Part 4: Technical Specifications

Education and Care Facilities Design Standards

Public education is for every child and young person in South Australia.

Government of South Australia
Department for Education

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Part 4: Technical Specifications

Introduction

Where the Education and Care Facilities Design Standards specify a requirement or performance standard which exceeds those in any relevant act, regulation, Australian or International standard or the National Construction Code the designs must comply with the department's higher requirement or performance standard.

Departures from these requirements are to have written approval as outlined in the overview and glossary.

Any reference to National Regulations refers to the Education and Care Services National Regulations.

The following sections describe the general building, fixtures and fittings to be considered in the design and detailing of department education and care facilities.

Refer to Part 3a: Generic Functional Briefs – Early Childhood Education and Care Facilities and Part 3b: Generic Functional Briefs – Primary and Secondary Schools for the fit-out requirements applicable to each specific functional unit.

A full glossary of terms is available here.

Technical specifications relating exclusively to Early Childhood Education and Care (ECEC) Facilities will be indicated with a green border.

For sites located in Port Pirie the additional guidance provided in the Addendum: Guiding requirements for effective ongoing Lead exposure management must be followed.

Building

Quality, materials and lifecycle

Where products are selected and used, it is the responsibility of the manufacturer, design teams, contractors and facilities management providers to ensure the products are:

- fit-for-purpose[1]
- compliant to all relevant Australian Standards
- robust to suit their environment
- selected to minimise ongoing service and maintenance and offer value for money.

In line with the requirements of the Industry Advocate, the preference is to use local products and services before selection of foreign products.

An analysis of life cycle impacts must be undertaken for building materials used in construction, with a preference for those with low embodied energy.

Materials should be:

- sourced locally and preferably manufactured or produced in South Australia
- responsibly sourced
- reused, have recycled content, have environmental product declarations, third party certification or stewardship programs
- prefinished and proprietary finishes for durability, reduced ongoing maintenance and ease of replacement, without requiring specialty equipment/personnel to maintain.

The following **must not** be installed:

- materials, exceeding the limits of those listed, in the Safe Work Australia Hazardous Chemical Information System (HCIS) prohibited materials include engineered stone, asbestos, lead, mercury and cadmium
- expanded polystyrene (EPS)
- materials that use chlorofluorocarbon (CFC) or hydro chlorofluorocarbon (HCFC) in the manufacturing process
- exposed glass and rock fibre flexible insulation products
- polypropene and polyester flooring products
- any tropical rainforest timbers including species Meranti, Merbau, Philippine Mahogany and Chengel
- medium density fibreboard (MDF)
    - if written approval for use is provided from the department, MDF must be pre-cut off-site and the builder is responsible for mitigating any risk of wood dust resultant from on-site adjustment work.
- timbers treated with arsenic containing preservatives (such as CCA)
- aluminium composite panels (ACPs)

[1] Fit-for-purpose means a facility can enable the education and care functions in a quality, safe, efficient and effective manner, and does not impair their use as education and care facilities.

Concrete

Concrete to be installed as per DIT NATSPEC.

Where viable:

- the mix water used for concrete should include captured or recycled water
- low emissions concrete to be specified achieving an embodied emissions reduction of 30% from baseline Portland Cement
    - an Environmental Product Declaration (EPD) demonstrating the baseline Portland Cement level and the improvement achieved by the low emissions concrete mix.

Steel

- All steelwork fabrication must be carried out by companies certified in accordance with the National Structural Steelwork Compliance Scheme.
- All structural steel is to be Construction Category 2.
- The protective paint coating to steel surfaces must be compatible. The final specified paint system must include a primer/undercoat as specified by the paint system manufacturer.
- ACRS Certification – SA Government Requirement: All reinforcement, structural steel and associated components and welding consumables must be manufactured by companies accredited to AS 9001 which hold a valid certificate of approval issued by the Australian Certification Authority for Reinforcing and Structural Steels (ACRS).

Timber

- Any timber which is to have a painted finish, used internally or externally, must be primed on all surfaces before fixing.
- Materials used for the construction of outdoor play elements and outdoor decking must be durable, robust and require limited ongoing maintenance.
- Material must be durability Class 1 and Class 2 timber.
- Material must meet the following Hazard Class for different installations:
    - Hazard Class 3 for exterior above ground timbers, such as decking
    - Hazard Class 4 for exterior in-ground timbers, such as posts, stumps and landscaping features
    - Hazard Class 5 for exterior in-ground timbers in contact with fresh water, such as wetlands and water course installations.
- All timber must be chamfered and sanded to avoid splintering and to eliminate sharp edges and corners.
- Maximise use of natural timber and low emission manufactured board products to limit chemical emissions into learning environments.
- At least 95% of all engineered wood products used are to meet the formaldehyde limits stipulated in the AS/NZS 4266.1 and EN120.
- If particleboard or MDF is approved, the product must be Australian made to ensure the product meets E0 classification specified in AS 1859.2.
- Incorporate anti-skate fittings where appropriate or required to protect the exposed edges of external decks from skateboard damage.
- All timber framing is to be chemically treated against termite attack and for exposure classification as applicable.

- Any timber or reconstituted timber product used as floor decking to an area that is attached to a building must be tested and certified to withstand exposure up to a minimum BAL-29 in accordance with AS 3959.

Timber preservative treatment

Treated timber must comply with AS/NZS 1604 series and must bear a treatment brand (a label or ink stamp) generally on the end-grain.

Alternative choices for CCA preservative treated timber include:

- light organic solvent protection (LOSP) suitable for:
    - H1 (inside, above ground, dry)
    - H2 (inside, above ground)
    - H3 (outside, above ground).
- Tanalised Ecowood or NatureWood suitable for:
    - H3 (outside, above ground)
    - H4 (outside, in ground)
    - H5 (outside, in ground or fresh water).

Termite management

Termite management measures must be in accordance with DIT Termite Management Guidenote G38.

To assist in termite prevention and inspections, the department prefers that building slabs are exposed to 75mm on all edges.

Site works, such as paving or installing garden beds (and includes the installation of air-conditioners and hot water systems), **must not** cover termite barriers, weep holes or inspection zones.

Paint

Paints must be selected from the Australian Paint Approval Scheme. Paint spraying is not permitted to ensure adequate coverage.

Volatile organic compounds (VOC's)

The maximum Total VOC (TVOC) content for paint, varnish, sealer and primer is specified in the table below.

Table 1: Paint and adhesives VOC content

Product	Maximum TVOC content g/L of product
Paint product type	
Walls and ceilings - interior semi-gloss	16
Walls and ceilings - interior low-gloss	16
Walls and ceilings - interior flat washable	16
Ceilings - interior flat	14
Trim - gloss, semi-gloss, varnishes and wood stains	75
Timber and binding primers	30
Latex primer for galvanised iron and Zincalume	60
Interior latex undercoat	65

Interior sealer	65
One and two pack performance coatings for floors	140
Adhesive product type	
Indoor carpet adhesive	50
Carpet pad adhesive	50
Wood flooring and laminate adhesive	100
Rubber flooring adhesive	60
Sub-floor adhesive	50
Ceramic tile adhesive	65
Cove base adhesive	50
Dry wall and panel adhesive	50
Multipurpose construction adhesive	70
Structural glazing adhesive	100
Architectural sealants	250

Paint finishes

The following finishes are recommended to maximise the use of pre-finished materials and reduce ongoing maintenance.

Table 2: Paint finishes

Substrate	**Paint finish**
External	
Concrete/cement render	semi-gloss acrylic
Fibre cement wall cladding	semi-gloss acrylic
Timber fascias, barges, rafters	flat acrylic (A)
Steel beams, posts, bag racks	System C and gloss enamel or galvanised finish (B)
Fibre cement soffits	low gloss acrylic
Timber doors and frames	full gloss enamel (C)
Timber window frames	full gloss enamel (C)
Internal	
Plaster and plasterboard walls	semi-gloss acrylic
Plasterboard ceilings and bulkheads	flat acrylic
Fibre cement toilet partitions	factory polyurethane
Timber doors and frames	full gloss enamel (C)
Timber windows	full gloss enamel
Timber sills, skirtings, and trim	full gloss enamel or clear finish
Timber joinery	full gloss enamel or clear finish or melamine surface
Steel columns and beams	full gloss enamel (B)

Notes:
(A) – External timber subject to weather is best protected with oil based pink primer and flat acrylic finish coats.

(B) – Galvanising is the preferred finish to metal surfaces that take wear. Metal surfaces to be painted must first be treated with System C protection and not galvanising.
(C) – Full gloss enamel is the preferred finish to timber surfaces that receive any hand contact, internally and externally.

Roof and roof plumbing

Must comply with:

- DIT Guidenote G190 'Building Access and Safety Systems'
- AS/NZS 4389 – Safety mesh
- Safework SA Fragile roofing requirements

Design Guidance:

- consideration must be given to heat reflective coatings to reduce heat gain. A lifecycle analysis comparing the heating and cooling load compared to increasing insulation and/or heat reflective coatings is to be included in concept reports for consideration by the department.
- avoid Zincalume roof sheeting where reflected glare may cause problems to neighbours or to upper floors of adjoining buildings.
- design of roofs for buildings in bushfire protection areas must minimise roof junctions that collect debris and/or trap embers (hip and valley junctions and valley gutters).
- large roofs facing north, northeast and northwest must be designed to structurally support current and/or future solar PV system installations. Roof and building designs must be oriented to maximise solar PV system available area and efficiency.
- in reactive soils construct flexible joints and expansion joints for stormwater at the building line. The type of joint required will depend on soil conditions.
- covered ways adjacent to, and between buildings must be designed to maximise protection from rain, considering site condition and exposure to wind and wind driven rain
- downpipes must consider the location of adjacent buildings and services such as rainwater tanks to restrict access to roofs, with gravity fed stormwater systems preferred

The following **must not** be installed:

- glazed roofs (does not include clear or translucent roof sheets, refer below)
- internal downpipes
- box gutter systems, or any gutter that could overflow internally into the building
- concealed gutter brackets
- gutter profiles where the rear upstand is lower than the front of the gutter must be mounted on external stand off brackets to provide a gap no less than 10mm to allow an overflow path at the back of the gutter.

Roofs

- Roof and ceiling insulation must be provided to meet NCC Section J requirements for all new builds and roof-replacement refurbishments
- Continuous tray flashing extending from the ridge of the roof must be provided for all roof penetrations, for large penetrations in low pitched roofs (<10 degrees):
    - refer DIT Standard Drawing DG36 Roof Flashing – Structural Penetration
    - extend the base flashing over the roofing ribs to the ridge to prevent ponding behind the penetrating element

    - base flashing to be formed with fall, around the penetration to prevent ponding against upstand
    - provide additional supports to the underside of roof sheets, to all sides of the penetration
- Roofs to new buildings must be installed at a minimum of 5 degrees to reduce the likelihood of leaks and water damage.
- Roof water must be collected in roof gutters and downpipes and discharged into a site stormwater collection system
- Roof Safety System must comply with DIT Guidenote G190 'Building Access and Safety Systems'

Roof sheets

- Roof sheets must be:
    - light in colour to reduce summer heat load, unless inappropriate for the local environment (such as glare or cultural/heritage requirements)
    - pre-painted steel, minimum 0.48mm Base Metal Thickness (BMT)
    - 50mm projected into gutters
    - provided with Insect and bird proofing
- Close off ribs at the 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.
- Profiles are preferred to be folded crest (KlipLok or similar) to allow external clamp on clips/brackets for walkways and plant to avoid piece fixings (no pop rivets etc)
- Provide a proprietary flexible clamping shoe with attached metal surround flashing to penetrations less than 30mm diameter
    - for penetrations greater than 30mm diameter a two-part metal upstand and weatherproof over flashing must be used.
- Clear or translucent roof sheets can be used to introduce light into large areas such as activity halls
    - clear or translucent sheeting must be of webglass fibreglass material
    - wire mesh must be installed underneath all clear and translucent sheeting conforming to AS/NZS 4389 - Safety mesh
        - signage at all locations where safety mesh is installed, in line with SafeWork SA Fragile roofing requirements, must be fixed.

Gutters

Gutters:

- to be Zincalume or Colorbond
    - may be stainless steel in coastal areas.
- have all brackets exposed
    - preferred option is half round eaves gutters with external bracket with 10mm gap at rear for overflow path
- height must be a minimum 2400mm to restrict access by individuals to the roof/covered way

Where box gutters are approved as part of a refurbishment or extension, they:

- must not be able to overflow internally into the building
- must be open ended to a rain head with unrestricted overflow
- must be accessible for cleaning.

Downpipes

Downpipes must be:

- fixed at the top and bottom for each storey of building using a stand off bracket with a 50mm projection
- connected to the underground stormwater system and not discharged to paving, garden beds or other surfaces
- provided with domed ball guards to all downpipe gutter outlets (refer DIT Standard Drawing DG33 Typical Ball Guard Detail)
- round with a minimum diameter of 100mm
- plumbed directly into PVC stormwater riser which must finish a minimum of 75mm above paving level, avoid the use of offsets at the base of downpipes
    - where unavoidable, offsets are preferred to be 45 degrees, not 90 degrees, to avoid blockages
- sewer grade uPVC with a stiffness rating of SN4 to a height of 2000mm above ground level

Inspection opening:

- not required for downpipes with length <3200mm as they can be cleaned from the gutter
- are required for downpipes with length >3200mm and must be made vandal-proof with self-drilling screws (such as Tek screws)
    - opening to be at ground level for dry system and above waterline for wet system (refer DIT Standard Drawing DG44 Sealed PVC Downpipe for Wet System with Inspection Point)

Standoff brackets are to be fixed at the rear of the downpipe to prevent climbing risk and laceration risk

Solar tubes and skylights

Solar tubes are preferred over skylights for their:

- reduced heat load
- reflective tubing system that can be located around obstacles/services in and on the roof
- diffuser system which spreads light more evenly throughout the room.

It is recommended that solar tubes:

- are dimmable when low light levels are required (such as during audio-visual presentations)
- include options for additional insulation to improve thermal performance.

Solar tubes and skylights **must not** be:

- located directly above ceiling fans (potential strobing effects)
- installed in facilities located in bushfire protection areas

Solar tubes and skylights installations must:

- include options for backup LED lights when natural light is low
- be in line with manufacturer's specifications, flashed back to the roof ridge, and oriented and designed to avoid direct sun shining into learning areas

- have safety mesh conforming to AS/NZS 4389 – Safety mesh or engineered weld mesh installed
- ensure purlin centres are compatible with skylight sheeting material

Covered ways

To reduce maintenance, steel construction is preferred over timber, and:

- columns for covered ways should be in grassed areas or garden beds and not within the paved surface
- include gutters and downpipes connected to the site stormwater disposal system to protect paving, building entrances and garden beds from water
- ensure the design and materials minimise roosting places for birds, enclosed sections such as Rectangular Hollow Section (RHS) and Square Hollow Section (SHS) are preferred, with purlins running between, not over, beams.

Walls

Must comply with:

- NCC Volume 1 - C2D10 (where applicable)
- AS 3959 Construction of Buildings in bushfire-prone areas (where applicable)
- AS 1428.1

Design Guidance:

- Walls must comply with the relevant bushfire attack level of the site for education sites located in bushfire protection areas requiring construction above BAL-29.
- Walls should be smooth with no protrusions or sharp edges that could be a hazard and exclude finger entrapment risks in joints and junctions.
- Walls **must not** allow climbing (including retaining walls) by ensuring flush junctions and mortar joints, and removing horizontal steps, ledges and purchase points in adjoining structures and fencing.
- Masonry and concrete finishes installed must have anti-graffiti protection applied at installation where walls are exposed to public areas or located in specific vandalism prone areas.

The following **must not** be installed:

- horizontal corrugated sheet metal due to the increased cleaning, maintenance and weatherproofing requirements and created safety hazards for finger entrapment at junctions and flashings
- sacrificial anti-graffiti protection coatings, due to issues with ongoing maintenance

External walls

External wall cladding must:

- comply with DIT NATSPEC unless otherwise specified below
- be non-combustible in accordance with NCC C2D10 regardless of the type of construction required by NCC Table C2D2
- have high impact resistant to a minimum above ground height of 2100mm
- be constructed to minimise sound transmission from the external to the internal environment
- be constructed from durable materials that are preferably pre-finished, do not have ongoing maintenance requirements, and do not require additional coatings to mitigate the effects of damage

- sheet materials that have a surface coating that can be scratched or damaged must be able to be repaired on site. Any sheet material that cannot be repaired on site **must not** be selected for heights under 2400mm

External feature timber wall cladding may be installed in small sections and must be completely protected from the weather

- timber or wood composite products fixed externally or abutting a building must be tested and certified to withstand exposure up to a minimum BAL-29 in accordance with AS 3959 in bushfire-prone areas regardless of the bushfire risk rating of the education or care facility
- metal sheet cladding finish and colour selection to reduce glare

Semi-sacrificial or non-sacrificial anti-graffiti protection coatings may be used and must be maintained to manufacturer specifications.

Internal walls

Internal wall linings must:

- have a smooth finish and be robust, durable and easy to clean
- comply with the fire hazard properties detailed in Specification C2D11 and Specification C7C4 of the NCC Volume 1
- be finished in a light colour to maximise light reflectivity and reduce reliance on artificial lighting
- include movement joints between any dissimilar materials
- be tiling, vinyl or other resilient, easily cleaned wall lining in wet areas
- consider the acoustic benefits and display opportunities sound absorbing wall linings can provide, in addition to protecting wall surfaces
- accept hook-and-loop fasteners (such as Velcro), in lieu of pins, where fabric faced sound absorbing wall linings are installed for display purposes and visual communications
- include acoustic insulation and treatment at ceiling junctions
- be painted in line with the Paint finishes and Paint and adhesives VOC content tables within this document
- be high impact sheeting, minimum 13mm thick, that runs the full height of the wall to allow for ease of installation, maintenance and replacement
- be lined with waterproof, seamless resilient wall finishes (sheet vinyl or glazed ceramic wall tiles) in shower compartments to a minimum height of 2100mm to all faces of the shower recess
- have stud walls and noggings designed and constructed to meet the manufacturer's required installation specifications for internal linings
- include deflection heads to steel studwork
- have noggings at 1350mm maximum centres above floor level (AFL), or at changes in wall linings
    - in tiled and wet areas provide an extra row of noggings immediately above wall-to-floor flashings
    - have proprietary (>32mm) holes pre-punched in metal noggings to facilitate new and future services being run.

Internal walls in toilets

Fully-enclosed[2] cubicles:

- are to be scheduled for all new builds and major toilet refurbishments where toilet fixtures are being relocated
- must have full height stud framing, acoustic insulation, and moisture resistant wall lining extending from floor level to the underside of the ceiling.

Internal wall linings to stud frames must be:

- fibre reinforced cement
- minimum 9mm
- with control joints and acoustic insulation.

Partition systems:

- for ECEC and reception to year 2 learning communities, may substitute fibre cement sheet with compact laminate systems that must be a minimum 13mm sheet:
    - in ECECs partitions must be 1200mm high and have a maximum gap of 85mm underneath (see Entrapment fact sheet by Kidsafe SA and the Education Standards Board's creating safe facilities).
    - in reception to year 2 learning communities, partitions must be a minimum 1800mm high. Doors/fanlights, frontals and partition walls must extend from floor level.
- forming fully enclosed toilet cubicles in schools (above year 2) are only acceptable in minor toilet refurbishments projects where installed partitions are being replaced in their current location on a 'like for like' basis, and:
    - must be 16mm fibre cement sheet or a proprietary compact laminate system (13mm for primary schools, 18mm for secondary and R-12 schools)
    - doors/fanlights, frontals and partition walls must extend from floor level to the underside of ceilings
- if, existing building conditions prevent full-height partitions, the minimum height requirements are:
    - Primary Schools - 2100mm
    - Secondary Schools - 2400mm.

Splashbacks

- minimum height to be 300mm
- 3mm to 5mm caulked gaps are required to all splashbacks, floor and wall junctions in wet areas
- are to extend the full length of joinery units that contain sinks, troughs and hand basins, and are to return for the full depth of the unit
- install:
    - sheet vinyl, laminated panels, stainless-steel, acrylic sheet or glazed ceramic wall tiles above benchtops with sinks and hand basins
    - stainless-steel or glazed ceramic wall tiles behind stoves or cooktops extending to the underside of rangehoods, cabinets or bulkheads

[2] Fully-enclosed cubicles provide for complete privacy with floor to ceiling walls and a door extending to the floor. This is not the same as self-contained cubicles which include a wash basin.

- sheet vinyl or glazed ceramic wall tiles from floor to minimum 1200mm above floor level behind wall mounted hand basins, toilet pans, cleaner's troughs and washing machines
- glass splashbacks must only be used in staff areas.

- **must not** include:
  - glass splashbacks in student areas
  - electrical accessories on any glass splashbacks.

Ceilings

Must comply with:

- C2D11 of the NCC Volume 1 fire hazard properties for ceiling linings
- Ceiling hangers are to be screw fixed with AS 3566.1 compliant fixings

Design Guidance:

- Where new services are installed at the same time as new ceiling linings an integrated and coordinated ceiling plan must be prepared showing all ceiling access hatches, HVAC equipment, light fittings, ceiling fans, security, AV, data and other fixtures. Provide coordinated ceiling plans for written approval by the department prior to contractor procurement.
  - Ceiling spaces must be appropriately sized and accessible to allow for services to be installed and modified, especially data services. Ensure that adequate access is also available between wall cavities and ceiling spaces for service modifications.
  - Ensure adequate ceiling space is designed for the location of Energy Recovery Ventilator (ERV) units including the provision of anti-vibration mounts and ceiling insulation to reduce noise transfer to occupied spaces
  - Ensure all access panels are free from obstructions/structure/services that block access to the service above, and/or cause damage to the panel during removal and replacement.
  - Ceiling access panel frames are to be mechanically fixed to the ceiling grid system.
    - Ceiling access panels are to be minimum 600mm x 600mm.
    - within perforated plasterboard ceilings include a 10mm plasterboard backing to perforated ceiling access panels to reduce the risk of damage during use.
    - In accordance with the DIT NATSPEC, provide each access panel with an identification mark on the ceiling grid to indicate the location of each concealed item requiring access for inspection, maintenance or operation.
  - Bulkheads for services must have a minimum height of 2400mm.
- Provide fully framed ceiling grid systems for plasterboard ceilings that will adequately support all surface mounted ceiling services. All penetrations through plasterboard ceilings greater than 250mm diameter (or square), or with a weight exceeding 300g, are to be fully framed out.
- Avoid exposed roof trusses and ledges at ceiling level which collect dust, due to cleaning maintenance limitations and concerns about allergies.
- Ceiling linings:
  - must meet the fire hazard properties detailed in Specification C2D11 of the NCC Volume 1.
  - Plasterboard ceiling linings to be minimum thickness 13mm.
  - Fibre cement soffit linings to be Type B Category 2, minimum thickness 6mm.
    - Where 6mm linings are used, recessed/countersunk fixings **must not** be selected.
    - Fibre cement soffits **must not** be designed with flush joints.

- Insulation in ceilings must be fire resistant polyester.
- Ceiling finishes in a light colour are preferred to maximise light reflectivity and reduce reliance on artificial lighting.
- Acoustic treatment to ensure reverberation time, maximum noise levels, and acoustic separation between spaces meet department requirements (see Acoustics section below).
    - Special attention must be given to acoustic requirements of areas where separation is required and where significant noise can be generated, such as workshops and laboratories.
    - Acoustic ceilings are required in all learning areas and staff work areas.
- Flush ceilings are required in food preparation areas such as food technology, VET kitchens and other kitchens used for cooking activities including staff lounge.
- The following **must not** be installed:
    - glass and rock fibre flexible insulation products in ceiling spaces or walls above ceiling level where exposed
    - recessed services, such as air conditioning and luminaire fittings via clamping, supported by plasterboard linings alone.
- Minimum ceiling height must be 2700mm.
- Gymnasiums must have a minimum unobstructed vertical clearance of 8500mm above floor level.
    - Ceiling structure and fixtures must be installed above the vertical clearance height
- The following spaces may be considered for a reduced ceiling height of 2400mm:
    - Student wellbeing spaces
    - Staff wellbeing spaces
    - First aid/sick bays
    - Psychologist's/counsellor's offices
    - Consulting and clinical services
    - Multi-faith rooms
    - Teaching and learning – self and co-regulation spaces
    - Teaching and learning – reflection and meeting spaces
    - Toilet amenities
    - Meeting rooms – Conference, Interview
    - Staff retreat/parenting rooms
    - Store rooms (when adjacent to spaces that have a 2400mm ceiling height)

Acoustics

In the absence of a specific requirement outlined in this document, learning and support spaces must take all reasonable and practicable steps to achieve the Association of Australasian Acoustical Consultants (AAAC) Guideline for Educational Facilities Acoustics for reverberation times, internal noise levels and acoustic separation between spaces as relevant.

The design must consider the:

- construction of internal walls that divide rooms
- type, positioning and sealing of doors
- treatment of adjoining spaces that are linked with an operable wall

- surface treatments of walls, floors and ceilings within learning and care spaces as well as in areas adjoining learning and care spaces to provides a cohesive and structured treatment
- visual and acoustic treatment and design of air ducts or other ventilation paths that connect spaces
- presence of internal timber wall surfaces with gloss finishes that could be highly reflective for sound
- attenuation of noise intruding into learning and care, sleep and rest, wellbeing, administration and community spaces from mechanical services, other equipment, or external sources such as road traffic, rail transport, aircraft, or rainfall onto the roof of a building.
- impact and treatment of external site noise sources on adjacent properties particularly in residential areas.

Open plan spaces such as learning communities and ECEC learning and play areas must have a high level of acoustic absorption for the space to be functional for multiple uses, increase speech intelligibility and provide learning benefits for children and students. A lower reverberation time[3] is essential for learning outcomes in such an environment. It is important that both the acoustic consultant and architect co-ordinate to deliver the appropriate extent of absorption to a space, as both the ceiling system and a portion of the wall surface will need to be dedicated to specific acoustic treatment in many cases.

Specialist acoustic advice must be sought from a certified acoustic consultant for all new buildings and significant redevelopment/refurbishment works to inform the most appropriate design, details and materials to meet the required objective performance requirements for reverberation times, acoustic separation and design sound levels.

Acoustic requirements in specialist spaces including design and technology workshops, performing arts, music, drama, assembly spaces, and all other specific combinations of walls between noise sensitive spaces, must be designed by an acoustic consultant with reference to the AAAC Guidelines.

The use of sliding doors between learning areas is intended to provide a compromise between a flexible space and an acoustically separated space.

Operable wall (bifold) systems may only be used where nominated in Part 3: Generic Functional Briefs (3a: ECECs and 3b: Schools) or where an opening is larger or requires more acoustic separation than can be achieved with a sliding door system. Operable wall systems must be designed by an acoustic consultant in conjunction with the architect including details and specifications for the successful implementation of the system.

The general approach for acoustics is to:

- Ensure the reverberation time in the space is as low as is practicable to reduce the potential for sound build up, increase speech intelligibility, and provide learning benefits.
- Optimise the performance of any operable system between spaces where it is identified that flexibility in the use of the space is more important than acoustic separation between spaces.
- Where acoustic separation is more important than flexibility between spaces:
    - the internal walls which separate learning and/or office areas must extend past the ceiling to the underside of the roof or floor structure above
    - the walls **must not** incorporate operable elements
    - hinged doors are to be used for access
    - the walls must achieve the reverberation and acoustic separation ratings nominated in the Maximum internal noise levels and reverberation time table found in this document.

[3] Reverberation time is dependent on both the surface finishes, and the size of a space. A smaller space with “soft” surface finishes that absorb noise (such as mineral fibre ceilings and carpet) will have a shorter reverberation time; whilst a larger space with “hard” surface finishes that reflect noise (such as plasterboard, vinyl and glass) will have a longer reverberation time.

- Where flexibility between spaces is more important than acoustic separation:
    - the internal walls which separate learning and/or office areas must extend past the ceiling to the underside of the roof or floor structure above
    - the walls can incorporate operable elements provided the operable elements achieve the required reverberation and acoustic separation rating in this standard and incorporate airtight seals
    - the overall wall and door system must achieve the reverberation and acoustic separation ratings nominated in the Maximum internal noise levels and reverberation time table found in this document.

For example, a space with a target noise level of 40 dB(A) may require the following elements to achieve a satisfactory outcome:

- Co-ordination between the acoustic consultant, architect and mechanical services engineer
- Use of a fully ducted HVAC system using large runs of acoustically insulated sheet metal ductwork and potentially in-duct attenuators
- Specific location of the fan coil unit, energy recovery unit, outside air fan and the condensing unit (as relevant) away from the space it is serving. It may not be possible for the equipment to be located directly above the space it is serving and specific areas, such as adjacent amenities areas, corridors or specific remote plant areas may be more appropriate for the location of noise generating equipment.
    - Alternatively, subject to the noise level data for the fan coil unit, energy recovery unit and/or outside air fan, it might be viable to install these systems above the space whilst incorporating high density insulation underneath with a solid ceiling for a certain distance in all directions from the systems
- Careful selection of air diffusion equipment to support the acoustic treatments in the ductwork systems.

Table 3: Maximum internal noise levels and reverberation time[4]

Unless it is specified below the standard recommended ambient noise level is ≤40 dB(A) with ≤0.6 seconds reverberation time.

Early Childhood Education and Care Facilities

Type of occupancy/activity	Internal ambient noise level (dB(A))	Reverberation time (seconds)
Learning and play area with closed doors	≤40	≤0.6
Spaces for children with special learning needs	≤35	≤0.6

[4] Meeting the standards for reverberation time will likely require an extensive and specifically designed amount of acoustic sound absorption. These have been developed based on the recommendations of AS/NZS 2107 and the AAAC Guidelines for Educational Facilities Acoustics. Times listed in the table are for middle frequencies, as identified in AS/NZS 2107.

Schools

Type of occupancy/activity	Internal ambient noise level (dB(A))	Reverberation time (seconds)
Wellbeing Hub		
Student wellbeing space	≤45	≤0.6
Senior Common Room	**≤**45	**≤**0.6
First aid/sickbay	**≤**45	**≤**0.8
Wellbeing staff space	≤45	≤0.6
Psychologist/Counsellor's office	≤45	≤0.6
Community and Cultural Space		
Aboriginal education space	**≤**45	Curve 3*, Note 2**
Cultural space	**≤**45	Curve 3*, Note 2
Learning Resource Centre/Library		
Resource collection and display	≤50	≤0.6
Multimedia production space	≤45	≤0.8
Senior Study Space	≤45	≤0.6
Learning Community		
Explicit teaching/presentation/gathering	≤45	Curve 3*, Note 2**
Collaboration space	≤45	Curve 3*****, Note 1******
Acoustically isolated studio (Primary only)	≤40	Curve 1*****
Internal circulation	<50	<0.8
Studio/Workshop – inter-disciplinary	≤45	<0.8
Student – 'heat and eat'	≤50	≤1.0
Student lockers	<50	<0.8
Design, Art, Tech, Science (STEM)		
Laboratory - Science	≤45	≤0.8
Science - general learning	≤**45**	≤0.8
Workshops – Design and technologies	<45	Note 1******
Studios - Arts	≤45	<0.8
Health, Fitness and Performing Arts		
Multi-purpose activity space	≤40	Curve 1*
Gymnasium	<50	Curve 4*****
Kitchenette with servery	≤50	≤1.0
Fitness and sport science – laboratory	<50	<1.0
Fitness and sport science - learning and teaching	≤**45**	Curve 3*, Note 2**
Food Technology – Kitchen	≤45	≤0.8

Explicit teaching/presentation/gathering/dining - Food Tech	≤**45**	≤0.8
Studio – Drama/Dance	≤40	Curve 1*****
Studio – Music	≤35	Curve 2*****, Note 3******
Explicit teaching/presentation/gathering - Drama/Dance	≤**45**	Curve 3*, Note 2**
Music practice rooms	≤45	≤0.9
Canteen – Cafeteria		
Café – internal	≤50	≤1.0
Canteen – all areas	≤50	≤1.0
Leadership, Administration and Staff Centre		
Foyer includes student reception, public reception/waiting/services	<50	<0.8
Meeting room - conference	≤40	≤0.7
Meeting room - interview	≤45	≤0.6
Offices - leadership	≤40	≤0.8
Staff collaborative planning area	≤45	<0.6
Staff lounge	≤45	<0.6
Staff workspace		
Staff workspace	≤45	<0.6
Student and Staff Amenities		
Toilets, changerooms, end of trip facilities, storage	<55	-
Out of School Hours Care – Primary		
OSHC kitchen/food preparation	≤50	≤1.0

* as per Appendix A Figure A1, AS/NZS 2107

** as per Tabe 1, AS/NZS 2107

Table 4: Acoustic separation

Type of spaces	Minimum weighted level difference (D_w)[5]
Any two spaces separated by a standard door arrangement	25
Early Childhood Education and Care: Internal walls separating open learning and play areas and staff preparation areas, and between indoor learning and play areas and external learning and play areas, where it is identified that flexibility in the use of space is more important than acoustic separation between spaces	30
Schools: Internal walls separating learning areas, collaboration spaces and play areas and staff workspaces where it is identified that flexibility in the use of space is more important than acoustic separation between spaces	
Early Childhood Education and Care: Internal walls separating open learning and play areas, sleep rooms, staff preparation areas, community spaces, clinical and consulting rooms, and office areas where acoustic separation is more important than flexibility	40
Schools: Internal walls separating learning areas, collaboration spaces and play areas, staff workspaces, community and cultural spaces, wellbeing spaces, and office areas where acoustic separation is more important than flexibility	
Internal walls separating learning areas, collaboration spaces, staff workspaces and office areas from workshops and music spaces. Acoustic requirements for these walls must be specifically determined by an acoustic consultant.	45
Internal walls separating music spaces; acoustic requirements must be specifically determined by an acoustic consultant	45

To assist the school in understanding the final expected performance and in selecting the desired performance for spaces which are not listed above, the following table provides a subjective description for a range of Dw ratings, and indicates where the standards are achieved:

[5] To provide an objective measure of the acoustic separation provided by a partition, reference is made to the "Weighted Level Difference" (D_W) descriptor, which is a measurable quantity for an overall partition system.

The D_w is different to the "Airborne Noise Rating" (RW), of a partition. The RW relates to the partition construction alone and does not account for the weaknesses introduced by installation, such as the quality of the junctions or ceiling systems. In order for a partition system to achieve the required D_w, it will need to be supported by the appropriate detailing as provided by an acoustic consultant, documented by the architect and then implemented by the builder.

Table 5: Dw ratings

Type of noise source	D_w value					
	25	30	35	40	45	50
Normal speech	Clearly audible	Clearly audible	Audible Some words intelligible	Just audible	Not audible	Not audible
Projected speech (educator's voice)	Clearly audible	Clearly audible	Clearly audible	Audible Some words intelligible	Just audible	Not audible
Shouting	Clearly audible	Clearly audible	Clearly audible	Clearly audible	Audible Some words intelligible	Just audible
Audio-visual displays	Clearly audible	Clearly audible	Clearly audible	Clearly audible	Clearly audible	Audible Some words intelligible

	D_w value					
	25	30	35	40	45	50
Achieves the Education Standard for a standard door	✓	✓	✓	✓	✓	✓
Achieves the Education Standard for a partition with an operable system	×	✓	✓	✓	✓	✓
Achieves the Education Standard for a partition without an operable system	×	×	×	✓	✓	✓
Achieves the Education Standard for a partition to a music space or workshop	×	×	×	×	✓	✓

The D_w rating of a partition system does not provide an indication of its ability to adequately reduce noise from the use of toilets, hand basins, wet areas and the like. Where partitions separate wet areas, workshop areas, amenities, or areas where pipework or impact might occur on or in the wall from a noise sensitive area such as a learning space or office, discontinuous construction studwork rows must be used in the construction.

Flooring

Must comply with:

- Slip resistance requirements as per HB 198 and AS 4663
- All carpets and flocked flooring must meet proper installation and maintenance requirements to comply with the product's warranty and AS 2455.1 Textile Floor Coverings – Installation Practice.
- All resilient flooring must meet proper installation and maintenance requirements to comply with the product's warranty and AS 1884.

Design Guidance:

- All floor finishes must be easily cleanable without requiring specialised chemicals, methods, or equipment. To simplify cleaning and maintenance requirements:
    - minimise the number of different floor finishes in any building, and on any site
    - ensure the junction between different flooring materials or colour/pattern is:
        - carefully detailed to avoid tampering with exposed edges
        - a border of simple lines or curves
        - occurs discreetly (such as under door panels where possible).
- Consider the use of the area, relationship to external and wet areas, acoustic requirements for noise reduction (including insulation against the transmission of impact noise), high traffic areas and types of furniture likely to be used in the space before making flooring selections
- Resilient flooring materials such as slip resistant resilient sheet vinyl (refer to Slip resistance table within this document), ceramic tiles or epoxy coatings must be provided to spaces as per Part 3: Generic Functional Briefs (3a: ECECs and 3b: Schools) and:
    - in rooms where wet areas may be confined to only part of the space, consideration can be given to providing a slip resistant resilient sheet strip to the floor of that part of the space
    - vinyl, linoleum and rubber selection and application must consider the types of activities in the space, maintenance and cleaning requirements, volatile compound (VOC) content, acoustic performance and slip resistance of the product
    - rubber flooring may be specified where slip resistance requirements are met
    - anti-fatigue flooring should be considered for locations where tasks involve standing for long periods
    - plain visual resilient flooring or glossy surfaces are to be avoided as it will show subfloor imperfections, scratching and damage more easily.
- Carpet tiles and flocked flooring tiles are preferred:
    - due to their ease of maintenance and replacement
    - in spaces requiring improved sound absorption or impact noise insulation.
- Acoustic underlay must be provided in the following circumstances:
    - in all learning areas in multi-storey buildings receiving textiles flooring above the first storey
    - ECEC and primary school learning communities where children and young people spend time sitting on the floor
    - where flooring is being laid over existing timber or uneven floor surfaces
    - where improved impact noise insulation is required.

