brazed joints have sufficient lap to provide a mechanically sound joint. Do not use butt joints relying on the filler metal fillet only.

Filler metal: [complete/delete]

### 3.3 STAINLESS STEEL FABRICATION

**Welding stainless steel**

Certification of welders: To AS 1796.

**Riveting**

General: Riveting may be used 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 CUSTOM-BUILT STEEL STAIRS

**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.

Nosing strip: To BCA D2.13.

**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.

### 3.5 PROPRIETARY STAIR SYSTEMS

**General**

Materials, design and construction: To AS 1657.

Nosing strip: To BCA D2.13.

Straight flight stair assembly: A proprietary system, pre assembled and fixed in place, comprising the following:

- Stair flights with treads and risers.
- Top landing.
- Balustrade to stair flight and landing.

Circular stairs: A proprietary system, mechanically assembled and fixed in place, comprising the following:

- A central steel tube column.
- Prefabricated metal treads sleeved over and cantilevered from the column.
- Top landing.
- Balustrade and handrail to stair and landing.
- Spacers, fixings and accessories necessary to complete the system.

### 3.6 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.

### 3.7 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

### 3.8 COMPLETION

**Cleaning**

Temporary coatings: On or before completion of the works, or before joining up to other surfaces, remove all traces of temporary coatings used as a means of protection.

## 4 SELECTIONS

### 4.1 STEEL BALUSTRADES

**Steel balustrade components schedule (refer to drawing)**

### 4.2 STEEL PIPE RAIL BALUSTRADES

**Steel pipe rail balustrade component schedule(refer to drawing)**

# 0581 SIGNS AND DISPLAY

## 1 GENERAL

### 1.1 RESPONSIBILITIES

**General**

Requirement: Provide signage systems, as documented and as follows:

- Appropriately secured.
- Located within a clear line of vision.
- To contrast with the background.
- With clean, well defined edges or arises, and free from blemishes.

### 1.2 STANDARDS

**Signs**

Safety signs - design and use: To AS 1319.

Signs and graphics for disabled access: AS 1428.1 and AS 1428.2.

### 1.3 INTERPRETATION

**Definitions**

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

- Changeable plate systems: Sign systems consisting of fixed plate holders to which may be attached or inserted removable interchangeable sign plates.
- Variable room identification systems: Changeable plate systems incorporating fixed room numbers and removable name strips.
- Changeable letter systems: Sign systems consisting of display boards or holders into which can be inserted removable individual letters, numbers, etc.
- Illuminated signs: Signs consisting of cabinets enclosing an illuminated source, lighting translucent face panels bearing the specified signage.
- House signage: Internal and external project specific signs.
- Statutory signage: Signs prescribed by the BCA and statutory authorities.

## 2 PRODUCTS

### 2.1 MATERIALS

**Materials standards**

Aluminium:

- Plate for engraving: Alloy and temper designation 6063-0.
- For casting: To AS 1874.

Stainless steel: Surface finish designation 4 (general purpose polished).

Plastics:

- PVC-U sheet: Semi-rigid sheet.
- Rigid cellular polystyrene: To AS 1366.3, class VH for cut-out shapes.

Photoluminiscent exit signs: To BCA E4.8(b).

## 3 EXECUTION

### 3.1 WORKMANSHIP

**Production**

General: Form graphics items accurately with clean, well defined edges or arises, free from blemishes.

Engraving to two layer plastic laminate: Cut lettering to expose the lower laminate.

Engraved and filled: Lettering precision cut and filled colouring material. Clean faces of all filling material.

Casting: Produce shapes free of pits, scale, blow holes or other defects, hand or machine finished if necessary.

Laser cut: Individual vinyl letters with self adhesive backing.

Printed lettering: Lettering and graphic images screen/digitally printed on:

- Film with self adhesive backing.
- Acrylic sheet.
- Aluminium plate.
- Stainless steel plate.

Large format digital printing: Lettering and graphic images screen printed film with self adhesive backing.

Signwriting: Lettering and graphic images hand painted direct to the background by a tradesman with recognised qualifications and demonstrated experience.

Fabricated: Three dimensional, formed as follows:

- Laser cutting from solid material and hand finished as necessary.
- Moulding: Individual plastic hollow three dimensional characters and shapes formed by:
  . Injection moulding.
  . Vacuum forming.
- Built-up individual shapes by fabricating the faces and edges from separate pieces neatly and securely joined.

**Installation**

General: Install signage level and plumb, securely mounted, with concealed theft-resistant fixings. Fix self adhesive signs free of bubbles and creases.

## 4 SELECTIONS

### 4.1 GENERAL SIGNS

**Sign type schedule (refer to drawing)**

**Sign schedule (refer to drawing)**

### 4.2 STATUTORY SIGNS

**Termite protection**

| | |
|---|---|
| Position | In or near meter box or similar |
| Message | Indicate:<br>The method of protection<br>The date of installation<br>The life expectancy of a chemical barrier as listed on the National Registration Authority label<br>The installer's recommendation for inspections |
| Sign type | Laminated page(s) |
| Compliance | BCA 3.1.3.2(b), BCA B1.4(i)(ii)<br>AS 3660.1 Appendix A |

**Required fire door and required smoke door**

| | |
|---|---|
| Position | On or adjacent to the door, on the side of the door that faces a person seeking egress, and if the door is in the held open position, on either the wall adjacent the doorway or both sides of the door. |
| Message if auto door with auto hold open device | FIRE SAFETY DOOR – DO NOT OBSTRUCT |

| | |
|---|---|
| Message if self closing door | FIRE SAFETY DOOR<br>DO NOT OBSTRUCT<br>DO NOT KEEP OPEN |
| Message if door discharging from a fire isolated exit | FIRE SAFETY DOOR – DO NOT OBSTRUCT |
| Letter height (minimum) | 20 mm |
| Sign type | As noted on drawing |
| Compliance | BCA D2.23 |

**Non-required stair, ramp or escalator**

| | |
|---|---|
| Position | Outside the shaft near all doors opening to the shaft |
| Message | DO NOT USE THIS STAIRWAY IF THERE IS A FIRE<br>(or)<br>Do not use this stairway if there is a fire |
| Letter height (minimum) | 20 mm (upper case)<br>16 mm (lower case) |
| Sign type | As noted on drawing |
| Compliance | BCA Spec D1.12 |

**Exit signs, Class 2, in lieu of illuminated exit signs**

| | |
|---|---|
| Position | On, above, or adjacent every door in BCA clause E4.5 |
| Message | EXIT |
| Letter height (minimum) | 25 mm |
| Sign type | As noted on drawing |
| Compliance | BCA E4.5 and BCA E4.7 |

**Braille and tactile exit signage-buildings required to be accessible**

| | |
|---|---|
| Position | To BCA Spec D3.6 for every door in BCA E4.5 |
| Message | Exit<br>(and)<br>Level (followed by the floor level number) |
| Letter height (minimum) | BCA Spec D3.6 |
| Sign type | As noted on drawing |
| Compliance | BCA E4.5, BCA D3.6 and BCA Spec D3.6 |

**Fire exit offence notice (NSW)**

| | |
|---|---|
| Position | Adjacent door providing access to (but not within) a fire exit stair, passage or ramp |
| Message | OFFENCE RELATING TO FIRE EXITS<br>It is an offence under<br>the Environmental Planning and Assessment Act 1 979.<br>(a) to place anything in or near this fire exit that may obstruct persons moving to and from the exit, or<br>(b) to interfere with or obstruct the operation of any fire doors, or<br>(c) to remove, damage or otherwise interfere with this notice. |
| Letter height (minimum) | 8 mm (title) |

| | |
|---|---|
| | 2.5 mm (rest) |
| Sign type | |
| Compliance | Environmental Planning and Assessment Regulation 2000 clause 183 |
| Letter height (minimum) | 20 mm (title)<br>3 mm (rest) |
| Sign type | Engraved and filled in contrasting colours |
| Compliance | BCA ACT- D1.101 |

**Portable fire extinguishers – cabinet**

| | |
|---|---|
| Position | Cabinet |
| Message | FIRE EXTINGUISHER |
| Letter height (minimum) | 32 mm |
| Sign type | Adhesive backed vinyl |
| Compliance | BCA E1.6<br>AS 2444 clause 3.6<br>Fire Brigade |

**Portable fire extinguishers – location signs**

| | |
|---|---|
| Position | As nominated in AS 2444 clause 3.2 at every installed extinguisher nominated BCA Table E1.6 |
| Message | Prescribed graphic |
| Letter height (minimum) | 16 mm |
| Sign type | Computer generated adhesive backed vinyl graphic |
| Compliance | BCA E1.6<br><br>AS 2444 clause 3.3<br>Fire Brigade |

**Unisex accessible sanitary facilities**

| | |
|---|---|
| Position | To BCA Spec D3.6 |
| Message | Braille and tactile signage incorporating the international symbol of access.<br>Indicate suitability for left or right handed use. |
| Symbol size | AS 1428.2 clause 16, Table 1. |
| Letter height (minimum) | Braille: BCA Spec D3.6<br>Raised characters: Sans serif type font 20 mm. |
| Sign type | As noted on drawing |
| Compliance | AS 1428.1<br>BCA D3.6 |

**Ambulant sanitary facilities**

| | |
|---|---|
| Position | To BCA Spec D3.6 |
| Message | Braille and tactile signage incorporating the male/ female ambulant symbol. |

| | |
|---|---|
| Symbol size | AS 1428.2 clause 16, Table 1. |
| Letter height (minimum) | Braille: BCA Spec D3.6<br>Raised characters: Sans serif type font 20 mm. |
| Sign type | As noted on drawing |
| Compliance | AS 1428.1<br>BCA D3.6 |

**Non-accessible sanitary facilities**

| | |
|---|---|
| Position | At each bank of sanitary facilities that are not provided with an accessible unisex sanitary facility. |
| Message | Braille and tactile signage incorporating the international symbol of access.<br>Indicate location of the nearest accessible unisex sanitary facility. |
| Letter height | AS 1428.2 clause 17, Table 2. |
| Symbol size | AS 1428.2 clause 16, Table 1. |
| Sign type | As noted on drawing |
| Compliance | AS 1428.1<br>BCA D3.6 |

# 0611 RENDERING AND PLASTERING

## 1 GENERAL

### 1.1 RESPONSIBILITIES

**General**

Requirement: Provide plaster finishes as documented and as follows:

- 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.
- 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:

- 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.
- Substrate: The surface to which a material or product is applied.
- 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: The final coat of a coating system.
- Finishing treatment: The treatment applied to a finish coat which may include processes and results as follows:
- Wood float: Plaster laid on with a trowel and finished with a dry wood float as soon as the wet sheen has disappeared from the surface.
- Sponge: Plaster laid on thinly with a trowel, floated up with a wood float and lightly finished with a sponge.
- Smooth (dado) finish: Cement based plaster laid on with a trowel, skimmed with a wood float and trowelled down. Surface is trowelled to a smooth, dense finish as the plaster stiffens and no water applied during trowelling.
- Ornamental: Patterned surfaces achieved by working the hardening plaster with a trowel or other tool.
- Sprayed: Textured surfaces achieved by projecting plaster onto a substrate using a purpose-designed machine. Also known as tyrolean.
- Stippled: Textured surfaces achieved by working the hardening plaster with a stiff brush.
- Thrown: Rough surfaces achieved by throwing plaster onto a substrate or pebbles onto a plastic plaster base.
- Plaster: A mixture of binders, aggregate and water which are applied to substrates in a plastic state and dry and cure 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 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.

## 2 PRODUCTS

### 2.1 MATERIALS AND COMPONENTS

**Accessories**

Beads: Provide metal proprietary sections manufactured to be fixed to substrates and/or embedded in the plaster to form and protect plaster edges and junctions.

Lath: Provide a proprietary product manufactured from raised expanded metal for use with plaster:

- Mass/unit area: 1.84 kg/$m^2$ or greater.
- Material thickness: 0.70 mm or greater.
- Mesh size: 9.5 x 28.6 mm.

Metallic-coatings: For beads or lath in cement plaster: To the **Corrosion resistance and durability table**.

**Admixtures**

Plasticizers or workability agents: Do not use in cement plasters.

**Aggregates**

Sand: Fine, sharp, well-graded sand with a clay content between 1% and 5%, and free from efflorescing salts.

Sand grading for base coat plaster:

**Plaster for autoclaved aerated concrete**

General: Provide a proprietary product manufactured for use with the wall system.