Floor finishes and adhesives

Must:

- have total VOC emissions of less than 0.5mg/m3 per hour
- be free from phthalate and formaldehyde
- consider low allergy finishes in all locations.

Skirting selections

Consider the type of wall lining to ensure adequate adherence of sheet materials, must:

- be timber to timber flooring
- be timber, aluminium or flat vinyl to carpeted areas
    - timber skirtings to be minimum 75mm height with bevelled edge profile
    - aluminium or flat vinyl skirtings to be minimum 100mm height
- be feathered edge vinyl or coved to resilient finishes (vinyl, linoleum, rubber)
    - coved skirtings are required to be minimum 150mm height or to match the height of toe boards to fixed joinery and must have impervious joints in corners
    - feathered edge skirting to be minimum 100mm height
- be ceramic tiles to tiled flooring
    - ceramic tile skirting to be minimum 150mm height.

Carpets and flocked flooring

- The moisture content and pH level of new and existing concrete slabs must be tested prior to installation. Testing to meet AS 2455.1, and flooring manufacturer's instructions.
- Preferred textile flooring options are carpet tiles or flocked flooring tiles (broadloom carpet may only be installed if required for state or local heritage refurbishment projects):
    - All carpets must meet the Australian Carpet Classification Scheme (ACCS) 'Contract/Commercial Heavy Duty (3 stars)' grade.
    - Textile flooring must meet, and preferably exceed, the Carpet Institute of Australia 'Environmental Certification Scheme' Level One certification (or equivalent).
    - Nylon 6 must be used for all carpet tiles and broadloom carpets.
    - Polypropene and polyester broadloom carpet or carpet tiles **must not** be used.
    - All carpet tiles and broadloom carpets must be Solution Dyed Nylon (SDN) (polyamide).
    - Must have an anti-static rating of less than:
        - 3.5kV at 21°C and 20% relative humidity for carpet
        - 2.0kV body voltage for flocked flooring
    - Must have a minimum product warranty of:
        - 15 years for carpet flooring.
        - 20 years for flocked flooring.
- Carpet and flocked flooring tiles:
    - dimensions must be 500mm x 500mm, or 1000mm x 250mm
    - must have a dimensional stability of less than 0.2% variation to heat and water.
- Carpet tiles and broadloom carpet must have:

    - a stitch gauge minimum of 1/10th.
    - a minimum total pile mass of 610g/m^2 (17oz/yd^2)
    - pile height to be no less than 2.4mm and no greater than 5mm
- Rugs must have a non-slip backing to avoid movement.
- Naplock and trims must be provided where broadloom carpet adjoins other floor finishes.
    - Floor trims to comply with AS 1428.1.
    - Metal hammered naplock is preferred.

Underlay

- Felted composite pad construction made from recycled textile.
- Install underlays using the 'dual bond (double-bonded)' method to avoid re-stretching of carpet.
- Carpet tiles must have cushion backing where selected for ECEC learning and play spaces, and primary school learning community areas (not including internal circulation).
- Cushion backing must be at least 2.5mm.
- For broadloom carpets, provide the following underlay:
- wool/nylon carpet – needled underfelt
- level loop or cut pile carpet – rubber
- electrostatically flocked nylon - high density latex cushion type.

Entrance mats

Must be:

- provided to the inside of external doors as an entrance transition to all floor finishes, except amenities, laundry, and stores
- removable to enable them to be cleaned and include appropriate transition trim/strips to avoid trip hazards
- easy to clean and from a suitable proprietary manufacturer
- multi-fibred and cut pile textile construction, or an engineered system incorporating bars and moisture absorbing strips providing the most effective dirt and moisture removal.
- be a minimum of 300mm wider than the external doorway and 1500mm deep
- have squared off corners
- match the finished floor levels of the surrounding floor finishes
- **must not** be solid black in colour
- **must not** be polypropene and polyester
- recessed mat wells **must not** be installed in existing concrete slabs

Sports floor system

Sports floor systems used in school gymnasiums and multi-purpose activity spaces are required to balance injury mitigation, performance for athletes, and support the multi-use functionality of the space.

Injury mitigation is largely determined by the shock absorption of the sports floor system, reducing the impact force on athletes' joints and muscles and the force of impact from trips and falls.

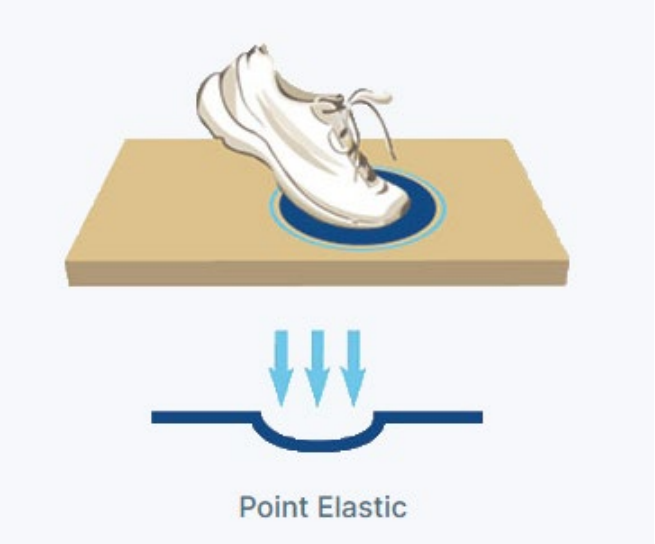
There are two main types of sports floor systems:

Point-elastic

Point-elastic floors are made from a synthetic wear layer like polyurethane or PVC vinyl, installed over an elastic shock absorbing layer such as rubber or a porous foam.

These floors quickly deform immediately around the impact point, similar to a cushion. They take a much lower impact force, compared to area-elastic systems, to deform and provide shock absorption protecting the user.

For students who are lighter and naturally create lower impact force, point-elastic floors can deliver more meaningful shock absorption. This helps protect from injuries, especially falls and head collisions with the ground.

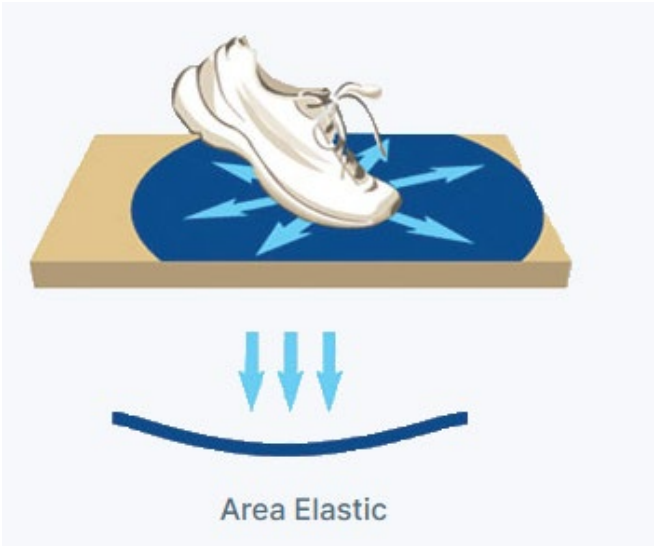


Area-elastic

Area-elastic floors are typically a timber layer installed over an elastic sub-floor system that may include pads, battens or a continuous elastic material.

These floors spread the impact force across a larger surrounding area, similar to a trampoline. While they offer a higher potential maximum for shock absorption, they need a significantly higher impact force, compared to point-elastic systems, to fully deform and provide the maximum shock absorption.

Heavier students, or adults, who naturally create higher impact forces, may have the mass to experience the full shock absorption potential of this floor system, however lighter students will benefit only from a fraction of this.so they work best for older/heavier users (such as senior students or adults). These floors will also generally offer less protection against injuries from falls and head collisions, especially if the user is lighter.



Selection and installation

Both types of sports flooring help prevent injuries through shock-absorption – however selection for a gymnasium or multi-purpose activity space must consider the principal cohort of users and the type of injury protection system that would most benefit them.

Point-elastic systems:

- provide immediate shock-absorption at low loads, offering particular benefits for young children, primary school students, or generally persons of lower body weight. They also require less maintenance and provide superior acoustic insulation.

Area-elastic systems:

- provide higher shock-absorption performance under greater loads, making them well suited to senior students, adult users (through community use agreements), or generally persons of higher body mass.

Selection should be based on the sports floor system that best suits the main group of users.

- Primary schools – permitted sports floor systems include:
    - synthetic point-elastic polyurethane and PVC vinyl, with a preference for polyurethane
- Secondary schools – permitted sports floor systems include:
    - synthetic point-elastic polyurethane and PVC vinyl, with a preference for polyurethane
    - area-elastic engineered timber and solid timber, with a preference for engineered timber

Sports floor systems must:

- be hard wearing, easy to maintain/refurbish and readily able to be line marked
- accommodate multi-purpose functionality for the gymnasium. This includes adequate resistance to point loads (such as table and chair legs) and distributed loads (such as stages and telescopic seating stands) without vertical deformation
    - for point-elastic sports floor systems, this is achieved by selecting products with an appropriate surface wear layer and elastic shock-absorbing composite system
    - for area-elastic sports floor systems, this is achieved by selecting products with an appropriate timber surface durability and elastic sub-construction composite system
- have a Light Reflective Value (LRV) below 0.45 (45%)
    - timber sports floor systems can meet this threshold by using finishes with matte or low-sheen coatings
- for multi-court installations, have a minimum 25mm separation between adjacent line markings
- have door seals installed to doors opening to spaces with sports floors to protect the finish from dust and grit
- where timber flooring is installed:
    - ensure the flooring finish allows for natural seasonal movement
    - ventilated timber skirtings are installed as part of the timber sports flooring system.

Resilient flooring

- The moisture content and pH level of new and existing concrete slabs must be tested prior to installation. Testing to meet AS 1884, and flooring manufacturer's instructions.
- Resilient flooring must have:
    - a minimum thickness of 2mm
    - general cleaning regime requirement of sweeping, a damp mop and vacuuming
    - no requirement for sealing, waxing or polishing
    - high resistance to staining and deterioration from chemicals
    - an anti-static rating of ≤2.0kV body voltage
    - a minimum product warranty of 10 years
    - a minimum wear layer thickness of 0.7mm and a high level of abrasion resistance for heterogeneous vinyl
    - a high level of abrasion resistance for homogeneous vinyls
    - a sustainable slip rating ≥P3, which is achieved by an aggregate such as silicon carbide, aluminium oxide, quartz crystal or sustainable surface roughness
        - products with embossed surfaces **must not** be used

    - pendulum (P) slip rating test results (as per AS 4663) must be guaranteed by the manufacturer for the warranted life of the product.
- Welded joints to be used for moisture resistance and prevention of dirt and bacteria build up in seams.
- Provide caulked joints filled with sealant and finished flush with the vinyl surface at the junction of built in joinery and other fixtures in contact with the floor.
- All primers, screeds and adhesives must be installed to manufacturer's instructions. Education and care sites on Kangaroo Island, in the Adelaide Hills and in the South East of SA (ie below Meningie) may require engineered screed complying with AS 1884.

Slip resistance ratings for internal and external spaces

The following slip resistance ratings apply to the selection of internal spaces (with resilient flooring) and external spaces:

Table 6: Slip resistance

Area	R rating	P rating	Barefoot
Canteen – student area	R10	P3	
Canteen – serving area (no food preparation)	R10	P3	
Canteen – food preparation areas	R12	P5	
Community change rooms with showers	R11	P4	B
Cleaner's rooms	R10	P3	
Decks (external)	R11	P4	
Design, Art, Technology, Science and inter-disciplinary – workshops, laboratories and studios	R10	P3	
Dry area (external)*	R10	P3	
ECEC Kitchen - food preparation areas	R12	P5	
ECEC Children's dining area	R10	P3	
ECEC indoor learning and play space	R10	P3	
Entries, circulation and access areas (excluding stairs and ramps)	R10	P3	
Food technology kitchen	R11	P4	
Ramps (external - not steeper than 1:14)	R11	P4	
Ramps (internal - not steeper than 1:14)	R12	P5	
Staff kitchen area	R10	P3	
Stairs (internal)	R11	P4	
Stairs (external)	R10	P3	
Student heat and eat	R10	P3	
Store rooms	R10	P3	
Team rooms	R10	P3	B
Toilets	R10	P3	B
Toilets with showers	R11	P4	B
Transitional area (external)**	R10	P3	
Wet area (external)***	R10	P3	

R rating = oil-wet inclining platform test (AS 4586 - Appendix D)
P rating = wet pendulum test (AS 4586 - Appendix A)
B = wet-barefoot inclining platform test (AS 4586 - Appendix C)
*Dry area: those areas in which appropriate control measures ensure an area remains dry and clean when in use
**Transitional area: Those areas that are intended to be kept dry such as by the provision of design features (awnings, drains, mats, air locks etc) appropriate to the physical location, climate and general exposure to water, as maintained in a dry and clean condition
*** Wet area: Those areas that are not defined as a dry or transitional area, which may be either constantly or intermittently wet or otherwise contaminated

Wet areas and amenities

Wet areas and amenities must have durable, low maintenance and non-slip finishes complying with AS/NZS 4586.

Ceramic tiles, vinyl or epoxy coatings are acceptable flooring solutions for wet areas and amenities.

- where installed, ceramic floor tiles must be a maximum 200x200mm for ease of installation and to increase slip-resistance and must use epoxy grout.

Doors

Must comply with:

- AS 1288 Glass in buildings – Selection and installation
- AS 1428.1
- NCC Section J5

Commercial grade systems (doors, frames and door hardware) must be used, and:

- Weight for all doors, including the glass and frame, **must not** exceed 150kg.
    - Where multiple sliding doors are provided in a stacked system, this weight applies to the entire stacking system.
- Force required to operate a door (including with a door closer) is to comply with AS 1428.1.
- Provide electronic access to all external doors in accordance with the department's Security and Emergency Management team requirements.
- Must be fully glazed aluminium doors with wide stiles and an anodised finish (no less than 15 microns) or solid core doors.
    - Aluminium door jamb must have a minimum wall thickness of 2mm with backing plate
- Door fixtures must be:
    - commercial quality
    - solid brass or stainless steel
    - Australian made from a reputable manufacturer of commercial furniture,
    - in accordance with Australian Standards.
- Maximum height of doors:
    - 2100mm in ECECs
    - 2400mm in schools.
- Standard door leaf:
    - width (except toilet cubicles) must be no less than 920mm.
    - thickness must be no less than 42mm.
- All door thresholds must permit wheelchair access and manoeuvring.

- Mid-rails or transoms are required to all external and internal fully glazed doors to reduce glazing size and costs of replacement.
- Glazing in all doors, sidelights and fanlights (excepting acoustic doors) to be minimum 6.38mm laminated safety glass.
- Recess hinges with door and frame edges.
- Doors to be sealed in accordance with NCC Section J5.
- The inclusion of doors other than standard side hung doors, such as automatic doors, bi-fold, sliding, operable and similar doors, must be done carefully with regards to:
    - maintenance
    - Work Health and Safety
    - shelter in place (invacuation) policy requirements.

  Written approval must be obtained from the department's Security and Emergency Management team for the installation of any external door openings other than side hung doors.

- In ECEC facilities:
    - all doors to child accessible areas must have finger guards fitted to all door hinges to the full height of the door and on both sides of the door
    - where sliding doors/operable walls are provided, they must be capable of being held securely in the fully opened and fully closed position and be operated by staff only
    - doors must be self-closing with a slow close using a cushioning device
- The following **must not** be installed:
    - residential frames and hardware
    - residential grade sliding doors
    - flush bolts on timber doors
    - frameless glass door systems
    - frosted full height film
    - pivot doors
    - pivot hinges
    - recessed door jambs
    - bi-fold doors in ECEC facilities (this does not include operable walls)
    - stable-type doors with top and bottom hinged panels in ECEC facilities

External Doors

- External doors:
    - **must not** be set back in deep door-wide recesses as they can create concerns for passive supervision
    - must only install:
        - bollards (refer to DIT Standard Drawing DG02 Door Bollard) and buffers to protect doors where required to prevent damage to the door and adjacent surfaces
- Security screen doors where specified in Part 3: Generic Functional Briefs (3a: ECECs and 3b: Schools), must be constructed from steel mesh and be lockable.

    - bi-fold doors with a casement door are the preferred option when the door is intended to provide a large flexible opening to increase functionality and connectivity between internal and external learning environments

- External bi-fold doors must:
    - be heavy duty commercial series aluminium top hung bi-fold doors with an anodised finish
    - be top hung with a lower guide
    - incorporate a casement door fitted with door closers and dead latches
    - incorporate a bottom sill/track which is flush with the finished floor level with a stainless-steel drainage system to ensure water does not pool in the track to ensure maintenance and cleaning (pressure clean/hoses) can be undertaken without water egress
    - where the door is not a required exit or a principal point of access and egress, external sliding doors may be used to create a connection between internal and external learning environments, with written approval provided by the department's Security and Emergency Management team
    - the Security and Emergency Management team must be contacted to confirm if additional security measures are required.
- Solid core timber doors must only be used when protected by the weather by a minimum 2000mm verandah or overhang on all sides.
- External ply lining must be marine grade.
- Paint finish must avoid dark colours to avoid fading when exposed to the sun.
- Heavy gauge door frames must be provided for timber solid core doors.
    - where not protected from the weather by a minimum 2000mm verandah or overhang on all sides must have a full metal cladding such as 0.6mm BMT Colorbond or similar.
- Outward opening external doors must open 180 degrees where possible and be able to be held back securely in the open position when required.
- Automated doors/doors with access control are to be operated via a relay of the existing alarm panel servicing the building/facility.
- Provide engraved "push/pull" signage where it is not obvious which way door is to be opened.

Entrance Doors

- Main building entrance:
    - must have a minimum half-glazing or full height glazing.
- Standard entrance to occupied areas (including hallways):
    - must incorporate a glazed panel or viewing panel.
- Unoccupied entrance (such as store rooms, cleaner's rooms etc):
    - external grade solid core doors (metal clad where exposed to the weather) must be used.
- Automatic doors:
    - automatic bi-parting doors are preferred
    - automatic single sliding doors can only be used for refurbishment projects
    - automatic hinged doors can only be used for refurbishment of heritage projects where no other option is available.

ECEC

External doors to learning and play areas and children's toilets must:

- be capable of being held securely in the fully open position flush against the adjacent wall
- have restraining mechanisms (and adjacent fixing points) mounted at a height that does not cause a trip or impact hazard for adults and children
    - ensure window transoms or mullions are coordinated with the position of the hold back device (if adjacent walls are glazed partitions)
    - have no gap greater than 85mm between the door in the open position and the adjacent wall.

Internal doors

- All doors to learning areas and support spaces occupied by children and students are preferred to be fully glazed
- Detailing of internal door frames and architraves must limit opportunities for climbing
- Principle point of access and egress to occupied areas must be fully glazed aluminium or solid core with viewing panels

Viewing panels

As a minimum, all doors to occupied areas are to have a glass viewing panel to provide passive supervision and reduce the hazard of doors opening without warning. Window furnishings can be installed to provide privacy during treatment or consultation.

- glazing film to external and internal doors is to provide for passive supervision between adjacent spaces (frosted full height film is not accepted)
- installation of one-way glazing film between staff occupied areas and learnings areas in inclusive learning communities, for clinical observation, and professional learning must be approved by the department in writing.

Glazing film to provide passive supervision between adjacent spaces **must not** be full privacy film (see figure 1 for an example).

Figure 1: examples of acceptable window glazing providing privacy while still supporting adequate line of sight and supervision.

In ECEC facilities, to meet National Regulation 115 – Premises designed to facilitate supervision viewing panels must:

- start from a maximum of 800mm above finished floor level
- have compliant window furnishings, if installed, to provide privacy during health consultations or treatment.

Toilet doors

Provide the following fittings and functions for individual cubicle toilet doors accessed from shared circulation areas or partition system cubicles located within air locks:

- ensure gaps between doors and partitions are designed to ensure privacy, **must not** be able to easily see between gaps into the toilet cubicle.
- where briefed, provide ventilation grilles
- fixed pull or lever handle with keyed mortice lock on the outside and a free lever and snib on the inside. Key retracts latch bolt and hold back.
- provide a separate indicator (red/green) bolt to the door mounted to comply with AS 1428.1.
- for partition systems only, door may be part of a proprietary compact laminate system. Compact laminate thickness must be no less than 13mm for use in primary schools and no less than 18mm for secondary and R-12 schools in areas accessed by secondary students.
- fully assisted toilet cubicles must be an automated sliding door with ≥950mm width, and push button operation complying with NCC Specification 27.
    - door control signage to comply with Specification C4D7 of the NCC.
- for ECEC children's toilet cubicle doors (privacy doors) be:
    - 1200mm high with a maximum gap of 85mm underneath
    - free swinging
    - inward opening (with buffer stop)
    - securable inside with reachable adult access

Acoustic doors

- Proprietary acoustic swing door systems and seals must be selected to achieve the required acoustic separation between spaces.
- Air relief systems, such as grilles or undercuts, **must not** be incorporated into doors where acoustic separation is required.
- All glazing in acoustic swing doors must be a minimum 10.38mm thick laminated glass.
- Where higher acoustic separation is required use specific solid panels in lieu of glass.
- Acoustic doors in existing buildings, where undulating slabs may be more prevalent, consider the inclusion of drop down rubber seals when door is closed in lieu of a fixed rubber or brush seal.

Operable walls

- Operable wall panels (to open up to 50% of a common wall) are the preferred method of providing flexibility between learning areas and should be installed where specified in the Part 3: Generic Functional Briefs (3a: ECECs and 3b: Schools) or project briefs to suit specific functions, and must:

- be a proprietary systems having panels hinged in pairs (with finger guards for ECEC facilities), hung from an overhead track, manually operated, centre stack, and able to be located at either side of the opening.
- have display board properties on both sides when dividing learning areas.
- have mechanical seals fitted.

Sliding doors

- All sliding doors must:
  - be at least heavy-duty commercial series with heavy duty door stops top and bottom
  - be top hung with twin rollers, ensuring the door cannot fall off the top track
  - have proprietary floor guides compliant with AS 1428.1 and no bottom track
  - have hardware that is durable and suitable for education and care environments
  - have a minimal gap between the floor and door to reduce sound transmission
  - include soft close hardware
    - ensure that the operation of the door does not create a finger entrapment hazard
    - sliding doors must be installed with infill panels at the openings to prevent fingers from being guillotined when closed
- External sliding doors:
  - are preferred to be industrial series
  - be protected from the weather, have self-draining door threshold and have threshold ramp complying with AS 1428.1 access requirements
  - the security alarm system must be able to detect whether the door is closed and prevent the system from arming if the door is not closed. Refer Security and Emergency Management team.
- Sliding door panels must be high quality commercial grade with appropriate door stops.
- Cavity sliding doors must be a proprietary system.
- Sliding doors are not preferred for standard width doors unless the door swing of a hinged door negatively impacts circulation space.

Door Hardware

Handles

Door handles to adult areas in ECEC facilities must be fitted at 1500mm, excluding:

- accessible toilets, where handles must comply with AS 1428.1 and include access card locks
- doors in the pathway of a required exit, where handles must comply with NCC D3

Internal door handles:

- for swing doors must be return lever type
- for sliding doors must be D type

External door handles:

- For ECECs external doors must have child height push pull handles installed at 750mm above floor level with a cabin hook to hold doors in the open position and have a second return lever and handle installed at 1500mm above floor level for adult control of movement when required.
- Lever handles **must not** be used externally.
- Fixed D handles or push/pull plates complying with AS 1428.1 that permit clear access and operation of key lock cylinders must be used for the external face.
- Free egress lever handles may be used for the internal face.
- Door handles must be fitted between 900mm and 1100mm AFL.
- Free egress lever handles **must not** cause finger entrapment where a fixed D-Handle is fitted internally.
- Holdback latch function incorporated in locking/latching system.

Hinges

Must use:

- Interfold hinges for all aluminium doorframes.
- Mortised butt hinges mounted flush with the door and frame edges for all timber doors.
- Four hinges minimum for all side hung doors.
- Fixed pin hinges, or security hinge bolts (1 per hinge) for outward opening external doors.
- minimum 304 stainless steel for external doors.

Kick plates

Kick plates must be:

- provided on timber doors to learning areas, toilet doors, and cleaner's store
- securely and permanently screwed and glued to the door.

Door stops

Door stops must be:

- provided, regardless of the installation of a door closer to the door, if doors open to impact on walls, joinery, or other protrusions.
- heavy duty metal types with rubber buffers and secured to floor or wall.
- Where hold open function is required on inward opening doors preference is a magnetic type.
- Where fixed to the floor, mechanical fixings are to be expanding bolts.
- located within the outer third of the door to avoid any lever action of the door putting stress on the hinges.
- installed to not present a trip hazard when the door is closed.

Closers

- External doors, internal doors leading into school toilet washrooms and chemical store, and doors to areas accessible by children in ECEC facilities require door closers.
- Door closers must:

- be heavy duty commercial
- have a maximum open angle of 180 degree
- have soft close operation
- to external learning area doors and main building entrances include hold open functions
- be surface mounted types for ease of adjustment and reduction of maintenance
- ensure top rail of door is deep enough for mounting.

Grilles

- High level transom louvre ventilation grilles are preferred where possible, otherwise may be mounted within door at a low level
- Ventilation grilles must be:
  - robust, mechanically fixed, and prevent vermin entry
  - be acoustically treated for fully-assisted toilets.

Roller doors

- Sectional panel lift doors **must not** be used unless specifically briefed.
- A personal access door is required to all rooms where a roller door is the only other option for entry.

Roller doors must:

- be commercial grade roller doors with hard-wired electronic operation
- have a 50mm x 25mm x 4mm strengthening bar fixed/bolted to the bottom rail at 600mm centres
- be provided with photoelectric beams
- have fixed wired controls, remote controls **must not** be provided
- Fixed electric controls must be lockable (momentary) manual press buttons consisting of the following:
  - UP – on pressing the UP button, the door opens fully to its pre-set maximum height (unless the STOP button is pressed which must stop the travel of the door)
  - STOP – must immediately stop all movement
  - DOWN – this button must be momentary only
- Provide manual chains to permit manual operation in the event of a power outage, chain operation must be from ground level and **must not** require a person to climb a ladder to engage the chain.

Windows and glazing

In all education and care facilities a minimum of 60% of the learning and teaching floor area, with a target of 90%, must:

- receive a minimum daylight factor of 2.5% as measured at the floor level under a uniform design sky
- have a direct line of sight externally
- have a clear line of sight to a high quality internal or external view.

Windows and glazing:

- must be operable in all occupied spaces to meet NCC F6D7 requirements (be at least 5% of the room floor area) to provide natural ventilation to spaces in temperate weather conditions when mechanical systems may not be required

- are designed to reduce and control glare:
    - review material selections externally including ground finishes, adjacent building finishes and shading to reduce glare
    - where glare cannot be designed out, consider external shading devices or internal blinds
    - ensure that design and technology workshops, science laboratories and art media studios have additional glare control.
    - visual art studios require high quality natural light.
- high level windows **must not** be operable
- full height glazing should carefully consider the:
    - extent and location of full height glazing to optimise wall space for joinery, storage, display and communication resources
    - increased capital costs of full-height windows
    - increased operational cost for heating/cooling, cleaning and maintenance
    - reduced safety of building occupants during invacuation procedures with full-height external windows.
- size of individual glazing panels to ensure panels are readily available for replacement if damaged
- placement of mullions and transoms of window frames to reduce the size of individual glazing panels
- design of window frames, sills and ledges for both internal and external faces of windows to discourage climbing.
- provision of screens to operable windows to prevent the incursion of insects and respond to risk and security measures according to particular settings (see insect screens below).

ECECs must meet National Regulation 110 – Ventilation and natural light and National Regulation 115 – premises designed to facilitate supervision. The amount of controlled natural daylight and ventilation to all areas occupied by children, staff and the community should be maximised. A Schedule of Natural Light must be completed and provided to the department as part of the Education Standards Board (ESB) approvals process, see Part 2: Design Principles for further information.

Windows must:

- provide views to the outside from child accessed areas with sill heights a maximum 300mm above floor level
- be provided to both internal and external walls to ensure maximum effective adult supervision of all child accessible areas, providing sill heights 1200mm above floor level
- the height of windows into sleep rooms from other internal spaces must be 900mm
- have lockable opening sashes in various open positions when publicly accessible (outside the fenced play areas)
- have obscured glass to external toilet windows where line of sight from publicly accessible areas (external to the building or outdoor play areas) are available
- have removable insect screens on all external opening window sashes (refer Insect screens section of this document for design requirements).

The following **must not** be installed:

- domestic suites and frameless sash systems
- toughened safety glass at heights <2000mm above external ground level
- mirror reflective film as it causes discomfort from reflected glare externally

- self-drilling screws (such as Tek screw) on window and door frames for fixing new screens
- plastic locks and plastic hinges
- awning operable sashes.

Window systems

- Must be heavy duty commercial grade aluminium frames with anodised finish (no less than 15 microns).
- Full height:
    - external windows are to have mid rails, transoms or other articulation of framing to reduce glazing size and costs of replacement.
    - internal windows do not require midrails unless there have been previous issues with breakage of full height glazed panels at the site.
- All external windows to occupied spaces must have key-lockable opening sashes to provide natural ventilation.
- All base materials for fittings and components must be corrosion resistant and any applied finishes UV resistant.

Glazing

- Laminated safety glass must be used for all glazing unless a higher grade of safety glass or treatment is required.
    - in new windows, sidelights and fanlights must be minimum 6.38mm or meet AS 1288 Glass in buildings – Selection and installation, whichever is greater.
- In situations where a high level of security (or anti-vandalism) is required, 9.5mm thick marr-resistant polycarbonate sheet must be used. The size of polycarbonate sheet has limitations due to flexing. Consult with the department's Security and Emergency Management team for information on the level of security required.
- Solar/safety film can be used on existing windows to provide sun shielding and protection against forced entry.

Insect screens

- Insect screens must be:
    - provided to all operable windows to use natural ventilation in lieu of air conditioning when the outside conditions are favourable
    - commercial grade
    - impact resistant or have other forms of protection when adjacent to play areas.
    - permanently fixed within an aluminium frame with mechanical fixing to the window, **must not** fix screens to frame using spline.
    - removable for cleaning and repairs, including frames.
        - fixings must reflect this requirement for removal.
- Mesh with 0.64-0.80mm yarn and 20x20 strands per square inch is recommended.
    - in coastal/river/waterway adjacent sites, where protection from small insects (such as sandfly and midge) is required, a finer weave is recommended.

- Aluminium insect screens are not supported in child/student accessible areas at heights less than 1800mm as they deform without recovering from touching or impact. Polyester mesh is recommended in these areas, except for sites in bushfire prone areas.
- Insect screens installed in bushfire prone areas must comply with AS 3959. Aluminium mesh screens complying with AS 3959 requirements are acceptable.
- Frames must be restrained using a recess head channel frame, fixed to the face of the window frame above the sash opening. The frame should then be secured to the window along the bottom rail.
    - Nutsert bolt fixings and clips are supported.

Window keying systems

Where provided, all windows should be keyed alike and locks must be heavy duty types.

Vertical circulation

Must comply with:

- AS 1428.1 provisions
- all other requirements of the current version of AS 1735.12 Facilities for persons with disabilities.

All stairs, ramps, handrails, balustrades and barriers must be included in the safety in design risk assessment (DIT Guidenote G125, Principles of Safe Design for Building Projects) to identify any additional safety issues due to their design.

Although the NCC does not require balustrades for landings under 1000mm above adjacent floor levels, consideration should be given to the use of the space/area and age group using the facility.

For example:

- in ECEC facilities, to provide for children's safe movement and use of spaces, consider the inclusion of barriers, to prevent falls in all indoor and outdoor areas, where the change in floor level is less than 1000mm
- designs must ensure the safety of non-mobile children (under 24 months of age) and mobile children in outdoor learning areas by non-intrusive physical barriers that provide visual connection between the play spaces. Any barriers used must be fixed in such a way that they are not moveable by children or able to fall over.
- where outdoor learning areas are used by high volumes of students and/or for high levels of activity or is adjacent thoroughfares or other active spaces a balustrade may be the most appropriate solution
- where stairs, platforms or decks are adjacent spaces occupied by children aged 5 to 8, and landings are between 700-1000mm high, balustrades must be provided to reduce the possibility of children falling when stairs/landings are used inappropriately.

The following **must not** be installed:

- glass balustrades
- tension wire balustrades

Balustrades, barriers and handrails

All balustrades and barriers must be non-scalable, with no horizontal rails (excluding those for crowd loading) or potential foot and hand holds which could be used for climbing.

- Acceptable balustrade and handrail materials:

- Galvanised steel tubular handrails
- Stainless steel tubular handrails
- Galvanised steel tubular balustrades
- Stainless steel tubular balustrades
- Powder coat steel tubular balustrades
- Galvanised steel aluminium sheet (including perforated mesh) balustrades
- Powder coat aluminium sheet (including perforated mesh) balustrades
- Internal balustrades to upper floor landing, circulation, learning spaces and breakout areas - open to the storey or ground below - must have a minimum height of 1800mm above finished floor level (with or without handrails and baseboards/kerb rails).

- External balustrades to ECECs, where the trafficable edge is at the same level or <2000mm above the surface beneath, must comply with AS 1926.1.

- External balustrades to ECECs and schools, where the trafficable surface is ≥2000mm above the surface beneath, must have a minimum height of 1800mm above finished floor level. If there are any purchase points, including horizontal rails for crowd loading, the balustrade or barrier must extend a minimum of 1800mm above the purchase point.
- Woven stainless steel wire mesh, that meets crowd loading requirements, can be installed above balustrades to fully enclose an outdoor learning area, roof deck or play space.
- Consider a secondary crowd loading barrier, complying with NCC Part D3, to provide a visual barrier to the edge of the outdoor space when woven mesh is installed. Ensure there is no access to the top of the balustrade if the barrier was to be used as a climbing ledge.

In ECEC facilities:

- An extra handrail must be provided on stairs and ramps along paths of exits, halfway between the stair tread and the top handrail. This provides a handrail at a suitable height for children to grip whilst using the stairs or a ramp as an exit.
- A barrier or restricted opening device must be provided in accordance with NCC Volume 1 D2.24, for any risk of fall from an openable window of 2m or more in ECEC facilities.
- Any barrier used to separate (and ensure the safety of) non-mobile children (generally up to 2 years of age) from mobile children in any indoor or outdoor learning area must be fixed in such a way that they are not moveable by children or able to fall over.
- Further information for outdoor areas in ECEC facilities is available in the 'protection against falling from heights' section.

Handrails

- Refer to AS 1428.1 for handrail specifications.
- Refer to NCC D3D22 for handrail specifications in primary schools and ECECs.
- Open ended handrail returns **must not** be used.
- Post base plate to be positioned with the post mounted centrally. Base plate size must be sufficient to accommodate the post and three or more evenly-spaced mechanical fixings.

Balustrades and barriers

- No furniture, joinery or outdoor features are to be attached to balustrades/barriers or placed within 1800mm of the balustrade or barrier.

- Balustrades and barriers must be a minimum of 900mm from any external wall elements that facilitate climbing.
- Openings in barriers **must not** permit a 125mm sphere to pass through.
- Any element of the barrier between 150mm and 760mm above finished floor level **must not** permit climbing.
- Any perforations in screens must:
    - not be between 8mm–25mm to prevent finger entrapment
    - be free of sharp edges and burrs.

Stairs

The underside of stairs must be protected to remove head height hazards. Preference is for this area to be used as a raised planter or seating area with a solid base. Where this is not possible:

- a handrail with a kerb or kickrail is acceptable
- defining the hazard area with Tactile Ground Surface Indicators (TGSIs) is not acceptable

Stairs must:

- have a maximum 180mm riser and minimum 270mm going
- have risers enclosed as per AS 1428.1 provisions
- have nosings as per AS 1428.1 provisions.
- follow the riser and going requirements in AS 1657 where access is for maintenance staff only
- incorporate heavy duty commercial or industrial anti-slip stair nosings to internal stairs, and external tiered seating, and steps

Tiered seating

Tiered seating must be compliant with AS 1428.1 and certified by a structural engineer.

Ramps and walkways

Ramps and walkway gradient, landings, kerb, handrails and grabrails must comply with AS 1428.1.

Walkways are preferable to ramps wherever possible and must be designed:

- with unobstructed width of 1500mm

Ramps providing access between different site levels must carefully consider:

- their location to support efficient and logical pedestrian movement
- the substructure and materials used in the construction ensuring suitability for climate and weather conditions, longevity of materials, bushfire risk and cost effectiveness

Ramps that are part of a pathway must be designed:

- for a maximum gradient of 1:16
- with unobstructed width between handrails of 1200mm
- with steps adjacent ramps as an alternative means of access.

Ramps that are part of access to play equipment and structures must:

- be at least 1:14 gradient with 1000mm clearance between the handrails
- have dual height handrails provided with one handrail fixed at a height of not less than 865mm and a second handrail fixed at a height between 665mm and 750mm

- have any landings built to a minimum size compliant with AS 4685.1 (with a preference for larger landings) and with interactive features that can be used as intermediate play platforms.

Lifts

Lifts must meet all requirements of AS 1735.12:

- Passenger lifts must have access control using card or key operation.
- Minimum lift car size for all new lifts is 1100mm wide x 2100mm deep between the inside of the closed car door and inside back wall.
- Minimum clear opening width of lift car door to be 900mm.

Building services

Demand management

HVAC, lighting and ICT represent the largest electricity consumption and demand generated and facilities must be designed to reduce peak electricity load (kVA).

It is the preferred strategy to manage site energy requirements within existing electrical supply capacity by using building design, energy efficiency, renewable energy, and demand management technologies to minimise electrical load increases resulting from new builds or refurbishments.

Solar photovoltaic (PV) systems

All new builds and major refurbishments must include a solar photovoltaic (PV) grid-connected rooftop system to provide learning opportunities for renewable technologies and reduce electricity imported from the grid.