**Bonding products**

General: Provide 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(s)** 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 - A and B to AS/NZS 2312**

| Situation | Metal lath, beads and embedded items | Minimum cement content (mix type) above damp-proof course |
|---|---|---|
| Internal | Galvanize after fabrication 300 g/$m^2$ Metallic-coated sheet Z275/AZ150 | CRW |
| External | Galvanize after fabrication | CRW |

| Situation | Metal lath, beads and embedded items | Minimum cement content (mix type) above damp-proof course |
|---|---|---|
| | 300 g/m$^2$<br>Stainless 316 | |
| | Powder coated aluminium | CRM |

**Corrosion resistance and durability table – Atmospheric corrosivity category - C to AS/NZS 2312**

| Situation | Metal lath, beads and embedded items | Minimum cement content (mix type) above damp-proof course |
|---|---|---|
| Internal | Galvanize after fabrication<br>300 g/m$^2$<br>Metallic-coated sheet<br>Z275/AZ150 | CRM |
| External | Stainless 316<br>Powder coated aluminium | CRM |

**Corrosion resistance and durability table– Atmospheric corrosivity category - D and F to AS/NZS 2312**

| Situation | Metal lath, beads and embedded items | Minimum cement content (mix type) above damp-proof course |
|---|---|---|
| Internal | Galvanize after fabrication<br>300 g/m$^2$<br>Metallic-coated sheet<br>Z275/AZ150 | CRW |
| External | Stainless 316<br>Powder coated aluminium | CRS |
| [1] Avoid organic coating in Category F 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.

**Metal lath**

Internal: Expanded metal to AS 1397 coating class Z350.

External: Stainless steel or PVC-U.

**Mixes**

General: Select a mix proportion to suit the conditions of application conforming to the **Mix proportion tables**.

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 | | |
|---|---|---|---|---|---|
| **Mix type** | | **Substrate** | **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<br>1 | 0<br>0.5 | 3<br>4.5 |
| | CRM | Regular clay or concrete masonry | 1<br>1 | 0.5<br>1 | 4.5<br>6 |
| | CRW | Lightweight concrete masonry and other weak substrates | 1<br>1 | 1<br>2 | 6<br>9 |
| Second coat - Internal | CRF | Cement render base coats | 1<br>1 | 1<br>2 | 6<br>9 |
| Second coat - External | CRF | Cement render base coats | 1<br>1 | 1<br>2 | 5<br>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<br>1 | -<br>- | 1.5<br>2 | -<br>- |

**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.

## 2.2 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**

General: In situ applied plaster system incorporating selected stone dust in a proprietary matrix producing a smooth polished surface with visual patterning.

**Glass bead coatings**

General: Glass beads bound in a proprietary matrix.

## 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 hacked off 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: ≥ 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.

**Finishing treatments**

Plain:

- Bag: Rub the finish coat when set firm.
- 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.

**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 that 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 $m^2$ 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 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:

- Fixing centres: ≤ 600 mm.

**Plaster thickness**

General: To the **Plaster thickness table**.

**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 10ºC or less or 30ºC or more make sure that the temperature of mixes, substrates and reinforcement at the time of application are between 5ºC and 35ºC.

## 3.3 TOLERANCES

**General**
Tolerances: To the **Tolerances table**.

**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 ± 10% over the length of the arris. |

## 3.4 COMPLETION

**Cornices**
General: Accurately cut and mitre corners. Match and align ornament. Unless required, or full lengths are not available, do not make butt joints in the length of a cornice.

Installation: Butter edges, mitres and joins for the full length of the cornice with adhesive:

Mechanical fixing: If a cornice projects across a ceiling 400 mm or more, provide additional mechanical fixing:

- Fixing centres: ≤ 600 mm.

**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.

# 0621 WATERPROOFING – WET AREAS

## 1 GENERAL

### 1.1 RESPONSIBILITIES

**General**

Requirement: Provide wet area waterproofing systems as documented which:

- Are graded to floor wastes to dispose of water without ponding.
- Prevent moisture entering the substrate or adjacent areas.

### 1.2 STANDARDS

**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:

- Substrates: The surface to which a material or product is applied.
- Bond breaker: A system preventing a membrane bonding to the substrate, bedding or lining.
- Membranes: 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 or sheet membrane system used to waterproof the floor and the wall/floor junctions of a shower area.
- 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 a 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 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.

### 1.5 SUBMISSIONS

**Execution records**

Placing records: Photographically record the application of membranes and information as follows:

- Date.
- Portion of work.
- Substrate preparation.

- Protection provided from traffic.

**Products documentation**

General: Submit copies of product manufacturers:

- Product technical data sheets.
- Material safety data sheets (MSDS).
- Type tests certificates verifying conformance to AS/NZS 4858.

## 2 PRODUCTS

### 2.1 PRODUCTS

**Membranes**

Standard: To AS/NZS 4858.

**Membrane systems**

Requirement: Provide a proprietary membrane systems certified as suitable for the intended wet area waterproofing.

Certificate: provide Certificate to Project manager

**Water stop angles**

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

**Bond breakers**

Requirement: Compatible with the flexibility 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.

External corners: Round or arris edges.

**Moisture content**

Concrete substrates: Cure for at least 21 days.

Moisture content: 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.

Test type:

- Hygrometer test: Seal a hygrometer to the substrate for at least 16 hours and measure the relative humidity of the air between the instrument and the slab.
- Electrical resistance test: Connect a resistance meter to the slab and read the moisture content.

**Falls**

Substrate: If the membrane is directly under the floor finish, make sure the fall in the substrate conforms to the fall nominated 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**

General: If required by the membrane manufacturer, prime the substrates with a primer compatible with 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 – 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**

General: 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.

**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.

Preformed drainage channels without drainage flanges: Provide continuous waterproofing under the channel and terminate the membrane at a floor waste with a recessed drainage flange.

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**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.

**Membrane horizontal penetrations**

Sleeves: Provide a flexible flange for all penetrations, bonded to the penetration and to the membrane.

**Membrane vertical penetrations**

Pipes, ducts, and vents: Provide separate sleeves for all pipes, ducts, and vents and have fixed to the substrate.

**Curing of liquid applied systems**

General: To the manufacturers 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.

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## 3.3 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.

**Warranty**

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.

# 0631B CERAMIC TILING

## 1 GENERAL

### 1.1 RESPONSIBILITIES

**General**

Requirement: Provide tiling systems to walls, floors and other substrates as documented and as follows:

- 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.
- To direct all water flowing from supply points to drainage outlets without leakage to the substrate or adjacent areas.

### 1.2 STANDARDS

**Tiling**

General: Comply with the documented recommendations of those parts of AS 3958.1

**Slip resistance**

Classification: To AS 4586 for the documented classifications.

Slip resistance measurement of completed installations: To AS 4663.

### 1.3 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.

### 1.4 TOLERANCES

**Completed tiling**

Standard: To AS 3958.1 clause 5.4.6.

### 1.5 SUBMISSIONS

**Samples**

General: Submit labelled samples of tiles, including fittings, accessories, grout and sealants, illustrating the range of variation in colour and finish.

## 2 PRODUCTS

### 2.1 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 and as documented in the **Accessories Schedule**.

**Accessories schedule (refer to drawing)**

## 2.2 ADHESIVES

**Type**

General: Provide adhesives compatible with the materials and surfaces to be adhered, and as documented in the **Wall tiling schedule** and to the **Floor tiling schedule.**

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.

## 2.3 MORTAR

**Materials**

Cement type to AS 3972: GP.

- White cement: Iron salts content ≤ 1%.
- Off-white cement: Iron salts content ≤ 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.

Terra cotta tiles: Use proprietary polymer modified mortar.

Mixing: To AS 3958.1 clause 2.15.

**Water**

General: Clean and free from any deleterious matter.

## 2.4 GROUT

**Type**

Cement based proprietary grout: Mix with water. Fine sand may be added as a filler in wider joints.

Terra cotta 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.

# 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 on swimming pool shell: A further 28 days minimum.

## 3.2 PREPARATION

**Standard**

Preparation: To 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: Ensure 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 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.

**Floor finish dividers**

General: Finish tiled floors at junctions with differing floor finishes with a corrosion-resistant metal dividing strip fixed to the substrate. If changes of floor finish occur at doorways, make the junction directly below the closed door.

## 3.4 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 ensure that fixtures interrupting the tile surfaces are accurately positioned in their designed or optimum locations relative to the tile layout.

## 3.5 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.

## 3.6 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.

Terra cotta 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.

**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: As described in 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 prior to 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.

## 3.7 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 surface with a clean cloth.

Edges of tiles: Grout exposed edge joints.

Epoxy grouted joints: Ensure that tile edge surfaces are free of extraneous matter such as cement films or wax, before grouting.

**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 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.

## 3.8 JOINT ACCESSORIES

**Floor finish dividers**

General: Finish tiled floors at junctions with differing floor finishes with a corrosion resistant metal dividing strip suitably fixed to the substrate, with top edge flush with the finished floor. Where changes of floor finish occur at doorways make the junction directly below the closed door.

Stepping: Less than 5 mm.

**Adjustments**

If the floor finish divider was installed by the wet area waterproof membrane applicator check that the height 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.

## 3.9 COMPLETION

**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.

Storage location: Project manager to advise.

**Cleaning**

General: Clean tiled surfaces using an appropriate tile cleaning agent, and polish.

**Operation and maintenance manuals**

General: Submit a manual describing care and maintenance of the tiling, including procedures for maintaining the slip-resistance grading stating the expected life of the slip-resistance grade.

## 4 SELECTIONS

### 4.1 SCHEDULES

**Wall tiling schedule ( refer to drawing)**
**Floor tiling schedule (refer to drawings)**

# 0651 RESILIENT FINISHES

## 1 GENERAL

### 1.1 RESPONSIBILITIES

**General**

Requirement: Provide resilient floor finishes to substrates, as documented.

### 1.2 STANDARDS

**General**

Installation: To AS 1884.

### 1.3 INTERPRETATION

**Definitions**

General: For the purposes of this worksection the definitions given in AS 1884 and the following apply:

- Resilient floor coverings classification: To BS EN ISO 10874.
- Substrate: The surface to which a material or product is applied.
- Underlay: A non-structural layer of sheet material or an in situ levelling material on the substrate to provide a smooth and level surface.

### 1.4 SUBMISSIONS

**Materials and components**

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, if relevant, the following:

- 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.

**Substrate acceptance**

Applicator: Submit the installer's certification of the acceptability of the flooring substrate before commencing installation.

**Tests**

Type tests: Submit results, as follows:

- Manufacturer's type tests showing that materials conform to cited standards.
- Fire hazard properties: Submit evidence of conformance to **PRODUCTS**, **GENERAL**, **Critical radiant flux** and **Smoke development rate**.
- Type test slip resistance of resilient finishes to AS 4586.

Other tests: Submit results, as follows:

- Site slip resistance test of completed installations.
- 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.

## 2 PRODUCTS

### 2.1 GENERAL

**Critical radiant flux**

Standard: To AS ISO 9239.1.

Floor finishes: Conform to the values of critical radiant flux as documented.

**Smoke development rate**

Standard: To AS ISO 9239.1.

Floor finishes in non-sprinklered buildings: 750 percent-minutes.

## 2.2 MARKING

**Identification**

General: Deliver materials to the site in the manufacturer's original sealed packaging legibly marked to show the following:

- Manufacturer's identification.
- Product brand name.
- Product type.
- Quantity.
- Product reference code and batch number.
- Date of manufacture.
- Material composition and characteristics such as volatility, flash point, light fastness, colour and pattern. Provide technical data sheets if not shown on labels.
- Handling and installation instructions.
- Materials safety data sheets.

## 2.3 UNDERLAYS

**Cementitious**

General: Polymer modified cementitious self smoothing and 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 processed fibreboard (hardboard) underlay**

Standard: To AS/NZS 1859.4.

Classification: General purpose medium board, manufactured specifically as flooring underlay.

Thickness: 5.5 mm.

## 2.4 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.

**Linoleum**

Standard: To BS EN ISO 24011.

**Rubber**

Standard:

- Smooth rubber: To BS EN 1817.
- Textured/relief rubber: To BS EN 12199.

**Polyvinyl chloride (PVC)**

Resilient floor covering, homogeneous and heterogeneous: To BS EN ISO 10581.

Resilient floor covering, jute or polyester felt backing: To BS EN 650.

Resilient floor covering, with foam layer: To BS EN 651.

Resilient floor covering, semi-flexible polyvinyl chloride tiles: To BS EN ISO 10595.

**Adhesives**

General: To the resilient finishes manufacturer's recommendations.

**Static control flooring**

General: Unbacked flexible sheet with electrical resistance within the range of surface resistance specified in AS 2834 clause 2.1.2, when tested to AS 4155.6.

**Acoustic sheet vinyl**

General: Unbacked flexible sheet vinyl laid over separate closed cell foam acoustic underlay.

Acoustic underlay thickness: 2 mm.

**Slip resistant sheet vinyl**
Slip resistance classification: To AS 4586.

**Inlaid vinyl sheet**
General: A layer of vinyl chips inlaid in a translucent vinyl matrix, bonded to a moisture resistant backing.

### 2.5 SYNTHETIC SPORTING SURFACES

**Standard**
General: To AS 3541.1.

## 3 EXECUTION

### 3.1 SUBCONTRACTORS

**General**
General: Use specialist installers recommended by the materials manufacturers.

### 3.2 PREPARATION

**Substrates**
General: To AS 1884 Section 3.

Tolerance: To the **Substrate tolerance table**.

**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**
Surface pH: ≤ 10 when tested to AS 1884 Appendix B and compatible with the adhesive.

Moisture content: Do not commence installation unless the moisture content of the concrete has been tested to AS 1884 Appendix A and the values in clause A3.1.2 or A3.1.3 have been obtained.

Surface treatments: Mechanically remove the following surface treatments:

- Sealers and hardeners.
- Curing compounds.
- Waterproofing additives.
- Surface coatings and contamination.

Concrete substrate correction: Remove projections and fill voids and hollows with a levelling compound compatible with the adhesive. Allow filling or levelling compound to dry to manufacturer's recommendations.

Cleaning: Remove loose materials or dust.

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**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.

**Conditioning**
General: Stabilise the room temperature for seven days before, and two days after, installation of resilient finishes, as follows:

- Areas with air conditioning installed: Run air conditioning at operational temperature.
- Air conditioned areas not operational: Maintain an ambient room temperature range of 15°C to 28°C.
- Non-air conditioned areas: Install at an ambient room temperature range of 15°C to 28°C.
- Underfloor heating: Turn off heating and allow substrate to stabilise at the temperature recommended by the manufacturer.

Underlay: Expose both faces of each sheet for at least 24 hours before fixing.

Resilient sheet and tile floor coverings: Stack for at least 48 hours before installation.

## 3.3 SHEET AND TILE INSTALLATION

**Sheet set out**

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

**Tile set out**

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

## 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 using a damp cloth.

Epoxy jointing: Join seams with epoxy adhesive.

**Conductive flooring**

General: Install conductive sheet on a copper grid comprising copper tape 80 µm thick x 10 mm wide adhered to the floor with conductive adhesive. Lay copper tape along each length of sheet vinyl and connect it at right angles to a 1 MΩ resistor. Connect to earth with copper tape at 20 to 30 $m^2$ intervals.

## 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.

UPVC 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: An arrangement of 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.

**Rubber coved skirtings and margins**

General: Form from smooth flat sheet matching the colour and total thickness of the rubber flooring. Scribe and mitre at internal corners.

External corners and stop ends: Provide purpose-made matching moulded pieces.

**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 requirements of the supplier for the sheeting material and thickness.

## 3.8 TESTING

**Construction tests**

General: Test and assess conformity of construction as follows:

- Slip resistance: If a slip resistance classification if required:
  . Method: To AS 4663.

## 3.9 COMPLETION

**Protection of sheet materials**

General: Keep traffic off floors until bonding has set or for 24 hours after laying, whichever period is the longer. Do not allow water in contact with the finish for 7 days.

**Reinstatement**

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

**Cleaning**

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

**Cleaning antistatic and conductive flooring**

General: Do not use sealers, wax or floor polish. Clean using a mild neutral detergent and lukewarm water. Dry buff clean floor using a scrubbing machine with a white nylon pad.

**Certificate of compliance**

General: Provide a certificate of compliance for antistatic and conductive floor installations.

**Maintenance manual**

General: Submit manufacturer’s published use, care and maintenance requirements for each type of finish.

### 3.10 PRODUCT SCHEDULES

**Sheet and tile schedule (refer to drawing)**

# 0671 PAINTING

## 1 GENERAL

### 1.1 STANDARDS

**Painting**
General: To the recommendations of those parts of AS/NZS 2311 which are referenced in this worksection.

### 1.2 INTERPRETATION

**Definitions**
General: For the purposes of this worksection the following definitions apply:

- Adhesion: The sum total of forces of attachment between a dry film and its substrate.
- Finish coat: The final coat of a coating system.
- 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, a surface with the following specular gloss reading are defined as follows:
  . Full gloss finish between 50 and 85 gloss units.
  . Semi gloss between 20 and 50 gloss units.
  . Low gloss between 5 and 20 gloss units (also known as low sheen).
  . Flat finish less than 5 gloss units (also known as matt).
- Opacity: The ability of a paint to obliterate the colour difference of a substrate.
- Paint: 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:
  . Materials from bleeding through to the surface.
  . Reaction of the substrate with incompatible top coats.
  . Undue absorption of the following coat into the substrate.
- Sheen: Gloss which is observed on an apparently matt surface at glancing angles of incidence.
- 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.

### 1.3 INSPECTION

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

- Painting stages, if noted on drawings;
  . Completion of surface preparation.
  . After application of prime or seal coats.
  . After application of undercoat.
  . After application of each subsequent coat.
- Clear finishing stages if noted on drawings;
  . Before surface preparation of timber.
  . Completion of surface preparation.
  . After staining.
  . After sanding of sealer.
  . After application of each clear finishing coat.

## 2 PRODUCTS

### 2.1 PAINTS

**Paint brand**

Quality: If the product is offered in a number of levels of quality, provide premium quality lines.

**Low VOC emitting paints**

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

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

**Combinations**

General: Do not combine paints 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 topcoats.

**Delivery**

General: Deliver paints to the site in the manufacturer's labelled and unopened containers.

**Putty and fillers**

Material: To the recommendation of the paint system manufacturer, as 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 requirements of Appendix I Uniform Paint Standard to the Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP).

## 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 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 against dust entry. Use drop sheets and masking to protect finished surfaces or other surfaces at risk of damage during painting.

Internal and external fixtures and furniture: Remove door furniture, switch plates, light fittings and other fixtures before starting to paint, and refix in position undamaged on completion of the painting.

Adjacent surfaces: Protect adjacent finished surfaces liable to damage from painting operations.

**Wet paint warning**

General: Place notices conspicuously and do not remove them until the paint is dry.

**Repair**

General: Clean off marks, paint spots and stains progressively and restore damaged surfaces to their original condition. Touch up new damaged decorative paintwork or misses only with the paint batch used in the original application.

**Substrate preparation**

General: Prepare substrates to receive the painting systems.

Cleaning: Clean down the substrate surface. Do not cause undue damage to the substrate or damage to, or contamination of, 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, by methods which may involve 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 (last abrasive no coarser than 220 grit) to show no scratches across the grain.

**Unpainted surfaces**

Standard: To AS/NZS 2311 Section 3.

**Previously painted surfaces**

Preparation of a substrate in good condition: To AS/NZS 2311 clause 7.4.

Preparation of a substrate in poor condition: To AS/NZS 2311 clause 7.5.

Preparation of steel substrates with protective coatings: To AS/NZS 2312 Section 10 and AS 1627.1.

Additional preparation:

- Seal stained ceilings before the application of latex paints.
- Clean PVC with methylated spirit and a nylon scouring pad.
- Remove wall paper and glue size with clean water and seal before painting.
- Remove water based kalsomine or lime wash paints by brushing with warm water.

**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 appropriate hand tools. Use sanding blocks to preserve the arrises of masonry and stone details.

## 3.2 PAINTING

**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: Do not paint in dusty conditions, or otherwise unsuitable weather as follows unless the paint is suitable and recommended for such conditions:

- Relative humidity: > 85%.
- Surface temperature: < 10°C or > 35°C.

**Priming before fixing**

General: Apply one coat of wood primer (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 does the following:

- Satisfactorily atomises the paint being applied.

- Does not require the 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 generally to the standards set out for spray painting booths, AS/NZS 4114.1 and AS/NZS 4114.2 .

**Sanding**

Clear finishes: Sand the sealer using the finest possible abrasive (no coarser than 320 grit) and avoid cutting through the colour. Take special care with round surfaces and edges.

**Repair of galvanizing**

General: For galvanized surfaces which have been subsequently welded, power tool grind to remove all rust and weld splatter. Remove all surface contaminants then immediately prime the affected area.

Primer: Organic zinc rich coating for the protection of steel to AS/NZS 3750.9 Type 2.

**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: If not embedded, paint new services and equipment including in plant rooms, except chromium, anodised aluminium, GRP, UPVC, stainless steel, non-metallic flexible materials and normally lubricated machined surfaces. Repaint proprietary items only if damaged.

**Windows**

Operation: Make sure that opening windows function correctly before and after painting.

**Door leafs**

Drying: Leave doors fixed open to allow drying. Do not allow door hardware, accessories or the like to damage the door finish during the drying process.

## 4 SELECTIONS

### 4.1 PAINTING SYSTEMS

**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 for the following final coats:

- High build textured or membrane finishes (B38 to AS/NZS 2311).
- 2 pack gloss pigmented polyurethane (B44 to AS/NZS 2311).
- 2 pack epoxy (B29 to AS/NZS 2311).
- 2 pack water based epoxy (B29A to AS/NZS 2311).

**Previously painted surfaces**

Standard: To AS/NZS 2311 Section 8.

### 4.2 PAINTING SCHEDULES

**General**

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

Final coat selection: To the **Interior painting schedule (refer to drawings)** and the **Exterior painting schedule (refer to drawings)**.

# 0702 MECHANICAL DESIGN AND INSTALL

## 1 GENERAL

### 1.1 RESPONSIBILITIES

**General**

Qualification: Use only appropriately experienced and qualified persons to undertake mechanical design work. If requested, provide documents verifying the qualification and experience.

### 1.2 STANDARDS

**General**

Electrical services: To Part 2 of AS/NZS 3000 unless otherwise documented.

Electrical systems: To AS/NZS 3008.1.1 and the recommendations of SAA HB 301.

Degrees of protection (IP code): To AS 60529.

EMC: To AS/NZS 61000.

Mechanical ventilation and air conditioning: To AS/NZS 1668.1 and AS 1668.2.

Microbial control: To AS/NZS 3666.1, AS/NZS 3666.2 as required by the BCA and the recommendations of SAA/SNZ HB 32.

Refrigeration systems: To AS/NZS 1677.2 and the recommendations of SAA HB 40.1 and SAA HB 40.2.

Plumbing, drainage and water supply: To AS/NZS 3500.0, AS/NZS 3500.1, AS/NZS 3500.2, AS/NZS 3500.4 and the PCA-NCC.

Telecommunications systems: To AS/CA S008, AS/CA S009, AS/NZS 3080, SAA HB 243 and SAA HB 29.

## 2 MECHANICAL SYSTEMS

### 2.1 DESIGN

**Air conditioning system design**

General: Design systems as documented.

Requirement: Provide engineering design that:

- Maximises the functionality, performance, safety, flexibility and reliability of the mechanical services.
- Is technically sound.
- Can be constructed using currently accepted methods.
- That provide the lowest combined owning and operating cost over the design life of the systems.

**Outdoor design conditions**

General: Use design conditions listed in AIRAH DA09, Table 1 or Table 1A for:

- The location geographically closest to the site.
- Comfort (or Non-Critical Process) Conditions.

**Indoor design conditions**

General: Conform to the following:

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

**Cooling performance**

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

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

**Heating performance**

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

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

**Temperature variation**

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

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

**Air conditioning heating and cooling load calculations**

Standards: Conform to the recommendations of one or more of the following:

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

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

**Zoning**

Requirement: Divide the systems into temperature controlled zones to meet the stated permissible limits in temperature variation, and the system divisions documented.

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

**Building fabric loads**

Requirement: Allow for loads from the construction documented.

Internal window shading: As documented.

**Lighting loads**

Requirement: Allow for lighting load as documented on the lighting layouts and details.

**Internal equipment loads**

Requirement: As documented in the **Internal air conditioning loads schedule**.

**People loads**

Requirement: As documented in the **Internal air conditioning loads schedule**.

**Supply air**

Minimum supply air to each air conditioned space ≥ 4.5 L/s/m² at all times the plant is operational.

**Outside air**

Standard: To AS 1668.2.

**Noise levels**

Ambient noise emitted: Lower than the level that can be heard within a habitable room in any neighbouring premises, regardless of whether any door or window to that room is open.

**Fire separation**

General: As documented.

**Heating**

Heat source: Select from the following:

- Reverse cycle air conditioning plant in which air conditioned areas are divided between systems so that cooling and reverse cycle heating can be provided simultaneously.
- An energy source with a greenhouse gas intensity less than 100 g $CO_2$-e/MJ.
- An on-site renewable energy source.
- Energy from another process as reclaimed energy.

**Mechanical ventilation system design**
Standard: To AS 1668.2.

**Natural ventilation**
Alternatives: As an alternative to mechanical ventilation, natural ventilation to AS 1668.4 may be offered provided it conforms to the BCA.

**Environmentally sustainable design**
Energy efficiency: [complete/delete]

### 2.2 SUBMISSIONS

**General**
Before starting work, submit the following:

- Outdoor design conditions, corresponding geographic location and source of data.
- Calculated total and sensible cooling capacities and heating capacity.
- Name of calculation method used.
- Makes and model numbers of proposed equipment.
- Total and sensible cooling capacities and heating capacity of the proposed equipment, adjusted for the documented outdoor and indoor conditions and any effects of the proposed plant configuration.
- Any assumptions on which the calculations are based.
- Details of any departures from this specification.
- Details of fire provisions.
- A drawing of the proposed duct, pipe and equipment layout. Show proposed zoning and methods of heating.
- Proposed plant locations.
- Method of heating and % of total heating load in the case of electric heating.
- Mechanical contractor provision for attendance to breakdowns.
- Availability of service network of plant manufacturer.
- AREMA certification of equipment.
- Proposed ventilation systems.
- Licence numbers and type of licences held by persons responsible for the installation.