Installations must include the provision of safe roof access for cleaning and maintenance and capacity to extend the PV array in the future.

Prior to design and install of solar systems, information on the following is required:

- site electrical supply and network grid constraints
- recommended locations for installation
- safe roof access design
- system size recommendations
- quote evaluation
- small scale technology (STC) and large scale generation (LGC) credits
- SAPN commissioning/small embedded generator (SEG) approval
- meter upgrades and sub-meter installations
- data loggers and web portals
- generation credits: STCs will be provided as a point of sale discount on the supply and installation costs of systems up to 100kW in size. STCs are to be transferred to the installation contractor upon completion of solar installation works and STC agreements are to be signed by the relevant project officer overseeing the solar installation project.

Solar PV system size

This standard must be read in conjunction with DIT Guide Note G140 - Solar Panels for Government Funded

Building Projects.

New schools must have a minimum 100kW solar PV system.

The following minimum system sizes are recommended for installation at existing:

- ECEC - 5kW
- Primary schools - 20kW
- Secondary school/area school/R-12 school - 50kW

Roof requirements

Solar PV installation must target roof areas with:

- predominantly north-facing aspects
- minimal shading from adjacent trees and buildings or rooftop plant
- suitable structural capacity and expected longevity as assessed by an engineer.

Solar system requirements

Orientation

Solar PV systems must be oriented to:

- generate optimum electricity during the facilities core operating hours
- increase generation when air-conditioning peaks during summer.

Structural requirements

For new builds the structural engineer must assess and certify the suitability of roof structure(s) for dead weight (inclusive of two maintenance personnel) and wind loading.

For major refurbishments:

- Engage a qualified structural engineer to undertake an on-site investigation, assess and certify suitability of roof structure(s) for dead weight and wind loading, and if necessary, provide recommendations on any bracing required. Any new building/strengthening work must be certified for Building Rules Compliance by an accredited professional.
- Assess the condition of the roof sheeting and its need for replacement during the anticipated life expectancy of the PV system.
- Assess existing safe roof access provisions and make recommendations for improvements to comply with DIT Guidenote G190, and AS/NZS 5033.
- Solar inverters must be installed within a communications or plant room near a distribution board. Areas where children, students or public have unsupervised access are not accepted. If no suitable indoor locations are available, the inverter must be installed on a south or east facing wall, away from direct sunlight and under cover to provide protection from weather. Inverters installed in a location where children, students or public have unsupervised access (such as hallways, external ground level walls) must be located in a secure enclosure compliant with DIT Standard Drawings DG23, DG24, DG25 and DG26 Plant Enclosure Details.

Solar system monitoring

All solar PV systems must include inverters that are capable of wirelessly and automatically sending inverter data to the manufacturer's online portal. Access to the manufacturer's portal is to be registered to Education.AssetSustainability@sa.gov.au.

Heating, ventilation and air-conditioning (HVAC)

All new buildings and redevelopment projects must complement passive design principles and solutions with mechanical systems to meet peak and extreme heating and cooling requirements and outdoor air quotients. Passive design solutions, coupled with opening windows and vents, must be capable of providing a comfortable environment without the need to operate the heating and cooling equipment, when external ambient conditions are deemed suitable by occupants.

Mechanical ventilation complying with AS 1668.2 and AS/NZS 3666.1 must be provided for air-conditioning systems in line with the HVAC systems summary section of this document.

Mechanical plant to be designed and installed to DIT Guidelines G189 and G190.

Reverse cycle air-conditioning is the preferred system to be provided for ECEC facilities making use of South Australia's low emissions electricity supply and supporting the Government's sustainable buildings requirements.

- Semi-commercial or commercial ducted or non-ducted systems may be installed.
- Air-conditioning units must be inaccessible to children.

The thermostat controller must be:

- located in a secure area (such as store, office or staff preparation area) not within the indoor learning and play areas (and outside of ceiling spaces)
- where unavoidable and controller must be mounted within a child accessible area, mounting height to be minimum 1500mm above floor level.

Ventilation

New buildings must comply with the NCC and AS 1668.2 requirements for the provision of outside air by means of mechanical ventilation through equipment/systems. Mechanical ventilation rates required under the NCC and AS 1668.2 **must not** be reduced on the basis of natural ventilation openings.

Refurbishment of existing buildings, must comply with the following:

- Mechanical ventilation is to be installed if a system/equipment is not already in-situ or existing system is approaching end of life. Operable windows are to be used to provide required natural ventilation. Doors **must not** be included in the calculations for the provision of outside air[6], except in the following circumstances:
    - The structure of the building is not adequate to support the installation of the new equipment or able to facilitate new penetrations in building structure as required.
    - Legislation requirements limit or will not approve modifications to the external fabric of the building required for the installation of the new mechanical ventilation systems.
- If the existing failed or end of life mechanical ventilation system installed incorporates an Energy Recovery Ventilator (ERV) but its operation is interlocked with the air-conditioning and/or does not include both motion sensors and CO_2 sensors:
    - This existing system is to be upgraded as part of the refurbishment project to comply with the Energy Recovery Ventilators (ERV) control strategy.

[6] In cases where windows alone are not able to meet ventilation requirements, written approval for a departure from the department will be required.

When installations occur they must comply with the following:

- Where evaporative air-conditioning is specified, self-closing backdraft dampers or manually operable windows must be installed for air relief paths. Ensure vermin and insect protection is provided.
- Where reverse cycle air-conditioning systems containing refrigerant are specified, ventilation must be provided by an ERV system to pre-treat the air before introducing it to occupied areas. Operable windows are to be closed while the system is in operation.
- ERVs must be capable of variable volume operation to ensure ventilation is provided in accordance with CO_2 levels.
- CO_2 sensors and motion sensors must be included in all occupied areas supplied by new ERV systems installed in accordance with this document:
    - Motion sensors are to be installed to determine occupancy for introduction of minimum outdoor air required (0.35L/s/m2) via mechanical ventilation
    - CO_2 sensors be capable of sending a signal to increase the provision of outside air when CO_2 rates reach a range of 600 to 700 parts per million (ppm) (as per AS 1668.2 CO_2 demand control systems)
    - Locations of CO_2 sensors will be dependent on the size/volume and design of the space.
    - CO_2 sensors **must not** be placed near openable windows or doors which may impact the accuracy of the sensors

Energy Recovery Ventilators (ERV) control strategy

- The ERVs must operate via interlock with motion sensors (complete with green 'LED' run light) and feedback from carbon dioxide sensors within the space served.
- ON/OFF control of the ERVs must be via local motion sensors located within each occupied area.
- Motion sensors must be provided by the electrical contractor. Refer to the electrical services documentation for further detail.
- When motion is detected within the occupied area, the associated ERV must turn ON (to minimum airflow quantity)
- The ERVs must be provided with a 15-minute run-on timer so, when motion is no longer detected, the ERV continues to run for a further 15 minutes before turning OFF.
- When ON, the ERVs must operate via the CO_2 sensors within each space to control CO_2 levels below the range of nominated range.
- The ERVs must operate normally at minimum airflow until a direct current (DC) relay output is generated by the CO_2 sensor, initially set at between 600 and 700ppm (adjustable).
- Following the signal input, the ERV must operate at maximum airflow until the CO_2 level reaches 550ppm (adjustable).

Large volume open area ventilation control strategy/Control strategy for ventilation in areas with no Energy Recover Ventilation (ERV)

Refer operational strategies specific to these areas:

- Gymnasiums
    - Natural ventilation and/or evaporative cooling
    - Refer to controls (HVAC) section – include manual cooling and fan speed control interface
- Design and Technology, and Food Technology
    - Refer to make-up air control strategy, and openable windows

Replacement of HVAC systems in existing facilities

Where mechanical services equipment failure occurs in existing education and care facilities, investigation must occur in the following funding scenarios to determine if the replacement works are able to be completed to align with the current version of this document or if like-for-like replacement is the most suitable approach[7]:

- site funded projects
- major refurbishments
- works completed under the AGFMA agreement through the FMSP.

Where HVAC systems are being replaced at an existing site, investigations must cover the following:

- The facilities management service provider (FMSP) must be engaged to confirm the age and condition of existing air-conditioning system.
- Where multiple systems are approaching their replacement date an asset performance assessment (APA) must be submitted to Asset and Facility Services for review.
- Where existing electrical capacity cannot be accommodated, upgrade of electrical capacity must be included in the project costs.
- Should a Building Services Mechanical Consultant be engaged, it is their responsibility to:
    - review and assess the existing system,
    - confirm elements of the existing, and associated adjacent systems, that comply with current ventilation requirements, and
    - provide recommendations and services estimates where briefed to ensure compliancy and ventilation requirements of the building on a holistic approach.
- A Building Services Mechanical Consultant must engage a Building Services Electrical Consultant to review and assess the existing site electrical infrastructure and capacity, to confirm the impact the load required by the proposed new HVAC system will have on the site's electrical capacity.

The control of new systems installed as part of replacement works in existing buildings must meet the requirements of the Controls (HVAC) section of this document.

Ceiling fans

Ceiling fans:

- can be installed where alternate mechanical air conditioning is not feasible (such as location, supply services, trade availability).
- **must not** be installed:
    - in rooms with specialist mechanical exhaust systems (including food technology, design and technologies, etc)
    - with blades lower than 2400mm
- must be installed so that a 600mm horizontal distance separates the edge of ceiling fan blades from the edge of any luminaires, solar tubes or skylights (to avoid strobing effects).

Energy efficiency

The design and specification of HVAC systems must include the evaluation of:

[7] The Department for Education reserves the right to provide final determination and direction on projects where existing facilities are being upgraded.

- Energy efficient air-conditioner design and selection, including but not limited to heat recovery, high Energy Efficient Ratio (EER)/Coefficient of Performance (COP) systems, low static ductwork, and variable volume operation.
- Demand responsive systems (such as variable speed drives, inverter compressors).
- Energy recovery ventilation provisions.
- Variable capacity compressors when a single compressor unit is installed or inverter first stage of compression in VRF/VRV or packaged air-conditioning systems where multiple compressors are installed.
- For new builds investigation into building thermal modelling (ie heat load calculations as a minimum, computational fluid dynamics analysis where briefed) must be undertaken to determine the most efficient building and system performance to correctly size the HVAC system and ensure optimal performance against the estimated load profile.

HVAC systems summary

Table 7: HVAC systems overview

	Learning communities*	Food technology kitchens**	Laboratories - Science	Leader, Administration and Staff centres	Workshops - Design and technologies	Studio/Workshops - Inter-disciplinary	Art studios	Gymnasiums or multi-purpose activity spaces	Studios - Music and drama/dance	Toilets	Laundries
Mechanical ventilation	1	2	1	1	2	1	1	2	1	-	-
Natural ventilation	3	3	3	3	3	3	3	4	-	3**	-
Exhaust systems	10	10	5	10	6,7	8	5	-	-	9	9
Heating	11	12	11	11	12	11	11	12	11	13	13
Cooling	14	15	14	14	15	14	14	15	14	16	16

*These include learning communities, learning and play spaces (ECEC), wellbeing hub spaces, learning resource centres/library, activity spaces, multi-purpose rooms and specialist learning areas. Modular buildings are to meet the same performance requirements.

**Toilets in ECEC are to be complete with openable windows where available. Where windows are not available, alternative make-up air path to be designed.

Mechanical Ventilation

1. ERV mechanical ventilation system
2. Mechanical ventilation system that does not include ERV system

Natural Ventilation

3. Openable windows to enable natural ventilation (where space is located on perimeter of building)
4. Natural ventilation by high and low vents (such as louvres in walls)

Exhaust

5. Flued fume cupboard
6. Woodwork dust extraction
7. Welding fume extraction
8. 3D printer/Laser cutter/Textile cutting machine fume extraction
9. Exhaust fan
10. Rangehood above cooktops

Heating

11. VRV/Split head refrigerated system
12. Electric heating to be provided as per the 'Large Volume Open Area' section of this document
13. No heating (heating in toilets may be briefed for fully assisted facilities)

Cooling

14. VRV/Split head refrigerated system
15. Evaporative cooling to be provided
16. No cooling (cooling in toilets may be briefed for fully assisted facilities)

Site vs infrastructure maintenance matrix

Existing electrical infrastructure installed throughout the state is not consistent and varies as per the following supply models:

- SAPN mains power transformer power supply.
- SAPN mains power pole mounted fuse supply.
- SAPN mains limited town power supply.
- Privately owned community-based generator supply.

The department has a responsibility to select HVAC equipment that can be supported by the local available electrical supply and for local contractors not to be excluded for servicing and maintaining the HVAC equipment installed within facilities.

Table 8: Installation Matrix table for sites based upon geographical location

- Regional centres: Greater Adelaide, Crafters Bridgewater, Gawler, Kingscote, Mount Gambier, Murray Bridge, Pt Augusta, Pt Lincoln, Renmark, Whyalla.
- Metro and regional centres: A location within 120 kilometres of the boundary of a South Australian urban centre with a population of 10,000 or more people.
- Remote location: A location that is 120 kilometres or more from the boundary of a Metro and Regional Centre but is not an Isolated Location.
- Isolated location: A Location that has a drive time of more than three hours from the boundary of a Metro and/or Regional Centre.

Infrastructure recommended to be installed	Metro and regional centres	Remote location [includes Kangaroo Island] (mains power)*	Isolated location (mains power)*	Isolated location (with generator power)*
Air-conditioning (cooling and heating)				
Reverse cycle (heat pump) chiller (2-pipe) (cooling or heating only) lower than GWP 750 refrigerant	✓	×	×	×
Reverse cycle (heat recovery) chiller (4-pipe) (simultaneous heating and cooling) lower than GWP 750 refrigerant	✓	×	×	×
Water cooled chillers (lower than GWP 750 refrigerant)/Boilers	✓	×	×	×
VRV/VRF (R410A refrigerant or lower than 750 GWP)	✓	✓	×	×
Single split type A/C (R32 Refrigerant)	✓	✓	✓	✓
Heating (cooling infrastructure to be provided separately when required)				
Electric Heat Pump	✓	✓	×	×
Boilers (Electric)	✓	×	×	×
Reverse cycle (heat pump) chiller (2-pipe) (programmed to heating only)	✓	×	×	×
Cooling (heating infrastructure to be provided separately when required)				
Water cooled chillers (lower than GWP 750 refrigerant)	✓	×	×	×
No DX - A/C evaporative cooling only	×	×	**	**
Mechanical Ventilation				
ERV's	✓	✓	**	**
Ceiling fans	✓	✓	✓	✓
Openable windows	✓	✓	✓	✓

*Electrical capacity review of site power supply to occur in the reporting phase, prior to any design or installation work occurring.
**The department recognises the importance of access to equal conditions on its sites, however this may not be achievable for some sites within existing installed infrastructure owned by third parties, to be confirmed during reporting phase.

Air-conditioning system design criteria

Air-conditioning systems can be broadly classified into either ducted or recirculating air-conditioning systems.

Ducted air-conditioning

Ducted air-conditioning systems must be of commercial quality and of the following unit types:

- Ducted split type fan coil unit connected to paired reverse cycle heat pump condensing unit. Or a reverse cycle heat pump/heat recovery VRF/VRV condensing unit.
- Reverse cycle heat pump ducted packaged type air-conditioning unit.

- The unit types nominated above can serve more than 1 room space from a ducted split type fan coil unit or packaged type air conditioning unit using ductwork to distribute the treated air to the connected spaces.
- These units are capable of introducing outdoor air as an integral part of the mechanical system air conditioning design which must meet the requirements in the Ventilation section of this document.
- Existing ductwork must only be reused if it is in good condition and can be integrated effectively with the new system. New insulation must comply with the current NCC Section J requirements.

Non-ducted (recirculating) air-conditioning

Non-ducted (recirculating) air-conditioning systems are to be of commercial quality and of the following unit types:

- high wall mount split type fan coil unit connected to paired reverse cycle heat pump condensing unit
- floor standing (console) split type fan coil unit connected to paired reverse cycle heat pump condensing unit
- ceiling cassette split type fan coil unit connected to paired reverse cycle heat pump condensing unit
- compact ceiling cassette split type fan coil unit connected to paired reverse cycle heat pump condensing unit
- under ceiling (ceiling suspended) split type fan coil unit connected to paired reverse cycle heat pump condensing unit
- or, a reverse cycle heat pump/heat recovery VRF/VRV condensing unit.

Where non-ducted air conditioning systems have been installed ventilation is to be provided by one of the two following systems:

- Opening windows as per the Glazing section of this document.
    - a sign must be mounted adjacent to the unit controls indicating that the windows must be opened (when external ambient conditions are suitable) to provide outside air.
- A mechanical ventilation system as per the Ventilation section of this document.
    - The introduction of outside air is provided in a way that adequate mixing of outdoor air and conditioned air is achieved to avoid discomfort from temperature variation and draughts.

For non-ducted air conditioning systems, designers must ensure that the proposed system is capable of coping with the introduction of pre-treated outside air via a mechanical ventilation system, as well as any mechanical exhausting required, as indicated in Ventilation section of this document.

Biodegradable lubricant must be used for air-compressors.

Heating and cooling

Refer to the NCC for climate zones and temperature parameters.

Temperature controls are to align with the DIT Environmentally Sustainable Design Specifications:

- Dry bulb temperature in the space is controlled between 19-22ºC for heating and 24-26ºC for cooling
- HVAC has separate zones as required for distinct activities and with independent temperature controls and sensors.

Proprietary air conditioner controllers are to be installed as per the Controls (HVAC) section of the document.

Large volume open areas

With reference to the HVAC systems table in this document, where heating is to be provided to new design and technology workshops, gymnasiums or multi-purpose halls, and food technology kitchens the use of natural gas to provide heating is to be reduced as per the Net Zero Emissions for Government Operations Program.

Investigation is to occur in the reporting phase with a scope to identify the best whole-of-life heating solution for the project:

- electric radiant panel heating
- underfloor heating (tube in slab)
- underfloor air distribution
- hydronic electric heating hot water coils paired with evaporative cooling system.

These investigations are to be completed on a project-by-project basis with items to be covered in the report listed in the Replacement of HVAC systems in existing facilities section of this document.

Noise

Maximum room noise levels arising from the air-conditioning and ventilation equipment in learning communities and leadership, administration and staff centre areas must meet AS 2107, and the requirements of internal noise levels detailed within the Acoustics section of this document.

Controls (HVAC)

New systems must have the following control infrastructure supplied and installed as a part of the project.

Air-conditioning

Refer to DIT NATSPEC 0710 DIT Mechanical Systems

- On/off control switches and temperature setting control switches must be installed separately.
    - The independent on/off control must:
        - be located near the entry and incorporate timers to automatically turn off the units after a pre-set time.
        - be a variable 0-4 (initially set for 2 hours) push button timer with instantaneous ‘on’ light and reset capability.
        - have the capability of manually switching off.
- The proprietary temperature setting controller must be in a readily accessible lockable enclosure located in a secure area, such as a store, and accessible to site maintenance staff only.
    - Temperature setting controllers **must not** be located in ceiling spaces.
- For internal cooling and heating setpoint values refer to the Heating and cooling section in this document.

Evaporative cooling

- The on/off control must be a variable 0-4 (initially set for 2 hours) push button timer with instantaneous ‘on’ light and reset capability.
- The independent on/off control must have the capability of manually switching off.
- Proprietary cool/vent and fans speed (high/low or variable) control to be located in the space they serve, adjacent the on/off control.

Mechanical ventilation

- Provide at least one CO_2 sensor and one motion sensor per space served by an ERV.
- Operation of the ERV must be as per Energy Recovery Ventilator (ERV) control strategy section in this document.

Plant location and maintenance

- Refer to DIT Standard Drawing DG28 Soakage Pits for A/C Units
- All plant and equipment associated with new buildings is to be located on the ground in secure cage(s) or enclosure(s) where it is readily accessible for routine maintenance and eventual replacement. All electrical controls, isolators and associated controls for services must be located within the secure enclosure.
- Electrical isolator must be:
    - installed adjacent to the equipment within the secure, cage or enclosure; and
    - in an accessible position once the equipment has been installed.
- Electrical isolator **must not** be:
    - installed directly on any item of plant; and
    - accessible from external to the equipment enclosure to prevent nuisance isolation.
- Where roof mounted serviceable plant is a requirement, written approval must be provided by the department for departure from the standards. If approved, plant must be installed on a structural plant platform, or in a dedicated plant room. Refer DIT Guidenotes G189 Access for Maintenance, G190 Building Access and Safety Systems and DIT Standard Drawing DD41 Roof Mounted Plant Detail.
- Where a structural plant platform is installed:
    - A safe roof access system, including stair / ladder access point, is to be installed to ensure adequate access to the new location, compliant with both:
        - AS 1657
        - DIT Guidenote G190 Building Access and Safety Systems.
    - All existing roof sheeting covered by the plant platform must be replaced with new.
    - A minimum gap of 1000mm clear access between roof sheet and underside of the platform structure is to be provided to facilitate future roof replacement.
    - Any external permanent stairs installed to access rooftop plant platforms must be fully enclosed with a secure gate at ground level to prevent student access.
- Any cassette type air conditioning units installed above 4000mm above floor level must incorporate a proprietary ‘filter drop system’ to facilitate filter maintenance.
- Operation and maintenance manuals documentation must be provided to the relevant facilities management service provider and the site detailing the maintenance scheduling requirements for the installed equipment.

Plant room and enclosure construction

- Refer to DIT Standard Drawings DG23, DG24, DG25 and DG26 Plant Enclosure Details.
- Where plant size exceeds feasible use of DIT plant enclosure design, enclosure is to be fenced off using 2100mm safety fencing see Fencing section.

- Louvred facades are acceptable. These must be aligned with the corresponding acoustic engineering report. Acoustic treatment must ensure acceptable noise levels, and of the following surrounding spaces:
    - internal learning spaces of the building and of neighbouring buildings
    - external learning areas
    - adjacent public spaces
    - neighbouring properties
- Temperature sensitive equipment must be located in a well-ventilated area as per manufacturer's requirements. All serviceable parts must be provided with safe and adequate access. Access to all fan coil units must meet requirements of AS/NZS 3666 and DIT Guidenote G189.
- Service access to all fan coil units (including electrical and electronic control components) and filters must be achieved.

Mechanical services earthquake provisions

The following mechanical services components and their fastenings must be designed for earthquake forces in accordance with Section 8 of AS/NZS 1170.4, DIT Guidenote G172, and DIT Standard Drawings DG51, DG52, DG53 and DG57:

- water heaters, flues, smokestacks, vents and pressure vessels
- reciprocating or rotating equipment
- utility and service interfaces
- ducts and piping distribution systems
- supports for ducts and piping distribution systems.

Net Zero Emissions for Government Operations Program

The Net Zero Emissions for Government Operations Program requires that the construction, maintenance, refurbishment, and operation of all government buildings minimises whole-of-life costs and reduce scope 1 and scope 2 greenhouse gas emissions (refer to Glossary of terms and abbreviations section of the program document).

New buildings and major refurbishments of existing assets must include a life cycle approach to the design and specification of the project, to ensure cost effective energy saving options are incorporated from the design stage.

Baseline common data is to be used in undertaking the life cycle analysis of alternative systems as defined below in the 'Lifecycle analysis' section.

System solutions must take into account the following criteria:

- capital cost
- outside air ventilation
- air quality
- energy consumption
- greenhouse gas emissions
- maintenance access and expenditure
- noise levels
- availability of equipment and replacement parts.

Lifecycle analysis data

Baseline common data to be used in life cycle analysis for learning and support communities located in the Greater Adelaide region. Local meteorological data is to be used for locations outside of the Greater Adelaide region.

Table 9: Lifecycle analysis data

Learning community floor area (New Buildings Only)	As per brief
Ceiling Height (New Buildings Only – nominal value)	2.7m
Number of students per general area	25 to 30
Outside air requirements	300 litres/sec/teaching and learning space
Number of school days per annum	205 pa*
School hours per day	7 hrs (8:30am to 3:30pm)*
Annual school hours	1,450 hrs*
Average heating – full load hours pa for Adelaide** (Bureau of Meteorology)	340 hrs*
Average cooling – full load hours p.a. for Adelaide** (Bureau of Meteorology)*	100 hrs*
Life cycle costing discount rate (set by treasury and may change)	6%
Inflation rate (set by treasury and may change)	2.5%
Present worth factor for 20 years life of equipment	Use net present worth formula with discount rate of 7%
Greenhouse gas (CO_2) output per electrical kWh input (from the Australian Greenhouse Office)	0.25 kg
Maximum classroom noise levels	Refer to the Acoustics section of this document.
Adelaide ambient design temperatures summer/winter (The Australian Institute of Refrigeration Air conditioning and Heating)	39.2 DB/22.7 WB (Summer) 4.6 DB (Winter)
Cooling temperature set point	Refer to the Heating and cooling section of this document
Heating temperature set point	Refer to the Heating and cooling section of this document

*OSHC and site-specific extracurricular activity hours not included and will be additional to those listed.
**Where the project location is outside of the Adelaide metro area local design data is to be used for hours of Cooling/Heating

Cost analysis

Retailer rates and current SAPN network tariffs must be used for the lifecycle cost analysis.

Mechanical exhaust systems

Externally flued mechanical exhaust ventilation must be provided in areas where heat, odour, pollutant and fume build-up can be a problem.

Mechanical exhaust ventilation systems must:

- meet noise exposure requirements of the Work Health and Safety Regulations 2012 – Chapter Four – Hazardous Work
- meet the requirements of AS 1668.2
- meet Work Health and Safety Workplace Exposure Standards requirements where briefed
- be installed in a location where noise levels of utilised outside spaces and internal adjacent buildings are not impacted
- be vented externally to the atmosphere - particulates and contaminants **must not** be recirculated through the general internal air supply but are to be discharged outside the building in a manner that that poses no risk to people outside the building.

Mechanical exhaust ventilation systems must be provided for the following items of equipment.

Stove and cooktops

All stove and cooktops must be provided with rangehoods.

- All rangehoods must:
    - have fans installed at hood level for ease of maintenance
    - be flued to the atmosphere via non-combustible flue (recirculating rangehoods **must not** be used)
    - be installed as per manufacturer's recommendations
    - be capable of operating at 800m^3/hr (225L/s) or higher
    - be wider than the width of the stove or cooktop
- For VET kitchen requirements, refer design brief.

Refer to DIT amended NATSPEC section '0741 DIT Ductwork'.

One of the following make-up air systems must be designed to supply the air-to-space equivalent to total-combined-airflow being exhausted from the food technology learning spaces where multiple stoves and rangehoods are installed. Ensure that food technology learning spaces maintain a negative pressure as per AS 1668.2.

- Make-up air path consisting of roof mounted outdoor air (O/A) cowls and motorised dampers, which drive open (spring return closed) with air to be delivered next to rangehoods they are connected to, when the rangehoods are turned on.
- Pre-treated by an InDirect Evaporative Cooler (IDEC) which supplies air to be delivered adjacent rangehoods they are connected to, when the rangehoods are turned on.
    - Provisions for heating to be investigated as per the Large Volume Open Areas section of this document.
- Pre-treated by an Evaporative Cooler (EVC) which supplies air to be delivered adjacent rangehoods they are connected to, when the rangehoods are turned on.
    - Provisions for heating to be investigated as per the Large Volume Open Areas section of this document.

Woodwork machines

- Design criteria (to be addressed in concept development):
    - locate dust extraction unit centrally to all ductwork requirements
    - minimisation of duct length and bends to increase efficiency of system
    - do not reuse existing systems from other buildings

    - changes in access to extraction unit exist between shaker unit and reverse pulse.
- Supplied and installed systems require certification to confirm build quality of the dust extraction unit meets the requirements of AS/NZS 4745 by specialist contractor.
- Any dust collector that is new and/or is modified under breakdown replacement works is to comply with AS/NZS 4745 for the extraction of an ST1 (wood dust) type product. The new system to be installed must be designed in accordance with the following section of AS/NZS 4745:
    - Clause 6.5.2
    - Clause 7.2
- if the two above clauses cannot be met - Clause 7.3
- The capture or receiving hood must:
    - be located within 2 hood diameters of each identified source of dust
    - be fixed to the machine or connected to the manufacturers supplied connection point by a flexible duct
    - have sufficient air velocity to draw dust away before it becomes airborne.
- General wood dust capture velocities is 15m/s, which will ensure noise levels of the space meet noise exposure requirements of the Work Health and Safety Regulations 2012 – Chapter Four – Hazardous Work.
- If slide gate valves are used to control the air flow to capture devices, these must be fixed in position at the time of commissioning, using:
    - self-drilling screws (such as Tek screws)
    - fixed with pad lock (keyed to school master key system).
- General wood transportation duct velocity is to be designed for 18m/s to ensure wood dust particles remain airborne and do not settle in the duct run.
- System installation is to be complete with concentric annual recirculation zone (CARZ) backflow prevention valve to ensure flame does not enter the workshop area should deflagration (explosion and fire as the result of an ignition source) occur in the dust collector. Blast panels on the collector to be aimed away from the building and potential locations where people may be present (including pathways and assembly points)
    - Installation criteria is wall thickness of duct to match the wall thickness of the dust collector up to the CARZ valve.
- Particle collectors (Reverse pulse dust extraction is preferred over shaker units for woodwork dust management):
    - Reverse pulse type system: anti-static fabric bag filter and/or cartridge type filter unit.
- Shaker type system: anti-static fabric bag filter unit.

Welding equipment

Welding fumes are considered a Type A effluent by AS 1668:2.

The capture velocity of the air, as it enters the capture device surrounding the source of Type A effluent generation, must be no less than 10m/s average across each opening in the capture device (5m/s is nominated by AS 1668:2).

For the purposes of this section, the capture device will be deemed to comprise the exhaust hood as well as any impervious walls, floors or benchtops that, together with the exhaust hood, serve to contain the source of effluent generation.

Where fixed oxyacetylene systems are installed, emergency push stop button to be located adjacent to main entry/exit to room. Push stop button to be pressure proving solenoids with lockable reset control panel.

Fume capture can be achieved by the following installations/apparatus (compliant with SafeWork SA Welding Processes Code of Practice):

- Fixed installations, such as side-draft or down-draft tables and benches, and partially or completely enclosed booths.
    - A local exhaust system comprising of a perforated vertical surface (wall) or horizontal surface (bench/table) for capturing welding fumes drawing them away from the user.
    - The exhaust system must be structured and placed near the emission point to contain the emission, not draw contaminant into the breathing zone of the operator and not be positioned so that the operator causes an air-flow obstruction.
- Portable installations, such as movable hoods that are attached to flexible ducts.
    - A local exhaust system comprising of a hood for capturing welding fumes close to the point of generation.
    - Steel hoods must be used. Plastic hoods **must not** be used.
    - The hood must be structured and placed at the emission point to contain the emission, not draw contaminant into the breathing zone of the operator and not be positioned so that the operator causes an air-flow obstruction.
- Fume extractors attached directly to the welding gun.
    - In the last method, a stainless-steel mesh shroud is attached to the welding torch with a small viewing window left open so that the welder can still view the welding operation.
    - The stainless-steel shroud acts as a barrier to the ultraviolet radiation, which produces ozone by reacting with the oxygen in the surrounding air. Using this method, ozone exposures rarely exceed the exposure standard of 0.1 part per million.
- The hood must be connected to a duct or ducting system which will effectively contain contaminants transported from the inlet and efficiently, with proper flow control, deliver the exhaust flow to the discharge (Rec. 10m/s) (5m/s is nominated by AS 1668:2).
    - The ducting must be sized and oriented so that the flow within it is efficient, such as approaching laminar flow rather than turbulence.
    - The rate must also be sufficient to allow the contaminant be transported and not deposited on the walls of the ducting.
- Discharge ducting must be placed so that it does not affect any air-supply system. The air being exhausted **must not** be entrained and recirculated into the workplace through the air supply system and conform to the following requirements in-line or exceeding AS 1668:2 for Type A Effluents:
    - be arranged vertically with discharge velocities no less than (10m/s) (exceeding 5m/s nominated by AS 1668:2)
    - located no less than 6m from a property boundary, any boundary to a public street, any outdoor air intake opening or any natural ventilation device or opening
    - treated to reduce the concentration of contaminants, when necessary, through filtration[8].

3D Printers/Laser cutters/Textile cutting machine

Local fume extraction systems must be provided where there are work, health and safety risks associated with the use of 3D printers, laser cutters and textile cutting machines. Where processes release dangerous airborne chemicals, or irritants, they must be removed from the building as a type A effluent as per the requirements of AS 1668.2.

[8] May be necessary where the ambient air is liable to be significantly polluted by the discharge. Refer to local government/EPA requirements for further guidance regarding control requirements relating to concentration of contaminants.

Localised fume extraction systems must comply with the following requirements:

- articulated snorkel type fume exhaust system and arm
- fumes must be discharged above the roof of the building
- discharge ducting must be placed so that it does not affect any air-supply system
- the air being exhausted **must not** be entrained and recirculated into the workplace through the air supply system
- be arranged vertically with discharge velocities no less than 5m/s
- located no less than 6m away from a property boundary, any outdoor air intake opening or any natural ventilation device or opening
- localised fume extraction fans **must not** be in teaching spaces
- for 3D printers, the following filaments (unless advised otherwise in the product SDS) require ventilation provisions:
    - PLA (polylactic acid)
    - ABS (Acrylonitrile Butadiene Styrene)
    - Carbon Fibre
    - Nylon (polyamide)
    - FLEX
    - HIPS (high impact polystyrene)
    - PVA (polyvinyl alcohol)
    - PETG (Polyethylene terephthalate glycol-modified)
    - TPE (Thermoplastic elastomers)
    - PC (Polycarbonate)

Chemical storage room

Refer to Part 3b: Generic Functional Briefs (Laboratory – Chemistry, Physics, Science (Biology/Geology)

- DIT Standard Drawing DD19 Typical Chemical Store layout
- Open shelving units for chemical storage to comply with DIT Standard Drawing DG04 Chemical Storage Open Shelf Unit
- Corrosives cabinet to comply with DIT Standard Drawing DG03 Corrosives Cabinet

Fume cupboards

Must comply with:

- Safety in laboratories to AS 2243.1.
- Hazardous areas to AS/NZS IEC 60079.10.1.
- Fume cupboards to AS/NZS 2243.8.

Refer to DIT amended NATSPEC section '0741 DIT Ductwork'.

- Recirculating fume cupboards **must not** be used.
- Non-recirculating fume cupboards must comply with AS/NZS 2243.8.
- All fume cupboards to have separate flues vented to external atmosphere.

- Fume cupboard discharge duct requires a constant velocity modulating rubber outlet device to maintain the required minimum outlet velocity from AS/NZS 2243.8 and to provide protection from vermin ingress.
- On site testing of all fume cupboards both at the time of installation and as part of ongoing preventative maintenance must be carried out in compliance with AS/NZS 2243.8.
- If fume cupboard extraction rate exceeds 225L/sec, investigation is required for a make-up air system
    - preference is for proprietary fume cupboard to have make-up air system incorporated as part of unit and system design.

Flammable liquids cabinet

Where located internal to the building the following construction and installation requirements are to be met:

- comply with AS 1940 and vented to the atmosphere
- DIT Standard Drawing DD19 – Typical DfE Chemical Store Layout.

Where located externally[9] the following requirements are to be met:

- constructed to comply with AS 1940 and vented to the atmosphere
- must be in a secure location (for example lockable enclosure or yard).

Vented corrosives cabinet

- Constructed and installed as per:
    - DIT Standard Drawing DG03 (June 2024) – Vented Corrosives Cupboard (referenced in DD19).
    - DIT Standard Drawing DD19 (June 2024) – Typical DfE Chemical Store Layout.
- 2 x 100mm diameter UPVC vent ducts vented to the atmosphere.

Kiln

Fume extraction system to be exhausted to the outside atmosphere. To prevent inhalation of kiln emissions, ensure extraction system operation commences with initial kiln firing (via interlock with kiln controls), and run-on operation continues for at least 15 (up to 30) minutes after kiln firing has ceased.

Note corrosion of metal fittings outside a kiln enclosure may indicate an ineffective ventilation system.

On/Off control to be complete with 'Green' LED run light to prove operation of the fan.

Ensure the extraction system:

- operates effectively at all times during the firing cycle
- vents outside the building, away from populated areas such as walkways and where staff and students may congregate
- is designed for removal of a type A effluent (Heated Air) as per AS 1668.2, with a capture velocity of 0.5m/s across the opening of the capture device/hood.
    - Hood design is to be Type 1 - does not emit grease. It includes apparatus that emit non-greasy heat or steam only.

[9] A workflow study must be conducted with site staff to determine if this option is suitable for the site during the reporting/client consultation phase of the project.

Spray booths

Dependent on the requirements of the project brief, the engagement of a hazardous area consultant may be required.

Spray booths to comply with the following Australian Standards:

- Ventilation design - AS/NZS 60079.13 and AS/NZS 4114
- Hoods or enclosure - AS/NZS 60079.13 0.5 – 1.0 m/s
- Exterior hoods - AS/NZS 60079.13
- Duct work – AS/NZS 4114
- Electrical installation - AS/NZS 3000
- Explosive Atmospheres - AS/NZS 60079.0

Fire protection

- Fire services must be designed to comply with the SA Fire Services requirements, NCC, NCC referenced Australian Standards, and sub-referenced Australian Standards.
- Where mains water supply is not available or inadequate, fire water storage tank and fire pump sets are required to provide adequate water source complying with NCC, relevant Australian Standards and SA Metro and Country Fire Services.
- Fire hydrants and fire hose reels must be provided in accordance with the NCC and its referenced Australian Standards. Consult with SA Fire Services and the building certifier on existing fire hydrant coverage to determine any new fire hydrant provisions that may be required.
- All above ground water supply pipes must be galvanised steel, minimum medium grade thickness.
- Hydrant booster assemblies are required where 2 or more hydrant standpipes are located on the education and care facility site.
- Existing hydrant booster assemblies may require upgrading to meet present Office of the Technical Regulator (OTR) and SA Water back flow prevention requirements.
- Fire blankets must be provided in spaces outlined in the Part 3: Generic Functional Briefs (3a: ECECs and 3b: Schools).
- Fire detection must be integrated with security detection systems (PSSD Control Room monitoring) and comply with department Education Security Design Standards (contact the Security and Emergency Management team for information on security system specifications).

Fire extinguishers

- Generally fire extinguishers must be ABE Dry Chemical Powder with associated signage, of nominal 4.5kg capacity, however the specification of fire extinguishers must consider adjacent services such as electrical equipment, to ensure the appropriate fire extinguisher is specified. Additional CO_2 extinguishers adjacent switchboards and data cabinets are to be included.
- Extinguishers must be:
    - located in occupied spaces (such as learning environments) rather than corridors, and near the emergency exit point
    - enclosed within a heavy duty plastic bag.
- The fire extinguisher safety pin must be a 100mm extended travel type. The pin is to be inserted such that it can only be removed once the extinguisher is removed from its mounting and the plastic bag.

- Consider providing a recess in the wall or installation in cabinet or enclosure in compliance with AS 2444 to house each fire extinguisher for protection.
- Where a fire source feature dictates a requirement for a special purpose fire extinguisher (such as distribution board, communications rack or similar), a suitable unit for that circumstance in line with the Australian Standard must be provided.

Plumbing

Plumbing waste systems must include the following specific requirements:

- Plumbing pipe and fittings to be manufactured from lead free materials.
- Pipe support systems to comply with DIT NATSPEC requirements.
- Science laboratory:
    - Waste pipes are required to be enclosed in service ducts with removable access panels.
    - Provide acid resistant, high density polyethylene (HDPE) pipework for laboratory waste pipes.
    - Laboratory safety showers to be provided with floor traps, draining to the laboratory waste treatment system.
- Floor trap grates in vinyl floor areas must be fitted with damp type fittings.
- Surface inspection openings must be:
    - Internal: non-slip chrome plated brass or stainless steel inserts.
    - External: cast iron covers with concrete ring.
- Sewer vents through metal roofs must be flashed with an upstand of similar material to the roof and fitted with a PVC weathering cone.
- Vents should offset in ceiling spaces to the roof ridge to limit pan flashings.
- Flexible UV-resistant rubber penetration flashing (such as Dektite or similar) only to be used for penetrations <50mm
- Rubber penetration flashing should not be selected in areas with a historical risk of damage from birds.
- The tops of gully trap grates in paved areas must finish 12mm above surrounding paving.
- Paving is to be graded away from gullies to prevent stormwater ingress.
- In reactive soils construct flexible joints and expansion joints for sewer at the building line. Type of joint required will depend on soil conditions, subject to geotechnical report.
- Conventional vents are to be used.

Water

- Drinking and non-drinking water services are to be strictly separated.
- Provide potable water to safety shower and shower/eye wash unit in laboratories, workshops and preparation/storerooms, amenities showers, sinks and troughs to all learning areas.
- Backflow prevention devices are to be installed in accordance with NCC requirements. Where backflow prevention devices are installed, install warning signage in accordance with AS/NZS 3500.1.
- Harvested rainwater may be used for toilet flushing. Provide signage adjacent each toilet or by the entrance to the amenities area stating that rainwater is being used for toilet flushing and is not for drinking

- Provide independent isolation of the water supply to each laboratory with an isolation valve positioned in a readily accessible location. If the valve is external to the building locate in a secure enclosure or within a path box with a cast iron cover (refer to DIT Standard Drawing DG32 Typical Valve Box Detail).
- Fittings must be brazed (silver solder/hot works).
- Press (crimp) type copper fittings **must not** be used.

Sub-metering

Where ECEC facilities are co-located on school sites, they must have a sub-meter to facilitate the monitoring of water use.

Water temperatures

Table 10: Approved water temperatures relevant to location

Fixture location		Cold only	Hot 42°C	Hot 45°C	Hot 60-65°C (mixer taps)
ECEC Facilities	Children hand basins and sinks (including standard toilets and learning areas)	✓			
	Adult and children accessible and fully assisted toilet hand basins		✓		
	Kitchen sink and hand basins (including community indoor meeting area kitchen)		✓		
	Adult hand basins and showers		✓		
	Shower within children's fully assisted toilet		✓		
	Baby bath (nappy change bench)		✓		
	Staff materials clean-up sink (art sink)		✓		
	Bottle preparation sink (if provided)		✓		
	Laundry trough			✓	
Schools	Student hand basins and sinks (including standard toilets and learning areas)	✓			
	Staff and student (accessible and fully assisted toilets) hand basins			✓	
	Staff and student showers			✓	
	Staff hand basins (including canteen, first aid/sick bay, consultation/clinical, staff lounge)			✓	
	Kitchens, kitchenettes and student heat and eat sinks			✓	
	Secondary - Food technology hand basins and sinks			✓	
	VET hand basins			✓	
	Senior common room			✓	
	Laboratory staff preparation area sink (1 hot water outlet only)			✓	
	Art studio sink (1 hot water outlet only)			✓	
	Produce garden kitchen sinks			✓	
	Laundry trough			✓	

	Design and technologies workshops – metalwork, automotive etc (material store and preparation) (1 hot water outlet per workshop only)				✓
	VET Commercial kitchens (sinks only)				✓
	Canteen sinks (provided they are not accessible by students)				✓
Staff Only	Staff centre sinks (provided they are not accessible by children/students)				✓
	Cleaners sinks/laundry troughs/facilities and grounds maintenance sinks (provided they are not freely accessible by children/students)				✓
	Washing machine outlets				✓

Hot water services

- Outlets receiving hot water must have a Thermostatic Mixing Valve (TMV) conforming with AS 4032.1 and adjusted to the specified outlet temperature at each outlet supplied from the TMV.
    - Alternatively, a thermostatically controlled tap conforming with AS 4032.4 and adjusted to an outlet temperature not exceeding the specified temperature at each outlet.
- Tempering valves **must not** be installed with any water heater system.
- All pipe work joints to be brazed or welded.
- Flow and return pumps (not heat pumps/heating circuits) are to be connected to the site's alarm installation to turn off circulating pumps when alarm is active and turn pumps on when alarm is isolated.

Heat pump water heaters and electric continuous flow water heaters are preferred over storage water heaters in most situations to reduce energy consumption.

Heat pumps are the preferred water heating solutions for larger buildings where a larger, centralised water heating system may support multiple hot water points.

Electric continuous flow water heaters may be preferred where supporting a low number of outlets or for infrequently used outlets (such as baby bath and other single isolated fixtures). Electric continuous flow water heaters must have the ability to have temperature locked within the unit, accessible by service personnel only.

Plant location

- Integral heat pump water heater plant (including storage tanks) is to be located externally, in ground level secure cage(s) or enclosure(s) where it is readily accessible for routine maintenance and eventual replacement.
- Electric continuous flow units and storage hot water services are preferred to be installed within a lockable vented cabinet or within external ground level secure cage(s) or enclosure(s), readily accessible for routine maintenance and eventual replacement.
    - Electric continuous flow units must be protected from weather within a cabinet such as a meter box.
    - Storage hot water **must not** be located in cabinetry inside buildings where they could compromise occupied areas, fixtures or fittings through flooding due to leakage or malfunction.
        - Where no alternative exists and mains pressure storage hot water systems must be installed inside, it must be located to ensure flooding is directed outside of the

building or flooding is contained within a safe tray draining to sewer or waterproofed and bunded area such as wet areas with impervious floors graded to a drainage outlet.

Specialist sanitisation equipment (food preparation areas)

- Hot water supplied to kitchen sinks in education and care facilities is not suitable to sanitise food contact areas, utensils and specialist equipment. Where required to meet sanitising requirements for food preparation areas and sanitisation, sites may install a dishwasher to wash the dishes/utensils above 65°C and/or use a food grade sanitiser to wash benches/utensils etc.
- Dishwashers and food grade sanitisers must meet Food Safety Standards. Refer to SA Health Food safety for businesses information.
- Refer to the SA Health Healthy Food Environments Hub for food safety legislation requirements under the *Food Act 2001* and associated regulations.

Instant boiling and chilled water taps

Where briefed to be installed in Part 3: Generic Functional Briefs (3a: ECECs and 3b: Schools), must:

- provide under bench boiling water in a lockable cupboard
- have tapware that includes a safety switch to prevent accidental boiling water activation
- be energy efficient
- include timers for shut-down at nighttime, weekends, holidays
- comply with AS 3498, AS/NZS 3500.4 and AS 1428.1
- comply with NCC Volume 3 Plumbing Code of Australia
- have a minimum 2 year warranty.

Trade waste discharge

Pre-treatment units (such as grease arrestors) may be required wherever there is waste liquid or product such as paint, sand, clay, or plaster particles being discharged into the main sewer system from dishwasher waste, kitchen sinks, art sinks or washdown areas as per the Schools and Childminding SA Water factsheet.

Inground pre-treatment units must be located to be easily accessed by wastewater contractor vehicles.

SA Water consider education and care facilities to be trade waste generators under the *Water Industry Act 2012*. Specific activities generating trade waste in the following spaces include (but are not limited to):

- canteens
- food technology
- commercial kitchens
- art studio/workshop
- inter-disciplinary workshop
- science
- design and technology (including wood, metal, electronics, automotive and digital technology)
- agricultural studies
- out of school hours care (OSHC)
- facilities and grounds maintenance workshop
- ECECs.

Backflow prevention

Reduced pressure zone devices (RPZD) (backflow prevention devices) with high hazard rating and complying with the Office of the Technical Regulator (OTR), are required for the following locations:

- baby bath (nappy change bench)
- interactive water features (IWFs) in outdoor play areas
- non-potable water connections
- new water service connections
- subsurface drip irrigation systems
- fire services hose reel (where shared with education site domestic connection).

When installed internally, backflow prevention devices must be located in recessed lockable enclosures with viewing panes and drain or located below bench with tundish in lockable cupboard.

When installed externally, backflow prevention devices must be located within a vandal proof enclosure.

When establishing a new recycled water connection, unless already present, additional backflow prevention devices (RPZ valves) are to be installed adjacent to all potable mains drinking water meters supplying the site.

Power

Cabling

- Cabling must be in compliance with AS/NZS 3000 and AS/NZS 3008.1.1.
- Unprotected cabling to be installed in compliance with DIT NATSPEC.
- Overhead catenary cables **must not** be specified between buildings and facilities. Cabling must be trenched as per the relevant Australian Standard and the requirements of DIT amended NATSPEC.
- Power and comms/data conduits to have a minimum of 1 spare conduit the same size of the main run in all underground runs. These are to be left unused with draw-cords. Perform mandrel testing to prove suitability and then seal all ends with proprietary PVC type caps. Include test results in the operation and maintenance manuals.
- Cables are required to be supported. Unsupported cables resting on ceilings are not acceptable.
- Provide propriety cable tray system for all consumer mains and sub-mains cabling over 70mm².
- Exposed cables are not permitted. Refer to Conduits section of this document for appropriate mechanical protection systems.
- Cables in inaccessible concealed spaces to be in UPVC conduit or tied to catenary systems.
- Data and communications cabling in stud walls must be re-wireable and installed in PVC conduit.
- Plant rooms, storerooms, or any area without ceiling linings: All cables <2100mm above floor level must be in earthed steel conduit. All other cabling must be in heavy duty UPVC conduit, or on cable tray or in a suitable duct.
- Make any penetrations through a high point on the roofing material profile. Penetrations through low point or pan of the roofing materials will not be accepted and will require replacement of the roof sheet and re-wiring.
- For penetrations ≤31mm, use a flexible UV-resistant rubber penetration flashing (such as Dektite or similar). No more than one cable or conduit per rubber penetration flashing to maintain seal.
- Rubber penetration flashing should not be selected in areas with a historical risk of damage from birds.

- Penetrations >31mm must be through an upstand and overflashing as per DIT Standard Detail DG50.

Conduits

- Cabling must be installed in medium duty (MD) PVC conduit.
- Conduits are to be concealed whenever possible.
- Exposed conduits in learning areas and child/student accessible areas are not permitted as part of new buildings or major refurbishments.
- If exposed to view, install conduits in parallel runs with right angle changes of direction.
- Install conduits with the equivalent of ≤2 right angled bends per cable draw-in run.
- Underground conduit bends must use large sweep bends, Clipsal 247L or 247P series, or approved equivalents.
- Conduits >80mm to have bellmouth cable guides at both ends to minimise damage to cable insulation.
- Roof-mounted plastic conduit (and accessories) exposed to direct sunlight must be Black Heat, Fire and Temperature resistant (HFT), or MD PVC conduit protected with 0.55mm BMT steel flashing with a painted or powder coat finish.
- MD PVC:
    - At high level (>2100mm AFL) areas exposed to direct sunlight must be protected with 0.55mm BMT steel flashing with a painted or powder coat finish.
    - In low level (<2100mm AFL) areas exposed to direct sunlight must be protected with 1.6mm BMT steel flashing with a painted or powder coat finish.
    - In low level (<2100mm AFL) areas that may be subject to severe mechanical damage must be protected with 3mm BMT steel flashing with a painted or powder coat finish.
- Locate conduits in roof spaces below roof insulation and sarking. In accessible roof spaces, provide mechanical protection for light-duty conduits. Solar Photovoltaic DC cabling to meet requirements of AS/NZS 5033.
- In any accessible locations, particularly in vandalism prone locations, fixings are to be secured to/with double-side metal saddles:
    - Internal use - Zinc plated saddles and fixings
    - External/exposed use - hot dipped galvanised saddles and fixings.
- Fixings must be independent of any other building services (such as mechanical ducts or pipes) or suspended ceilings.

Pits

- Provide cable draw-in pits installed in accordance with:
    - AS 3996 and DIT Standard Drawing DG56 (as a combined installation), and
    - the manufacturer's written installation instructions with draining, and necessary strengthening treatments (such as concrete base, sides and collar) to obtain the appropriate load and sealing ratings.
- Pits must be installed higher than the surrounding ground to prevent the entry of surface water.
- Ramping down to surrounding areas not to become a trip hazard and in compliance with AS 1428.1.
- Pit/lid combinations found to be installed too low compared to their surrounding environs, will be rectified at the contractor's cost.

- Provide drainage/soakage drains to the bottom of the pit.
- Provide drainage from the bottom of cable pits, with minimum 50mm PVC pipe to absorption trenches filled with rubble, formed of 25mm aggregate and geotextile barrier.
    - Do not connect to the stormwater drainage system.
- Provide:
    - Class B (as defined in AS 3996) load rated pit/lid combinations to non-vehicle accessed areas, preferably garden beds, where there is no risk of the pit being exposed to any vehicle.
    - Class D (as defined in AS 3996) load rated pit/lid combination to all vehicle accessible areas, such as paved (vehicle and pedestrian), grassed and open areas.
- Where required by the network, and located in a non-vehicle accessible area, pit/lids approved by the communications network provider may be used for lead in pits only.
- In general, all lids and their frame assemblies must be of ductile iron manufacture and be cast into a precast or formed in situ concrete collar.
- When being used in Class D applications, a reinforcement cage of rebar (minimum Y12 deformed bar or equal approved) must also be included in the concrete surround to ensure the tensile strength is high enough to achieve the Class D load rating.
- Pit lids must identify the service types in pits.
- Pit cover lids must be greased around their frame, to allow easy access when required.
- Provide one set of cable pit lid lifters per project, to be handed over to the site at the end of the project.
- Provide one set of lifting handles for each size and type of cover/lid section.
- Provide proprietary locking lids for high-risk areas (such as Barri Bolts or approved equivalent).
    - provide a locking tool to the site at project completion.
    - where the number of in-ground cable pits exceed 10 pits, two tools must be provided.

Underground cable markers

- Accurately record the routes of underground cables including digital photographic records before backfilling. Include routes and photos as part of the as-built record drawings in the operation and maintenance manual.
- Provide a 150mm wide marker tape bearing the words ‘WARNING – electric cable buried below’, laid in the trench in accordance with AS/NZS 3000.
- Marker tape to be orange for electrical, and/or white for data/comms/security and the like.
- Accurately mark the location of underground cables with route markers consisting of a metal marker plate complete with securely fixed direction arrows indicating distance to next marker, set flush in a concrete base.
    - marker plates and/or their fixings **must not** be a trip hazard and must be finished flush with adjacent surfaces.
- Marker plates to be:
    - brass, aluminium or mild steel hot-dipped galvanized, minimum size 75 x 75 x 3mm thick, fixed with waterproof adhesive and secure stainless steel fixings
    - 200mm diameter x 200mm deep minimum, concrete
    - placed at:
        - building entry/exit points
        - in-ground cable joints

- route junction
- change of direction
- termination and building entry point, and
- in straight runs at intervals of no more than 100m.

Sub-metering

Where ECEC facilities are co-located on school sites, they must have a sub-meter for electricity to facilitate the monitoring of energy use.

Switchboards

- External switchboards must have full weather protection in line with DIT NATSPEC, covering to a minimum of 1000mm past the open door of the front of the switchboard and typically 500mm to each other side of the switchboard.
- Install an AS/NZS 2293.1 compliant emergency lighting luminaire in front of the board to provide adequate lighting in emergency conditions.
- External switchboards and switchboards within plant rooms to be IP56 minimum.
- Cable entries **must not** compromise the IP rating of the switchboard.
- For external switchboards, cable entry only from the bottom.
- IP rating for all internal switchboards to be IP43 minimum.
- Keying of switchboards to be 604 type unless otherwise briefed.
- Switchboard enclosure, including material and width, to comply with DIT NATSPEC requirements.
- 24 poles or less must be 600mm per section.
- Switchboard doors and door construction to comply with DIT NATSPEC requirements.
- Provide ≥30% spare poles for boards smaller than 30 poles, ≥20% for boards larger than 30 poles.
- Provide a communications earth terminal at switchboard earth bar complying with AS/CA S009.
- Circuit numbering must run consecutively throughout each floor of a building. For example:
- switchboard A (with 60-ways) will be identified R1, W1, B1 through to R20, W20, B20
- the next switchboard's (switchboard B) numbering sequence must continue as R21, W21, B21 typically through to R40, W40, B40 and so on.
- Switchboard compliance with DIT NATSPEC requirements:
    - covers
    - gland plates
    - escutcheon plates and panels
    - cable entries
    - cable enclosures
    - cable supports.
- Provide anti-condensation heaters to all externally mounted/installed electrical distribution boards and the like. Provide a minimum of 1 per switchboard cubical. Sizing to be calculated to a minimum of 20W/m² of the total Height multiplied by Width of the enclosure.
- Provide thermostatic control to anti-condensation heaters, initially set at 25° Celsius.
- Label the switchboard assembly in conformance with AS/NZS 61439.1 including the following:

- Size and type of all incoming and outgoing mains and submains, including protection settings.
- Emergency operating procedures.
- Sub circuits: with IPA studs, colour to match phase, number to match circuit. Plastic 'stickers' will not be acceptable.
- Schedule cards: For general light and power distribution assemblies, provide schedule cards of minimum A4 size, with printed text showing the following as-installed information:
    - Submain designation, rating and short-circuit protective device.
    - Light and power circuit numbers and current ratings, cable sizes and type and areas supplied.
- Mounting: Mount schedule cards in individual holders, one per page, firmly fixed to the inside of the assembly or cupboard door, next to the distribution circuit switches. Protect with hard plastic transparent covers.
- Main switchboards and distribution switchboard assemblies: Provide single-line diagrams wall mounted adjacent to all Main Switchboards and Main Distribution Switchboards. Non-fading print, full size, showing the system as installed. Enclose in a non-reflective frame and wall mount close to assembly. DIT standard legend card to be completed.
    - A DIT standard legend card is available as a Microsoft Excel file, on request.
- Combined Circuit Breaker/Residual Current Devices (RCD) must be installed in switchboards to protect each circuit. For any renovations or alterations which affect outlet circuits RCD protection must be provided.

Distribution boards

- Distribution board to be all metal construction with lockable door. Lock to be flushed with a 604 type key. Separate escutcheon panel is to be hinged-fixed and removable.
- Fitted with an appropriately sized 3-phase main switch (100A non-automatic circuit breaker minimum).
- Minimum 12-pole board with miniature single pole miniature circuit breaker/RCD to all individual circuits. kVA rating to be minimum 6kVA.
- Distribution boards must be sized to ensure there are a minimum of 6 spare ways or 30% spare capacity, whichever is the greater.
- Provide appropriately sized conduits in the wall to areas accessible at the switchboard and communications cabinet with draw wires for electrical and data connection. Minimum access conduit sizes to be 50mm.
- Completion of electrical and data connections to be undertaken following delivery.

Switched socket outlets

- Internal switched socket outlets:
    - must be safety shuttered in ECEC facilities
    - pendant switched socket outlets **must not** be used in ECEC facilities.
    - must be, where possible, located out of the reach of children in ECEC facilities, including in secure lockable cupboards or staff accessible areas.
    - mounted to comply with AS 1428.1 in accessible and fully assisted toilets
- Externally rated, lockable and weatherproof switched socket outlets:

- must be safety shuttered
- must be mounted at 1500mm above floor level in areas accessed by children and students
- in student accessible areas are to be mounted in padlockable weatherproof enclosures with clear flip lid.
- supporting plant or in plant areas must be IP56 rated.

- Refer to the Information and communications technology section for power supply requirements for ICT equipment.
- Provide dedicated power circuits for special applications and equipment (including, but not limited to, dishwashers, microwaves, and hot water systems) used for curriculum activities.
- Installation of floor boxes must comply with DIT Guidenote G167.
- USB power outlets are not to be provided.
- Clearance from the centre of a switched socket outlet and an adjacent horizontal surface must be ≥150mm.
- No outlets are permitted to rest solely on the surface of benches.
- Switched socket outlets may not be installed with their respective outlets facing directly upwards.
- Clearance from the centre of a switched socket outlet above an adjacent benchtop in proximity to gas outlets must be ≥300mm.
- Switched socket outlets mounted below benchtops are to be mounted beyond the flow of gas or water off the benchtop and protected by benchtop cantilever.
- Switched socket outlets in proximity to sinks are to be mounted with clearances in line with AS/NZS 3000.
- Locate switched socket outlets a minimum 1800mm horizontally from safety showers. Locate switched socket outlets a minimum 1000mm horizontally from safety eyewash units.
- Do not install any electrical accessories across junctions of wall finishes.
- Provide a minimum of two 15A switched socket outlets on individual dedicated circuits in each learning community for laptop charging stations[10].
- Where the number of accessories, in particular switches, is large, consider specifying a stainless steel or powder coat finished plate as an alternative to plastic.

Switches

- Provide multi switch positions ganged under one cover plate, arranged in ganged boxes similar in plan to the lighting points controlled. Where more than 6 switches are required at the one location, install mechanisms on a flush mounted multi-gang lighting control panel, with identification labelling. Identification windows must be engraved with the function/area that the switch controls.
- Internal switches for lights, air conditioning and switched socket outlets:
  - are to be mounted in accordance with AS 1428.1. This includes (but not limited to) mounting heights and clearances from internal corners.
  - are to be mounted at 1500mm above floor level in areas accessed by children in ECEC facilities
  - **must not** be fixed to wall(s) through acoustic wall linings. Special linings are to be fixed around switch and outlet locations

[10] Laptop charging stations are a centralised hub designed to charge and store multiple laptops or tablets simultaneously

- **must not**, wherever possible, be fixed over white boards/writeable surfaces/display boards/wall panels/compressible surfaces.
    - Where positioning of an electrical accessory in the location of an above listed surface is unavoidable, the accessory must be fixed securely to the face of the wall surface underneath with a mounting block or spacer to avoid tampering with the outlet cover and potential exposure of live terminals or cabling (see Figure 2)

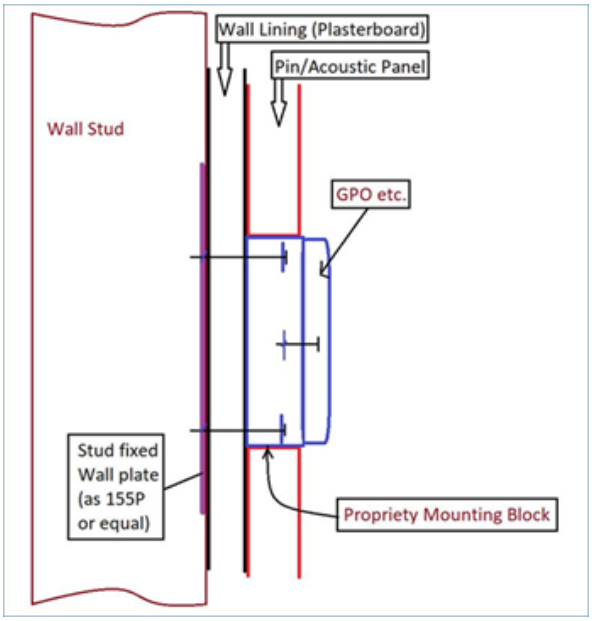


Figure 2: Mounting block detail for electrical accessory installed in the location of a display board, whiteboard or writeable surface.

- are to be 15A rocker mechanism switches (Clipsal 30USM or approved equivalent) screw fixed to mounting plate.
- must have a fixed cover plate with no removable fascia.

- Push buttons (when required) to be Clipsal 30MBPR mechanism or approved equivalent, screw fixed to mounting plate.
- Internal and external switches for lights, air conditioning and switched socket outlets, and any other relevant electrical accessories, must be fitted with phase coloured IPA electrical identification studs to indicate phase and circuit, and a black and white stud to identify the switchboard supply.
- Plant room switches to be industrial type rated IP56.
- An appropriately labelled override/test switch must be fitted externally to the originating switchboard and be accessible without opening the switchboard or its escutcheon panel.
- RCDs are required to all 3-phase switched socket outlets, regardless of current rating.

Appliances and hard-wired equipment

- Stoves, ovens and cooktops to be electric only and to be induction models.
- Ensure switched socket outlets, electrical loading and phase connections are appropriate for selected appliances, particularly where commercial equipment is specified in kitchens and laundry areas.
- For ovens and hot plates:
    - single-phase provide a minimum 20A isolator
    - 3-phase provide minimum 32A isolator.
- Provide all appliances internally wired and complete with control switches, controllers and connecting links.

- Unless stated otherwise, provide an isolating switch adjacent to all direct connected appliances and equipment. The isolation device **must not** be immediately behind the equipment or on the equipment itself but be readily accessible adjacent to it.
- Connect each 3-phase appliance with a separate full size neutral and earth.
- Install the final connection to any equipment installed away from, but within 600mm of, a wall or column in flexible PVC conduit. PVC clad flexible steel conduit must be used for machinery and in workshop type environments.
- Where any equipment is located at greater than 600mm from the wall, where possible, conceal the cabling. Where it is not practical to conceal the cabling, surface-mounted proprietary aluminium skirting ducting, in-floor ducting cast into the slab/flooring or by securely fixed metallic service pole (minimum 3mm thickness) is acceptable.
- In addition, provide a lockable (padlockable) isolation switch below the bench for maintenance purposes in an adjacent cupboard secured from student access.
- Due consideration will be required for the installation environment, including but not limited to:
- Chemical/corrosive resistance may be important in commercial kitchen and laundry environments.
- Plastic-coated flexible metal conduits (such as 'Anaconda' or similar) where mechanical damage is likely.
- Type of environment/product selected to provide a longevity of in-service installation.
- Outlets that are dedicated for individual appliances, such as fridge, dishwasher, microwave, rangehood, water boiling units and hot water service etc, must be installed on individual dedicated circuits, separate from other general-purpose outlets in the area.

Earthing

- Provide a non-ferrous earth electrode pit. Pit to be non-conductive and be encased in 100mm concrete surround (200mm depth) to provide secure installation. Internally the earth connection, must be well wrapped in Petrolatum type tape (as 'Denso Tape') or self-amalgamating tape.
- Provide proprietary earthing and bonding clamps complying with AS 1882.

Circuit protection

- Lighting: 1800VA at 240Vac, 1725VA at 230Vac, on a 10A circuit breaker.
- General Power: 24 double power socket outlets, on a 16A circuit breaker, or 20 double power socket outlets on a 20A circuit for circuits in a permanently air-conditioned environment. For this latter option, strict adherence to AS/NZS 3008.1.1 will be required. Provide calculations of compliance on request.
- Ensure circuit protective devices are sized and adjusted to protect installed circuits
- Calibrate, set and adjust control instruments, controls systems and safety controls.
- Submit test results and compliance certificates prior to practical completion and provide copies in the operation and maintenance manuals.

Cables

- Aluminium cables are not permitted. Written approval must be provided by the department for departure from this standard. Departures will only be considered for consumer mains and sub mains and only where it can be demonstrated that 20% capacity is maintained, and volt drop/carrying capacities are met.
- Cables with conductor size of less than or equal to 35mm^2:

    - Run in conduit, cable ducts or support on cable trays, catenary wire or ladders.
- Cables larger than 35mm^2 must be supported by cable tray or ladders.
- Conduits, ducts, trays and ladders must be sized to allow 30% spare capacity for future additions.
- Cables with diameter less than 13mm:
    - Run in conduit, cable ducts or support on cable trays or ladders.
- Metal framed stud walls: Typically, Install TPS (Data, Communications, Security, and Mechanical or Hydraulic control) cabling, allowing for rewirability within all walls, with vertical drops as the preference (minimising horizontal cabling). Additionally, vertically run cabling is not permitted within the Studwork Electrical Cable Exclusion Zone.
- Effectively bush all cable penetrations in steel framing to prevent cable damage. Cables run in through propriety rolled bell-mouth service holes require no further bushing.
- Horizontal cable trays, ladders, switchboard entries:
    - Fix cables using premium quality and durable proprietary nylon cable ties or straps, cable saddles or clips at AS/NZS 3000 compliant intervals.
- Nylon Cable Glands are required for all Cable Entries.
- Stainless Steel cable ties are required for fire-rated cable systems.
- All cabling below 2100mm to be in steel conduit (earthed), or on cable tray with metallic protection covers. If internal cable tray(s) is accessible to any vehicular traffic, metallic protection covers must be equal to 3mm BMT. Otherwise 1mm BMT (nominal) is acceptable.
- Data and/or Communications cabling must be run in PVC conduit in the walls to enable future rewiring. Minimum size conduit to be 25mm.
- Stud partition:
    - Provide fixed propriety wall plate (typically Clipsal 155P or similar) or fixed wall box (typically as Clipsal 157 or similar).
- Maintain rewirability at the wall plate/box as required.
- Earth and shroud all metal frame partitions at each accessory location/circuit.
- Additional equipotential (minimum) 4mm conductor to be provided to all separate (non-electrically/mechanically continuous) freestanding metal wall systems.

Ceiling mounted accessories

- Document areas where accessories may be mounted direct to the building service.
- All equipment must be adequately supported, considering its own weight, the capacity of what it is installed into, and the environment it is in.
- Installation of ceiling mount accessories must comply with DIT NATSPEC.
- Surface-mounted equipment **must not** be installed using only “wall mate” or toggle bolts into plasterboard without additional bracing.
- No loose items (including, but not limited to, junction boxes, transformers, remote switchgear or battery packs) are to solely rest on top of removable ceiling tiles but are to be securely fixed to ceiling structural supports.
- Pendant outlets:
    - Refer to refer to DIT standard detail Drawing DG54 for installation requirements.
    - Proprietary switched socket outlet suspensions systems to be used consisting of welded closed link chain or catenary wire, secured to the building structure (not the ceiling system).

- All outlets to be independently switched.
- Where 3-phase switched socket outlets are proposed, RCD may be remotely located or be installed within/on the final sub-circuits' originating switchboard.
- Cable must be heavy duty (PVC) flex and typically orange for power.

Emergency isolation switches

- Provide individual and functional emergency isolation switches (40mm button, push to isolate, key operation to reset) to cut supply of electricity and/or gas in each science laboratory, food technology rooms, design and technology workshops. A separate isolation switch is to be provided for the electrical switched socket outlets and any existing gas supply for each room.
- Emergency isolation switches must be in prominent locations free of equipment and fixtures.
- In each teaching space, emergency isolation switches are to be located adjacent to the educator/demonstration bench, with a second switch located adjacent to the main exit of the room.
- Mushroom-head push button shut off switches coloured red with key release for gas and power isolation, to control outlets and hardwired equipment in the immediate area only.
- Provide engraved label 'Power Shut-off' or 'Gas shut-off' 10mm high letters and mounted on the wall, directly above the switch for distant visibility.
- Locate isolation switches for equipment items, either:
  - on secure and separate metallic hot dipped galvanised upstand/bracket, adjacent to the piece of equipment it is serving, or
  - wall mounted (if within/adjacent a wall/structure).
- The isolation switch will only isolate the electrical switched socket outlets and/or gas to that room, not the whole area or building.
- The electrical service to fume cupboards **must not** be controlled by the room emergency switch.
- Isolating switch to all live conductors with minimum 20A rating, such as 2-pole for single phase, 4-pole for three phase.
- Where the air conditioning unit is installed within a cage, the isolator must be located within the cage.
- Isolation switches **must not** be mounted directly on or directly behind the item of plant.
- Where operation allows 2 spaces to combine, the design and user teams must agree on clear procedures for controlling energy supplies. Consider separating 'functional switching' from 'emergency shutdown' controls, in consultation with users.

Surge and earthquake protection

- Provide power surge and earthquake protection to all equipment within the central communications room, using a 3-mode surge reduction filter, installed in a visible location.
- Provide local transient surge protection for electrical circuits supplying power to all data/communications cabinets/racks and to all administration and other critical function ICT infrastructure.
- The following electrical services components and their fastenings must be designed for earthquake forces in accordance with Section 8 of AS 1170.4:
  - Communication systems (such as cable systems motor control devices, switchgear, transformers and unit substations).
  - Utility and service interfaces.
  - Lighting fixtures.

- Electrical panel boards and dimmers.
- Ducts and piping distribution systems.
- Pipe support systems to comply with DIT NATSPEC requirements.

Lighting

Natural lighting must be used wherever possible and artificial lighting must be designed to complement natural lighting. High efficiency luminaires must be provided to promote energy savings and provide ease of maintenance and replacement through local contract arrangements.

- Light-emitting diode (LED) lighting must be specified for all areas unless specialty lighting is required or where LED lighting is not appropriate.
- LED products must have a minimum product warranty of 10 years and preferably be Australian made.
    - The supplier must guarantee availability of spare parts for no less than 20 years from the date of purchase, including LED driver, boards and light diffusers.
    - Installation contractors must give manufacturer certification for the 10 year warranty and 20 year parts availability warranty.
    - Replacement of parts must be possible on-site without the requirement of sending equipment to manufacturers.
- High energy efficiency and low maintenance lighting solutions must be investigated where LED lighting is not appropriate while ensuring that adequate lighting levels are not compromised.
- For all luminaires that are within easy reach, mounted less than 2100mm AFL, such as in-ground uplighters, wall lights (recessed or surface-mount), the touch-temperature of all exposed parts **must not** exceed 50°C.

Internal lighting

- All lights are to be flicker free and must be specified in accordance with AS/NZS 1680.0.
- The colour rendering index[11] of internal LED lighting must be >90.
- In learning areas, including learning resource centres, the general light source should have a Melanopic Ratio of 0.95 or greater. This improves awareness and study concentration.
- The correlated colour temperature (CCT)[12] of LED lighting must be:
    - 3000K in performance and presentation spaces, gymnasiums, library, breakout and regulation spaces, sleep rooms, quiet and rest spaces, parenting rooms, multi-faith rooms, reception, staff lounges and amenities areas
    - 4000K in learning and play areas, community and cultural spaces, offices and work areas
- 5000K in outdoor sports applications.
- Provide LED luminous efficacy of the LED luminaire at normal operating temperature in its normal position and enclosure of >90 lumens per watt.

[11] Colour rending index (CRI) is the measurement of how colours look under a light source when compared with sunlight. The index is measured from 0-100, with a perfect 100 indicating that colours under the light source appear the same as they would under natural sunlight.

[12] Correlated colour temperature (CCT) defines the colour appearance of a white LED. A warm light is around 2700K, neutral white around 4000K and cool white at 5000K or more.

- Lighting levels (lux) are not to exceed 'best practice' illuminance as defined in AS/NZS 1680.0 by more than 25%, and the maintained illuminance values achieve a uniformity of no less than the values given in table 3.2 of AS/NZS 1680.1.
- In multi-purpose halls/gymnasiums luminaires must provide a minimum of 320 lux, be mounted at maximum height, and be of impact resistant construction with shatterproof diffusers. High bay LED impact resistant fittings are preferred. Luminaires in these spaces should be rated for ambient 50°C to ensure adequate operation through summer months.
- Luminaires in other high-risk locations (such as workshops, plantrooms, internal carparks) must be impact resistant and located in a space protected from impact damage. Preference is for such luminaires to be mounted to structure at high level, not suspended.
- In rooms with a focus on screen-based tasks, the lighting must be in accordance with AS/NZS 1680.2.2.
- Glare from lights:
    - is to be reduced with diffusers and appropriate lighting designs
    - in standard learning environments is to aim for a Unified Glare Rating (UGR) of <19
    - in specialty/technical learning environments, such as senior art, engineering and design and technology workshops, aim for a UGR of <16.
- Where existing fittings are being retrofitted with LED lighting, LED tubes must be Australian Standards approved and be opaque.
- Luminaires must be installed on proprietary supports by means of battens, trims, noggings, roses and packing material. Luminaries **must not** be supported by ceiling linings.
- Provide large terminal blocks suitable for 3 x 2.5mm^2 conductors in all luminaires.
- Diffusers to be hinged frame type.
- For luminaire types with changeable lamp, only provide a propriety screw fixed gear tray cover to cover all internal control gear and associated wiring, to allow safe servicing of lamps/tubes for maintenance purposes by non-licenced workers.
- Minimum cable (multi-strand conductors) size must be 4mm² for light circuits.
- Suspended luminaires must be rod fixed (solid or threaded rod) and have gimbal galleries at the ceiling line to permit inadvertent movement. This allows for any installation on raked ceilings. Where threaded rod is used, quantity of rods is to be chosen to provide a sturdy installation of the luminaire. Minimum rod size is 8mm.
- Stainless steel (multi-strand) levelling wire is only acceptable if rod suspension is not practical. Minimum 4 wires and 4 individual anchor points in a rectangular arrangement, at least 100mm apart at the luminaire and running up parallel up to the ceiling.
- Where narrow bodied luminaires (less than 100mm wide) are chosen, suspension systems must be solid/threaded rod.
- Electroplated welded link chain is acceptable for use in workshops only. Where link chains are used, they must be a minimum of 4 chains and 4 individual anchor points in a rectangular arrangement, at least 100mm apart (width) at the luminaire ends, running parallel up to the ceiling.
- To avoid strobing effects, luminaires must be installed so that a 600mm horizontal distance separates them from the edge of ceiling fan blades.
- Luminaires in general facilities (learning areas and administration areas) must be standard recessed fittings in T-bar ceilings or surface mounted luminaires in flush ceilings.
- Install recessed luminaires in trimmed openings in suspended ceilings.
- Recessed luminaires with a lip <20mm **must not** be used.