**Certification**
Requirement: On completion, certify that the design and installation conforms to all contractual and statutory requirements.

## 3 PACKAGED AIR CONDITIONING

### 3.1 RESPONSIBILITIES

**General**
General: Provide packaged air conditioning plant, as documented.

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

### 3.2 GENERAL

**Operating conditions**
General: Provide equipment that operates within an ambient temperature range of 0°C to 45°C, without excessive head pressure, unstable operation or icing.

**Split systems**
Outdoor units: Provide packaged condensing units consisting of refrigerant condensers, compressors and associated piping and electrical connections, mounted within the condenser enclosure.

Indoor units: Provide units consisting of coils, piping, supply air fan, accessories and electrical connections, mounted within an insulated enclosure.

**One-piece packages**
General: Provide packaged units consisting of refrigerant condensers, compressors, supply air fan, cooling coil and associated piping and electrical connections, mounted within the same enclosure.

## 3.3 EQUIPMENT ENCLOSURES

**General**

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

**Material and finishes**

Materials: Conform to the following:

- Metallic-coated steel: Base and legs ≥ 1.6 mm with ≥ 1.0 mm panels.
- Aluminium: Base and legs ≥ 2.0 mm with ≥ 1.6 mm panels.

Outdoor equipment finishes: Powder coat all metallic-coated steel interior and exterior surfaces to AS 3715 or AS 4506 as appropriate.

**Insulation**

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

## 3.4 FILTERS

**General**

Filters: Type 1 to AS 1324.1 with Class and Performance rating as documented but not less than:

- Test Dust No. 1 to AS 1324.2: ≥ 20% efficiency.
- Test Dust No. 4 to AS 1324.2: ≥ 85% arrestance.

## 3.5 REFRIGERATION PIPING

**General**

General: Conform to equipment manufacturer's recommendations for the refrigerant used. Provide refrigeration piping designed and installed so that the complete system meets the documented performance under the documented operating conditions.

## 3.6 CONDENSATE DRAINS

**General**

Condensate drains: Provide trapped drain lines with uniform and continuous fall to connect condensate trays to the nearest building drain point. Provide drains from:

- Each indoor coil.
- Each outdoor coil unless casing freely drains to a roof or other location where condensate and/or rain water will not cause damage or pond.
- Each safety tray.
- Other moisture and rainwater collecting areas.

## 3.7 SAFETY TRAY

**Location**

General: Provide a safety tray under packaged unit and indoor unit of split systems if leaks or condensation from these could cause nuisance or damage to the building or its contents.

Reverse cycle units: If reverse cycle outdoor units do not have drain connections, locate safety tray below unit and pipe drain to waste.

## 3.8 UNIT INSTALLATION

**General**

General: Supply all necessary components, including but not limited to the following:

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

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

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

**Outdoor equipment**

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

Plinths: If located on grassed or similar permeable surfaces provide concrete plinths under outdoor equipment.

**Duct connections**

Supply duct: Provide internal or external flexible duct connection.

Return, outside air and condenser duct connections: Provide external flexible duct connection.

## 4 ROOM AIR CONDITIONERS

### 4.1 RESPONSIBILITIES

**General**

General: Provide room air conditioners, as documented.

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

### 4.2 GENERAL

**Safety**

General: Conform to AS/NZS 3350.2.34 and AS/NZS 3350.2.40.

**Construction**

Insulation: Insulate and vapour seal to prevent external condensation under all operating conditions.

Supply fan: Centrifugal with multi-speed or variable speed motor.

Filter performance to AS 1324.1: G2 rating, Type 1 (dry media), Class C (washable media in a reusable frame).

Condenser fans: Low speed propeller or axial.

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

Drains: Provide aluminium, stainless steel or plastic drain trays to collect all moisture generated inside unit. Provide trapped drain to waste.

### 4.3 CONDENSATE DRAINS

**General**

Condensate drains: Provide trapped drain lines with uniform and continuous fall to connect condensate trays to the nearest building drain point. Provide drains from:

- Each indoor coil.
- Each outdoor coil unless casing freely drains to a roof or other location where condensate and/or rain water will not cause damage or pond.
- Each safety tray.
- Other moisture or rainwater collecting areas.

## 5 FANS

### 5.1 RESPONSIBILITIES

**General**

General: Provide fans as documented.

### 5.2 DESIGN

**Centrifugal fans**

Centrifugal fans: Provide fans selected so the air flow can be increased ≥ 5% above the rate documented as follows:

- Against the corresponding increased system resistance as installed.
- Without unstable operation.
- By speed change alone.

**Axial flow fans**

Axial flow fans: Provide fans selected so the air flow can be increased ≥ 5% above the rate documented as follows:

- Against the corresponding increased system resistance as installed.
- Without unstable operation.
- By pitch angle change alone.

**Fans with multi-speed motors**

General:

- Two speed fans: Provide fans selected to perform documented duties.
- Fans with 3 or more speeds and single phase fans with adjustable speed control: Provide fans selected to achieve the documented duty at a speed no more than 80% of highest speed.

## 5.3 CENTRIFUGAL FANS – IN-LINE

**General**

General: Provide fans with non-overloading power characteristics.

**Construction**

Casings: 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.

Impellers: Backward inclined or forward curved style as documented, constructed from metallic-coated steel, extruded aluminium or polypropylene. Balance impellers statically and dynamically.

Motors: Direct mounted to impellers with minimum thermal class 155 (F) insulation to IEC 60085. Provide sealed for life bearings with a minimum rating fatigue life of 40 000 hours at 40$^{o}$C ambient.

Electrical connection: Provide terminal box external to fan casing and wired to fan motor.

Access:

- Impellers < 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.

## 5.4 AXIAL FLOW FANS

**General**

Requirement: Provide fans with non-overloading power characteristics.

**Casings**

General: Tubular, flanged at each end, constructed from mild steel, fully welded, hot dip galvanized after fabrication.

**Impellers**

General: Provide aerofoil section blades constructed from cast aluminium alloy or glass reinforced plastic.

## 5.5 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**

General: 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, hotdip galvanised (HDG) after manufacture, material as documented.

**Vertical discharge**

General: Provide weatherproof galvanized steel, plastic or aluminium backdraft dampers where the weather may enter when units are stopped.

Backdraft damper closure: Counter weighted or electrically driven.

**Motors**

Bearings: Provide 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.

### 5.6 WINDOW/WALL FANS

**General**

Housing: Provide:

- 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.

### 5.7 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.

## 6 DUCTWORK

### 6.1 RESPONSIBILITIES

**General**

General: Provide ductwork, as documented.

### 6.2 DESIGN

**Standards**

Design and installation: Conform to the recommendations of one or more of the following:

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

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

**Rigid sheet metal ductwork**

Duct design: Size ductwork as follows:

- Velocity: ≤ 6 m/s.
- Pressure loss: ≤ 1.2 Pa/m.

**Flexible duct**

Requirement: Conform to the following:

- Velocity: ≤ 4.0 m/s.
- Length: Not more than 6 m total flexible duct length in the air path between the fan and furthest outlet or grille served. Provide rigid sheet metal duct for the remainder of the air path between the fan and furthest outlet or grille served.

### 6.3 STANDARD

**General**

Flexible ductwork: To AS 4254.1.

Rigid ductwork: To AS 4254.2.

## 6.4 FLEXIBLE DUCT

**Standard**
To: AS 4254.1.

**Materials**
Uninsulated flexible duct: Aluminised fabric clamped on a formed metal helix. Do not use adhesives. If a metal helix is provided, it must not be in contact with the air stream.

Insulated flexible duct: As for uninsulated flexible duct with flexible blanket insulation wrapped around duct and covered with an outer vapour barrier.

Material R-value: To BCA Spec J5.2.

## 6.5 DAMPERS – GENERAL

**Location**
Balancing dampers: Provide at each branch duct or tee as follows:

- Splitter type: Use only for supply branches up to 300 mm maximum dimension and with velocity in main less than 10 m/s. Do not use on return or exhaust ducts.
- Opposed blade dampers: Use for any size supply and for all return and exhaust ducts. Locate in each branch.

## 6.6 ACCESS OPENINGS – LOCATION

**Access panels**
Location: Provide access panels in the following locations:

- Next to each component located inside the duct requiring regular inspection and maintenance including, but not limited to:
  - . Fire and smoke dampers.
  - . Smoke detectors.
  - . Motorised dampers.
  - . Filters.
  - . On the air entering side of electric duct heaters.
  - . On the air entering side of duct mounted heating coils.
- In air handling units where unit size is insufficient to fit an access door.

## 6.7 ELECTRIC DUCT HEATERS

**General**
Standard: To AS/NZS 3102.

Elements: Sheathed in steel or nickel alloy. Provide brazed spiral steel fins.

Frames: Assemble elements in a galvanized steel frame with terminal connections contained in an enclosed terminal box.

Heating section: Install to allow access to the terminal box and removal of the assembly without disturbing other components.

Fin rating: < 20 W/m².

Electrical connection: Provide a permanent electrical connection to the heater.

## 6.8 DUCTWORK INSTALLATION

**Arrangement**
Ductwork: Arrange ductwork neatly. Provide access to ductwork components which require inspection, entry, maintenance and repairs. Where possible arrange duct runs adjacent and parallel to each other and to building elements.

**Flexible duct**
General: 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).

Joints: Securely fix flexible duct to rigid spigots and sleeves using sealant and draw band encased with at least two wraps of duct sealing tape.

Joints between flexible ducts: Join lengths of flexible duct only for the purpose of providing an air tight or acoustic sleeve at a partition.

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

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

Flexible ducts used for air containing free moisture: Locate supporting helix outside airstream.

### 6.9 LEAKAGE TESTING

**Standard**

Leakage testing methods: Select from the following:

- SMACNA HVAC Air Duct Leakage Manual.
- The Heating and Ventilating Contractors' Association publication HVCA DW/143- *A Practical Guide to Ductwork Leakage Testing*.

Maximum leakage rate under test: To AS 4254.2.

## 7 DUCTWORK INSULATION

### 7.1 RESPONSIBILITIES

**General**

General: Provide insulation of ductwork and related items.

### 7.2 STANDARDS

**General**

Ductwork insulation: To AS 4254.1 and AS 4254.2.

### 7.3 INSULATION PERFORMANCE

**General**

Insulation material R-Value: To BCA Spec J5.2 and as documented.

### 7.4 INSULATION MATERIALS

**Insulation materials**

Standard: To AS/NZS 4859.1.

Form: Batt, board or blanket.

Polyester: Thermally bonded polyester fibres.

Polyolefin: Closed cell cross-linked polyolefin foam produced using non-CFC blowing agent.

**Aluminium foil laminate sheet**

Standard: To AS/NZS 4200.1 as follows:

- Internal insulation: Heavy duty before perforation.
- External insulation: Heavy duty unperforated.

### 7.5 INTERNAL INSULATION – LAMINATE FACED

**System description**

Insulation type: Semi-rigid board or batt.

Surface facing: Factory applied perforated aluminium foil laminate.

**Fixing method**

Method: Select from the following:

- Corner angle and end nosing method.
- Free edge method.

Fixing pins: To AS 4254.2 clause 2.7.1.

**Corner angle and end nosing method**

Corners: Overlap insulation on adjacent sides at corners. Hold insulation in position with metallic-coated steel corner angles. Fix corner angles under the turn back of the end nosing. For corner angles longer than 1600 mm provide additional fixing at 1600 mm maximum centres.

**Free edge method**

General: Use only where larger duct side is no more than 300 mm.

Edges: Extend insulation proud of ductwork at each end, to provide cushion joints that fully seal during assembly.

### 7.6 EXTERNAL INSULATION – LAMINATE FACED

**System description**

Insulation type: Flexible batts or blanket.

Surface facing: Factory applied aluminium foil laminate.

**Application**

General: Wrap insulation around the outside of ducts, covering the parts designated to be insulated. Minimise the number of joints.

**Fixing method**

Materials other than polyolefin foam: Select from the following:

- Pin method: Provide pins to each face of the duct as follows:
  - . Horizontal ducts < 380 mm wide: Pins not required.
  - . Horizontal ducts > 380, < 760 mm wide: One row of pins along centreline to side and bottom duct faces at 380 mm maximum centres.
  - . Horizontal ducts ≥ 760 mm wide: Pins spaced at 380 mm maximum centres.
  - . Vertical ducts < 610 mm wide: Pins not required.
  - . Vertical ducts ≥ 610 mm wide: Pins spaced at 380 mm maximum centres.
- Strap and pin method: Provide 12 mm wide polypropylene strapping at maximum 600 mm intervals.
  - . Horizontal ducts ≥ 600 mm wide: Hold insulation in position on the underside with fixing pins spaced at 400 mm maximum centres with at least one row per duct face.
  - . Vertical ducts ≥ 600 mm wide: Provide pins to all faces at 400 mm maximum centres.
- Corner angle and strap method: Provide metallic-coated sheet steel corner angles on all four sides of the duct. Retain with 12 mm wide polypropylene strapping at maximum 750 mm intervals. Provide angles as follows:
  - . 25 mm nominal thickness insulation: 38 x 38 mm.
  - . 50 mm nominal thickness insulation: 63 x 63 mm.

Polyolefin foam: Provide pins spaced 50 mm from all edges and spaced 200 to 300 mm apart in all directions.

### 7.7 INSULATION OF DUCTWORK ACCESSORIES

**Plenum boxes on air outlets**

Insulation type: Internal insulation, with perforated aluminium foil laminate, black finish.

Material R-Value: Same as the connected duct.

### 7.8 INSULATION OF DUCT FLEXIBLE CONNECTIONS

**General**

General: Insulate duct flexible connections if the temperature of the air inside the duct may cause condensation on the outside of the flexible connection.

Material R-Value: Same as the connected duct.

## 8 AIR GRILLES

### 8.1 RESPONSIBILITIES

**General**

General: Provide air grilles, as documented.

### 8.2 DESIGN

**General**

Requirement: Design air grilles and other air distribution equipment, as documented.

**Supply air**

Requirement: Provide supply grilles, diffusers, registers or unducted room air conditioners to:

- Evenly distribute supply air within the space, free from draughts, and to achieve the documented permissible temperature variation.
- Achieve the documented noise levels within the space.

- With at least one grille, diffuser or unducted room air conditioner in each room or space served.

**Return air**

Requirement: Provide return air grilles to:

- Return air to the air conditioning plant in an energy efficient manner.
- Achieve the documented noise levels within the space.

**Door grilles**

Requirement: Provide door grilles to:

- Return air to the plant if the return air path is through the door opening.
- Provide make-up air to exhaust ventilated spaces.
- In other locations necessary to prevent excessive space air pressures and achieve energy efficient plant operation.

**Exhaust grilles**

Requirement: Provide exhaust grilles to meet statutory ventilation requirements.

**Outside air grilles and louvres**

Requirement: Provide grilles and louvres on the face of the building to:

- Supply fresh air to air conditioning and ventilation plant.
- Provide relief of exhaust and return air.
- Prevent the entry of rain and vermin.

## 8.3 GENERAL

**Manufacture**

General: Provide proprietary grilles:

- Free from distortion, bends, surface defects, irregular joints, exposed fastenings and operation vibration.
- Mounted with secure and concealed fixings.
- With flange corners neatly mitred, butted and buffed, with no joint gaps.

Material: Steel or aluminium.

Finish:

- Exposed surfaces: Powder coated to nominated colour.

## 8.4 VOLUME CONTROL DAMPERS

General: Provide a damper as follows:

- If the duct spigot is located above a tiled or otherwise accessible ceiling: Provide a butterfly damper in the rigid duct spigot.
- If the duct spigot is not located above a tiled or otherwise accessible ceiling: Provide an opposed blade damper behind the face of the diffuser or grille.

## 8.5 AIR GRILLE TYPES

**Louvre ceiling diffusers**

General: Provide either:

- Multi-bladed, removable core 4-way blow configuration, fitted with a blanking plate for 1-, 2-, or 3-way blow, as appropriate; or
- Multi-bladed, removable core 1-, 2-, 3- or 4-way blow configuration.

Reducer necks: If the outlet neck is smaller than the outlet necessary to suit the louvre face size, provide a reducer neck.

Frame: Provide a frame style to suit the type of ceiling, and ceiling grid mounting requirements.

Cushion head: If the diffuser is connected to a flexible duct, provide a cushion head box.

Air volume control: Conform to **VOLUME CONTROL DAMPERS**.

**Side wall registers**

General: Double deflection type with horizontal front louvre blades and vertical rear blades at 19 mm nominal centres, capable of field adjustment of air throw over the range ± 45°.

Construction: Extruded aluminium with mitred corners and aerofoil section blades which rotate in non metallic bearings in the support frame. Hold blades firmly so they do not rattle or flutter.

Core: Provide a removable core (support frame and blades).

Blades > 600 mm long: Support at mid point on a notched support bar.

Dampers: Provide a stream splitter or opposed blade type damper behind each register, to provide even air flow across the register face.

**Thermally powered VAV diffusers**

Type: Proprietary VAV diffuser with integral actuator and dampers to adjust air volume in response to temperature sensed at the diffuser. Provide uniform air distribution pattern to maximise Coanda effect over the operating range from full open to the minimum air flow.

Construction: Provide an appearance panel mounted within a pressed diffuser frame.

Material: Powder coated metallic-coated steel sheet.

Frame: Provide a frame style to suit the type of ceiling, and ceiling grid mounting requirements.

Operation: Provide integral hinged dampers to vary the outlet supply air volume under the control of an inbuilt room temperature sensing element.

Control: Provide either:

- Self-powered type with expanding wax or similar temperature sensitive elements.
- Line powered with integral 24 volt transformer.

Heating operation: If the system operates in both heating and cooling modes provide a factory preset supply duct temperature sensor that reverses the control action between heating and cooling. Operate in cooling mode when the air supply is below 20°C and in heating mode when supply air is above 27°C.

Room temperature set point: Adjustable from below the face of the diffuser over the range 21°C to 26°C.

Cushion head: If the diffuser is connected to a flexible duct, provide a cushion head box.

Air volume control: Conform to **VOLUME CONTROL DAMPERS**.

**Weatherproof louvre grilles**

Construction: Extruded aluminium with fixed horizontal blades set into a fixed frame.

Louvre blades: Set at nominal 45° angle and incorporating at least one hooked edge to prevent ingress of water under all operating conditions. Brace and stiffen to prevent rattling or movement.

Frame: Flanged or channel to suit the installation profile.

Pressure drop: ≤ 15 Pa at the documented air flow.

Screens: Provide metallic-coated steel wire or PVC mesh screens behind louvres to prevent the entry of vermin, birds, rodents and wind blown extraneous material such as leaves and papers.

**Return or exhaust grilles – indoor**

Construction: Extruded aluminium with fixed horizontal blades set into a fixed support frame with mitred corners. Fit blades tightly into the frame to prevent rattling or movement. Brace and stiffen to produce a rigid assembly.

Pressure drop: ≤ 10 Pa at the documented air flow.

Blades:

- Half chevron type: Blades at nominal 45° angle on a nominal 25 mm pitch.
- Inverted Vee chevron type: Blades at nominal 25 mm pitch. Provide a telescopic frame with clip-on pattern surround frames on both sides.
- Light proof grilles: Inverted Vee chevron type but with double inverted V chevron blades and blade pitch selected to stop light penetration.

Air volume control: If the grille is connected to a duct, provide an opposed blade damper behind the grille core, key operated without removing the grille core.

**Egg crate return or exhaust grilles**

Construction: Nominal 12 x 12 mm square, 12 mm deep egg crate type aluminium core fixed in an extruded aluminium frame with mitred corners. Fit core tightly into the frame to prevent rattling or movement.

Free Area: ≥ 90% of nominal face area.

Air volume control: If the grille is connected to a duct, provide an opposed blade damper behind the grille core, key operated without removing the grille core.

### 8.6 INSTALLATION OF AIR GRILLES

**Mounting**

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

Tiled ceilings: Locate grilles and diffusers to minimise cut tiles. Otherwise, locate grille symmetrically in the tile.

Appearance: Install square.

**Fixing**

Visibility: Provide concealed fixings.

Accessibility: Provide fixings which allow removal without damage to surrounds or outlets.

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

**Plenum and cushion head boxes**

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

## 9 AUTOMATIC CONTROLS

### 9.1 RESPONSIBILITIES

**General**

General: Provide automatic control systems to provide the documented control functions and system performance.

### 9.2 DESIGN

**General**

Requirement: Design automatic control systems, as documented.

Performance: Within the documented plant capacities, maintain the documented conditions. Provide control systems that are safe and stable in operation under all anticipated operating conditions including start up, shut down and fault condition.

Safety: Provide control devices and software to protect personnel from injury and equipment from damage by either normal or abnormal operation of the control system, including the removal and reapplication of power whether expected or unexpected.

Operating environment: Provide components that function correctly in their local environment.

**Automatic control system design, application and calculations**

Standards: Conform to the recommendations of one or more of the following:

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

### 9.3 CONTROL COMPONENTS

**Performance**

Requirement: Provide sensors and control components that are:

- Of corrosion resistant construction.
- Suitable for the respective operating environment.
- Not affected by the accumulation of dust or moisture, extraneous influences or variation of ± 30% in supply voltage.
- Protected against the entry of vermin.
- Selected for a response time appropriate to the application.
- Provided with proprietary connections suitable for the size and type of cable used.

### 9.4 INPUT DEVICES – GENERAL

**General**

General: Provide input devices with the following characteristics:

- With range, accuracy and response time appropriate to the required control function including the effects of transducer accuracy and signal transmission errors.

- Maintain documented performance over time.
- Protected by location or otherwise from extraneous influences including sunlight, heat sources and nonrepresentative locations.

### 9.5 INSTALLATION

**Sensors in occupied areas**

Installation: Securely attach to walls, ceilings or columns. Mount on concealed junction boxes and seal cable entries to prevent air from the cavity entering the junction box. Conceal all wiring from view inside wall, column or ceiling space.

Wall or column mounted sensors: Locate 1500 mm above floor level.

**Sensors in unoccupied areas**

Installation: Conform to **Sensors in occupied areas** except that devices may be mounted on surface mounted junction boxes with wiring in exposed conduit.

## 10 MECHANICAL ELECTRICAL

### 10.1 RESPONSIBILITIES

**General**

General: Provide mechanical electrical installations, as documented.

### 10.2 LOW VOLTAGE POWER SYSTEMS

**Standards**

General: To AS/NZS 3000 Section 2 unless otherwise documented.

### 10.3 MOTORS AND STARTERS

**General**

General: Provide motors selected in conformance with AS 60034.1, the application load characteristics, motor manufacturers' recommendations and the following:

- Motors ≥ 0.75 kW: Three phase.

**Rating**

Standard: To AS 60034.1.

Maximum power rating: The greater of the documented minimum motor size and next preferred standard frame size above the maximum load of the driven equipment.

Duty: ≥ S1.

Class: Continuous running.

Speed: ≤ 1500 r/min.

**Starters**

General: To AS 60947.1.

Electromechanical motor starters: To AS 60947.4.1.

**Selection**

General: Provide motor starters selected according to the following:

- Electricity distribution network limitations for starting currents and voltage flicker.
- Torque requirements for the motor load.
- Heating effects on the motor.
- Voltage drop during start due to starting currents.
- Time required to accelerate from rest to full speed.
- Number of starts per hour.

### 10.4 MOTOR PROTECTION

**General**

General: Provide over-current protection with manual reset giving overload protection in each phase of supply as part of the equipment assembly for each motor starter.

**Single phase motor protection**

General: Provide overload units matching the motor heating curve characteristics.

**3-phase motor protection**
General: Provide thermal overload protection relays for each motor.

## 11 MECHANICAL COMMISSIONING

### 11.1 RESPONSIBILITIES

**General**
General: Provide commissioning of all mechanical systems, as documented.

### 11.2 COMMISSIONING

**General**
General: Commission mechanical services when:

- The respective systems or parts of systems are complete.
- The building work on which commissioning depends is complete.

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

**Reports**
General: Submit reports indicating observations and results of tests and compliance or non-compliance with requirements.

### 11.3 AIR BALANCING

**General**
General: Balance each air handling system.

Completion: Balancing is complete when all the following conditions are met:

- All air quantities are within the tolerances in **Air quantity tolerance table**.
- For the same component, each air quantity measured deviates by less than the instrument accuracy from the previous measured air quantity.
- Resistance across the cooling coil bank (if present) is equal to the wetted coil resistance.
- Resistance of the filter bank (if present) is equal to the average of its clean resistance and resistance of the filter when fully loaded with dirt. If necessary to achieve this, simulate filter resistance by blanking or other means.
- For fans with variable speed drives, the frequency to the motor is no more than 50 Hz.
- At least one outlet on each branch has its damper at the minimum pressure drop position.
- At least one sub-branch damper is at the minimum pressure drop position.
- At least one branch damper is at the minimum pressure drop position.
- The fan speed or pitch angle is at the lowest value consistent with the above.

**Air quantity tolerances**
General: Balance air handling systems to the designated air quantities within the tolerances in the **Air quantity tolerance table**:

- Terminal: A supply, return or exhaust diffuser, grille or equivalent device discharging air into, or drawing air from, a space.
- Sub-branch: A duct connected to one or more terminals.
- Branch: A duct with no terminals connected to it.
- Total air quantity: The sum of air flows to the connected terminals, branches or sub-branches under the conditions of measurement.