- Surface mounted luminaires:
    - less than 150mm wide must have a single fixing at each end in conjunction with 1.6mm backing plates
    - greater than 150mm wide or in vandalism prone locations must have a minimum of 4 anti-vandal screw fixings to the diffuser to prevent access to the internals of the luminaire
    - **must not** be fixed directly into ceiling linings.
- LEDs may be located above 2700mm AFL and recessed due to the expected life and maintenance requirements of LEDs.
- Where lights are accessible, they should be detention or vandal resistant types with screw fixings for safety reasons.
- Provide control gear support enclosure within the body of the luminaire, except where remotely mounted control gear is documented or required by the manufacturer.
- Remote control gear **must not** sit solely on top of a T-bar ceiling tile, instead must be firmly attached to the luminaire or nearby ceiling support system.
- Luminaires **must not** be located directly above toilet pans.
- Luminaires in design and technology workshops to be mounted at the highest level, where possible.
- Where ceilings are lower than 2400mm and in large resource centres with T-bar ceilings, luminaires must be recessed.
- Provide seismic restraint safety wires to comply with Section 8 of AS 1170.4 to all luminaires.

Dimmable lighting

Dimmable lighting must:

- be provide by LEDs (Clipsal LED dimmer mechanism or equal approved) which are compatible with the LED driver
- ensure there is no flickering across the full dimmer range
- have controls screw fixed to the face plate
- be hard wired
- include a push button or rotary dimmer mechanism
- not have both dimming and colour change capabilities.

Lighting controls

Infrared occupancy sensors

Ensure occupancy sensors are located so they are not unnecessarily tripped by persons walking in the adjacent space/corridor, noting larger spaces may require more than 1 sensor.

Infrared occupancy sensors are to:

- be installed in series with mechanical light switches
- be set and commissioned to operate for a minimum 20 minute ‘on’ period.

Electronic timer switches

In areas with irregular activities and classes, timer switches must be specified to reduce energy usage.

Electronic timer switches to be adjustable between 5 minutes and 2 hours. Initially set timers at 20 minutes and make final adjustments in consultation with end user groups. Provide indicator light to be activated

when artificial illumination is ‘off’.

Electronic timer switches are to be installed in multi-purpose halls/gymnasiums set at a 2 hour ‘on’ period. Consideration must be given to safe access lighting when the 2 hour ‘on’ period expires and the space is still occupied, ideally by the installation of a infrared occupancy sensors to bring the lights back on.

Switching

- Refer Switches subsection under Switched socket outlets section of this document.
- Lighting controls must be hard wired.
- Provide both manual control switching for user control, and infrared occupancy sensors.
- Provide integral photo electric switch units adjustable between 50 and 1000 lux in internal applications and compatible with selected lighting controls systems.
- Switch lighting in banks and rows to suit varying light requirements to use natural daylight wherever possible and to reduce energy consumption.
- Banks must be clearly labelled.
- Provide one bank of lighting to interactive display, whiteboard or AV presentation areas within learning areas and meeting spaces. Manual switching to ‘off’ for this bank of lights must override any occupancy sensors to switch lights ‘on’ again.

External lighting

- Proprietary solar external lighting systems are supported where service trenching costs would otherwise be significant. Solar lighting is required to have an acceptable level of anti-vandalism design. Must consult with the Security and Emergency Management team.
- Fittings are to include impact and weather resistant housings.
- Luminaires must be of corrosion resistant materials such as die-cast marine grade aluminium or UV resistant polycarbonate. Diffusers must be polycarbonate.

Security lighting

The surface method or target directed lighting is most effective in education and care facility environments. Targeted lighting is directed at the building rather than away from it. This means that potential offenders close to a building are clearly illuminated.

- Vandal resistant to (IEC 62262) IK10, energy efficient security lights supplying an adequate level of security as specified above must be provided around all buildings, preferably at eaves level and under verandas. These must be installed above 2700mm AFL and have vandal resistant stainless steel diffuser clips secured with stainless steel retaining screws.
- Effective security lighting must provide between 30 and 75 lux to provide adequate security levels.
- Courtyards and hidden areas must be illuminated.
- Security lighting luminaires must be mounted in a horizontal position and be operated by photo-electric solar switches (daylight sensors). Maintenance override switches must be provided in all switchboards supplying power to external lighting circuits/luminaires.
- Daylight sensors must be installed on buildings (south side) and operate dusk to dawn.
- Consider using movement activated lighting to reduce electricity usage and provide access lighting for staff movement after hours.

Access lighting

- Access lighting must be provided to pathways, steps, ramps and car parks to allow safe access to and between buildings. Luminaires with high pressure sodium lamps are preferred for this application.
- Lighting must comply with the Discomfort Glare Index (DGI) requirements of AS/NZS 1158.3.1.
- Pole or building-mounted luminaires must be used for access lighting. As far as practical all luminaires must be directed vertically downward and must have a light distribution cut-off not exceeding 80 degrees from the vertical (no light above horizontal).
- All external light poles must be a minimum of 4m high.
- Bollard lighting **must not** be used.
- Consult with the department's Security and Emergency Management team for advice on carpark lighting level requirements.

Flood lighting

Security issues must be mitigated with the use of appropriately located access lighting. Where unavoidable, floodlighting can be provided at a minimum height of 5m above ground. Floodlights aimed horizontally or near horizontally are not acceptable and must be designed to minimise nuisance lighting into neighbouring properties.

Refer to AS/NZS 4282 to minimise external light pollution to neighbouring bodies and to the night sky.

Security

The Security and Emergency Management team (SEM) has established security design standards for the following, ensuring compliance with best practices and industry regulations:

- Access control
- Closed Circuit Television (CCTV)
- Emergency Warning Interconnection Systems (EWIS) and Occupant Warning Systems (OWS)
- Fire detection systems
- Security systems.

These standards include sensitive information relating to system configurations, operational protocols, and security measures designed to protect assets and personnel. Due to the confidential nature of this information, further details can only be provided upon request. For more information, please contact SEM directly via education.securityandemergency@sa.gov.au or 1800 000 279.

Information about fencing and gates is available in the Site Fixtures section below.

Emergency evacuation and exits

All emergency exits must be compliant with AS/NZS 2293.1 and NCC E4D8, clearly signposted and easily located. Emergency exit signage must comply with the requirements for fire safety certification.

To meet National Regulations 97 and 168, emergency evacuation procedures (including instructions about what must be done in the event of an emergency and emergency evacuation floor plans) must be clear and concise and displayed near each exit in a prominent position to show the specific location and emergency evacuation routes to be taken to the nominated assembly point.

Evacuation diagrams

Providing or updating emergency evacuation diagrams forms part of the minimum requirements for construction projects undertaken at department sites.

Evacuation diagrams must be prepared by a third-party provider (see here for a list of approved providers) and must be:

- positioned between 1.2 and 1.6 metres above floor level
- A3 size as a minimum
- titled 'evacuation diagram'
- have a 'you are here' location on each diagram
- identify North
- exit points, identified in green
- warden intercommunications points, identified in red
- manual call points, identified in red
- emergency call points, identified in white or with black borders
- main controls or panels for any occupancy warning system equipment or fire indicator panel
- hose reels, identified in red
- fire extinguishers and fire blankets, identified in red
- first aid stations and kits, identified by a white cross on a green background
- eye wash stations and any HAZCHEM response safety measures
- paths of travel, identified by green arrows
- location of assembly area(s)
- a legend to reflect any symbols used
- date the evacuation plan was published
- date the evacuation plan must be reviewed.

Safe egress (second exit)

Safe egress (second exit) for staff must be provided in spaces identified in the Part 3: Generic Functional Briefs (3a: ECECs and 3b: Schools) where 1:1 interactions may occur (see Figure 3 as an example).

The preferred configuration should include (see example in figure 3):

- 2 doors located opposite each other - one leading from a public accessible area (foyer)/main entry point and the other from a staff area
    - in ECECs not the children's education and care spaces/open space
    - in schools not student learning spaces
- door access from the public area/main entry point to open inward, from the staff area/open space to open outward
- door to staff area/open space **must not** be fitted with privacy bolts or turn knobs.

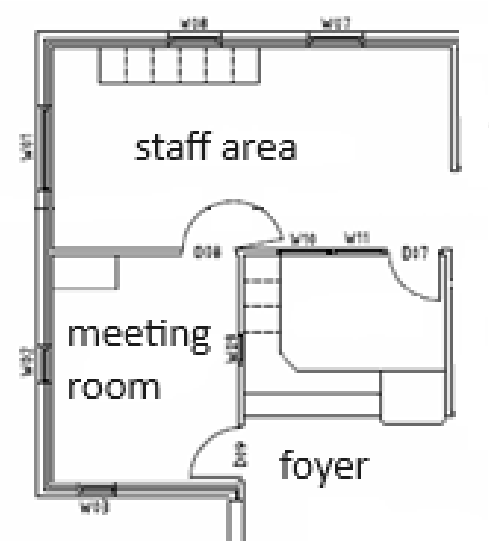


Figure 3: Example of safe egress door configuration.

Occupant Warning Systems (OWS)/Emergency Warning and Intercommunication System (EWIS)

- EWIS complying with AS 1670.4 are required in:
    - buildings having a rise in storeys of more than 3
    - theatres, halls and gymnasiums used for large gatherings or performances that have a floor area of more than 1000m^2 or a rise in storeys of more than 2.
- Confirm with Security and Emergency Management team the appropriate design performance requirements prior to procurement and installation.
- EWIS and OWS are not required in standalone toilet amenities buildings. Ensure there are external speakers mounted to adjacent buildings in the vicinity.
- The installation of IP-based audio systems to meet the single or combined functions of emergency warning, paging, school bell, public address systems (such as AcroVista BellCommander software and Barix Exstreamer devices) is not permitted.
- Wiring, zone descriptions and communication standards must be to the department's and Police Security Services Branch (PSSB) requirements.

Emergency call system (accessible and fully-assisted toilets)

- In accessible toilets, mount the assistance call button adjacent to the toilet roll holder within easy reach of the cohort using the pan, at 900-1200mm above floor level and ≥50mm clearance from any other wall mounted fixings.
- In fully-assisted toilets, mount the assistance call button on the wall behind the pan, 900-1200mm above floor level and ≥50mm clearance from any other wall mounted fixings.
- The warning device must continue to operate until it is reset via the security software workstation or at the point of activation (subject to the type of call button provided).
- Locate an audible and visual warning device outside the accessible toilet and in an administrative area where a staff member is permanently located during operation hours.
- An audible and visual warning device installed in an administrative area to ensure rapid physical response to the activation of an assistance call must be clearly labelled with the location of the associated alarm activation button (such as ACC TOILET – BLDG 3 – GROUND – RM 201). The label should be legible from the ordinary seated position of a staff member expected to monitor the audible and visual warning device.

- Security alarm systems must be programmed to report assistance calls as a medical alarm or other appropriate description using the approved Contact ID codes for PSSB. Under no circumstances is an accessible toilet alarm or other assistance call (such as balconies and cool rooms) to be programmed and commissioned as a duress alarm.
- Where necessary, special alarm instruction forms may be submitted to PSSB to ensure patrol attendance if assistance calls are activated outside of the normal operating hours for a site.

Security Closed Circuit Television (CCTV)

The Security and Emergency Management team has established CCTV security design standards ensuring compliance with best practices, industry regulations, and both state and national legislation on the installation of surveillance devices.

Security system design, including component layout, and CCTV locations must be validated by the department's Security and Emergency Management team prior to the completion of project design documentation.

All CCTV cameras must be internet protocol (IP) and power over-ethernet (PoE) capable and use the building's common structured cabling system. Double field outlets (double datapoint) for CCTV cameras must be provided near all building entry/exit doors, subject to a security system design review.

Information and communications technology

Structured cabling for buildings

Facilities are to be designed with a future focus and must use one common structured cabling system within a building.

The structured cabling system must cater for the convergence of multiple building sub-systems using low voltage cables, consistent with the intent of standard AS 11801.6.

A converged network is a single communications network infrastructure that supports transmission of multiple types of services, including:

- computing data
- voice/telephony communications
- audio-visual content
- security system components, such as access control and monitoring, including CCTV cameras
- building sensors or Internet-of-Things (IOT) such as lighting control, HVAC plant, vape detection
- energy management and EV charge systems
- power-over-ethernet (PoE) distribution of low voltage DC power to capable devices or lighting in support of future Net Zero initiatives.

The structured cabling system must be a robust and reliable design for the long-term, with the selected cable manufacturer to supply equipment, installation, and an application performance guarantee. The design must also allow for flexibility, being easily adapted to changing floor plan requirements at minimal operating cost.

Design of structured cabling

Selection of the appropriate structured cabling design must consider the type of building project and scale/volume that is required of the structured cabling system. There are 2 types of structure cabling design, Cross-Connect or Inter-Connect, as described in the following sections.

Table 11: Scenarios where each type of structured cabling design is preferred.

Building Scenario	Cross-Connect Design	Inter-Connect Design
New site		
New building on new site High density Field Outlets, 192 or greater, for each horizontal floor distribution (Inclusive of 30% spare capacity across all Service Consolidation Points)	✓	×
Less than 192 field outlets, per horizontal floor distribution	×	✓
Existing site		
New stand-alone building construction on existing site High density Field Outlets, 192 or greater, per horizontal floor distribution	✓	✓
Less than 192 field outlets, per horizontal floor distribution	×	✓
Refurbished existing building (part or all) on existing site Consider existing structured cabling system provisions	×	✓

Structured cabling key points

- Campus and building backbone sub-system must connect the core node directly to other edge nodes (per STAR topology, see communications cabinets section) in every instance.
- Backbone sub-system cabling must be of a minimum 12 core optical fibre type media (single mode (SMOF) or multi-mode (MMOF) optical fibre subject to existing site provisions and conditions), be electromagnetic compatibility (EMC) compliant and comply with AS 11801.1.
- Existing sites should match the existing backbone fibre optic media for best compatibility, that is OM3 or OM4 media. Where this is not possible, due to distance or other limitations, SMOF OS2 media must be used instead.
- All new sites must use SMOF OS2 media for the backbone sub-system through-out.
- All optical fibre cores must be terminated in fibre trays with LC connectors.
- Horizontal cabling sub-system to the field outlets must be EMC compliant and comply with AS 11801.1. All low voltage cabling must be low smoke, zero halogen.
- Horizontal cabling sub-system must be installed as per AS/CA S009 and manufacturer installation guidelines and be kept separate from 240v power cabling by at least 50mm or a physical barrier.
- Where there are more than 48 cables together, they must be reticulated using wire mesh trays. For less than 48 cables, they must be reticulated using catenary in bundles of up to 24 cables.
- To allow for ongoing horizontal cabling modifications, each SCP servicing a specified floor plan zone must include an additional 30% available connection capacity over and above the initial number of field outlets required.
- All communications cabling must be tested to the requirements of AS 11801.1 in accordance with IEC 61935.1 (copper) and AS/NZS 14763.3 (fibre) and a test report provided as a permanent record of the implementation.
- All fibre trays, field outlets, SCPs and SDFs, and inter-connect patch panels must be labelled in accordance with AS/NZS 3085.1.

- All patch cords and fly leads supplied must be stranded conductor and from the same cabling manufacturer as the backbone and horizontal cabling.

Cross-connect design

The building's common structured cabling must:

- allow converged operational networks to function without separate building wiring infrastructure and avoid duplicated capital cost
- ensure performance of each network application both known and emerging
- provide flexibility to change the physical configuration as required
- minimise both maintenance and support effort, and operational costs over the life of the building.

A cross-connect structured cabling design is illustrated in Figure 4 and Figure 5.

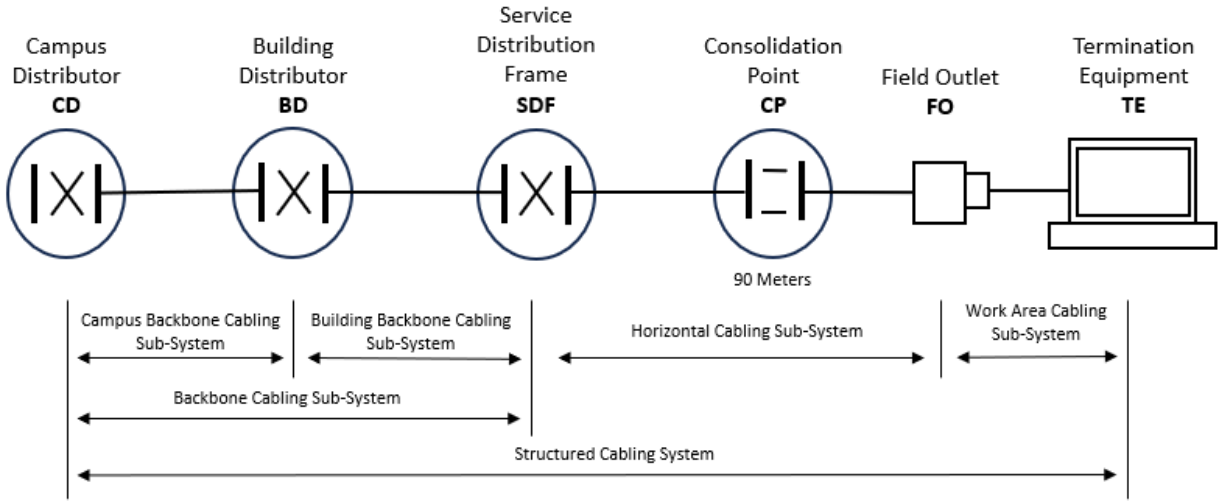


Figure 4: Cross-connect structured cabling design.

The cross-connect design approach concentrates field outlets (data points) within a given zone of the floor plan to a Service Concentration Point (SCP). Each SCP has capacity over and above the initially required field outlets in that zone. All SCP cables are home-run to the stand-alone service distribution frame for a horizontal floor distribution. Active network equipment is connected into the service distribution frame.

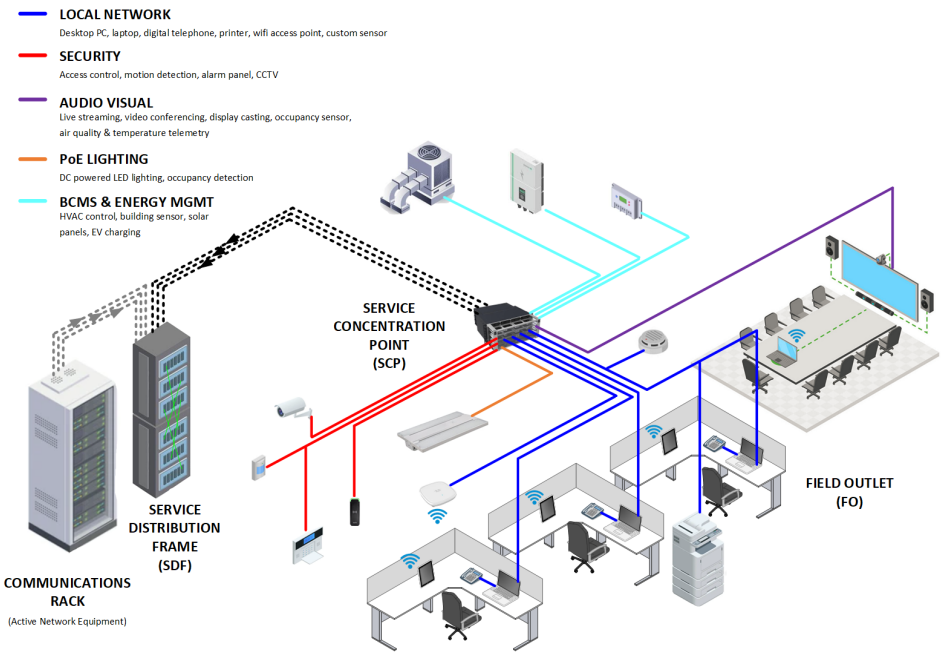


Figure 5: Layout of a cross-connect design approach.

Field outlets are cross-connected at the Service Distribution Frame (SDF) to active network equipment. This flexible cabling design allows:

- any field outlet to connect to any active network equipment (building sub-system) without limitation
- field outlets to be quickly commissioned and decommissioned without having to install new horizontal cable from the field outlet floor position to the SDF.

The cross-connect design copper cabling is to be installed as a pair-managed cross-connect solution using patch cords that present a uniquely identified label on each end of the patch cord in the SDF. The performance level must be Class EA (Cat 6A) Permanent Link and Channel.

Given the high-density field outlet requirement of a converged network, the department's preference for a cross-connect design installation must use the CommScope copper cable and connector system listed below, which includes site-wide installation certification and assured application performance.

- Systimax GigaSPEED X10D 3091B ETL Verified Category 6A U/UTP Cable
- Systimax VisiPatch 360 System
- Systimax Assurance

Structured cabling:

- Patch cords used within an SDF must be uniquely identified with a common label at both ends of the patch cord.
- Patch cords at the field outlet - connecting endpoint devices - are standard and not required to be Ultra-Thin type.

Inter-connect design

An inter-connect design differs from a cross-connect design as it connects field outlets directly back to a floor distributor panel within a single communications cabinet (see Figure 6 below). It limits connection to the active network equipment to only that available within the single communications cabinet location.

Post installation, the provision of additional building Field Outlets in this scenario will be more costly and time consuming due to any new horizontal cabling requiring pathway access and cable length from Field Outlet to Floor Distributor. However, the initial capital cost is reduced for this method as there are fewer cabling system components initially installed.

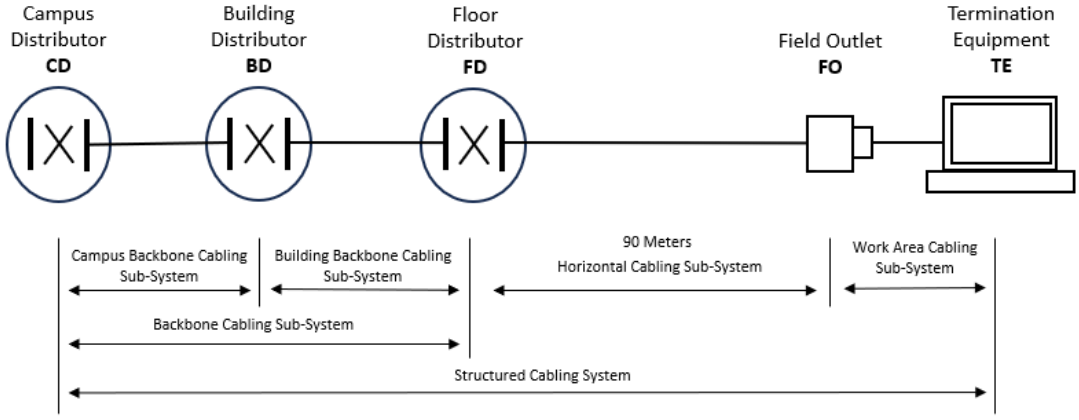


Figure 6: Layout of an inter-connect design.

The existing cable manufacturer products as installed at each site must be maintained when extending or remediating the structured cabling system wherever possible.

Fibre-optic, copper cable and connector systems from a single manufacturer must be used throughout the site, of either CommScope or Panduit manufacturer which includes installation certification and cable performance guarantee for a period of 20+ years. The copper cabling performance level must be Class EA (Cat 6A) Permanent Link and Channel.

Structured cabling:

- Ultra-Thin patch cords (flexible and malleable) are preferred for cable management within individual communications cabinets.
- Colour-coded patch cords must be used to identify different types of Field Outlet functions within an individual communications cabinet. Refer to department ICT Services for quantities required per each project.

GREEN	Administration network wired device field outlets.
BLUE	Curriculum network wired device field outlets.
PURPLE	Wireless access point (WAP) field outlet.
YELLOW	Telephone field outlet.
RED	Security system data gathering panel, security device/detector/reader or CCTV field outlet.

- Patch cords at the field outlet - connecting endpoint devices - are standard and not required to be ultra-thin.
- Two (2) patch cords must be provided per connected field outlet. Cable lengths and colour-code cable quantity to be confirmed prior to hand-over of the building from construction project.
- Cabling sub-contractors installing the communications cabling must have a minimum of ACMA Open Cabling Registration (OCR) **and** be certified to install the nominated cabling manufacturer product to ensure a 20-year warranty can be applied and maintained for the whole site.

Communication Room(s)

- Access and circulation space to comply with Australian Standards (AS/CA S009, AS/NZS 3084)
- Cross-Connect structured cabling will require adequate and accessible wall space for a Service Distribution Frame to present Field Outlets and Active Network Equipment.
- Inter-Connect structured cabling will require adequate cable management trays and cable pathways internally within the communications rack.
- The department's ICT Services division must be consulted for the quantity and physical measurements of equipment required to be accommodated within each communications rack
- All cabinets and metallic components within the cabinets must be earthed in accordance with AS/CA S009. Contractors are to verify the existence/soundness and if necessary, upgrade the earthing requirements must it be found that the earth is not there, damaged, or presents high impedance readings when tested.
- Communications room flooring must be:
    - durable (weight and traffic of equipment and personnel)
    - flat/level, moisture resistant, and anti-static to prevent damage to sensitive electronic equipment.
        - Vinyl, epoxy flooring or polished and sealed concrete are acceptable static electricity dissipative choices.
        - Carpet flooring is <u>not</u> to be selected/installed.

Core Node (campus distribution)

- The Core Node will allow for multiple floor-standing 800Wx1200Dx45RU communications racks as the design requires (with a future option to add further identical racks).
- Communication racks must be secure key lockable with two side front and rear access, and clearance of minimum 1 meter distance all around. Internal rack rail supports must be positioned at

600Wx1000D footprint to accommodate standard server support rails, shelving and UPS mounting rails.

    - Each core node 45RU communication rack must have separate 2x 15A minimum surge protected circuits, each connecting a power distribution unit (PDUs) with minimum 20x AU outlet sockets.

- Temperature Control
    - a dual air-conditioning solution with sufficient redundancy must be provided, with a heat rejection load of 100% of the heat load of intended initial equipment with an additional 25% to cater for future growth
    - the temperature needs to be maintained at 22-24ºC with a relative humidity between 40%-60% (maintained by all units simultaneously)
    - there must be an audio-visual alarm facility for alerting of room temperature outside of this range, set at 25ºC, for example a red light flashing located outside the room.
    - there must be a second alert for shutdown facility provided at 27ºC - to a sequential mobile phone list developed by the site that continues to loop until it is answered by someone on the list.

Edge node (building distribution)

- An Edge Node will allow for one or more floor-standing communications racks depending on the hosting requirements from the horizontal floor plan.
    - separate surge protected circuits are still required, along with PDUs with sufficient AU outlet sockets to cater for quantity of active network equipment plus spare capacity
- Communication cabinets must be secure key lockable with front and two side access and clearance of minimum 1 meter distance all around.
- Subject to field outlet density and active network equipment required - a small wall mounted communications cabinet 800Wx800Dx12RU can be sufficient for an Edge Node - this is the maximum size acceptable for a wall mounted communication cabinet.
    - The specification of a swing frame cabinet permits the required access to active equipment. In this case, sufficient cable length must be allowed within the communications cabinet to allow swing arc to not be restricted, and not to impede network equipment installation within the rack.
    - Wall mount communications cabinets must also be secure lockable and installed at an accessible height to avoid introducing a workplace safety risk for equipment access and maintenance.
- Temperature Control:
    - in locations that only contain network switches and adequately passively ventilated space along with an exhaust fan must be provided with a local thermostat to activate the fan set to 24ºC to on. The exhaust fan **must not** cause acoustic issues to the facility when running.

Servers and Data Storage

Education and care facilities will adopt a ‘cloud first’ approach to network services and ICT solutions.

Where a cloud-based solution does not make sense for accessibility, performance, security or other compelling reasons, a local server and/or data storage hardware option may be required. Where equipment is required on-premise it must:

- be installed within the Core Node communications room only
- use scalable and redundant hardware

- consolidate physical servers and disparate Administration and Curriculum server environments to a common robust hardware platform
- use standard hypervisor of Microsoft HyperV for managed virtual server instances
- be compatible with Dell Open Manage portal for server monitoring and remote management
- use only core network services provisioned by the Education gateway router or firewall, such as routing, DNS, DHCP, NTP
- use authentication from Microsoft Azure based Active Directory for @schools accounts, via HP Aruba ClearPass central policy appliance and EdPass Single-Sign-On facility
- preference the cloud-based Microsoft InTune / AutoPilot for endpoint management including hardware deployment and ongoing policy management
- ensure device maintenance and patching mechanisms are in place and operating effectively
- provide data backup to a local storage target, and upload to department sponsored, Education central tenancy Cloud-based storage, for multi-layer data resilience and recovery

Server hardware platforms are pre-configured and sized in preparation for a given ICT solution data processing and storage requirements per the number of connections required. Any number of virtual servers can be assigned a portion of the hardware resources, to the limit of the hardware available. Hardware resources **must not** be over provisioned such that server operations are put at risk.

Table 12: Server hardware platforms

Name	Processor	Storage	Connections	Format
Small	12 core CPU	64gb / 8TB	150-300	Rack only
Medium	16 core CPU	128gb / 12TB	Multiples of 300	Rack only
Large	20 core CPU	128gb / 15TB	Multiples of 600	Rack only
Extra Large	Multi CPU	Custom	Custom	Custom

Uninterruptable Power Supply (UPS)

Education and care sites must be designed to provide a UPS for the core node only, for the purposes of providing (surge protected) power supply for core network equipment, and for automated graceful core equipment shutdown in the event of an extended mains electrical supply outage.

- A UPS of 3000VA capacity will be provided by the department's ICT Services Division for the core node communications rack and deliver power to one PDU via one of the two 15A surge protected circuits. The electrical cabling and connectors must suit 15A socket outlet to UPS input (C20 male), and then UPS outlet (C20 male) to PDU.
- A dedicated 15A switched socket outlet must be provided for any other UPS equipment (less than 3000VA) specified by the site for any edge nodes, or any other electrical equipment requiring power supply redundancy.
- If a UPS that is more than 3000VA is briefed, then an electrical circuit greater than 15A is required. Each UPS over 3000VA will require a bespoke, dedicated hard-wired circuit incorporated into the electrical design.

Networks

Wired network

Education and care sites require suitable enterprise-grade managed network equipment, designed, installed, and maintained by the site's ICT support services. Active network equipment must be provisioned to the capacity of connected field outlets required, plus 30% growth allowance where practicable.

- Active network equipment may connect a variety of device types using the structured cabling system (refer 'Structured cabling for buildings' section). A site's wired network must be capable of integrating data, voice, video, security, audio visual and building monitoring and automation services (including HVAC, lighting, access control, energy management) using common network protocols and low voltage Power over Ethernet (PoE) provisions.
- The quantity and location of wired network connections (field outlets or datapoints) is defined as part of a site's low voltage electrical design to ensure that adequate building infrastructure is being provided to meet site operational needs.
- The department's ICT Services Division and the electrical engineer must meet with the site to establish all the devices to be connected and translate this into an electrical design. For example:
    - A typical staff workstation provision would include two (2) field outlets. Reception or student services workstations may have additional connection requirements for printers, point of sale devices, security computers or telephone handset.
- A double switched socket outlet and double datapoint should be installed to stand-alone Multi-Function Devices (MFD) (copy, print or scan devices) or stand-alone printer locations.
- The number of connections to specialist learning areas are to be determined based on activities and the associated specialist device requirements.
- Wired network communications are separated into local sub-networks to reduce network congestion/response times and optimise data transmission routes. The default virtual local area network (VLAN) specification is as follows.

Table 13: Virtual local area network (VLAN)

Network Name	Subnet Size	VLAN ID	Firewall Zone
Administration	254	100	Administration
Digital Telephony	254	130	VOIP
Curriculum resources	510	200	Curriculum
Curriculum wired clients	1022	210	Curriculum
Curriculum wired clients	1022	215	Curriculum
Curriculum wired BYOD	1022	220	Curriculum
Curriculum wireless clients	1022	410	Curriculum
Curriculum wireless clients	1022	415	Curriculum
Curriculum wireless BYOD	1022	420	BYOD
Curriculum wireless BYOD	1022	425	BYOD
Curriculum staff wireless clients	510	430	Curriculum
Curriculum guest wireless clients	510	435	BYOD
Provisioning network	254	440	Provisioning

Network Name	Subnet Size	VLAN ID	Firewall Zone
Infrastructure management	510	500	Administration
Audio Video network	510	550	AV
Security and Building management	510	600	Facilities

- Where a wired network is combined with a partner site, a variation (extension) to the VLAN specification above will be required to manage segregation of network traffic between the two entities and will be described as part of a specific site ICT environment variations and as-built documentation.

Wireless Network

Wireless network coverage must be available throughout all internal areas except for toilets, storage, circulation and other utility areas. Coverage must also be provided for undercover and outdoor learning areas where practicable. The general specifications for Wi-Fi coverage are as follows, however can be customised during network design to cater for specific requirements/specialist technology areas:

- Minimum -67db signal strength, both primary and secondary Access Point (AP) coverage
- 50-80 client connection density per AP
- Optimised for 6Ghz and 5Ghz frequency coverage, as least contended frequency band
- Wifi 2.4Ghz frequency is disabled due to the frequency being highly contested with minimal signal range.

A predictive WiFi survey (software based) completed by the department's ICT Services division must be used to account for as many WiFi variables as possible, including the site's layout, wall materials, and other sources of radio frequency interference. The result is a wireless network design (also known as a WiFi heat map) capable of providing sufficient coverage, connection density, and to determine the ideal placement of wireless APs for a cost-effective implementation.

An active scan of the WiFi coverage by the site's ICT support services post network installation will check and validate the design decisions formed using the predictive survey and remediate any wireless network coverage issues discovered.

- A double field outlet (double datapoint) must be provided at every specified wireless AP location defined by the heat map and will be optimised on a per project basis.
- Field outlets for APs must be mounted on the ceiling wherever roof structure allows and/or accessible as block terminations on loose cable in a suspended ceiling space.
- Interior APs will be mounted to the underside of the ceiling tiles and connected to ceiling-mounted field outlets or within the suspended ceiling space using a short network patch lead. APs installed within gymnasium spaces must be installed with impact guards to avoid accidental equipment damage.
- Interior APs **must not** be mounted in such a way as to have the radio frequency transmission obstructed by other ceiling mechanical objects such as air-conditioning ducts, cable containment trays, extraction vents, water or waste pipes or other similar ceiling fittings. If in doubt, wireless APs should always be mounted at the same AFL height as the lighting in each room.
- Outdoor APs will require consideration of mount point and antenna orientation, and tamper protection.
- The department will provide all APs for at-height installation by a building construction sub-contractor. The department will commission all APs onto the managed network at the site once connected.

Telephony

Consideration must be given to construction project impacts to a site's telephone system. A digital telephone Voice-Over-Internet-Protocol (VoIP) system must be provided for all new facilities and existing facilities undergoing major refurbishment.

- On-site PABX systems are end-of-life and must be decommissioned as part of major refurbishments of existing facilities. An upgrade to digital telephones must comply with the whole-of-government Voice and Unified Communication Services (Category 3) agreements, with Cisco Webex Calling platform the department selected solution.
- Digital telephone handsets connect using the common structured cabling system in the building. Field outlets or datapoints must be installed to the required handset locations, either wall mounted handset at 1500mm AFL or a desktop handset.
- Where a telephony upgrade is identified, department ICT Services must design, price and support the digital telephony implementation.

Distributed Antenna System (DAS)

- The requirement for a DAS solution must be determined by an active scan of each mobile carrier's signal strength and performance both inside and outside of a new or refurbished school building.
- The DAS solution design must consider any technical, structural, and/or architectural constraints, comply with any applicable regulatory conditions and standards (building codes, electrical safety, etc) plus any health, safety and welfare laws and regulations.
- Building/construction stakeholders and sub-contractors must ensure engagement with mobile carrier(s) is completed as part of an installation to confirm acknowledgement of any DAS impacts on the localised mobile network capacity or performance.

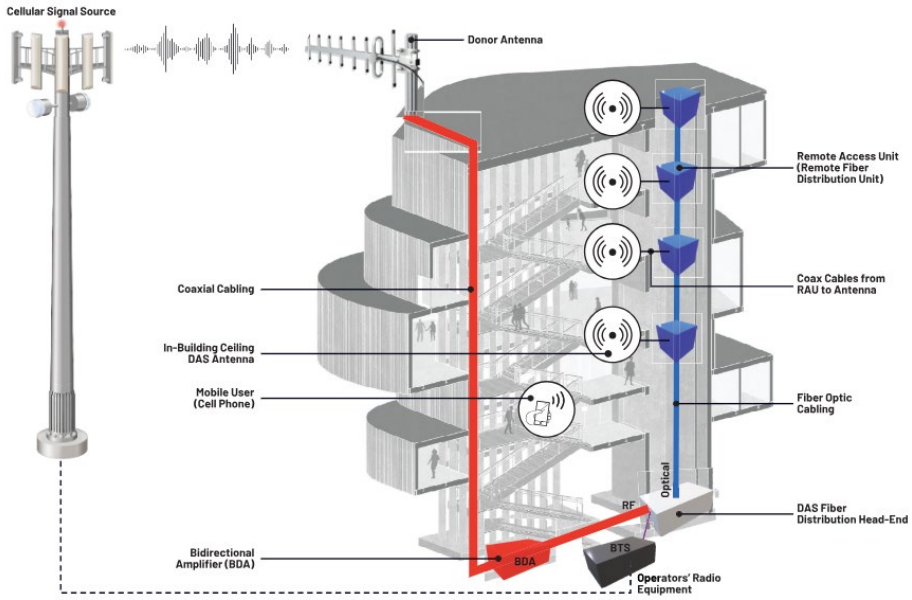


Figure 7: Layout of Distributed Antenna System (DAS).