**Air quantity tolerance table**

| System type | Terminal air quantity tolerance | Branch air quantity tolerance | Total air quantity tolerance |
|---|---|---|---|
| Low velocity supply, return or exhaust system where all terminals on any one sub-branch serve the same space | +20%<br>-0% | +10%<br>-0% | +10%<br>-0% |

| System type | Terminal air quantity tolerance | Branch air quantity tolerance | Total air quantity tolerance |
|---|---|---|---|
| Low velocity supply, return or exhaust system where the terminals on any one sub-branch serve more than one space | +15%<br>-0% | +10%<br>-0% | +10%<br>-0% |

### 11.4 AUTOMATIC CONTROLS

**General**

General: Test all controls hardware and software for correct operation.

**Sensor calibration**

General: Calibrate all sensors to within the documented accuracy of the sensor.

### 11.5 SAFETY CONTROLS

**Testing**

General: Test each safety control and facility by simulating the unsafe condition that the control is intended to protect against.

Monitoring: Make sure that monitoring and safety measures are in place for the test to protect personnel from injury and the building and equipment from damage.

## 12 MECHANICAL MAINTENANCE

### 12.1 RESPONSIBILITIES

**General**

General: Provide maintenance of the mechanical systems, as documented.

### 12.2 STANDARDS

**General**

Air handling system maintenance: Maintain to AS 1851.

Microbial control: Maintain to AS/NZS 3666.2.

### 12.3 OPERATION AND MAINTENANCE MANUALS

**Mechanical systems and equipment**

General: Provide operation and maintenance manuals for the whole of the mechanical work.

### 12.4 MAINTENANCE REQUIREMENTS

**General**

Requirement: Provide all labour and material necessary to maintain the mechanical installation including, but not limited, to filter media, belts, refrigerants, lubricants and all items commonly referred to as consumable.

**Site control**

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

### 12.5 CORRECTIVE MAINTENANCE

**General**

Requirement: Respond to call outs for breakdowns or other faults requiring corrective maintenance. Rectify faults and replace faulty materials and equipment.

### 12.6 REGULAR MAINTENANCE

**General**

Requirement: Make routine service visits as documented in the **Maintenance requirements schedule**. Service items of equipment in conformance with the maintenance schedules in the operation and maintenance manuals.

### 12.7 STATUTORY CERTIFICATION

**General**

Annual certification: Inspect and certify all items required to be inspected annually under statutory requirements including but not limited to air handling systems required for fire operation, boilers and pressure vessels. Submit certification to the principal.

### 12.8 MAINTENANCE RECORDS

**General**

Requirement: Record maintenance undertaken. If available, record in the schedules provided as part of the maintenance manuals.

## 13 SELECTIONS

### 13.1 AIR CONDITIONING LOADS

**Internal air conditioning loads schedule**

| Room or area | Use | No. of people in room | Internal equipment load |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

### 13.2 EQUIPMENT

**Non-ducted air conditioning system schedule**

| Property | A | B | C |
|---|---|---|---|
| Plant location and area served | | | |
| System type | | | |
| Minimum Energy Star rating | | | |
| Plant location | | | |

**Ducted air conditioning system schedule**

| Property | A | B | C |
|---|---|---|---|
| Areas served | | | |
| System type | | | |
| Minimum Energy Star rating | | | |
| Plant location | | | |

**Maintenance requirements schedule**

| Provision | Requirement |
|---|---|
| Mechanical maintenance period | Conform to *General requirements* |
| Call out response time not to exceed | |
| Maximum time between programmed service visits | |
| Frequency of periodic maintenance and performance reports | |
| Recommissioning frequency | |

# 0802 HYDRAULIC DESIGN AND INSTALL

## 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.

Microbial control: To AS/NZS 3666.1, AS/NZS 3666.2 and the recommendations of SAA/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 only 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 abbreviations apply:

- LPG: Liquefied petroleum gas.

**Definitions**

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

- Hot-dip galvanized: Zinc coated to AS/NZS 4680 after fabrication with coating thickness and mass to AS/NZS 4680 Table 1.
- Network Utility Operator: A person who undertakes the piped distribution of drinking water or natural gas for supply or is the operator of a sewerage system or a stormwater system.

# 2 HYDRAULIC SYSTEMS

## 2.1 DESIGN

**Extent**

Requirement: Provide additional design work necessary to complete the documented hydraulic services.

## 2.2 INSPECTION

**Notice**

Inspection: If required, give sufficient notice so that inspection may be made of the following:

- Excavated surfaces.
- Concealed or underground services.

## 2.3 SUBMISSIONS

**Certification**

General: Submit evidence that proposed fixtures are listed in the WaterMark Product Database.

Certification: Submit certification that the plant and equipment submitted meets the requirements and capacities of the contract documents except for departures that are identified in the submission.

**Shop drawings**

Standard: To AS 1100.101, AS 1100.201, AS 1100.301, AS 1100.401 and AS/NZS 1100.501 as applicable.

Requirement: Submit detail drawings at minimum 1:100 scale, showing the following:

- Pipework and equipment layout and sections showing the work to be installed on the level that the services are installed. Do not submit glass floor drawings.
- Long sections of below ground drainage.
- Riser layouts and sections.

- Piping and other schematic drawings including numbering of each valve to correspond to valve tags notation.
- Inclusions: Include the following on the drawings:
  - Access openings, cover plates, valve boxes and access pits.
  - Details of control panels including control and power diagrams.
  - Insulation of piping, fittings and tanks.
  - Location, capacity, type and other relevant details of water heaters, including supports and safe trays.
  - Location, type, grade and finish of piping, fittings, valves, meters and pipe supports.
  - On-site detention pondage areas.
  - Provision of a temporary fire hydrant service in the construction period.
  - Provision of blue metal back fill to seepage drain system.
  - Provision of erosion control measures.
  - Provision of road barriers and lighting.
  - Provision of site treatment and fire vehicle parking as required adjacent to the fire hydrant booster inlet valve station.
  - Provision of temporary sanitary accommodation for construction workers.
  - Provision of trafficable cover plates in the public domain.
  - Relevant survey levels.
  - Site and floor set out points.
  - Tank stands and supporting structures.

**Technical data**

Submissions: Submit technical data for all items of plant and equipment.

Data: Include at least the following information in technical submissions:

- 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.

## 2.4 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 so that isolation of parts of the system for safe isolation of the system in the event of leaks or maintenance causes a minimum of inconvenience to building occupants.

**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.

## 2.5 PAINTING, FINISHES MARKING

**Finishes**

General: 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.

## 3 SANITARY FIXTURES

### 3.1 RESPONSIBILITIES

**General**

General: Provide sanitary fixtures, as documented.

### 3.2 STANDARDS

**Standards**

Sanitary fixtures: To ATS 5200 series.

Design for access and mobility: AS 1428.1, AS 1428.2 and AS 1428.3.

## 4 TAPWARE

### 4.1 RESPONSIBILITIES

**General**

General: Provide tapware, as documented.

### 4.2 STANDARDS

**Standards**

Tapware: To ATS 5200series.

Design for access and mobility: AS 1428.1, AS 1428.2 and AS 1428.3.

## 5 WATER HEATERS

### 5.1 GENERAL

**General**

General: Provide water heaters, as documented.

### 5.2 ELECTRIC STORAGE WATER HEATERS

**Description**

General: Provide a proprietary automatic electrically heated water heater including connections, controls and necessary fittings.

**Standard**

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.

### 5.3 HEAT PUMP WATER HEATERS

**Description**

General: Provide a proprietary automatic water heater comprising self-contained reverse cycle heating system and storage container, including connections, controls and necessary fittings.

**Standard**

General: To AS/NZS 2712.

Performance evaluation: To AS/NZS 5125.1.

# 6 STORMWATER – BUILDINGS

## 6.1 GENERAL

**General**

General: Provide stormwater installation, as documented.

## 6.2 STORMWATER DRAINS

**Location**

General: Provide stormwater drains to connect downpipes, surface drains, subsoil drains and drainage pits to the outlet point or point of connection. Make sure that location of piping will not interfere with other services and building elements not yet installed or built. Subject to the preceding and documented layouts, follow the most direct route with the least number of changes in direction.

Downpipe connections: Turn up branch pipelines with bends to meet the downpipe, finishing 50 mm (nominal) above finished ground or pavement level. Seal joints between downpipes and drains.

**Laying**

General: Lay in straight lines between changes in direction or grade with sockets pointing up hill. If other pipes are adjacent, set each pipe true to line and complete each joint before laying the next pipe. If work is not continuous cap open ends to prevent entry of foreign matter.

**Pipe underlay (bedding)**

General: Bed piping on a continuous underlay of bedding material, minimum 75 mm, maximum 150 mm thick after compaction. Grade the underlay evenly to the gradient of the pipeline.

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 maximum 200 mm loose thickness, and compact without damaging or displacing the piping.

**Anchor blocks**

General: If necessary to restrain lateral and axial movement of the stormwater pipes provide reinforced concrete anchor blocks at junctions and changes of grade or direction conforming to AS/NZS 3500.33 clause 8.10.

**Thermal movement**

General: Arrange piping to accommodate thermal expansion. Provide proprietary expansion joints in copper and plastic pipes where pipe flexibility is not sufficient to absorb movement. Make sure that movement does not strain branch connections.

## 6.3 SUBSOIL DRAINS

**General**

General: 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, where the pipe passes below the following elements:

- 100 mm below formation level of the pavement, kerb or channel.
- 100 mm below the average gradient of the bottom of footings.
- 450 mm below the finished surface of unpaved ground.

**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, minimum 75 mm thick after compaction. Lay the pipe with one line of perforations at the bottom.

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 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.

**Geotextiles**

General: Provide polymeric fabric formed from plastic yarn composed of at least 85% by weight propylene, ethylene amide or vinyledenechloride 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 polyester permeable socks capable of retaining particles of 0.25 mm size. Securely fit or join the sock at each joint.

### 6.4 PITS

**Finish to 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.

### 6.5 TESTING

**Pre-completion tests**

General: Before backfilling or concealing, carry out the following tests:

- Downpipes within buildings: Air or water pressure test to AS/NZS 3500.3 Section 10.
- Site stormwater drains and main internal drains: Air or water pressure test to AS/NZS 3500.3 Section 10.
- Rising mains from pumped discharge: Water pressure test to AS/NZS 3500.3 Section 10.

Leaks: If leaks are found, rectify and re-test.

### 6.6 COMPLETION

**Cleaning**

General: Clean and flush the whole installation.

## 7 WASTEWATER

### 7.1 GENERAL

**General**

General: Provide sanitary plumbing and drainage, as documented.

### 7.2 SANITARY PLUMBING

**Location**

General: Verify location and invert of piping before commencing installation.

Layout: Arrange piping to conform to the documented layouts and as follows:

- Avoid interference with other services and building elements not yet installed or built.

- Follow the most direct route with the least number of changes of direction.

Ducts: If installed in ducts, locate and fix stacks, wastes and pipes independently of other services. Arrange so they are easily accessible and removable throughout their entire length.

**Discharge from air handling systems**

Trays, sumps and plumbing: To AS/NZS 3666.1.

**Thermal movement**

General: Arrange piping to accommodate thermal expansion. Provide proprietary expansion joints in copper and plastic pipes where pipe flexibility is not sufficient to absorb movement. Make sure that movement does not strain branch connections.

**Vent pipes**

General: 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.

### 7.3 SANITARY DRAINAGE

**Laying**

General: Lay in straight lines between changes in direction or grade with sockets pointing up hill. If other pipes are adjacent, set each pipe true to line and complete each joint before laying the next pipe. If work is not continuous cap open ends to prevent entry of foreign matter.

### 7.4 TESTS

**Pre-completions tests**

Before backfilling or concealing: Test to AS/NZS 3500.2 Section 13.

Leaks: If leaks are found, rectify and re-test.

### 7.5 COMPLETION

**Cleaning**

General: On completion clean and flush the whole installation.

## 8 COLD AND HEATED WATER

### 8.1 RESPONSIBILITIES

**General**

General: Provide cold water and heated water systems, as documented.

### 8.2 PRODUCTS

**Backflow prevention devices**

Standard: To AS/NZS 2845.1 and AS 2845.2.

**Water tanks**

General: To ATS 5200.026.

Materials: To AS/NZS 3500.1.

Polyethylene water tanks: To AS/NZS 4766.

Temperature: Do not exceed the rated service temperature of the tank material.

Flywire: Provide plastic flywire covering to overflow and vent pipes.

**Water meters**

Standard: To the AS 3565.1 and AS 3565.4.

Installation: To the requirements of the Network Utility Operator.

### 8.3 PIPING

**Location**

Mains connection: Connect the cold water supply system to the Network Utility Operator's main through a stop valve and meter.

Cold water system: Provide the cold water supply system, installed from the meter to the draw-off points or connections to other services.

Heated water system: Provide the heated water system, installed from the cold water connection points to the draw-off points or connections to other services.

**Fittings and accessories**

General: Provide the fittings necessary for the proper functioning of the water supply system, including taps, valves, backflow prevention devices, pressure and temperature control devices, strainers, gauges and automatic controls and alarms.

Provision for dismantling: Arrange piping by the provision of unions or similar so that valves, taps and other maintainable components can be removed for maintenance without disturbing or cutting adjacent piping.