Audio-Visual (AV) solutions

Audio-Visual (AV) solutions will be installed by a specialist AV integrator. Site builders will collaborate with the AV integrator recommended by the department and coordinate prior to first fix and during second fix electrical, to confirm service locations and positions.

To assist the engagement of an appropriate AV integrator, an AV Requirements Brief is developed by the

department with site-wide mandatory AV requirements to instruct the development and procurement of a fit-for-purpose solution.

Mandatory AV Requirements

- The primary presentation method on a given display panel or projector will be via a wireless connection method and will be a consistent approach for all displays at an education site where possible/practicable.
- Physical or cabled end-user connections to audio visual displays to be provided only as a back-up, or for controlling video conferencing equipment attached to a display (where specified).
- Physical connections must be directly to the audio-visual display device via front facing or accessible plug-in ports.
- The provision of permanent in-wall cabling (HDMI and/or USB) connecting an end-user to an audio-visual display at a remote 'teacher point' or wall outlet is no longer preferred given the mobility of educator and learner devices.
- Audio visual equipment must be connected and utilise the building's common structured cabling system for the purposes of sharing or streaming content (for example digital signage) or audio-visual device management.
- The AV integrator will work with the builder to provide the necessary audio-visual display positioning (wall elevations on shop drawings), specify audio visual display mount height and heights for the required quantity of power and data wall plates, as well as any bracing to wall and ceiling framing required to receive AV equipment.
- Power, data, control panels, and peripheral cables must be concealed behind the audio-visual display or within joinery furniture.
- Schedule display power on/off for site operating hours or another custom schedule is required.
- Digital signage presentation will be available on all screens when not actively used for specific learning program purposes.
- Audio visual content should be synchronised on paired/grouped space's displays where required.
- Hearing Augmentation (HA) for each designated space must be integrated with the audio-visual equipment (refer to Hearing Augmentation Systems section for more details).
- AV integrator 12-month warranty (defects and liability period) for all equipment and installation workmanship.
- Provision of a content management system to allow delegation of control to authorised users.
- Provision of prototype equipment to assist in evaluation of changing AV requirements.

Audio-Visual Types

ICT Services division will compile an AV Requirements Brief for approval by site leadership that describes the audio-visual equipment required. Major Audio-Visual Types (below) must be used to categorise, identify and designate floor-plan spaces on an AV Requirements Brief, and it is from this document a solution can be defined for competing quotations.

Table 14: AV Types

AV-Type	Title
Type 1	Large Collaboration / Presentation
Type 2	Room Presentation
Type 2-VC	Room Presentation with Video Conferencing

AV-Type	Title
Type 4	Digital Signage
Type 4-ID	Room / Wayfinding Signage
Type 8	Boardroom
Type 10	Activity Space
Type 10-CMB	Combined Activity Space
Type 11	Portable Display
Type 12-IN	Sports / Activity Hall
Type 12-EX	Outdoor Activity
Type 13	Small Group Huddle
Type 14	Performing Arts
Type 15	Performing Arts Practice
Type 16	Media Capture / Streaming Room
Type 21	Portable Audio
Type 22	Demonstration Benchtop
Type 23	Activity Capture

Performing Arts

Education sites requiring performing arts fit-outs with audio-visual equipment require an engagement with a specialist provider for a bespoke designed solution.

The solution design must be completed during project conception and be guided by an assessment and report of acoustic qualities of the space(s) to optimise placement and performance of any equipment. The implementation must be completed across multiple trusted partners for the best outcome and value for money.

It is preferred that transmission of audio, video, lighting content, and control data use the common structured cabling system available in the building with relevant media converters included as part of the bespoke solution.

Where the design calls for a separate, specialist audio or lighting cabling the rationale for a non-digital approach and associated overall costs must be approved by the relevant project cost manager.

Hearing Augmentation Systems (Soundfields)

Permanently installed soundfield infrastructure must be available to all locations identified in Part 3: Generic Functional Briefs (3a: ECECs and 3b: Schools).

Soundfield infrastructure involves the capture of all sounds of teaching (including, but not limited to, audio from AV sources, and voices of educators, children and students) and distributes sound evenly throughout the learning spaces by wall or ceiling mounted speakers so that an educator's conversational voice is heard in all areas.

Hearing augmentation key points

- Soundfield infrastructure **must not** be connected to PA systems.
    - If soundfield infrastructure is wired to public address (PA) system speakers, those using assistive listening devices receive a signal from intermixed sound sources which can be overwhelming and difficult to distinguish the sound source.
    - Any important message received from a PA system should be relayed by staff to people with hearing loss through the hearing augmentation system to ensure a single clear message is received.
    - Input from a separate PA system may be transmitted to assistive listening devices if the system can completely prioritise a PA message when that message is broadcast. Once the PA signal ends, signal from the soundfield infrastructure may resume.
- Cabling from these sound sources is to terminate to a practical location so that transmitters to receivers in hearing aids can by connected and operate effectively without the need for software or proprietary technology.
- A suitable wall plate system is recommended to keep transmitters secure, and audio from these sound sources must be transformed and balanced to be ready for input to transmitters.
- Transmission is to be achieved by using transmitters that operate with the current generation of receivers supplied by Hearing Australia or other government entity. Children and students may use their own transmitters, or the education/care site maintains communal transmitters for this purpose.
- Induction/T-Switch systems **must not** be used.
- Learning spaces that are smaller than $50m^2$ and have PA infrastructure require a hearing augmentation wall plate system only.
- Secondary students must be able to connect to the hearing augmentation system automatically when entering a room via a wall pilot or similar. Automatic connection for primary students is recommended but not required.
- Soundfield technology is to be as discreet as possible and optimise safety by having speakers that are in-ceiling, or wall mounted at a height to not be impacted by users of the space.
- Microphones used with soundfield must be as small and light as possible and not involve cabling between microphones and belt-packs.
- Transmission from microphone to soundfield receiver must be of a technology that minimises congestion with other forms of educational technology including Wi-Fi and other radio frequency technology.
- Charging stations and controls to be located in a lockable acrylic enclosure at 1200mm above floor level.
    - Wall mounted enclosures to be formed with rounded corners and chamfered edges to avoid sharp exposed corners and edges.
    - For new builds, charging station enclosures mounted within secure joinery are preferred. Enclosures within secure joinery are to be mounted on the side panels of joinery units, not the rear of cupboard units, to ensure easy access to the units and to maximise storage capacity within the joinery unit.
- A ‘Soundfield’ placard indicating that an assistive hearing device is installed or is available must be provided in accordance with AS 1428.1 and AS 1428.2 at the main entry door to the learning space.

Building Control and Management System

Building Control and Management System (BCMS) components are required to use the building’s common

structured cable system where possible/practicable. This includes control or data gathering panels, host servers, HVAC controllers, energy monitoring systems (solar panels or batteries) or energy consumption displays, and electric vehicle (EV) charging monitors.

Fixture, fittings and furniture

Selections should:

- suit the function(s) to be undertaken in the space and the intended users
- meet accessibility requirements
- support inclusive environments
- be complimentary to the design, including any flexible and agile requirements
- be fit-for-purpose and meet applicable standards
- be durable, vandalism resistant, easily maintained and cleaned, environmentally sustainable including whole-of-life costs.

Automated External Defibrillators (AED)

AEDs are required at all schools and stand-alone ECECs in compliance with the Automated External Defibrillators (Public Access) Act 2022.

AEDs:

- must be:
    - stored in the foyer of the administration area, behind the public reception desk
    - accessible to members of the public – either the ability to get the AED themselves, or request access to the AED
- **must not** require a key or access code for use in case of emergency.

Signage for the AED must be:

- installed in the foyer of the administration area near the AED
- in addition, mounted external to the building near the entrance indicating that an AED is nearby.
- sourced from the SA Health website or from the EDi first aid webpage.

Cots

Must:

- comply with the department's safe sleeping and resting for infants and young children procedure
- have lockable castors to enable them to be relocated during an evacuation/emergency.

Curtains and blinds

Curtains and blinds must have a fire retardant incorporated in their manufacture in accordance with AS/NZS 1530.3.

Curtains may be specified in specialist learning areas where blackout or dim out provisions are required, such as media or drama learning areas. Blinds may be used in specific circumstances to provide dim out provisions, reduce heat load and glare when required.

Design selection and placement should pay careful consideration to any nearby present or intended heat sources.

Cords

Cordless blinds and curtains are preferred, where this is not possible, cords must:

- be installed in such a way that a loose cord **cannot** form a loop 220mm or longer at less than 1600mm AFL
- have cords secured with either tie-downs (cleats) or tension devices that enclose cords and chain loops at a minimum height of 1600mm AFL
- where windows are obstructed by a cupboard, or fixture and fixing is unable to be mounted at 1600mm, the cord fixing must be mounted at a level which is accessible to staff and does not pose a risk for Work Health and Safety.

Internal corded window coverings **must not** be installed in unsupervised learning areas such as student wellbeing spaces, multi-faith rooms, reflection and meeting spaces.

Window furnishings to control daylight in child accessible areas in ECEC facilities must be manual or mechanically operated systems (corded curtains or blinds **must not** be used due to potential ligature risks).

Mechanical window coverings

Where sites require specialty daylight control in areas, such as wellbeing spaces, mechanically operated systems may be installed.

Locate automated controls in a secure location or with secure joinery that is not accessible to children and students.

Gas turrets

Where gas turrets are installed (for established sites only), they must be located a minimum of 300mm away from sinks and 300mm from the front of the bench. Distance to be measured from the centre line of the tap or turret. Mount tapware to the side of sinks with the handle facing the front of the bench and not to the rear of the tap. Ensure the positioning does not impact any blinds or curtains present.

Amenities

Hand basins

Hand washing facilities must be provided within or in close proximity to all learning and common areas. The number of hand basins or sinks provided must consider the number of children/students entering the learning area, common area or building at one time to ensure hand washing for all can be undertaken efficiently. These provisions are in addition to those provided in children/student amenities.

Hand basins must be provided for personal hygiene and where food preparation is undertaken and must be mounted at the following above floor level heights:

- ECEC - 600mm
- Primary schools - 700mm
- Secondary schools - 850mm
- Staff facilities - 900mm

Hand basins must:

- have integral overflows where no floor traps are provided
- be white vitreous china mounted on heavy duty brackets
    - may be stainless steel in student toilets
- have ferrous drains if easily accessible
- in ECEC facilities, for both child use and adult use in child accessible areas, have all plumbing wastes concealed with sink/plumbing shrouds or in secure under bench cupboards to remove entrapment points (see Figure 8).

Figure 8: Example of sink shroud.

Sink and troughs

Sinks and troughs:

- must have integral overflows where no floor traps are provided
- with front lip and tile skirt are preferred over inset sinks
- must be stainless steel, grade 304, except in the following:
    - secondary school science laboratory and preparation areas (and other areas where chemicals are to be used such as Science, Technology, Engineering and Mathematics labs)
        - Grade 316 stainless steel sinks and troughs for educator use
        - Vitreous china or grade 316 stainless steel sinks for student use
        - Chemical resistant integrated Corian solid surface - avoid plain white due to staining
        - All science lab sinks must be under mounted to ensure chemical spills can be easily cleaned into the sink.
    - high salt areas (Coastal and APY Lands)
        - Grade 316
- for kitchens provide a double sink with integrated drainer (see Figure 9).

Figure 9: Example of double sink with integrated drainer.

- in ECEC facilities for adult use sinks and troughs must:
    - in child accessible areas have all plumbing wastes concealed with sink/plumbing shrouds or in secure under bench cupboards to remove entrapment points
    - for cleaning materials not be in or adjoining food preparation areas
    - allow bucket access under taps to wash troughs
    - provide a minimum 40 litre stainless-steel laundry trough with integrated drainer for art sinks (see Figure 10) and overflow slot as per the Schools and Childminding SA Water factsheet in line with DIT Standard Drawing DD18.

Figure 10: Example of 40L trough with integrated drainer.

- Nappy change bench (sink):
    - provide a stainless-steel Grade 304 sloped (650mm L x 490mm W x 200mm D) sink within the nappy change bench joinery (see Figure 11)
        - provide a handheld shower via pull out mixer tap to the baby bath
        - refer to nappy change bench for additional specifications

Figure 11: Example of nappy change sink

Refer to the following approved DIT Standard Drawings where relevant:

- DD13 – Bench - Nappy Change
- DD16a – Bench – Lab Sink
- DD18 - Art Sink

Drinking troughs/fountains

Disability provisions must be considered to ensure equitable access. Although not required at every fountain, convenient access for both able-bodied and people with disability must be considered.

They must be stainless steel proprietary items in convenient locations around the site and must be located away from toilet areas and entrances to reduce the likelihood of cross-contamination and conflicts in movement.

Drinking fountain outlets must aim to be the highest practicable Water Efficiency Labelling Scheme (WELS) rating and:

- for ease of maintenance and cleaning, be above stainless steel troughs, particularly if they are located outside of buildings
- for all easily accessible drains, be ferrous
- provide a sturdy, low maintenance chrome plated bubbler outlet with integral rubber bacteria preventative mouthguard and a self-closing tap
- the drinking bubbler must also have an integral bottle filler for filling water bottles in a quick and easy manner
- the bubbler outlet must be set at the following heights (except where disability provisions are specified):
    - ECEC facilities - 600mm
    - Primary Schools - 650 to 800mm
    - Secondary Schools - 900 to 1000mm
- where possible be recessed into the wall space to reduce encroachment on usable space.

Refrigeration and/or filters to drinking water is not a standard provision. Where sites elect to install refrigeration and/or filters, installation and ongoing maintenance (as per the manufacturer's instructions) is the responsibility of the site. If provided ensure any electrical connections are hard wired and that cabling and the like does not pose a trip hazard.

Tapware

Tapware meeting the requirements of the NCC 2022 Volume Three (Plumbing Code of Australia) must be specified for plumbing products that are intended for use in contact with drinking water where these products are available in the market.

Tapware must:

- be specified to meet a 6 star WELS rating
- have all outlets and breeching pieces manufactured from de-zincification resistant material approved by SA Water
- for sensor taps be hard-wired, not battery powered, to reduce ongoing maintenance.

Hand basin and sink tapware

- taps to internal sinks and hand basins, excluding amenities or unless otherwise indicated in this standard, must have lever handles and must:
    - have no less than 50mm clearance from an adjacent surface
    - have the lever towards the user for side-mounted taps
    - be commercial grade
    - have highly visible colour indicators which are permanently attached for single lever mixers
    - can be wall or bench mounted
        - if bench mounted, they must be secured to the bench top through the sink apron
    - have swivel outlets locked to not rotate outside of supported sinks
- provide fixed gooseneck tapware in teaching and learning spaces.

Toilet tapware

- child/student toilets must have 1 pillar cock for cold water to each hand basin
- provide:
    - ECEC facilities and Primary Schools - soft touch 'lever action' timeflow
    - Secondary Schools - push button activated timeflow with delayed return
    - Staff toilet areas - commercial grade single lever mixers with colour indicator
- fully assisted toilet amenities must have cold water screw nose bibcock below and close to hand basin for cleaner's use.

External tapware

- External sinks may have PVC or PE traps in lieu of chrome plated copper or brass traps where there is a risk of copper and brass fittings being removed due to the high scrap metal value.
- Taps to external troughs to be push-button activated timeflow with delayed return, lever timed bib taps are not accepted.
- Garden taps must meet backflow requirements laid out in the NCC and have consolidated brass 20mm key-locked screw-nosed bib-taps fitted to 20mm copper standpipe, or a removable handle or taps located in a recessed enclosure.
    - The above also applies to any harvested rainwater storage tanks to avoid children/students drinking from untreated sources in line with the department's recycled water connections procedure.

Toilets

Cubicles

The following should be provided:

- Toilet cubicle width:
    - must be no less than 850mm to face of internal lining
    - ambulant and accessible must comply with AS 1428.1
    - fully-assisted must comply with NCC Specification 27.
- Circulation space complying with:

    - AS 1428.1 must be provided all accessible toilet amenities
    - NCC Specification 27 must be provided for all fully-assisted toilet amenities
- Space for sanitary disposal in female and all-gender cubicles, nappy or incontinence pants disposal freestanding units, supplied by the department under servicing contracts.

Rails

- Grabrails complying with:
- AS 1428.1 must be provided for all accessible and ambulant toilet cubicles
- NCC Specification 27 (fold down) must be provided for all fully-assisted toilet cubicles
- Changing rails complying with NCC Specification 27 must be installed in fully-assisted toilet cubicles.
- Grabrails to ambulant and accessible children's toilets in ECEC facilities must be mounted at 600mm above floor height (see Figure 12)

Exhaust fans

- Exhaust fans must be installed in all fully enclosed toilet cubicles or common ablution areas where cubicle partition systems are installed.
- Exhaust fans must be interlocked with lighting controls to engage when light is on.

Mirrors

- Mirrors that are vandalism resistant, and an appropriate size for the age group, must be installed above each hand basin as follows:
    - in self-contained standard toilet cubicles and common ablution areas
    - in self-contained ambulant, and accessible toilet amenities, complying with AS 1428.1
    - in fully-assisted toilet amenities, complying with NCC Specification 27
- in ECEC facilities, provided above each child hand basin fixed to the wall
    - mounted at child standing height, with the lowest edge at 750mm above floor level.

Clothes hooks

Clothes hooks:

- with cushion stop (for inward opening doors) mounted to student and staff toilet cubicle doors
- complying with:
    - AS 1428.1 mounted within all ambulant and accessible cubicles
    - NCC Specification 27 mounted within all fully-accessible cubicles.

Soap dispenser

Liquid soap dispensers (preferably foaming) must be:

- installed in line with AS 1428.1 for all self-contained, accessible and fully assisted toilet cubicles and common ablution areas
- tamper proof and capable of being refillable by maintenance personnel only
- fixed over the sink or hand basin with no less than 50mm clearance from hand basin and tapware

Toilet paper dispenser

Toilet paper dispenser (double roll holders recommended), installed at height and within reach of intended user cohort, must be adequately secured to prevent rolls being removed:

- complying with:
    - AS 1428.1 within all ambulant and accessible cubicles
    - NCC Specification 27 (incorporated with fold down grabrail) within all fully accessible cubicles

- for children in ECEC facilities the toilet paper dispenser must be mounted within a zone that is level with the height of the toilet seat, a maximum of 300mm from the front of the toilet pan and a maximum 570mm from floor level (see Figure 12).

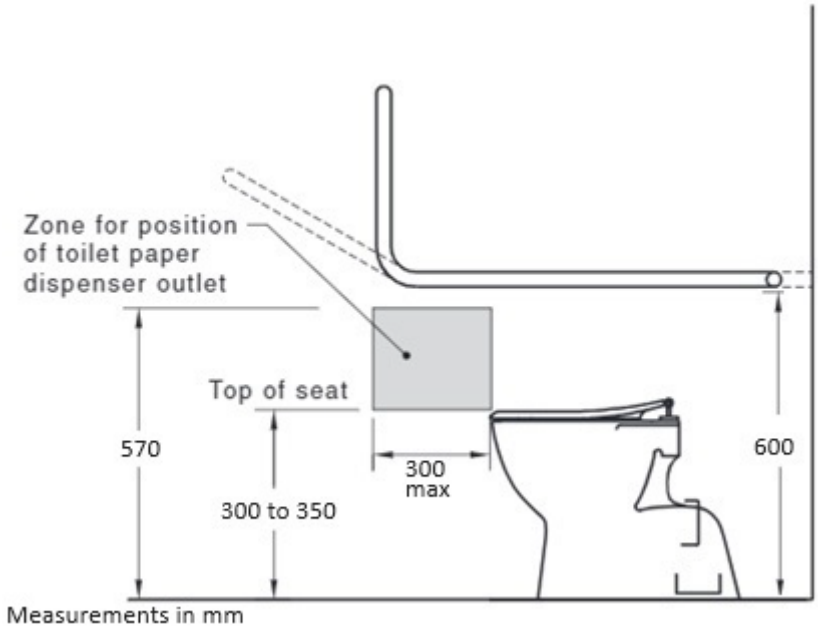


Figure 12: Specifications for junior pan (paper dispenser and ambulant/accessible toilet grabrail) placement.

Pans

Specify the most water efficient equipment practicable, aiming for within 1 star of the best available WELS rating.

Provide the following sizes:

- ECEC facilities - junior size (350mm) for children
- Primary and Secondary Schools - adult size (380mm – 460mm)

Toilet pans must:

- for all children and student toilet pans, be basic design with single flap seat (no lids)
- for all staff toilet pans, be basic design with double flap seat
- meet the accessibility requirements of AS 1428.1 for all ambulant and accessible pans
- meet the accessibility requirements of NCC (S27C4) for all fully-assisted pans
    - and be installed with a privacy screen
- be close-coupled cisterns with fixed covers, white vitreous china, dual flush with vandal-proof push buttons.

Urinals **must not** be provided, the required number stipulated in the NCC are to be converted to closet pans. Urinals must be converted to closet pans as part of refurbishment works.

Hand dryers and hand towel dispensers

Hand dryers must:

- be installed (in addition to hand towel dispensers) in all self-contained, accessible and fully assisted toilet cubicles and common ablution areas
- have metal casing, with fixed air nozzle and push button or sensor operation
- be hard wired with no exposed cabling, and isolator mounted at 2100mm above floor level
- have a noise rating less than 65 dB(A) at 1000mm
- have concealed mounting hardware to suit the wall type
- be mounted on vibration insulating rubber
- have a timing circuit which provides time and adjustment to cycles between 30 and 180 seconds
    - alternatively, an automatic sensing type may be offered
- have an automatically reset overload protection circuit incorporated
- if air jet, be wall mounted only with downward direction of air stream and have integrated drainage
- have the operable outlet of the hand dryer mounted at the following heights:
    - ECECs – 650mm AFL
    - Primary student and disability access toilets - 1000mm AFL.
    - Staff and secondary student toilets - 1200mm AFL.

Hand towel dispensers must be installed in compliance with AS 1428.1 in all self-contained, accessible and fully-assisted toilet cubicles and common ablution areas.

Nappy change table (fold down)

To be a recessed or surface mounted fold down horizontal baby change station compliant with AS 1428.1 accessible installation:

- must be provided in community accessible toilets and staff accessible toilets near staff retreat/parenting room
- a maximum height of 820mm above floor level (when in the open position)
- a minimum clearance of 720mm underneath (when in the open position)
- **must not** encroach into the circulation space of any other sanitary fixture or door access when in the folded-up position
    - not exceed a 300mm projection (when in the closed position)
- hand grip or locking device a maximum 1100mm above floor level
- centreline of the change table no closer than 425mm from any side wall or obstruction, with at least 100mm clearance on either side to prevent finger entrapment
- accessible toilets that include fold down nappy change bench must also allow space for an adjacent nappy disposal unit supplied by the department under servicing contracts.

Showers

- Shower heads must be specified to meet a 6 star WELS rating.

- Shower recesses:
    - in accessible and fully-assisted toilet cubicles must comply with AS 1248.1
    - in fully-assisted toilet cubicles:
        - must have a conical heavy duty flushing floor trap
        - have taps located so that operation is convenient for users outside the shower recesses
        - have water isolation valves in a location convenient for users outside the shower alcove and a minimum 1500mm AFL.

Emergency shower and eyewash

- A hand-held shower must be provided in every science laboratory and design and technology workshop, mounted on a bench adjacent to a sink.
- Controlled flow of flushing fluid is to be provided to both eyes simultaneously at a low velocity.
- Final location to be determined in consultation with the site users.
- A drench shower and eye wash unit must be provided in the science laboratory preparation/storeroom with:
    - shower flow required to be at least 76L/min at a velocity low enough to not cause injury
    - controlled flow of flushing fluid is to be provided to both eyes simultaneously at a low velocity
    - hand push activation for shower and foot push activation of eyewash is preferred
    - Enware model EC090 combination emergency shower and eyewash (or equivalent) is an acceptable fitting
- The following provisions apply to all emergency shower/eyewash facilities:
    - locate in an easily accessible, visible and unobstructed location
    - provide with separate potable water supply
    - provide a floor trap connected to the building sewer waste system
    - ensure all waste outlets from the drench shower and eye wash unit are connected to underfloor plumbing
    - signage complying with AS 1319.

Joinery

The preference is to minimise fixed joinery and to provide flexibility with loose furniture. System furniture workstations are similarly not desirable as they restrict flexibility in general work areas.

Fixed joinery items must be excluded when calculating the unencumbered floor space in ECECs and should have large radius rounded corners.

Cupboards and drawers

- Hinges must be of commercial standard and have a cam for height adjustment and not a slotted screw.
- Number of hinges to be fitted to each door for under bench joinery varies:
    - ECEC facilities – 2 hinges

- Primary schools – 2 hinges
- Secondary schools and R-12 schools – 3 hinges

- Doors to cupboards:
  - under benches must be no more than 450mm wide.
  - taller than bench height must be no more than 600mm wide and must have 4 hinges.

- Lockable cupboards in children's areas in ECECs must be internal finger catches to ensure adult access only.

- Any equipment items including storage racks and shelving over 2000mm must be designed for earthquake forces in accordance with Section 8 of AS/NZS 1170.4 including all parts, component and connections.
- All concealed cupboard door hinges are to have a 170 degree opening unless the cupboard is adjacent a wall in which case the door may open to 90 degrees.
- All full height cupboards or overhead shelving must have a bulkhead extending to the ceiling to enclose the space above cupboards/shelving. The highest shelf of joinery is to be mounted at 1800mm above floor level.

Benchtop work surfaces

- Refer to DIT Standard Drawing DD11 Worktop Construction
- Engineered stone benchtops **must not** be used in any application within education and care facilities.
- Disability access must be provided as per AS 1428.2.
- Adjustable counter tops are not preferred in areas accessible to children or students due to finger entrapment.

Table 15: Bench heights (mm):

Facility/Age	Seated height	Standing (or stool) height	Sink height
Under 2 years	550		
Over 2 years	600		
Reception to Year 2	720	720	
Year 3 to Year 6		850	
Secondary		850	
Staff areas		900*	

*900mm to conform to industry standard and allow appliances such as dishwashers to fit under counter tops

- Provide a minimum of one accessible work point to each specialist area including fixed benching at 850mm height with knee and foot space under, sink, services and tapware in accordance with AS 1428.2.
- Ensure oven doors are hinged to allow direct transfer of hot items from the oven to adjacent benchtop(s).
- Sinks incorporated in work benches in kitchen areas are acceptable at 850mm height.
- Open corners of bench tops must be rounded or mitred at 45 degrees for safety reasons.
- Bench top surfaces in science laboratories must be chemical and heat-resistant compact laminate or chemical resistant solid surface.

- Impact resistant UPVC edging, factory applied as opposed to self-edge on laminate benches or post forming and vinyl wrapping is preferred.
- Install underbench supports using laminated fins or steel legs at a minimum of 1200mm spacing. Additional benchtop support may be required to support load strength if heavy equipment items are mounted to the bench top or to increase the robustness of the work surface.

Hardware

- Cupboard doors and drawers:
    - must have D-handles with rounded corners, avoid sharp square corners that can cause injury
    - **must not** have sharknose or recess joinery handles.
- Provide clearance of 20mm between the handle and the door face.
- Flush and/or concealed joinery handles may be specifically briefed to prevent access or tampering. Ensure any recessed pulls do not have sharp edges or corners at the leading edge of cupboard doors.
- Cupboard door locks are only to be provided where specifically briefed, such as secure storage in specialist areas and ECECs. Where briefed, cupboard door locks are to be keyed alike.

Nappy change bench

To meet National Regulations 112 – Adequate and appropriate hygienic facilities are provided for nappy changing, the nappy change bench must:

- comply with the NCC F4D4 requirements
- be between 850mm to 900mm above the finished floor level
- be positioned to allow staff line-of-sight to indoor learning and play areas at all times
- have a separate adult hand basin within 1000mm
- include access steps, or pull-out stairs to provide child access
- for under bench pull-out stairs provided a space no less than 800mm high, 500mm wide and 800mm deep
- ensure any stairs to nappy-change benches are secured in a manner that is not accessible by children when not in use
- fixed stairways must be fitted with a childproof gate to prevent free access by children to upper levels (bolt on back of gate 300mm from the top)
- under bench pull-out stairs on castors must be able to be secured in the open and closed position to ensure the safety of children
- provide grabrails fitted adjacent to access stairs or incorporated within pull out stairs
- provide non-slip stair treads (the NCC specifies appropriate stair dimensions)
- provide storage space for nappy change bins and nappy change supplies
- refer DIT Standard drawing DD13 (provide nappy change bench sink as per sinks and troughs) see Figure 13.

Figure 13: Example of nappy change bench layout.

Specialist storage

Cold room storage provisions

- The provision of new cold room storage, and the relocation of existing storage, is not permitted.
- Existing cold room storage facilities must meet the requirements of the NCC G1D3.

Fume cupboards

- Fume cupboards are to:
    - be 1500mm wide and include sink, cold water (and gas supply for established sites only). Double sided fume cupboards are acceptable
    - be located a minimum of 1m away from door openings
    - have flues vented to external atmosphere
    - ensure on-site testing is carried out in compliance with AS/NZS 2243.8.

Flammable materials cabinets

- Refer DIT Refer DIT Standard Drawing DD19 Typical Chemical Store Layout.
- Constructed to comply with AS 1940 and vented to the atmosphere.
- Minimum 250L capacity with double doors and 3 shelves.
- High and low level vents on opposite sides of the cabinet.

Vented corrosives cupboards

- Constructed as per DIT Standard Drawing DG03 – Vented Corrosives Cupboard.
- 2 x 100mm diameter UPVC vent ducts vented to the atmosphere.

Kilns

Where provided, kiln selection, location and installation must meet the following requirements:

- front loading electric kilns in an outdoor enclosure with the appropriate electricity supply, ventilation and extraction systems
- kerosene and oil drop kilns **must not** be used
- provide 300mm minimum distance at the rear of the kiln and 600mm minimum clearance at the front, to the sides, and around the door arc for safe access to the plant for operation, cleaning, maintenance and inspection
- the kiln and door opening arc **must not** obstruct walkways and emergency exits
- ensure any adjacent wall linings are non-combustible
- shell construction to be pre-shrunk ceramic fibre board with multi-layer back-up ceramic fibre blanket insulation
- ensure the kiln has adequate insulation on all parts, a lockable isolation switch, and a 2-stage door latch with padlock loop including integrated safety switch
- provide auto fire multi-stage, multi-program digital controller with built in safety circuit and delay start function, a red pilot light viewable from the exterior to indicate kiln operation/firing process is continuing and a safety heat fuse
- appropriate mechanical exhaust systems
- all controls to be clearly labelled
- refer to the safety specifications for operation.

3D printers

Where provided, 3D printer selection, location, installation and operation must meet the following requirements:

- a fully enclosed cabinet model with high efficiency particulate air (HEPA) grade particulate filter and activated carbon filter
- open framed printers **must not** be installed
- refer to the safety specifications for operation.

Bag storage

- In ECEC facilities, bag storage should preferably be:
    - provided by pigeon hole joinery units
    - 300mm wide x 300mm high x 300mm deep
    - no more than 1000mm high. Where bag storage units are static units against walls they must be securely fixed to the wall.
- Bag storage units:
    - can be mobile units with lockable castors.
    - are recommended to be located in areas of high passive observation.
- When located externally, bag storage units are recommended to be appropriately shaded.
- External plastic bag storage units must be UV stable and fire resistant.

Hooks are an alternative:

- **must not** be provided for children under 3 years old

- may use a ‘Snughook’ system (or similar equivalent) designed to remove the hazards of traditional hooks
- must have a protective timber covering if providing a traditional metal hook (see Figure 14).

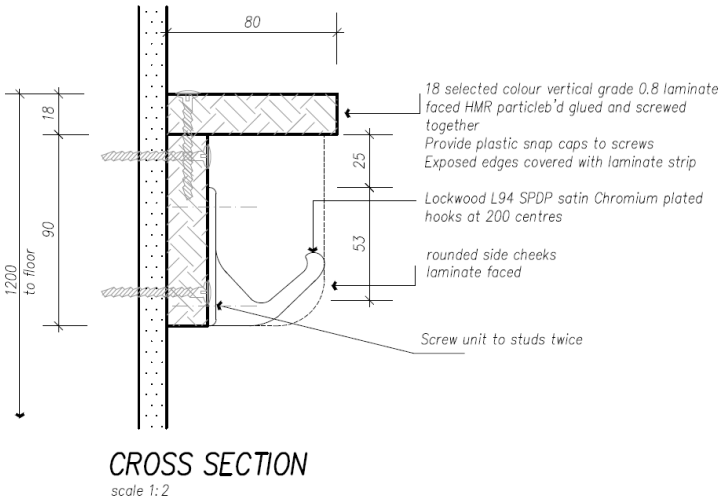


Figure 14: Example of protective timber covering.

Display boards, whiteboards and writeable surfaces

Display boards, whiteboards and writeable surfaces must:

- consider access for all users (such as extending display and writable surfaces from floor level in ECEC and primary school settings, and increasing height to a maximum of 2400mm above floor level in secondary school setting)
- target a wall coverage area, which may be distributed through the space, equivalent to a minimum of 20% of the floor perimeter in learning areas, community spaces, and gathering spaces
- fabrics must be compatible with hook fastening strips (ie Velcro or similar)
- display board(s) **must not** use pins in ECEC facilities
- avoid locating above sinks
- for individual whiteboards, have a frame and be mechanically fixed to enable relocation without damage to the board or wall surface
- where the writing surface covers the entire wall from floor to ceiling and forms the wall finish the writeable wall lining may be adhesive fixed.
- have locations coordinated with switches, refer to Switches section for mounting requirements for lights, air conditioning, power and data outlets to display boards, whiteboards and writeable surfaces.

Compactus units

- Use proprietary units 900mm deep by 2000mm-2200mm high.
- Unit lengths, shelf depths and fit-out of the unit must be as briefed for each location.
- The end mobile bay must be 400mm deep to provide stability.
- Low profile tracks to be used that permit trolley and wheelchair access.
- For disability access and safety, ensure that floor finish is level with the top of the tracks.
- Where tracks are laid on the floor slab, form a ramp on the entry side of the unit and infill between tracks with flooring.

- Where plinth units are used, provide identification warning strips to edge of step.
- The location of the units must be confirmed by a structural engineer to ensure floor load capacity is not exceeded.

Key cabinet

Must be securely fixed to a solid wall and the size must suit the sites key requirements.

Pigeon-holes (staff lounge)

Where installed, staff pigeon-hole units are recommended to:

- be provided for each staff member (maximum projected school enrolment) plus 10%
- have compartment sizes to allow for A4 size envelopes to lie flat
- have shelves at least 16mm thick to allow staff names to be displayed horizontally.

Safe

A freestanding safe must be provided for every stand-alone site, and must:

- be fire resistant
- have minimum internal dimensions of 230mm x 320mm.

An alternative is a wall safe that can be secured to the building structure and positioned within a joinery unit.

Signage

Internal

Room signage

The preference is for rooms to be numbered rather than named, as room functions can change over time.

Signage (including braille and tactile signage) must:

- be provided in buildings and to all new and refurbished buildings and individual rooms
- comply with the NCC (format and mounting position)
- be consistent with the Strategic Asset Management Information System (SAMIS) building and room numbering system where appropriate
- be robust and securely fixed to walls and doors.

Emergency identification signage

Emergency identification labels and signs are required to be permanently fixed and vandal resistant:

- stick-on labels **must not** be used as they are easily removed
- engraved signs are preferred.

Signs to be clearly visible and legible.

Exit signage

Opportunities to select hybrid photoluminescent and LED technology, complying with NCC and

AS/NZS 2293.1, must be considered as part of new builds and major refurbishments to improve energy efficiency.

External

All external signage, including banners, must be co-branded with the site's logo as well as the department logo and comply with government branding guidelines. Clear, distinctive signs are to be provided to indicate the following:

- site name on main road frontage
- visitor car-parking
- directions to administration and any community use facilities
- standard regulatory and safety signs (which may be used as teaching aids)
- access to toilet facilities including ambulant, accessible and fully assisted toilets, male, female, all-gender, and nappy changing
- clear and unambiguous warning signs about trespass and potential prosecution in areas that may be accessed by the public.

All signs must:

- be robust and preferably mounted on buildings
- relate to the Strategic Asset Management Information System (SAMIS) building and room numbering system where appropriate.

Other signs for buildings, rooms and to give direction can be considered where appropriate and/or where required by Work Health and Safety or Australian Standards.

Recycled water irrigation signage

Where recycled water is used to irrigate sports fields or other lawned areas, warning signage stating 'Irrigated using recycled water – do not drink' or similar must be installed at entry points to the lawned area.

- Recycled water suppliers may supply warning signage.
- If required, the department warning signage template may be used (see Figure 15).

Figure 15: Recycled water warning signage template

Gate operational hours signage

Any signage mounted to education site perimeter gates indicating hours during which the gate may be unlocked and operations must adhere to design requirements laid out by the Security and Emergency Management team (SEM) team.

Smoke-free and vape-free signage

All areas within education and care facilities premises/campus are smoke-free and vape-free in compliance with the *Tobacco and E-Cigarette Products (Smoking Bans) Amendment Regulations 2023*.

As per the above legislation smoking and vaping is also banned within 10m of the boundary of a site (this area does not extend into areas that are not open to, or used by, the public or a section of the public – such as residential premises - that share a boundary with the education and care site) (see Figure 16).

The site is required to display approved signage to show there is no smoking or e-cigarette use allowed in the area. There must be a sufficient number of signs in positions of prominence so that they are likely to be seen by people within the area. Examples of appropriate signage is available for download at the SA Health website.

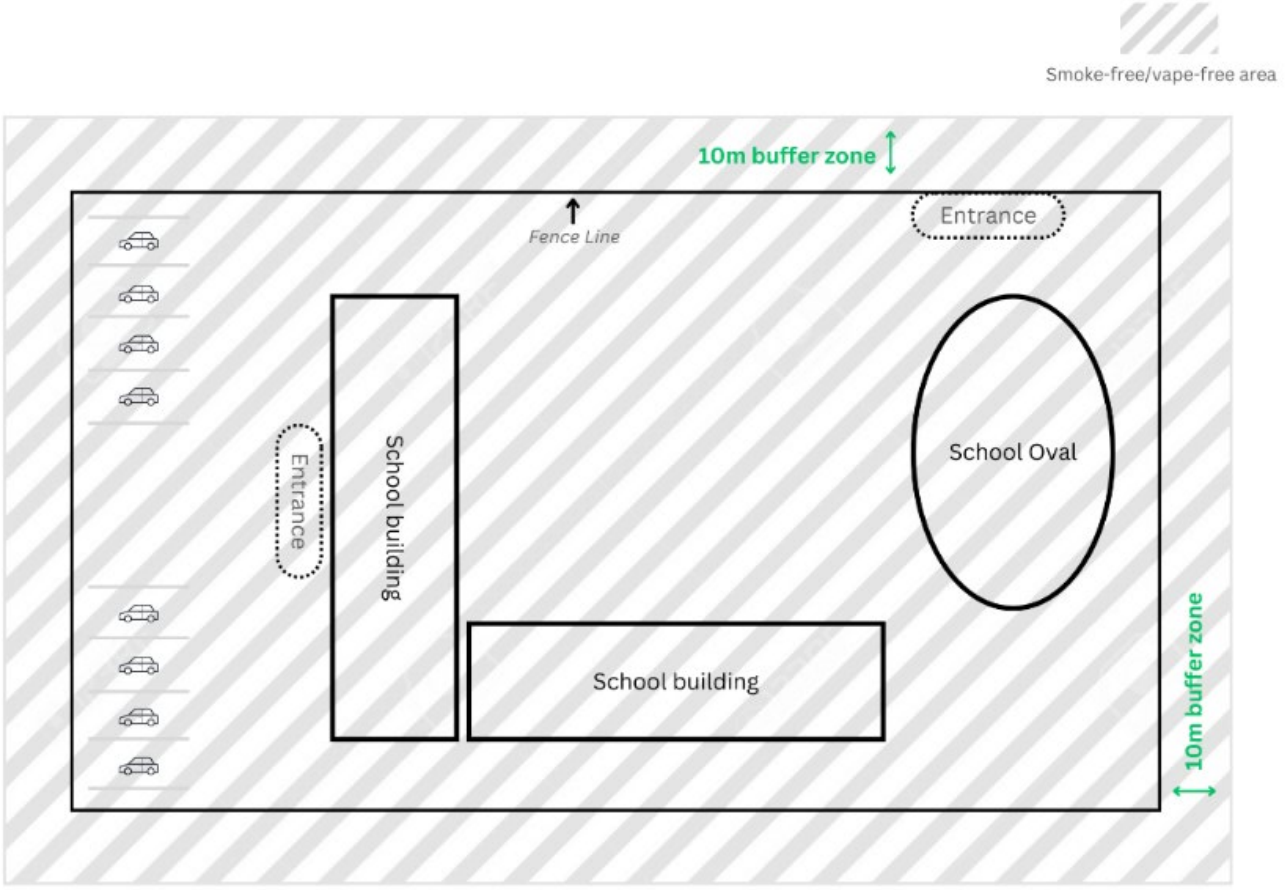


Figure 16: An example of where smoking and vaping laws apply at a school

Loose furniture and equipment

The following items (not an exhaustive list) may be purchased by or on behalf of sites from a furniture and equipment grant or budget, and are not captured within the scope of the design standards:

- tables, desks, chairs and stools
- moveable whiteboards
- proprietary shelving systems

- refrigerators
- dishwashers
- washing machine and clothes dryers
- AV equipment including screens and digital displays
- clocks

Consider the colours, textures and smell of materials and finishes, and the operational and static noise and movement of equipment and appliances to ensure these selections are sympathetic to the building works and are inclusive of neurodivergent occupants including those with sensory processing disorders.

Site

Site access

Pedestrian access (pathways)

Pathways should be provided to entrance doorways, around perimeter of building, and between shed, verandah and selected areas (such as sanded areas, water play areas, and grassed areas) to conveniently link all points of access, they are to:

- include a continuous path of travel and adequate clearance from obstructions for persons with disabilities
- not intrude on or go through any impact absorbing area.

Pathways must be constructed in compliance with the Pavements section of this document.

Pathways must meet the following:

- main path width is at least 2000mm wide
- secondary paths width is at least 1500mm wide, allowing movement through play spaces and bicycle tracks
- be a minimum 1000mm wide when adjacent to building perimeters and with little pedestrian traffic
- have adequate space for manoeuvring, a turning circle diameter of 2200mm

Pathways through play areas and to access play equipment must be a rubber or synthetic impact absorbing materials with a maximum 50mm depth (this depth may not provide adequate impact absorption for adjacent play equipment)

Impact areas for play equipment and circulation pathways must be carefully designed to consider the different requirements for each of these uses.

Vehicle access

Access roads into the site must be kept to a minimum and only to provide:

- convenient delivery of goods to the administration, canteen, design and technology workshops, food technology and art buildings, for grounds maintenance and access to mechanical and electrical plant, and to waste disposal areas - noting it may be necessary to provide delivery drop off point(s) for goods to be taken by hand truck to the point of requirement
- access for emergency vehicles
- access for taxis (including access cabs) and buses to relevant parts of the site - minimising travel distances to buildings and exposures to the elements

- considered access and manoeuvrability of industrial bin collection vehicles.

A variation in texture or colour can be used to indicate a potential danger area such as a pedestrian movement or a conflict point. These provisions effectively:

- slow down and direct pedestrian traffic
- alert vehicles to commonly used circulation areas
- avoid potentially dangerous situations.

Vehicle access gates

To ensure emergency vehicles can access all buildings, hard-play and grassed areas including ECEC outdoor learning and play areas as per NCC and Education Security Design Standards requirements, see gates below.

Internal roadways

Minimum roadway width between kerbs for:

- one-way roadway is 3000mm
- two-way roadway is 5500mm.

Preferred surfaces:

- 40mm thick asphalt with a mix designed to suit the specific requirements of the site.
- 80mm thick interlocking herringbone pattern pavers laid over bedding compliant with the DIT NATSPEC.
- Bus zone pavements are to be appropriately designed using 80mm thick interlocking herringbone pattern interlocking pavers as a minimum.
- Reinforced concrete may be considered where internal roadways intersect with pedestrian pathways or are in close proximity to buildings. Design of concrete roadways must be undertaken by qualified engineers, specifically designed for the site conditions and expected roadway use.

Speed reducing devices

Speed humps may be used on service roads and access roads to ensure traffic slows down to an acceptable speed. They must:

- consider heavy vehicle access and slow vehicles at entry
- be constructed and painted in accordance with AS/NZS 2890.1.
- use appropriate signage in accordance with AS 1743 and AS 1744.

Bollards

May be placed across points to prevent vehicles entering areas used by pedestrians or where regular use by vehicles could damage surfaces provided. They must be:

- able to be removed or lowered to allow delivery, maintenance or emergency vehicles to enter
- provided in accordance with the *Road Traffic Act 1961*.

Parking

Car Parking

Car parks must be designed and constructed in accordance with:

- AS/NZS 2890.1

- AS/NZS 2890.6
- AS 1742(Set)
- AS/NZS 1158.1.1
- AS/NZS 1158.1.2
- AS/NZS 1158.2
- AS/NZS 1158.3.1
- AS/NZS 1158.4

Car parks must:

- be located as close as possible to the main entrance with an accessible pathway
- provide appropriate security and area lighting
- where possible, be provided for staff and visitors located close to and in view of the administration area
- be designed to avoid conflict between pedestrian, student and bicycle access, and site circulation
- provide wheel stops adjacent to buildings, landscaped areas or pedestrian access areas and pathways which may be impacted by car overhang
- for new schools and major refurbishments, provide in-ground conduits to facilitate future integration of electric vehicle charging points/infrastructure to assist in the transition to low carbon forms of transport

Boom gates are not preferred and if installed by an education or care facility all maintenance and replacement costs are a site responsibility.

Pick up and set down provisions must:

- where practicable, be provided for children and students travelling by car or bus
- not be provided on primary or secondary school sites
- be constructed on the public thoroughfare to afford users protection under the *Road Traffic Act 1961*.
- where practicable, include a median strip off-site to provide additional pedestrian safety and prevent vehicles from making U turns
- have undertaken negotiations with local government authorities to provide these facilities on roads or public reserves adjoining the facility
- negotiations may be entered into concerning the grant of an appropriate portion of school property to local government or DIT for the purpose of constructing a pick up and set down facility

With the increasing use of schools by the community, negotiations must be undertaken by the school, in consultation with the department, with the local council to provide additional off-site parking adjacent to the school, or as part of neighbourhood facilities.

Schools must develop a traffic management policy which reflects the local traffic and parking issues.

- Consideration must be given to the location of car parks using compacted quarry material, as these are generally dusty in the summer and may become muddy in the winter.
- Recycled pavement materials **must not** be used for any road pavements.
- Car parks:
    - are preferred to be asphalt using 30mm thick AC10
    - must have kerbs and channels
    - must have bollards to restrict vehicle access

- must have 100mm wide white line markings
- with parallel parking spaces must meet minimum dimensions as per AS/NZS 2890.6, however 3700mm is preferable (excluding any required shared area).

- If pavers are used in areas with vehicles access they are:
  - 60-80mm thick interlocking herringbone pattern pavers laid over 30mm sand, over 200mm PM1/20 rubble, achieving 98% compaction

Bicycle and scooter parking

- Consider enclosing bicycle and scooter parks within an 1800mm high chain mesh fence with lockable gates, where the local situation requires this level of security.

Bicycle and scooter parking consists of racks/rails which are:

- covered and protected from the elements
- designed to allow both a wheel and the frame to be locked securely to the structure in accordance with AS 2890.3
- ground mounted for students
- ground or vertically mounted for staff.

Fencing

To meet National Regulation 104 - Fencing all ECEC fencing must be designed to prevent movement through, over or under it. To achieve this the NCC G1D4 necessitates construction meets AS 1926.1 – Swimming Pool Safety.

Fences shall not be erected within 1500mm of a naturally occurring or man-made climbing aid that may facilitate ingress or egress.

Returns should be installed around such objects at a reasonable distance to reduce the opportunity to use the object to climb over the fence. All climbable zones within 1500mm that cannot be removed or protected must be approved in writing by the department prior to works proceeding.

Non-climbable zone

To prevent falls and unintended access in ECEC facilities, all items inside the fence line must be placed a minimum 1200mm[13] away from the top of the fence (see Figure 17).

[13] Education Standards Board: creating safe facilities

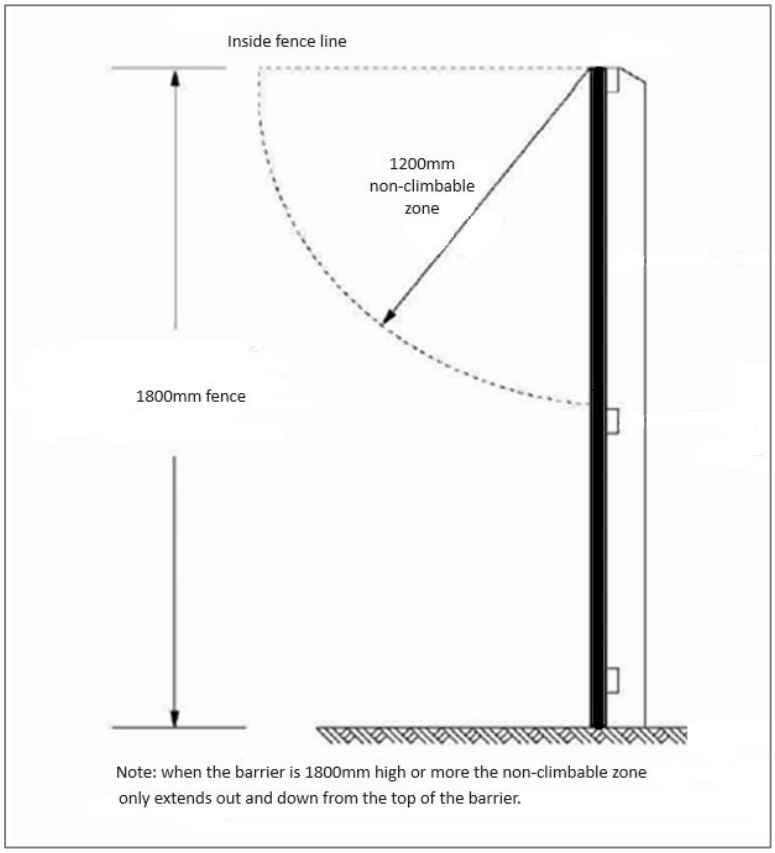


Figure 17: Illustration of non-climbable zone on 'type 2' 1800mm fencing.

Steel specifications

Fencing must be manufactured from locally procured Australian steel, manufactured by companies accredited to AS/NSZ ISO 9001 with a valid certificate of approval issued by the Australian Certificate Authority for Reinforcing and Structural Steels (ACRS).

Fence panel (uprights and rail) and gates (stiles, rails and uprights) shall be manufactured using precision tube complying with AS 1450 – Steel tubes for mechanical purposes - Product Designation AS 1450/C250/ERW.

Steel tubes and fully enclosed security brackets to be galvanised finish with zinc coating mass of 275 g/m^2 over the internal and external surfaces of the tube in accordance with:

- AS 1397, Product Designation AS 1397/G2/Z275 as a minimum.

Gate posts shall be manufactured using structural steel sections in accordance with:

- AS/NZS 1163, Product Designation AS1163 C350L0 as a minimum.

Structural steel to be galvanized (zinc coated inside and outside) in accordance with:

- AS 4750, Hollow section coating mass requirement (Table 3) ZE50/50; or
- AS/NZS 4792, Coating mass requirement (Table 3.1) ZB 50/50; or
- AS/NZS 4680 (may be applicable for 150 x 150 x 5mm sections and larger)

Finishes

Finishes for all components of fence and gate posts and panels (including fully enclosed security brackets) must have a powder coated finish certified to meet the following requirements:

- Colour to be 'Coral black gloss' Interpon D1000 GN063A or equivalent
- Powder coat thickness: 70um +/- 10um.

Powder coated finishes must comply with AS 4506 and AS 2331.3.1, and provided with minimum a 10-year colour-fast warranty subject to the supplier's powder coatings terms and conditions.

A barrier primer in compliance with AS 4312 must be quoted as an optional extra for projects located in a category C4 or higher environment.

Warranties

A minimum 5 year warranty must be provided for all materials used.

Fence panels

- Fence panel lengths must be 2400-2735mm.
- School fence heights must be:
    - Security fence - 2100mm or 2400mm
    - Safety fence - 1500mm or 1800mm
- ECEC fence heights must be:
    - Perimeter security fence – 2100mm
    - Perimeter safety fence - 1800mm
    - Safety fence to separate from school grounds - 1500mm
    - Internal fence between different programs (such as Long Day Care, Inclusive Preschool Program) – 900mm
        - Safety and Internal fencing, where connected to the perimeter fence, must be constructed with anti-climb panels.

Fabrications standards

- Pickets will be punched through rails, silicon bronze welding on alternate sides of the picket and installed to meet flush with the interior faces of the top and bottom of rails.
- Pickets face welded to rails will not be accepted under any circumstances.
- Silicon bronze welding must be used for all fabrication. Mild steel welding will not be accepted.

Pickets – Type 1

Type 1 pickets are to be used for non-specialised school service fencing installations.

- Minimum 25mm x 25mm SHS @ 1.2mm minimum thickness.
- Opening/space between pickets to be ≤112mm.
- Pickets for either fencing type **must not** be installed beneath ground level at any point.
- On flat or near flat ground, clearance of the base of all fencing from the ground surface must be ≤100mm.
- On sloping ground, clearance of the base of stepped or raked fence panels must be ≤100mm for safety fencing and ≤150mm for security fencing.
- Safety fencing picket style must be flat top railing (Bluedog Crowdtuff or approved equivalent).
- Security fence pickets are to be 'crushed spear top' (Bluedog Securatop or approved equivalent) with apex of spear to be slightly rounded, not sharp. Punching of rounded spear top to be completed prior to fabrication of fence panel.

Pickets – Type 2

Type 2 pickets are to be used where an ECEC or specialised education option is located on one or both sides of the fencing installation.

- Minimum 25mm x 25mm SHS @ 1.2mm minimum thickness.
- Opening/space between pickets to be maximum 85mm to prevent head entrapment.
- On flat or sloping ground, clearance of the base of the fence from the ground surface must be ≤85mm
    - on sloping ground panels must be raked to achieve the required clearance or additional groundwork is required such as retaining walls, concrete plinths – stepped panelling will not be accepted if resulting ground clearance exceeds 85mm
- Pickets **must not** be installed beneath ground level at any point
- Pickets must have no V or U shape parts that could create unbound entrapments (flat top is required) (see Figure 18)
- ensure materials and spacing of vertical pickets do not provide opportunities for finger, arm or leg entrapment, this includes any feature fencing or screens (see Figure 18).

Figure 18: Examples of **non-compliant** fencing with entrapment risks.

Rails

- Minimum 40mm x 40mm SHS @ 1.6mm minimum thickness.
- Panel rail length is to match panel length (ie 2400mm-2735mm).
- Each rail end must be supported by a fully enclosed one-piece security bracket to be attached to the inside of the post and rail by a minimum of 3 fixing points (minimum anti-tamper self-drilling screws).
- Engineering certification must be provided for the rail end brackets to confirm they shall resist wind and live loads as prescribed by AS/NZS 1170.1 Table 3.3.
- Fully enclosed security brackets between post and panel must be fully enclosed one-piece heavy duty security bracket (Bluedog SmartaBracket or approved equivalent).
    - Cast metal/alloy or plastic brackets will not be accepted.
- Fixings must be minimum 12g, 25mm Pentaforce anti tamper self-drilling screws or approved equivalent.
- For ‘type 2’ 1500mm and 1800mm panels, ensure a minimum of 1000mm is provided between the top rail and the next rail down (see Figure 19)
    - to prevent falls and unintended access by children by placing items/equipment a minimum 900mm from the fence.

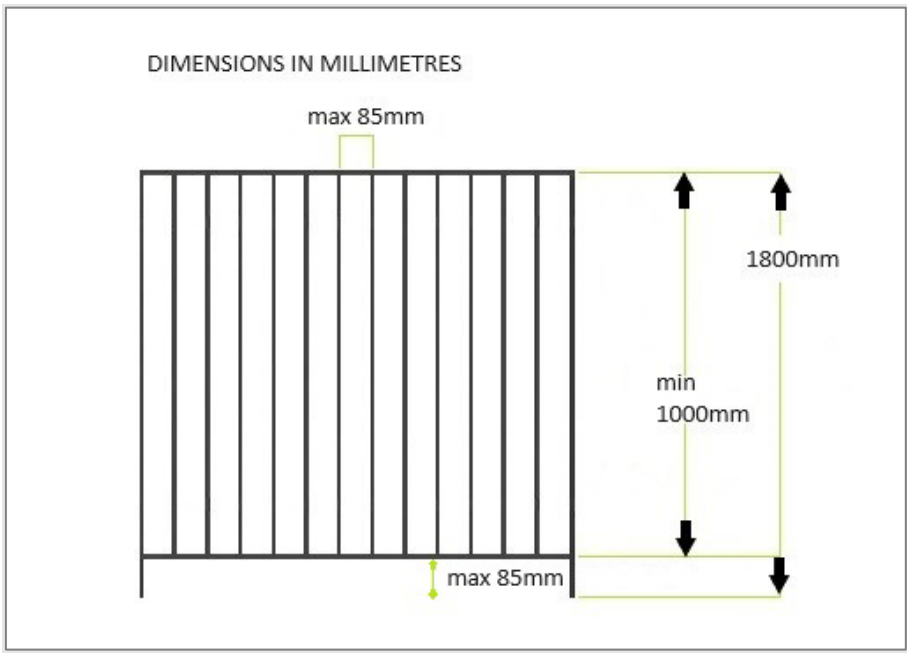


Figure 19: Illustration of fencing that complies with Regulation 104, AS 1926.1 and the department's Security Design Standards.

Fence post footings

- For 900mm internal fencing and 1500mm safety fencing, posts to:
  - be set in concrete footings with ≥300mm diameter and ≥600mm depth (or to manufacturer's recommendations, whichever is the greater)
  - extend a minimum of 500mm into ground and shall be fully concreted.
- For 1800mm safety fencing and all security fencing, posts to:
  - be set in concrete footings with ≥300mm diameter and ≥800mm depth (or to manufacturer's recommendations, whichever is the greater)
  - extend a minimum of 700mm into ground and shall be fully concreted.
- Footings to be below the existing surface for:
  - bitumen/brick paving - surface to allow for the previous surface material to be reinstated to match the level of the surrounding existing surface
  - concrete surface - footings should match the existing surface
  - natural earth surface - allow for a minimal coverage of natural earth.
- Footings must be wet mix concrete. Finish below ground to be domed to eliminate water lying at base of posts. Concrete to be:
  - ≥20 MPa strength for 900mm internal and 1500mm safety fencing
  - ≥25 MPa for 1800mm safety fencing and all security fencing.
- Denso tape to be applied to the posts to prevent corrosion due to moisture. Denso tape to be Ultraflex 1500 (black) or equivalent applied around the post with 30mm lap. Denso tape to extend 100mm into the footing and 50mm above the ground surface.

Gates

- If gate widths are not detailed in drawings, use the following dimensions (or as specified separately):
  - Single pedestrian gate (small), 1 leaf providing a 1000mm clear opening
  - Double vehicle gate (basic), 2 leaves providing a 4000mm clear opening

- Double vehicle gate (large), 2 leaves providing a 6000mm clear opening

- On flat or near flat ground, clearance of the base of all 'type 1' fencing from the ground surface must be ≤100mm.
- On sloping ground, clearance of the base of stepped or raked fence panels must be ≤100mm for safety fencing and ≤150mm for security fencing.
- On flat or sloping ground, clearance of the base of 'type 2' gates from the ground surface must be ≤85mm.
- Minimum 65mm x 65mm SHS vertical stiles @ 1.6mm minimum thickness.
- Supplied with twin bottom 65mm x 65mm minimum SHS horizontal rails.
- Single and double gates shall be hinged
  - for 900mm internal and 1500mm safety fencing, from 75mm x 75mm x 3mm or 100mm x 100mm x 4mm galvanised SHS posts.
  - for 1800mm safety fencing and all security fencing, from 100mm x 100mm x 4mm or 100mm x 100mm x 5mm galvanised SHS posts.
- Pickets to be vertical, minimum 25mm x 25mm SHS @ 1.2mm minimum thickness.
  - Security fencing gate pickets to match fence panel pickets with 'crush spear top' with apex of spear to be slightly rounded, not sharp.
- For all security fence gates, to eliminate foothold space where Broadhurst locking device and/or drop bolt mechanism is fitted, perforated steel mesh will be fitted between the top and bottom rails.
  - Mesh shall be pattern 23414 or pattern 24415 @ 1.2mm thickness or similar with a maximum of 12mm round hole, powder coated to match fencing colour.
  - Mesh plate will be affixed to the exterior of the gate leaf via M10 shear bolts/nuts, anti-tamper self-drilling screws, or welded during manufacture.
- For all gates, no diagonal or horizontal bracing on gates that would create a foothold for unauthorised access will be accepted.
- For ECEC pedestrian access gates:
  - when main entrances are located near carparks or busy roads, a suitably sized fenced holding area is recommended with self-closing, self-latching mechanisms fitted to gates (see Figure 20). If this is also the main entrance to the facility, additional entry mechanisms may be necessary to ensure facilities are accessible to all

Figure 20: Example of holding area gate set-up.

[14] Pattern 234 – 6.4mm round hole x 9.5mm staggered pitch

[15] Pattern 244– 9.5mm round hole x 12.7mm staggered pitch

- ensure finger entrapment points between gate and fence are eliminated.

Access control gates

- All access control gates must be hardwired access control unless specified by SEM.
- For gates fitted with access control, the maximum clearance between gate and post is 5mm to ensure effective operation of the electric strike.
- Gates fitted with access control must be provided with a strike protector to stop unauthorised access via the electric strike.
- For any access control proposed on 2m wide pedestrian access (PA) gates, contact SEM for further advice.
- For any access control gates, perforated steel mesh is to be provided on the gate and a full panel next to the card reader to ensure gate cannot be manually opened through the fence.
- Perforations in steel mesh are to be <8mm or >25mm to prevent finger entrapment.
- Access control gates and locking mechanisms must be installed in such a manner to ensure the gate will correctly latch and lock at all times.
- For any gates fitted with access control - a suitable closer should be provided rated the appropriate weight to effectively close the gate. Contact SEM for further advice.
- Any gates fitted with read in and read out functionality (no free handle egress) an emergency break glass must be provided.
- A gate closer must be fitted to achieve a consistent latch operation.

Hinges

- Hinges are to:
  - for all internal and safety fence gates, be adjustable, heavy duty, self-closing type or roller bearing type (dependent on application requirements).
  - for all security fence gates, be Bluedog heavy duty, roller bearing type or approved equivalent.
  - allow the gate to open at least
    - 90° for internal fences and safety fences
    - 180° (unless otherwise specified) for security fences
  - be self-closing hinges certified to AS 1926.1 for ECEC facilities.
- Double gate hinges must be mounted to posts/gates with minimum M10 shear bolts / nuts, anti-tamper self-drilling screws or similar.
- Final design for all gate hinges must be submitted by the successful contractor for approval by the SEM unit, project coordinator or facilities manager.

Gate posts

- For 900mm internal and 1500mm safety fencing:
  - minimum 75mm x 75mm SHS @ 3mm thickness
  - where gate leaf width exceeds 2500mm, minimum to be 100mm x 100mm SHS @ 4mm thickness.
- For 1800mm safety fencing and all security fencing:
  - minimum 100mm x 100mm SHS @ 4mm thickness

- where gate leaf width exceeds 2500mm, minimum to be 100mm x 100mm SHS @ 5mm thickness.

- Must be capped at top with galvanised steel caps (for all security fencing, align to top of pickets).

Gate post footings

- For 900mm internal and 1500mm safety fencing:
  - gate posts are to be set in concrete footings with ≥450mm diameter and ≥700mm depth (or to manufacturer's recommendations, whichever is greater)
  - gate post to extend a minimum of 600mm into ground and shall be fully concreted.
  - gate post footings shall be tied to, and poured in conjunction with, strip footings, where gate opening is ≥4000mm
    - strip footings shall be 300mm wide x 300mm deep with two N12 bars top and bottom and RW8 ligatures @1200mm centres between piers.
- For 1800mm safety fencing and all security fencing:
  - gate posts are to be set in concrete footings with ≥450mm diameter and ≥800mm depth (or to manufacturer's recommendations, whichever is greater)
  - gate post to extend a minimum of 700mm into ground and shall be fully concreted
  - gate post footings shall be tied to, and poured in conjunction with, strip footings
    - strip footings shall be 450mm wide x 300mm deep with two N12 bars top and bottom and RW8 ligatures @1200mm centres between piers.
- Footings to use wet mix concrete only.
  - Finish below ground to be domed to eliminate water lying at base of posts.
  - Concrete to be ≥20 MPa strength for 900mm internal and 1500mm safety fencing
  - Concrete to be ≥25 MPa for 1800mm safety fencing and all security fencing.
- Footings should match the height of the existing surface. Existing bitumen, brick paving or concrete surfaces should be saw cut to provide a clean edge to abut the concrete footing.
- For natural surface provide a compacted road base pad either side of the strip footings to prevent soil erosion.
  - Pad to be 100mm deep and extend 1200mm either side of the gate strip and 500mm past the gate posts.
  - Pad material 20mm DGB Road base compacted using a plate compacter.
- Denso tape to be applied to the posts to prevent corrosion due to moisture.
  - Ultraflex 1500 (black) or equivalent applied around the post with 30mm lap.
  - extend 100mm into the footing and 50mm above the ground surface.

Drop bolts

- Each leaf of any double gates to be fitted with lockable drop bolts (minimum 700mm in length).
- Drop bolt length to be:
  - 500mm for safety fencing gates
  - 700mm for security fencing gates

- Drop bolt assembly to include a 'D' handle. The gate frame to include a welded metal tab with a hole in it. The 'D' handle should engage with the metal tab to enable the drop bolt to be secured down, with a padlock applied when the gate is in the closed position (to prevent the drop bolt being raised). The welded metal tab should engage with the keeper post chain to enable the gate to be secured in the open position.
- The drop bolt is to have a fastener installed to the shaft to prevent unwarranted removal of the drop bolt.
- Installation of the metal tab after the gate is installed may be better to get the correct levels.
- Ground drop bolt receiver:
    - to secure double gates in the closed position.
    - to be installed so no tripping hazard is present/created.

Keeper post

- Where briefed for safety fence gates, and for all security fence gates, gate keeper posts with link chain attached shall be installed to lock a single gate and each leaf of a double gate in the open position.
- Post should be located to prevent use as a climbing aid and located ≥500mm inside the fence.
    - a minimum 65mm x 65mm SHS steel @ 2.5mm thickness, capped with galvanised steel caps and a maximum of 1200mm high
    - powder coat 'Safety Yellow' for visibility when standalone.
- An acceptable alternative is to adjust the fence panel width so that an in-line fence post is located in a suitable position to also act as a keeper post.
    - In-line fence posts acting as keeper posts may be installed when briefed. In these circumstances a link chain will be attached to the in-line fence post in the same manner as a standard keeper post.
    - Under no circumstances are fence pickets to be constructed or adapted to be an alternative to the keeper post.
- All security gates are to be constructed and installed to allow the gates to be locked in the fully open and closed position.

Locks and keys

Internal and Safety fence gates

- In most instances:
    - all pedestrian or single leaf gates should be capable of being secured in the closed position by the following latches or approved equivalents.
        - MagnaLatch is required for pedestrian gates installed as part of 1500mm safety fencing
        - Lokklatch Deluxe is required for pedestrian gates installed as part of 1800mm safety fencing
    - For ECEC facilities, unless otherwise specified, vehicle gates are to be fitted with a simple slide bolt mechanism in addition to drop bolts that allow for locking with standard padlocks.
- Where a project requires perimeter gates to be capable of being permanently secured (including all ECEC gates):
    - all pedestrian gates are to be provided with:

        - Lockwood key entry deadbolts or dead latches with both exit and entry cylinders
        - Carbine Acrobat Hook key entry deadbolt or Lockwood 3782 key entry dead latch with both exit and entry cylinders
        - for ECEC facilities, have keyed latches that automatically catch when the gate closes
    - the dead lock shall be Carbine Acrobat Hook
    - the dead latch supplied shall be Lockwood Synergy 3782
    - both locks shall be installed via suitable welded lockbox within the gate frame and are not to be supplied with handles unless otherwise advised
    - for school facilities, locks shall be mounted at 1100mm from the ground to comply with AS 1428.1
    - for ECEC facilities, locks shall be mounted at a minimum 1500mm
- Ground drop bolt receiver to be provided where briefed to secure double gates in the closed position and should be installed so no tripping hazard is present/created.
- Where keeper posts have been briefed, vehicle and pedestrian gates should be provided with appropriate number of standard padlocks to secure the gates in the open position (generally 2 for vehicle gates and 1 for pedestrian gates).

Security fence gates

- Unless electronic access control has been specified and authorised by the SEM unit:
    - all pedestrian gates are to be provided with Carbine Acrobat Hook key entry deadbolt or Lockwood 3782 key entry dead latch with both exit and entry cylinders. Locks to be mounted at 1100mm above ground surface to comply with AS 1428.1.
        - the exact configuration of dead bolts or dead latches shall be determined in consultation with the site leader and project coordinator. The final decision on gate lock hardware shall rest with the SEM unit.
        - the dead lock supplied must be Carbine Acrobat Hook.
        - the dead latch supplied must be Lockwood Synergy 3782
        - both locks must be installed via suitable welded lockbox within the gate frame and are not to be supplied with handles unless otherwise advised.
    - vehicle gates are to be fitted with an internal Broadhurst locking mechanism positioned 1500mm above ground surface.
        - Broadhurst locking mechanism to have 20mm diameter steel bar and two elongated lugs, or one lug of sufficient width, to receive shoot bolt to prevent gates opening when drop bolts are not closed and/or locked.
- Any inward opening single gate fitted with the Lockwood Synergy 3782 or access control must be complemented with the installation of a gate/door stop to the lock keeper side gate post to form protection to the lock strike/bolt.
- Any outward opening single gate fitted with the Lockwood Synergy 3782 or access control must be complemented with the installation of a gate/door stop to the leading edge of the gate to form protection to the lock strike/bolt.
- Vehicles gates are to be provided with 2 additional standard padlocks and pedestrian gates to be provided with 1 additional standard padlock to secure the gates in the open position.
- Key cylinders specified for the pedestrian and vehicle gates are to be configured in the manner dictated by the SEM unit, in line with the department's approved hierarchical key structure for security fencing.

- The standard padlocks to be used to secure the gates in the open position are ABUS 83/50 (with special alloy shackles and replaceable cylinder).

Keying

- All manual gate locks must be keyed to the ABUS 14 inline system. Keys designated for use by external users (ie Community groups) shall be incapable of opening any locks except the 2 approved external user gates identified by the school.
- A maximum of 20 individual site keys will be provided for each site and handed to the school principal at practical completion or earlier as negotiated. Where requested, an additional 10 'hirers' keys will be supplied.
- Padlocks used to hold the gates in the open position will be keyed to the school's existing master key system where possible. No other locks associated to the security fencing are to be keyed in this manner.

Mailboxes

Where specified in the fence design, mailboxes shall be provided in a location agreed by the site.

- Mailboxes must:
    - comply with Australia Post Street Mail Service – Conditions of Delivery and shall be at least 300mm deep (front to back) x 200mm high (top to bottom) x 485mm wide (side to side) unless otherwise specified
        - suitable proprietary mailboxes can be provided by Heatlie Letterboxes or other recognised providers
    - be fixed to the pickets in such a way as to not compromise the integrity of the fence.
    - be fitted with a weatherproof lockable rear access door (two lock keys shall be provided to the site).
    - be provided with a horizontal aperture with the aperture located 1100mm above ground level. The weather cowl over the aperture should prevent rain entering the mailbox and the angle of the weather cowl should be constructed at 45° to prevent climbing.
- To further eliminate footholds in the fence design, perforated steel mesh shall be provided between the top and bottom rail. Mesh shall be:
    - mesh pattern 2341 or 2442 @ 1.6mm thickness and shall be affixed to the outside of the gate leaf (or fence panel, as appropriate) with either via M10 shear bolts/nuts, anti-tamper self-drilling screws, or welded during manufacture.
    - powder coated to match the fence.

Hard court fencing

Hard court fencing must:

- be chain mesh minimum 3600mm high with top and bottom rail
- where courts are adjacent to private property, investigate increasing the height in consultation with the neighbouring property owners
- have 1 double gate for ambulance access (see vehicle access gates).
- provide pedestrian access gate(s).

Retaining walls

- Where concrete or timber sleeper retaining walls are installed, ensure the tops of exposed H and C beams between sleepers have caps or brackets securely fixed to avoid risk of injury.
- Ensure the caps are securely fastened and have rounded corners and exposed edges.

Outdoor seating

Can be incorporated into retaining walls, fixed to building walls, as tree surrounds or under shade structures. Recommended seating heights:

- ECEC - 300mm to 350mm
- Primary schools - 325mm to 450mm high
- Secondary schools - 325mm to 600mm high

Use seating material that:

- does not require painting, sealing or maintenance
- can withstand weather and heavy use
- is suitable for the planned location and local sun exposure (recycled plastic or composite timber is not appropriate without shade protection).

Flagpoles

Must comply with:

- AS/NZS 1664.1
- AS/NZS 1664.2
- AS 4100 Steel structures code
- AS/NZS 1170.2

Flagpoles:

- must be of the internal halyard design with captive weighted necklace fitted around the flagpole
- able to be demounted if maintenance is required
- steelwork to be hot-dip galvanised after fabrication
- preferred finish is Pearl White powder coated to AS 3715 for external use
- where mounted in lawned areas a raised concrete plinth (in addition to the footing) approximately 400mm x 400mm x 100mm square is recommended to protect from mowing equipment
- all fittings to be of marine grade stainless steel or UV stabilised polycarbonate
- ensure mounting location is clearly visible from street frontage and clear of overhanging trees or built structures.