**Pipes under pressure embedded in concrete**

General: Use only copper pipe and the minimum number of joints. Pressure test and rectify leaks before the concrete is poured.

## 8.4 PIPING INSULATION

**Location**

General: Insulate all non-chrome plated heated water piping, fittings and valves.

Application: Fit insulation tightly to piping surfaces without gaps. Close butt ends of insulation sections. Minimise number of joints. If the insulation is in half-sections, make only half-circumferential joints at any one place. Seal longitudinal seams in foil laminate and fix insulation at maximum 500 mm centres with polypropylene, zinc-coated steel or aluminium straps.

Unions and other items requiring service: Install the insulation so that it is readily removable.

Fittings: Provide insulation with thermal resistance at least equal to that of the adjacent piping insulation.

## 8.5 TESTING

**Pre-completion tests**

Pressure tests: Before insulation is applied to joints pressure test piping to AS/NZS 3500.1 and AS/NZS 3500.4 as appropriate. If leaks are found, rectify and re-test.

Cross connections: Isolate systems individually and check for cross connections.

Backflow prevention: To AS/NZS 3500.1.

Tapware: Check for leaks.

**Completion test**

General: Provide a full operational test to verify compliance with documented requirements.

## 8.6 COMPLETION

**Commissioning**

Strainers: Remove, clean and replace strainer baskets.

Cleaning: To AS/NZS 3500.1 Appendix H.

Disinfection: Disinfect to AS/NZS 3500.1 Appendix I.

Cold water systems: Test and commission to AS/NZS 3500.1 Section 16.

Heated water systems: Test and commission to AS/NZS 3500.4 Section 11.

Testable backflow prevention devices: Test and commission to AS 2845.3 by a licensed plumber with backflow device accreditation. Tag and certify to the requirements of the Network Utility Operator.

**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.

**Maintenance**

Heated water systems: To AS/NZS 3500.4 Section 12 and AS/NZS 3666.2.

Maintenance manuals: To AS/NZS 3666.2.

the Principal as warrantee. Include a copy of the warranty in the operation and maintenance manual.

to contain potable water, conform to AS 2070 with testing of materials to AS/NZS 4020.

: To AS/NZS 3497 and the requirements of the statutory authorities having jurisdiction.

**Sanitary fixtures schedule (refer to drawings)**

# 0902 ELECTRICAL DESIGN AND INSTALL

## 1 GENERAL

### 1.1 RESPONSIBILITIES

**General**

General::

No Electrical Engineering documentation has been provided.

It is the Contractors responsibility to assess and advised if sufficient electrical load is provided to the **Building ,** for the work required.

Authority requirements: If additional load is required, Contractor to liaison with the Electrical Authority unless otherwise noted.

Fault protection: Automatic disconnection to AS/NZS 3000 clause 2.4.

Maximum demand: Calculation method to AS/NZS 3000 Appendix C.

**Electrical performance**

Supply system: 400 V, 3-phase, 4-wire, 50 Hz, multiple earth neutral (MEN) system.

### 1.2 STANDARDS

**General**

Electrical services: To AS/NZS 3000 unless otherwise documented.

**Electrical installations**

Design guide: To the recommendations of SAA HB 301.

Selection of cables: To AS/NZS 3008.1.1.

Degrees of protection (IP code): To AS 60529.

EMC: To AS/NZS 61000.

Telecommunications systems: To AS/CA S008, AS/CA S009, AS/NZS 3080, SAA HB 243 and SAA HB 29.

### 1.3 CONTRACT DOCUMENTS

**General**

Requirement: If required Contractor to provide.

### 1.4 INSPECTION

**General**

Requirement: If required by Authority, identified in drawings or noted in Request for Tender Electrical Authority.

**Notice**

Inspection: As required by Authority.

### 1.5 WORK ON EXISTING SYSTEMS

**Demolition**

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

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

Recovered materials: Recover all components associated with the listed items. Minimise damage during removal and deliver to the locations documented.

**Existing electrical systems**

Condition of existing systems:

- If the existing condition does not conform to the requirements in the contract documents, submit proposals to rectify the deficiencies with related costing, time and other impacts.
- Subject to the rectification works on existing systems, achieve the performance in the contract documents.

# 2 LOW VOLTAGE POWER SYSTEMS

## 2.1 RESPONSIBILITIES

**General**

General: Provide low voltage power systems, as documented.

## 2.2 SYSTEM DESCRIPTION

**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.

**Distribution system**

General: Provide power distribution system elements, as documented.

## 2.3 SURGE PROTECTION DEVICES (SPD)

**General**

Responsibilities: Provide surge protection devices as documented and where required to protect sensitive electrical equipment.

**Surge protection devices (SPD)**

General: Where nominated in the document, provide all mode metal oxide varistor based series connected SPD to protect final equipment in racks and cabinets.

Standard: To AS 4262.1 and AS 4262.2.

Surge Rating: $I_{max} \geq 20$ kA per phase.

Residual Voltage: $U_p < 600$ V.

Visual indicator: Provide visual indication of SPD status.

Enclosure and installation: House SPD in a metal enclosure and protected with a suitable rated circuit breaker equal to or less than the load current rating of the SPD.

## 2.4 SITE ELECTRICITY SUPPLY

**General**

Responsibilities: Provide site electricity supplies as documented.

**Consumers' Mains**

Selection: Provide consumers' mains, associated services and all necessary fault and overload current protection equipment to AS/NZS 3000 Section 3, the local electricity distributor’s standards, the local Service and Installation Rules and as documented.

Protected consumers mains: Provide short circuit and overload protection, where required by the network distributor.

**Alternative power supplies**

General: Provide alternative power supplies, as documented.

**Metering**

Retail: Provide metering to the requirements of the principal, the selected electricity retailer and the electricity distributor.

Private: Provide private metering, as documented.

## 2.5 WIRING SYSTEMS

**Selection**

General: 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.

Cable support system: To AS/NZS 3000.

## 2.6 POWER CABLES

**Standards**

Polymeric insulated cables: To AS/NZS 5000.1.

Aerial cables: To AS 1746.

**Cable**

General: Provide multi-stranded copper cables.

Default insulation: V-75.

Default sheathing: 4V-75.

Minimum size: Conform to the following:

- Lighting subcircuits: 1.5 $mm^2$.
- Power subcircuits: 2.5 $mm^2$.
- Submains: 6 $mm^2$.

Voltage drop: Provide final subcircuit cables within the voltage drop parameters set 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: To AS/NZS 4026.

**Colours**

Cables: For fixed wiring, provide coloured conductor insulation. If this is not practicable, slide at least 150 mm of close fitting coloured sleeving on to each conductor at the termination points.

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**

Standard: Classifications to AS/NZS 3013.

Handling cables: Report damage to cable insulation, serving or sheathing.

Stress: Make sure that installation methods do not 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.

Extra-low voltage circuits: Individual wiring of extra-low voltage circuits: Tie together at regular intervals.

**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.
- Cables for lighting systems: Run in conduit, cable ducts, suspend on catenary systems or support on cable trays or ladders.
- Inaccessible concealed spaces: Install cable in PVC-U conduit.
- In 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$^{o}$C.

- In accessible ceiling voids: Support and enclose cables on ceiling surfaces or ceiling suspension systems.
- In walls filled with bulk thermal insulation: Install cables in PVC-U conduit.
- In metal stud framed walls: Install cable using TPS cable allowing rewirability. Bush all knock-outs in steel framing to prevent cable damage. Earth metal stud frames to the electrical earthing system.
- On horizontal cable trays or ladders: Fix cables using proprietary nylon cable ties or straps, cable saddles or clips at 2000 mm intervals.
- In 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.

## 2.7 EARTHING SYSTEMS

**Earthing systems**

Standard: Provide a protective earthing system with a multiple earth neutral (MEN) connection to AS/NZS 3000 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.

## 2.8 ELECTRICAL ACCESSORIES

**General**

Selections: Provide accessories, as documented.

Style: Provide accessories of the same style and from the same manufacturer.

**Socket outlets**

Standards:

- General: To AS/NZS 3112.
- Industrial: To AS/NZS 3123.

**Plastic switched socket outlets**

Type: Integral switched socket outlet.

Material: High impact plastic.

Size: Standard single gang.

Colour: White electrical.

Current rating: 10 A.

Pin arrangement: Mount outlets with the earth pins at the 6 o’clock position.

Mounting configuration: Horizontal.

**Ironclad socket outlets**

Type: Integral switched socket outlet.

Material: Diecast metal or cast iron.

Size: Standard single gang.

Colour: Grey.

Current rating: 10 A.

Pin arrangement: Mount outlets with the earth pins, at the 6 o’clock position.

**Weatherproof socket outlets**

Type: Integral switched socket outlet.

Material: High impact plastic.

Size: Standard single gang.

Colour: Grey.

Current rating: 10 A.

Pin arrangement: Mount outlets with the earth pins, at the 6 o'clock position.

**Combined RCD switched socket outlets**

Type: Integral RCD unit with double switched socket outlet.

Material: High impact plastic.

Size: Standard single gang.

Colour: White electrical.

Current rating: 10 A.

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 in the project documents.

Pin arrangement: Mount outlets with the earth pins, at the 6 o'clock position.

**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.

Current rating: 10 A.

**Plugs – 230 volt**

General: Provide plugs with integral pins of the insulated type to AS/NZS 3112.

**230 volt combination switch and permanently connected cord outlet**

Type: Three terminal flush mounted switch and flex-lock insert assembly.

Material: High impact plastic.

Size: Standard single gang.

Colour: White electrical.

Current rating: 10 A.

Neon Indicator: Provide neon indicator, where nominated in the project documents.

Flex-lock assembly: Match and securely grip the size and type of flexible cable to be used.

Mounting configuration: Horizontal.

**Permanently connected equipment**

General: Provide final subcircuit to permanently connected equipment, as documented.

Isolation: Provide isolating switch adjacent to equipment.

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 IEC 60947-5-5.

**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.

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.

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.

**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.

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.

Flush mounting: Provide flush mounted accessories, 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: Provide 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, e.g. operating theatre shadowless lights.

## 3 SWITCHBOARDS – PROPRIETARY

### 3.1 RESPONSIBILITIES

**General**

General: Provide proprietary switchboards for the following, as documented:

- Main switchboard.
- Distribution boards
- Private meters

### 3.2 STANDARDS

**General**

Standards: To AS/NZS 3000 and AS/NZS 3439.3.

### 3.3 GENERAL

**Enclosure**

Default material: Metallic-coated sheet steel.

**Separation**

Default: Form 1.

**Metering**

Retail: Provide metering to the requirements of the principal, the selected electricity retailer and the electricity distributor.

Private: Provide private metering, as documented.

**Busbars**

General: Incorporate proprietary insulated busbar systems for the interconnection of isolators, circuit breakers and other circuit protective devices.

**Spare capacity**

Default spare poles: ≥ 20%.

**Surge protection**
General: Provide surge protection as documented.

**Earthing**
General: Provide 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**
Exterior and Interior: To the manufacturer's standard colour.

**Supporting structure**
Assemblies:

- Wall mounted: ≤ 2 $m^2$.
- Floor mounted: > 2 $m^2$.

**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**
Cable enclosures: Continue cable enclosures to or into assemblies and fit cable entry plates so that the IP rating of the assembly and the fire rating of the cable are maintained.

**Cable supports**
Cable supports: Support or tie mains and submains cables within 200 mm of terminations. Provide cable supports suitable for stresses resulting from short circuit conditions.

## 4 SWITCHBOARD COMPONENTS

### 4.1 RESPONSIBILITIES

**General**
Responsibilities: Provide switchboard components as documented.

**Statutory authority's equipment**
General: Liaise with the electricity distributor regarding the installation and coordination of their metering, protection and control equipment.

### 4.2 PRODUCTS

**General**
Selection: Conform to the requirements of AS/NZS 3000 clause 1.7 and AS/NZS 3000 Section 2.

Rated duty: Uninterrupted.

Rated making capacity (peak): ≥ 2.1 x fault level (r.m.s.) at assembly incoming terminals.

Utilisation category: To AS 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.

## 4.3 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.

## 4.4 SWITCH-ISOLATOR AND COMBINATION FUSE-SWITCH UNITS

Standard: To AS 60947.1 and AS/NZS 3947.3.

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/NZS 3947.3 Table 3.

Rated short-time withstand current: To AS 60947.1 clause 4.3.6 and the manufacturer's recommendation to meet the prospective fault current conditions applying.

Rated short-circuit making capacity: To AS 60947.1 clause 4.3.6 and the manufacturer's recommendation to meet the prospective fault current conditions applying.

Rated short-circuit breaking capacity: To AS 60947.1 clause 4.3.6 and the manufacturer's recommendation to meet the prospective fault current conditions applying.

**Load make/load break switch-isolators**

Rated breaking capacity: To AS/NZS 3947.3 Table 3.

Rated short-time withstand current: To AS 60947.1 clause 4.3.5 and the manufacturer's recommendation to meet the current conditions applying.

Rated making capacity: To AS 60947.1 clause 4.3.5 and the manufacturer's recommendation to meet the current conditions applying.

Rated breaking capacity: To AS 60947.1 clause 4.3.5 and the manufacturer's recommendation to meet the current conditions applying.

Fuse links: Isolate when switch contacts are open. Provide 3 phase sets of high rupturing capacity (HRC) fuse links.

## 4.5 MOULDED CASE AND MINIATURE CIRCUIT BREAKERS

Moulded case breakers: To AS 60947.1, AS 2184 and AS 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.

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.

Trip settings: Set for load requirements, 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.

## 4.6 ELECTRICITY DISTRIBUTOR'S SERVICE PROTECTIVE DEVICES

Requirement: Provide low voltage service protective devices to AS/NZS 3000, the electricity distributor's requirements and the supply authority Service and Installation rules.

For service protective devices > 100 A: Provide fault current limiting circuit breakers with adjustable overload and short circuit current facilities with full discrimination and cascade protection between the incoming supply protection systems and the downstream protection systems.

### 4.7 RESIDUAL CURRENT OPERATED CIRCUIT BREAKERS (RCDS)

**General**

Standard: To AS/NZS 3190.

Integral non-overload protection type: To AS/NZS 61008.1.

Integral overload protection type: To AS/NZS 61009.1.

Modular type: To AS 60947.2.

Type: Type II.

Default tripping current: 30 mA.

### 4.8 FUSES WITH ENCLOSED FUSE LINKS

**General**

Standards: To AS 60269.1, AS 60269.2.0 and AS 60269.2.1.

Fuses with fuse-links for the protection of semiconductor devices: To AS 60269.4.0.

Fuses with fuse-links used as fault current limiters: Co-ordinate fuse type and rating with the protection switchgear manufacturer's recommendation if used downstream of the fault current limiters. Provide labels adjacent to the fuse holder stating FAULT CURRENT LIMITER and fuse size.

Fuse links: Enclosed, high rupturing capacity type mounted in a fuse carrier.

Breaking range and utilisation category:

- Distribution/general purpose: gG.
- Motors: gM.

Fuse-holders: Mount fuse-holders so that fuse carriers can be withdrawn directly towards the operator and away from live parts. Provide fixed insulation which shrouds live metal when the fuse carrier is withdrawn.

Barriers: Provide barriers on both sides of each fuse link, preventing inadvertent electrical contact between phases by the insertion of screwdriver.

Spare fuse links: Provide 3 spare fuse links for each rating of fuse link on each assembly. Mount spares on clips within the spares cabinet.

### 4.9 CONTACTORS

**General**

Standard: To AS 60947.4.1.

Type: Enclosed, block type, air break, electro-magnetic.

Poles: 3.

Rated operational current: The greater of:

- Full load current of the load controlled.
- 16 A.

Mechanical durability: 10 million cycles to AS 60947.4.1.

Electric durability: ≥ 1 million operations at AC-22 to AS 60947.4.1.

Mounting: Mount with sufficient clearance to allow full access for maintenance, removal and replacement of coils and contacts, without the need to disconnect wiring or remove other equipment.

Auxiliary contacts: Provide auxiliary contacts with at least one normally-open and one normally-closed separate contacts with rating of 6 A at 230 V a.c., utilisation category: AC-1.

## 5 LIGHTING

### 5.1 RESPONSIBILITIES

**General**

Requirement: Provide lighting and control systems, as documented.

**Minimum energy performance standards (MEPS)**

General: To AS/NZS 4847.2, AS/NZS 4783.2, AS 4934.2.

Self ballasted lamps: To AS/NZS 4847.2.

## 5.2 STANDARDS

**Standards**
Energy efficiency for ballasts and lamps: To AS/NZS 4783.2.

## 5.3 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.

## 5.4 FLUORESCENT LAMPS

**Standards**
Fluorescent lamps: To AS/NZS 4782.1 and AS/NZS 4782.2.

Compact fluorescent lamps: To AS/NZS 4782.1 and AS/NZS 4782.2.

Single capped fluorescent lamps: To AS/NZS 60901.

**General**
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.

## 5.5 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.

**Compact fluorescent lamps (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.

## 5.6 LIGHT-EMITTING DIODES (LEDS) LUMINAIRES

**General**
Requirement: Provide light emitting diode (LED) luminaires, as documented.

Colour: CRI > 80.

CCT: 3000 K.

## 5.7 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.

Control gear enclosure: Form a barrier against direct contact with live parts of the control gear and the area of the luminaire containing the lamp and lamp support holders.

Separate control gear enclosures: If separate control gear enclosures external to the luminaire are required, conform to the above requirements.

Fixing: Screw fixed.

## 5.8 WIRING

**Flexible cords**

Recessed luminaires: Provide external 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.

## 5.9 LIGHTING CONTROL

**General**

Requirement: Provide the following as documented:

- Lighting switches.
- Dimmers.
- Automatic control systems.

## 5.10 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 one space.

**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 luminaries**

General: Install recessed luminaries in trimmed openings in the suspended ceiling.

Standard: To AS 2946.

## 5.11 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.

## 6 TELECOMMUNICATIONS CABLING

### 6.1 RESPONSIBILITIES

**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 3080 clause 6.3: E.

Balanced system to AS/NZS 3080 clause 7 (data): Category 6.

Balanced system to AS/NZS 3080 clause 7 (voice): Category 6.

Fibre system class: To AS/NZS 3080 clause 8.

System warranty: 15 years minimum.

**Surge protection devices (SPD)**

General: Provide surge protection devices to protect final equipment in racks and cabinets.

### 6.2 STANDARDS

**General**

Authorities: To the requirements of the Australian Communications and Media Authority (ACMA).

Cabling products: To AS/CA S008 and AS/NZS 3080.

Installation of cabling: To AS/CA S009, AS/NZS 3080, AS/NZS 3084, SAA HB 29 and SAA HB 243.

Installation of small office/home office cabling: To AS/CA S009, AS/NZS ISO/IEC 15018 and SAA HB 29.

Cable management and documentation: To AS/NZS 3085.1.

EMC: To the recommendations of AS/NZS 3080.

### 6.3 TELECOMMUNICATIONS OUTLETS

**General**

Outlets: Provide RJ45 8 way modular jacks except where documented otherwise. 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 3080.

### 6.4 FLY LEADS

**General**

Type: Stranded.

Length: 1200 mm.

Quantity: Provide fly leads to 50% of outlets installed.

### 6.5 PATCH CORDS

**General**

Type: Stranded.

Length: 900 mm.

Quantity: 100% of outlets installed.

Termination: Registered jacks.

## 6.6 WIRELESS ACCESS POINT (WAP)

**General**

Requirement: Provide WAPs as documented, cabled to routers in the nearest Floor Distributor and conforming to IEEE 802.11.

Location: Install in ceiling voids distributed around the site buildings. Determine the number and location by a site survey using the wireless network to confirm full site coverage.

Power source: Utilise Power over Internet (PoE) connectivity to power WAPs.

## 6.7 ENGINEERING SERVICES

**General**

Requirement: Provide cabling systems, as documented.

## 6.8 CABLE INSTALLATION

**Installation**

General: To 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**

The separation specified in AS/CA S009 is based on insulation grading.

Clearances need to be specified for telecommunications cables reticulated parallel to power cables or adjacent to fluorescent luminaires. AS/NZS 3084 provides guidance on separation distances.

For safety: To AS/CA S009, and by at least 150 mm.

Electromagnetic interference(EMI): To SAA HB 29.

Fluorescent luminaires: Maintain a clearance of more than 300 mm.

**External cables**

External cables: To ACIF C524.

## 6.9 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 3080 Fig 15.

## 6.10 EARTHING SYSTEM

**General**

Standard: To AS/CA S009 and SAA HB 29.

**Communication earth system**

Communication earth system (CES): 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 in conformance with SAA HB 29.

Interconnections: Verify that there are no interconnections between the lightning protective earthing system and the telecommunications earthing system.

## 6.11 COMPLETION

**Cable management**

General: Before practical completion submit log books for each distribution frame with details of cable terminations and provisions for recording cable, line and jumper information.

Identification and labelling, and record documentation: To AS/NZS 3085.1.

## 7 TELEVISION DISTRIBUTION SYSTEMS

### 7.1 RESPONSIBILITIES

**General**

Requirement: Provide a system suitable for the reception and distribution of analogue and digital television, video, radio and sound signals as documented.

Network connection: Arrange with the network operator(s) for the connection of their 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.

### 7.2 SYSTEM DESCRIPTION

**System type**

Type: As documented.

**Performance**

General: To AS/NZS 1367.

Capacity: Provide the distribution system with the installed capacity to accommodate 30% additional outlets.

**Signal sources**

Free-to-air (FTA) antennae system: Provide FTA antennae system terminating at the premises cabling interface.

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 on separate channels of the network.

**Service entry**

General: Provide service entry facilities to suit signal sources, head end equipment and distribution systems.

Location: As documented.

**Head end equipment**

General: Provide head end equipment to suit signal sources, distribution systems and documented performance.

Location: As documented.

**Surge protection devices (SPD)**

General: Provide surge protection devices to protect final equipment in racks and cabinets.

**Distribution system**

General: Provide a cabling distribution network from the head end equipment 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.

**Outlets**

General: Provide outlets and feeders from distribution tap(s).

Quantity: Provide separate sockets for each source and service.

### 7.3 STANDARDS

Electromagnetic compatibility: To AS/NZS 1367 Section 3.

Bending radius: Conform to the manufacturer’s recommendations minimum bending radius for the size of cable.

# 8 EMERGENCY EVACUATION LIGHTING

## 8.1 RESPONSIBILITIES

**General**

Requirement: Provide single point monitored emergency lighting and exit signs as documented.

## 8.2 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: Provide 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.

## 8.3 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.

# 9 FIRE DETECTION AND ALARMS

## 9.1 RESPONSIBILITIES

**General**

Requirement: Provide fire detection and alarm systems as documented.

## 9.2 SYSTEM DESCRIPTION

**General**

System type: Addressable.

Interface: Emergency warning and intercommunications system.

## 9.3 STANDARD

**General**

Standard: To AS 1670.1 and AS 7240.13.

## 9.4 AUTHORISED PRODUCTS – FIRE DETECTION AND ALARMS

**General**

Equipment: Provide equipment listed in the ActivFire Register of Fire Protection Equipment.

## 9.5 CONTROL AND INDICATING EQUIPMENT

**Standards**

General: To 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.

Fire brigade panel: To AS 4428.3.

Routing equipment: To AS 7240.21.

Wire-free alarm zone circuits: To AS 4428.9.

**Fire indicator panels**

General: Provide metal cubicle-type enclosures.

**Isolation**

Isolating facilities: Provide on fire indicator panels to allow testing without the transmission of alarm signals to the fire brigade.

**Capacity**

Spare zones: 50% minimum.

## 9.6 DETECTORS

**Type**

Areas generally: Optical beam smoke detectors

Hot areas: Fixed temperature integral heat detector/alarm unit type.

**Standards**

Smoke alarms: To BCA Spec E2.2a.

Duct sampling units (DSUs): To AS 1603.13.

Heat detectors: To AS 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-point aspirated smoke detectors: To AS 1603.8.

Optical beam smoke detectors: To AS 1603.7.

Point type smoke detectors: To AS 1603.2.

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 fire indicator panel. 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.

## 9.7 MANUAL CALL POINTS

**General**

Standard: To AS 1603.5 and AS 7240.11.

### 9.8 EXTERNAL ALARM INDICATION

**Standards**

Bell circuits: To AS 4428.1.

Strobe lights: To AS 1603.11.

**Power supply**

To the strobe light and ≤ 2 others: From the fire indicator panel battery power supply.

To additional strobe lights: From the mains supply. Provide appropriate interface relays, operated by the fire indicator panel.

## 10 ELECTRONIC SECURITY AND ACCESS CONTROL

### 10.1 RESPONSIBILITIES

**General**

Requirement: Provide electronic security and access control systems as follows and as documented.

- Remote monitoring system.
- Access control system.
- Intruder detection system.
- Closed circuit television system.
- Intercom system.

Security classification: As documented.

**Intruder alarm systems**

General: To AS/NZS 2201.1.

Alarm transmission system: To AS/NZS 2201.5.

Internal detection devices: To AS 2201.3.

Wire free systems: To AS 2201.4.

**CCTV systems**

General: To AS 4806.2.

Remote monitored systems: To AS 4806.4.

### 10.2 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 scheduled.

**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**

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**

Anti tamper devices: 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.

**Alarm circuit supervision**

Alarm circuit supervision: At each detection device, provide alarm circuit supervision by means of an end-of-line device connected via a separate circuit within the cable.

Function: To register an instantaneous alarm if cable characteristics change, such as when cut or short circuited.

**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.

signal, interrupts the scanning sequence and switches to the relevant security zones.

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## 11 SELECTIONS

### 11.1 LIGHTING

**Lighting types and illumination levels schedule (refer to drawing)**