6m flagpoles are the preference and must be:

- manufactured:
    - from 6063T6 80mm x 2mm thick wall parallel or spun tapered aluminium alloy
    - with 1650mm length 50NB medium wall galvanised spigot with 2 poly bushes to insulate dissimilar metals

- Installed with:
    - a minimum footing size of 650mm deep x 400m diameter (subject to site specific geotechnical parameters)
    - 25MPa wet mix concrete only
        - if an existing footing is to be used a flange base can be used and secured with chemical anchors, it is essential that existing footings are in good order and of a known dimension and are not less than specified footing dimensions

8-9m flagpoles, where briefed must be:

- manufactured:
    - from 6063T6 100mm x 3mm thick wall spun tapered aluminium alloy
    - to have flange base with 1800mm long 80NB x 4mm spigot continuous butt welded to 12mm thick base plate
- Installed with:
    - the 3 x M20 galvanised cranked hold down bolts (650mm long) to be set in concrete footings
    - a minimum footing size of 900mm deep x 500mm x 500mm 25MPa concrete (subject to site specific geotechnical parameters)

Halyard

- to be 5mm 8 ply polyester UV stabilised
- rope cleat to be cast aluminium (CL236 Ronstan); plastic not allowed
- to be fitted with 2 UV stabilised nylon flag clips
- access must be via tamper proof hatch
- sliding collar type
- held secure with security screw
- supplied with 2 keys per pole.

Sheds

- Shed are recommended to be constructed from pre-painted steel sheets, with concrete floor and ramped access to door thresholds
- Clear or translucent roof sheeting can be used in areas that are not prone to bushfires
    - must be made a heavy gauge woven mat reinforced fibreglass system
    - must have galvanized metal mesh installed underneath conforming to AS/NZS 4389
- Doors may be single or double leaf, sliding door or roller door access (tilt-up doors are not accepted)
    - closing mechanism for roller doors to be installed 1500mm above floor height
    - where roller doors are provided, include a separate pedestrian access door
- Shelving is recommended to be fixed (Dexion shelving or equivalent is acceptable)
- Galvanized metal mesh must be installed behind wall linings and under roof cladding
- Shed downpipes must be connected to underground stormwater system
- Power, lighting and water may be briefed as required.

Covered outdoor learning area (COLA) structures

The installation of COLAs must conform to the manufacturer's specifications and standard designs as well as the following requirements:

- Preferred freestanding. If the structure is intended to be fixed to an existing building, a structural engineer must advise on the structural suitability of the existing building and design connection requirements.
- Designed to cover outdoor learning areas only and **must not** be designed to be enclosed at or after the time of installation.
- Bird nesting opportunities must be minimised.

Table 16: General structure sizes are provided for the following enrolments:

Dimensions	Enrolments		
	Primary School	Secondary School	Area School
21m X 14m x 5m high*	150 to 500	Up to 400	Up to 400
22m x 18.5m x 7m high*	Over 500	Over 400	Over 400
37m x 22m x 7m high*	Large enough to allow a regulation netball court to be marked out as well as basketball, tennis and 3 volleyball courts, including required run-off areas all around.		

* Dimensions are clear distances between columns, height is clear height to lowest point of structural frame, excluding bracing.

Structure

- Framing components must be hot-dip galvanised steel sections, bolted together with high tensile fasteners.
- Corrosion protection to steel sections must be:
    - at least Z350 coating
    - Z450 coating at education sites within 1000m of the coast or within 750m of industrial emissions
- Corrosion protection to fabricated components and connections must be hot-dipped galvanised with Z600 coating.
- Columns must be supported by concrete footings specifically designed for the site conditions, and independent of any floor slab. Columns and base connections below pavement level must be encased in concrete.
- The structural frame should be designed utilising a portal frame system in both directions.

Roof

- Roof cladding must be pre-painted steel, minimum 0.48mm BMT.
- Some translucent sheeting in full length strips, taking care not to cause glare, may be used in areas that are not prone to bushfires.
    - Translucent sheeting must be made of webglass fibreglass material.
    - Any clear roof sheeting must have safety mesh installed underneath conforming to AS/NZS 4389.
- Stormwater is to be collected using gutters and downpipes complying with design standards laid out in this document and discharged into rainwater tanks connected to underground irrigation or connected direct to underground stormwater system.

- Stormwater **must not** be discharged to paving, garden beds or other surfaces.

Infill

- Mesh infill between columns may be provided where briefed.
- Retractable netting is acceptable.
- No solid wall cladding is to be provided.
- Column protectors must be provided to all columns to a minimum of 2.4m high, to fully enclose the steel column sections.

Shade structures

An assessment of the risk and safety issues associated with the provision of shade structures must be undertaken prior to any decision about the type of structure, its location and installation.

- The shade structure is preferred to be freestanding but can be designed to abut existing buildings.
- If the structure is intended to be fixed to an existing building, a structural engineer must advise on the structural suitability of the existing building and design connection requirements.
- When installed over a sand play area, shade structure columns must limit hazards for users entering and leaving the sand area. Ensure the base of columns are located external to sand areas.
- Cantilevered structures are not permitted. Structures must have four posts or columns supporting the roof.
- If covering a playground or outdoor equipment, shade structure design must ensure:
  - clearance of 1.5m above any play equipment
  - separation distance of 2.5m from the lowest accessible edge of the shade cover from any part of the play equipment
  - posts are beyond the impact area of all play equipment in accordance with AS 4685.1.

Structure

- The total structure must be designed by a professional structural engineer considering the wind terrain category and design wind speed for the particular site. (These structures can be susceptible to damage from strong wind).
- Posts are to be set in concrete footings specifically designed for the site conditions.
- Shade structure columns must be non-scalable, be clearly visible, and have rounded edges and/or padding. Locate columns a minimum of 1500mm away from fences and adjacent structures to avoid scalability.
- Must be installed permanently and not as removable structures.
- Steel framed structures must be used.

Roof

Shade structure roofs may be approved solid or fabric materials.

Solid roofs:

- Opaque solid roof sheets must be pre-painted steel, minimum 0.48mm BMT.
- Clear or translucent roof sheets must be of webglass fibreglass material. Wire mesh must be installed underneath all clear and translucent sheeting conforming to AS/NZS 4389.
- Solid roofs are to be pitched to shed rainwater (minimum of 5 degrees).

- Roof water is to be collected in rainwater tanks connected to gravity-fed irrigation or connected direct to underground stormwater system.
- Stormwater **must not** be discharged to paving, garden beds or other surfaces.

Fabric roofs:

- Fabric covering material must provide a minimum 90% shade and 91% UVE block-out and must comply with AS 4174.
- Fabric covering materials can be susceptible to damage if within easy reach or accessible from adjoining structures
- The repairs, maintenance and replacement of fabric coverings will be at the site's own cost.

Fabric membrane structures

Where engineered fabric membrane structures are identified as the only feasible shade provision option, a risk benefit analysis of the proposed structure must be undertaken and submitted to the department for approval.

All material data sheets for the proposed fabric membrane must be provided.

Sail structures

New shade sail structures comprising of fabric material supported by tension wires between structural members, and cantilevered fabric structures, **must not** be installed.

Existing sail structures that become due for replacement for any reason (such as vandalism or age) must be replaced by alternative shade structures which meet the above requirements.

Pavements

Pavers

- Interlocking unit pavers, concrete and bitumen are the preferred materials. Specify clearly the type, shape, colour, thickness, pattern and starting point for paving layout.
- Pavers must:
    - be a maximum 200mm x 200mm with a bevilled edge
    - be 60mm thick over 30mm bedding sand over 125mm PM1/20.
- Slip resistance requirements for pedestrian paths must comply with AS 4586 and DIT NATSPEC.
- For more information on slip resistance pedestrian materials please refer to HB 197:1999.
- All pavements must be designed and constructed appropriate to substrate type, location and possible usage (such as vehicle access and pedestrian traffic). Where vehicular access is required, heavy duty interlocking unit pavers must be specified.
- Pavement must be designed so as to avoid becoming a tripping hazard with changed conditions (ie reactive soils).
- Large pavers susceptible to cracking must only be specified in areas of pedestrian traffic.
- Recycled materials PM2/20RG and PM3/20RG (Transport SA specifications) **must not** be used and are not acceptable alternatives to PM2/20QG and PM3/20QG.
- Site won pavers may be utilised for replacement and repair only.
- For paving edges please refer to DIT Construction Drawing DG38 - Concealed Concrete Edge Restraint for Unit Paving.

Insitu concrete

- Concrete pavement to have a non-slip finish, such as broom finish.
- Concrete edge restraints detail is required to prevent movement of the edge of the block pavement.

Asphalt and bitumen pavement

- Generally on school sites a layer of hot mix asphalt is specified as the wearing surface using an asphaltic concrete mix. Asphalt footpaths **must not** be used in areas with reactive soils and/or poor drainage. Only concrete or block paving must be used in these areas.

Outdoor decking

- Any timber or wood composite product fixed externally or abutting a building such as floor decking must:
    - meet the requirements of AS 5113, or
    - be tested and certified to withstand exposure up to a minimum BAL-29 in accordance with AS 3959 regardless of the bushfire risk rating of the school.
- For sites located in bushfire protection areas requiring construction above BAL-29, comply with the relevant bushfire attack level for that site.

Consider decking products selected for seating, tiers and platforms as heat gain from sun exposure may result in surfaces becoming too hot for seating.

Composite timber decking products must be sealed in accordance with manufacturer's recommendations on installation and prior to handover. Re-sealing of composite timber decking will be required by sites depending on usage, exposure to weather and cleaning regimes.

Waste storage and disposal

Maximise the opportunities for recycling and composting to reduce waste ensuring storage and collection spaces for multi-stream waste materials support the department's waste contract requirements.

Internal bins

- Internal bins must be 60L or 140L, depending on education site size, local foot traffic, and waste generation volumes.
- Bins may be held in multi-bay proprietary or joiner-built lockable bin surrounds.
- Bin bays are to consist of up to four waste streams: Waste, Recycling, Organics, and Paper and Cardboard. Waste streams found in any one area are to be determined by the type of waste generated in the area.

External bins

- The recommended capacity for external bins must be 140L or 240L, depending on site size, local foot traffic, and waste generation volumes.
- Bins may be held in multi-bay proprietary or fabricated lockable bin surrounds. External bin surrounds must be non-flammable.
- External bin surrounds:
    - are to be designed to prevent wildlife accessing waste.
    - must have an elevated roof to mitigate the ingress of rain.

- Bin bays are to consist of up to three waste streams: Waste, Recycling, and Organics. Waste stream bins installed in any one area are to be determined by the type of waste generated in the area.
- External bins not held in bin surrounds must:
    - have poles with a concrete base provided to secure the bins at all times
    - be located at minimum 10m from buildings/structures, covered walkways or eaves/verandas and overhanging trees to prevent the potential spread of fire.

All bins

- Where bin surrounds are installed, bins and bin surrounds are required to have matching sizes with no more than a 50mm gap between the edge of the bin and bin surround.
- For ease of use, bin surrounds to have clear openings to have no coverings/lids. The only exception is internal organic bins, which may include a covering if it is the site's preference.
- Bin surrounds are to feature colouring corresponding to each waste stream, in line with AS 4123.7, for ease of identification:
    - **Red** for Waste
    - **Yellow** for Recycling
    - **Green** for Organics
    - **Blue** for Paper and Cardboard
- Bins (and bin surrounds, where signs can be safely affixed) must feature Department for Education bin signage found on the EDi Central waste management services for schools page.

Waste disposal areas

Must:

- be located adjacent to an access road
- avoid any overhead cables and overhanging trees
- allow easy access to waste collection bins by front-loading trucks, avoiding the need to reverse
- preferably be screened by brick, metal or timber fencing, or plantings
- ensure the flooring:
    - is heavy duty paving suitable for heavy vehicle loading
    - can be easily cleaned.

The access road must be a heavy duty surface or pavement to withstand the high loads and turning movements of the truck. The access road must be wide enough to manoeuvre to avoid damage to site fixtures.

Stormwater and sewerage

- All work external to the boundary to be carried out in accordance with the requirements of the local council, SA Water, and other relevant authorities.
- Design of stormwater drainage system must be based on design methods outlined in the current edition of Australian Rainfall and Runoff (ARR).
- A site wide stormwater management plan is to be provided during the concept phase for any new work that connects to an existing stormwater system or where new stormwater infrastructure is provided. The design report is to detail design assumptions, design standards, and parameters and calculations used.

- If existing underground stormwater infrastructure is being relied upon for the disposal and management of site stormwater run-off, existing systems must be inspected and the condition assessed to ensure pits and pipes are suitable and not damaged or blocked.
- Undertake detailed CCTV inspection of all sewer and stormwater drainage within the scope of works and downstream of any new connections to determine suitability of connection and check that downstream connections are not blocked.
- All pavement and grassed stormwater runoff is to be collected on the property prior to discharging on to council or neighbouring properties. Check flows from adjacent properties.
- All stormwater and sewer drains to be at least SN4 PVC.
- Stormwater minimum pipe diameter:
    - 100mm for connection direct to downpipe
    - 150mm downstream from any grated pit
- Sewer minimum pipe diameter – 100mm.
- The minimum pipe diameters are specified to reduce the risk of pipe blockage affecting operation of the pipe, and if a blockage does occur the minimum specified diameter allows for easier cleaning. Although the minimum pipe diameter specified may be larger than what is required following a detailed drainage design, it provides an improved service life.
- If there is a risk of vehicle traffic or insufficient pipe cover, reinforced concrete pipes (RCP) must be used for storm water.
- Individual site-specific designs must be undertaken for each site and needs to consider factors such as location, impervious area, gradient across the site and downstream infrastructure.
- Services to be marked with the approved magnetic tape.
- Consider the use of vegetated buffer strips to intercept and filter the run-off reducing the extent of piped stormwater collection.
- Ensure external overland flow paths exist around buildings to minimise the possibility of flooding buildings due to blocked pipes and major storms. Ensure no local ponding adjacent to buildings or ponding that prevents access to buildings can occur.
- The selection of suitable design Annual Exceedance Probability (AEP) for the surface water drainage system is to be made by the designer in accordance with local conditions and requirements, and the risks of injury or inconvenience to people and damage of property caused by stormwater.
- Typically, AEP for minor storms is 5 to 20%. Design to ensure that there is no impeded access to the entrances to the school or school buildings following a 5% AEP event. For minor storm performance, the surface water drainage system must be designed to:
    - dispose of stormwater flows from rainfall events having an AEP appropriate to the importance of the site
    - mitigate the level of nuisance and the severity of potential damage and injury that would be caused by overflows due to rainfall events of greater AEP or failure of the system.
- Typically AEP for major storms is 1 to 2%. For major storms the surface drainage system must be designed so overflows do not:
    - present excessive danger to people
    - cause significant damage to property
- enter the buildings.
- The drainage system must be aesthetically pleasing, economical, safe, robust and durable, and designed to avoid blockages.

- In fully enclosed (but not covered) courtyard areas, allow for 2 independent outlets for water to escape to, to keep flooding potential to a minimum.
- Allow for a minimum of 300mm freeboard in flood prone areas.

Rainwater tanks

- Rainwater tanks must be:
    - constructed from polyethylene complying with AS/NZS 4766.
    - installed where roof catchments are in close proximity to garden bed landscaped areas to support WSUD by contributing to rainfall runoff controls and harvesting rainwater for later use
    - connected to gravity fed drip or soaker hose irrigation systems to support nearby garden beds, or integrate with existing harvested rainwater delivery systems.
- Irrigation systems supplied with harvested rainwater are to:
    - operate without the use of pumps or similar mechanical plant to increase water pressure.
    - be designed to allow for mains water supply to be used as a backup in the event the rainwater supply is not available.
        - Isolation and backflow prevention devices are to comply with the NCC and AS/NZS 3500.1.
        - Irrigation tubing components, fittings, and valve boxes to comply with DIT NATSPEC.
- Rainwater tank overflow is to be plumbed to underground stormwater system.
- Rainwater tanks **must not** be placed adjacent to buildings without providing appropriate barriers to ensure the roof cannot be accessed from the rainwater tank.

Flood management

An assessment of the project flood risk must consider factors such as sea level rises where this may impact the stormwater system over the design life of the project. After considering these factors, the designer will need to ensure:

- All piped systems are designed to convey all flows up to an AEP of 63%.
- Overland flow systems are designed to safely convey all flows up to and including an AEP of 5%.
- Damage is prevented to all on-site infrastructure and neighbouring properties for all flows up to and including an AEP of 1%.

Specialist hydraulic and flood modelling must be undertaken by the designer where the site is within an identified floodplain.

On-site detention

On-site detention is not desirable but where briefed must comply with AS/NZS 3500.3. In addition, for the case that on-site detention may be required as a development condition, pumped systems are not preferred and must be avoided where possible. If a pumped system is designed, the designer must ensure that there are sufficient backup systems in the case of:

- a pump failure.
- an extended power outage.

Future expansion

Ensure that stormwater and sewer pipe capacity and invert levels of the present system are adequate to

cope with future development such as additional buildings and hard paved areas.

Pit covers

In ECEC facilities, the diameter of drainage grate holes must be smaller than 5mm or larger than 25mm to prevent child finger entrapment. See Entrapment fact sheet by Kidsafe SA and the Education Standards Board's creating safe facilities.

- Side entry pits **must not** be used on sites as balls and similar items are hard to retrieve.
- Wherever possible hard paving to abut pit frames.
- Cover infill to be in the same material as and match adjacent paving.
- Pit covers must be a tight fitting bolted down design or have sufficient weight to prevent their easy removal.
- All covers are to comply with AS 3996 and must be:
    - Class "D" to any paved areas and where vehicle access may occur
    - Class "B" for landscaped areas.
- If a lesser class of cover is considered, note the requirement to prevent their easy removal.
- Grates must be cast iron and in accordance with AS 1428.1.
- All grates must be secured in position with grating clips that require the use of a tool for removal. Secure grates in position without creating a tripping hazard.
    - surface inspection openings and surface inspection point covers to be screwed down type and supported on concrete rings.
    - surface inspection openings and surface inspection point in high profile areas must be brass or chrome cover type.
- Checker plate covers **must not** be used.

Swales

Swales are only to be used after careful consideration since they are high maintenance and can become occupational health safety and welfare risks.

- For slopes and depth of ponding as in AS/NZS 3500.3 Section M.12 must be taken as minimum and maximum values rather than desirable values.
- The sides of swales must be 1:3 to 1:4 maximum so that they can be maintained with a ride-on mower.

Neighbouring properties

Designs must prevent runoff from the education and care facility property, including any oval and grassed areas as well as paved and building areas, that may potentially cause damage to neighbouring properties and facilities.

All storm water runoff must be collected on the education and care facility property and discharged into council drains through an underground stormwater system.

Subsurface drainage for grassed areas

- Poor draining soil or excessive runoff has the potential to create waterlogged soils.
- Subsurface drainage for grassed playing fields and communal areas that are connected to council stormwater drains are to be considered depending on soil type and conditions.

- Drains must run at a slight angle to the design contours.
- An assessment of the site is required to design the subsurface drainage system.
- It is preferable to have a separate design/documentation phase rather than a design and install contract.
- The consultant must assess the survey of existing levels, conduct a geotechnical assessment of the soil type, soil profile and structure, permeability and its consistency across the playing fields by sampling, testing and analysis.
- Ensure using minimum grades as recommended by manufacturers of propriety items such a strip drains and agricultural pipes.
- Design spacing and depth of laterals using information on soil type, permeability, rainfall, surface grades, and size and grade of strip drain or agricultural pipe.
- Minimum cover of 500mm required over all subsoil drainage pipes. Minimum cover of 300mm over all subsoil strip drains.
- Consider providing a surface inspection point (SIP) at the high point of the lateral or sweep up the end of the lateral. Locate cap on SIP or pipe at 200mm below surface.
- Provide SIPs at the end of the mains line. Locate cap on vertical riser at 200mm below surface.
- Generally, backfill laterals with imported coarse washed sand to surface.
- Use PVC pipework over main collector lines.
- Cut existing turf and relay on main lines.
- During installation locate and record the setout dimension inspection points, laterals, main lines etc from fixed points for inclusion on as constructed drawings.
- Provide as constructed drawing to DIT using DIT title block and drawing number.
- Note the location of existing irrigation system and the constraints on the installation of the subsurface drainage system.

Pits (neutralisers, grease arrestors)

Pits to be tight cast iron lids, top to be flush with pavement.

Tank will require separate vent and treated internally with epoxy coating.

Stormwater pollution prevention

The design of stormwater systems must minimise pollution loads, complying with Part 4 of the *Environmental Protection Act 1993*.

Ensure adherence to the requirements of:

- International Erosion Control Association (IECA Australasia) Best Practice Erosion and Sediment Control for building and construction sites (BPESC)
- Code of Practice for the Building and Construction Industry for Stormwater Pollution Prevention (EPA - 1999)

Due to the potential risk of petroleum hydrocarbon, heavy metal, and other toxic constituent contamination associated with car park stormwater, run-off **must not** be collected from driveways and car parks for irrigation purposes.

Stormwater drainage wet system

Design of wet systems for the drainage and collection of roof rainwater runoff must include adequate inspection points and flushout valve in accordance with DIT Standard Drawing DG46.

Landscaping

Outdoor Environments

Design guidance is available in Part 2: Design Principles (outdoor learning environments), Part 3a: ECEC (outdoor learning and play), and Part 3b: Schools (outdoor environments).

Must comply with the requirements of the AS 4685(Set).

For ECEC facilities, National Regulations 104, 108, 113, 114, and 115 apply to outdoor learning and play environments.

Therapy and sensory equipment

Sensory swings and ceiling suspended equipment must:

- be installed with complying fall zones under and around them
- have impact attenuating surface underneath the swing to the full extent of the impact area complying with AS 4685.1
- the impact area for swings is determined through measurement and calculation described in AS 4685.2
- be installed with ground clearance described in AS 4685.2
- use appropriately loaded heavy duty swing hooks (obtain load ratings of hooks and equipment from the manufacturer/supplier to assess whether they are fit for the intended purpose)
- have existing ceiling structures inspected and assessed by a certified structural engineer to ensure sufficient structural support to bear the maximum load rating of the swing or equipment item
- have any suspension kits installed to the ceiling structure rated for a point load of 200kg
- ensure the swing/hammock or sensory equipment is rated to the approximate weight for the intended users.

Fall zones and impact attenuating surfaces

The Australian Standards for playgrounds provide guidelines for fall heights, falling and free space, and impact area and impact absorbing materials:

- AS 4685.0 to AS 4685.6 Playground equipment and surfacing
- AS 4685.11 Playground Equipment
- AS 4422 Playground Surfacing – Specification, requirements and test method

Refer to the Kidsafe SA Playground Safety Information Sheets (specifically, Playground Surfacing) for further guidance.

- Falling space and free space provided must comply with AS 4685.

Free height of fall (FHOF)

All equipment or natural elements intended for play that have a FHOF of 600mm or more above ground level, or equipment with forced movement, must have impact attenuating surfacing in alignment with AS 4685.1.

The maximum FHOF for:

- moveable equipment in ECEC facilities is limited to 1500mm (refer to AS 4685.1 for specific requirements for all applications)
- fixed equipment in ECEC facilities is 1800mm
- all other settings is 3000mm
- upper body equipment (such as monkey bars) is 2200mm, measured from the surface of hand support to surface below
- climbing trees is 2200mm, measurement is the maximum distance between the last standing branch to surface below.

Impact area

Impact attenuating surfacing should be provided under all items of play equipment with forced movement regardless of elevated height.

There are specific impact areas for different types of moving playground equipment.

- for any elevated parts of equipment (logs, rocks, climbable platforms, climbable surfaces, climbing trees or other natural elements between 600mm and 1500mm above adjacent horizontal surfaces) an impact area of 1500mm must be provided to all sides of the elevated sections of the equipment or element
- for any elevated parts of equipment (logs, rocks, climbable surfaces, climbing trees or other natural elements over 1500mm) must be calculated using AS 4685.1.

Refer to the Kidsafe SA Playground Safety Information Sheets (specifically Impact Areas and Playground Surfacing) and AS 4685.

Swings

The impact area for a swing set in which 2 flexible seats are individually suspended from a horizontal load bearing beam are determined through measurement and calculation.

For example, a swing with a horizontal load bearing beam with a height of 3000mm, the distance from a stationary swing seat to the containment edge should be approximately 4500mm both in front of and behind the seat.

For varying beam heights and corresponding containment edges refer to AS 4685.

Slides

For slides attached to platforms where the run-out section is short (ie Type 1 slide), a long impact area of 2000mm is required beyond the end of the slide.

For slides where the run-out section is long (ie Type 2 slide), a short impact area of 1000mm is required beyond the end of the slide.

Cableway or flying fox

Cableways and flying foxes require a minimum impact area of 2000mm at each end and to each side of the cableway.

Impact absorbing materials

Children under 3 **must not** have access to small objects of a size that presents a choking hazard including bark chip softfall. For existing ECEC facilities with bark chip soft fall in outdoor play areas accessed by children under 3 years of age consider alternative natural loose fill products when complete replacement of existing loose fill is required.

Loose fill

Natural loose fill is the preferred impact absorbing material for playgrounds and nature play areas and must be:

- tested to and comply with AS 4422 requirements (with the supplier providing relevant certification to confirm this)
- retained by a border or edge to reduce displacement
- sufficiently provided to impact areas underneath and surrounding playground equipment, nature play elements and climbing trees with a fall height of greater than 600mm.

Bark chips must be:

- compliant with AS 4422
- where used for impact absorption, maintained to a minimum depth of 300mm in impact areas (this requirement exceeds the minimum depth of softfall identified in AS 4685.1 Table 4 and allows for product loss and dispersion as children use the play space).

Sand must be:

- certified in accordance with AS 4422, or
- verified in accordance with AS 4685.1 Table 4 (which identifies grain size, particle type, minimum depths and critical fall heights).

Borders or edging must be:

- an appropriate height to ensure loose material can be maintained at a depth of 300mm and does not allow dispersion
- made of materials that are durable and do not present a trip hazard with adjacent pedestrian walkway surfaces or have any sharp protrusions
- positioned appropriately to ensure playground equipment impact area clearances are maintained.

Refer to the Kidsafe SA Playground Safety Information Sheets (specifically Playground Surfacing).

Rubber or synthetic impact absorbing material

Must be:

- installed by an appropriately skilled person who can provide a certificate of compliance demonstrating that the material has been installed in accordance with the manufacturer's instructions and relevant Australian Standards (AS 4422, AS 4685)
- installed where adequate shade is provided to mitigate the potential for rubber or synthetic surfaces to heat up in direct sunlight.

Refer to the Kidsafe SA Playground Safety Information Sheets (specifically Playground Surfacing).

Protection against falling from heights

Protection from falling can be provided in the form of handrails, guardrails and barriers. For specific details

on the requirements for protection for different categories of equipment and heights refer AS 4685.1.

Handrails

Handrails are intended as rails to assist the user to keep balance and may be in addition to the requirements for a barrier (see below).

Handrail installation must comply with AS 4685.1.

They may be used on stairs and ramps leading to platforms and on climbing items.

Guardrails

Guardrails are intended as a rail to prevent the user from falling from the equipment and may be in addition to the requirements for a barrier (see below).

Guardrail installation must comply with AS 4685.1 and AS 4685.3.

Barriers

Barriers are intended to prevent the user from falling from the equipment and from passing beneath, and:

- can be used on platforms, stairs, ramps or rigid bridges
- may also be required to other trafficable surfaces and retaining walls where there is a change in level between adjacent ground surfaces
- must comply with AS 4685.1
- may be briefed to be above the minimum requirements of AS 4685 for some projects
- must consider the age group of users
- must be provided on equipment that is easily accessible to all ages and in all ECEC facilities and should be a minimum of 700mm high (measured from the surface of the platform, stairs or ramp) on any platform and walkway 600mm and above in height from adjacent ground level (see Figure 21)
- must, where the equipment is not easily accessible, be provided on any platform or equipment 1000mm or above in height measured vertically from the surface beneath (see Figure 21)

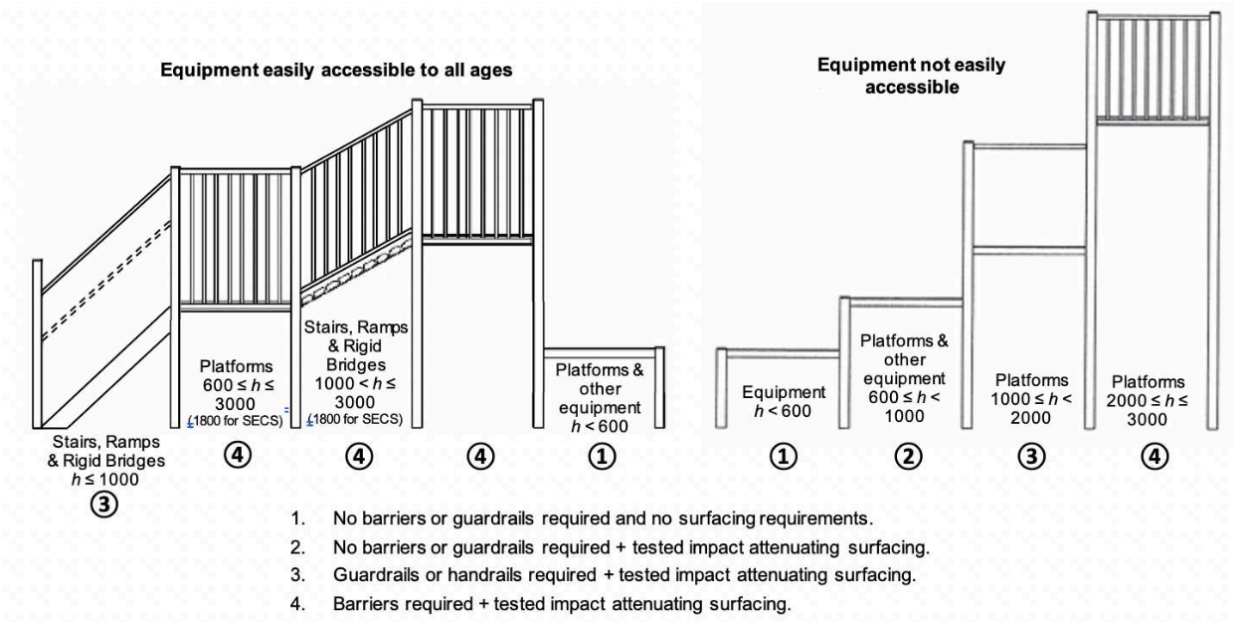


Figure 21: Examples of fall heights and barrier requirements[16].

[16] A Guide to Australian Playground Standards (written by Andrew Reedy – Play Check) – page 17

- Probe C or E, as per AS 4685.1, must not pass through any opening
- **must not** facilitate climbing on any horizontal or decorative infill elements
- tops should not encourage children to stand or sit on them
- must have gaps underneath no greater than 85mm
- openings **must not** create any form of entrapment (including gaps, V-shaped openings or protrusions) in which a part of clothing can become trapped while or immediately before the user is undergoing a forced movement
- openings must be:
    - <85mm or >230mm in diameter to prevent head entrapment
    - <5mm and >25mm in diameter to prevent finger entrapment
- all chain gaps must be <8.6mm
- all S-hooks and connectors gaps must be <8.6mm or >12mm.

For ECECs refer to the Education Standards Board's creating safe facilities.

Sand environments

The recommended depths of sand for play areas designed for use by children:

- <2 years of age is - minimum depth: 400mm, centre depth: 500mm
- >2 years of age - minimum depth: 400mm, centre depth: 800mm.

Sand areas **must not** be bordered by boulders in areas for children < 2 years of age.

Refer to the Kidsafe SA Playground Safety Information Sheets (specifically Sand Pits).

Drainage

To allow for adequate drainage of a sand area it is recommended:

- the base is loose paving stones on a gravel bed, banked to the centre
- a drainage membrane is installed separating the sand from the gravel base.

Rocks and boulders

Rocks and boulders:

- should measure less than 500mm in height from the playing surface level for ease of access and to avoid tested surfacing requirements
- if their size requires, are surrounded by the correct impact area and impact absorbing material
- are positioned to ensure there are no potential limb entrapment hazards or gaps (including entrapment gaps between 8-25mm)
- must be:
    - larger than 35mm diameter so as not to present a choking hazard
    - stabilised (with the use of cement/mortar) so no movement occurs when children and adults travel over them
    - provided with smooth well-rounded surfaces ensuring any sharp corners/edges are removed

- must have adequate drainage to prevent pooling of water to discourage the harbouring of vermin and snakes between them.

Interactive water features (IWFs)

- are not acceptable in Port Pirie where cross contamination of water sources can occur from lead dust contamination in the area (refer to Addendum: Guiding requirements for effective ongoing Lead exposure management)
- water courses must be designed so that the depth of the water, at any point, is less than 300mm
- additional considerations should be given to ECEC facilities and an appropriate depth (less than 300mm) should be identified following a risk assessment
- where possible, are to be directed into sand areas and garden beds that have suitable drainage systems
- water supply must be from a potable water source to protect student health and wellbeing (however IWFs **must not** be used for drinking water)
- a 'Do not Drink' warning sign must be installed at every outlet of an IWF in compliance with AS/NZS 3500.1 Clause 9.7.2
- installation of plumbing must comply with the NCC Volume 3 and AS/NZS 3500.1 for cold water installations.
- are 'end of line' equipment items and must have a testable backflow prevention device to protect the drinking water system from contamination
- must ensure compliance with the Office of the Technical Regulator (OTR) who regulate the installation of pipework connected to the IWF including the installation of backflow prevention devices (detailed in the Interactive water features - Plumbing Advisory Note) including:
    - all plumbing pipework and equipment supplying water to IWFs must be WaterMarked
    - where an IWF is connected from a dedicated water storage tank, or a rainwater tank, the tank must be installed above ground and comply with AS/NZS 3500.1 Section 8.
    - a reduced pressure zone (RPZ) backflow prevention device must be installed on the dedicated water supply branch to the IWF to protect the on-site plumbing drinking water system from contamination
    - the backflow prevention device must be located above ground within a vandal proof enclosure, not within an inground valve box
    - there must be no branches connected to the pipework between the testable backflow prevention device and the IWF
    - plumbing installations including all pipework and RPZ backflow prevention device must be carried out by a licensed plumber.

Refer to the following resources for detailed design requirements:

- Office of the Technical Regulator – Interactive water features – Plumbing Advisory Note
- SA Health Fact Sheet – Managing health risks associated with interactive water features
- Kidsafe SA factsheet – Water safety in Education and Care Settings.

Slopes and mounds

- should have maximum gradient of 1:3, with a preferred gradient of no more than 1:4 to allow ride-on mowers.

- should have an extra 1m^2 flat area provided at the top of the mound to act as a landing or low level platform
- where possible should incorporate accessibility provisions such as wheelchair access
- may have a slide installed (provide 1000mm free space from the centre of the slide on each side and a 2000mm radius impact absorbing surface at the end of the slide) with handgrips recommended at slide entrance to assist children upon entering
- with incorporated landings and other features with FHOF of 600mm or more above ground level:
    - impact attenuating surfacing with the corresponding impact area is required
    - barriers and guardrails may be required.

Fire pits

Fire pits must be approved by local council in accordance with Environmental Protection Authority requirements and must:

- be located a minimum of 3000mm away from any structure (building/verandahs/shade) and vegetation (including overhang) and not positioned directly on grass
- be a minimum 150mm in depth and 600mm in diameter
- have a tap and hose adjacent to the fire pit
- have a 2000mm radius free from flammable materials cleared and maintained around the fire pit.

Playground equipment

Australian Standards

The Australian Standards for playgrounds provide minimum benchmark guidelines for the design, installation, maintenance and operation of playgrounds:

- AS 4422 Playground Surfacing – Specification, requirements and test method
- AS 4685.0 to 6 Playground equipment and surfacing
- Part 0: Development, installation, inspection, maintenance and operation
- Part 1: General safety requirements and test methods
- Part 2: Additional specific safety requirements and test methods for swings
- Part 3: Additional specific safety requirements and tests methods for slides
- Part 4: Additional specific safety requirements and test methods for cableways
- Part 5: Additional specific safety requirements and test methods for carousels
- Part 6: Additional specific safety requirements and test methods for rocking equipment
- AS 4685.11 Playground equipment
- Part 11: Additional specific safety requirements and test methods for spatial networks

New playground equipment, fixed play structures and nature play spaces

Playground equipment, fixed play structures and nature play spaces must:

- comply with the relevant Australian Standards above
- be installed strictly in accordance with the manufacturer's instructions

- be sourced and selected in compliance with the department's Procurement governance policy and considering:
    - quality control over installation
    - after sales service
    - maintenance and availability of replacement parts and components that local suppliers or companies with SA based representatives can offer
- ensure swings and fixed play structures are suitable for the age of users
- ensure pigtail hooks for swings allow back and forward motion only (360 degree rotational hooks are not accepted) S hooks **must not** be used for basket swings
- ensure nylon sleeves are installed to hooks to prevent metal on metal wear between hooks and play equipment frames.

Moveable play equipment

Moveable play equipment includes, but is not limited to, the following:

- trestle frames
- balance beams
- see-saws or rockers
- plastic interconnected structures
- toddler, jogger, rebound trampolines with handles.

Moveable play equipment must:

- comply with AS 4685.1
- have a maximum FHOF of 1500mm
- be placed on a level surface for stability with due consideration for the type of surface and activity
- have a complying impact area and certified impact attenuating softfall for all items that measure 600mm or more above ground level (where equipment is intentionally connected then the impact area is to reflect the perimeter of the setup, refer KidsafeSA Playground Safety Information Sheets (specifically Moveable Play Equipment)
- be set up on a soft surface such as well-maintained grass for all items that measure less than 600mm above ground level
- have an impact area of 1500mm between each piece of equipment that is not part of the same cluster of equipment.
- have a minimum circulation zone of 1000mm surrounding low equipment items that are designed for climbing, rocking, jumping and balancing
- be placed to ensure pieces of equipment designed to be linked do not inadvertently create entrapment, falling injury or crush points.

Inground trampolines (bouncing facilities)

Inground trampolines must:

- comply with the relevant standards:
- AS 4422
- AS 4685.0
- AS 4685.1

- be constructed of twice galvanised frame and all stainless-steel hardware
- have safety pads to completely cover springs and frame and extend past the outside edge of the frame by a minimum of 75mm with heavy duty reinforced tie straps to secure the pads in place
- have bounce mats that are UV resistant heavy duty breathable weave mesh
- provide a minimum of 1000mm of free space from the edge of the bouncing surface (fall zones of other equipment **must not** overlap this space)
- provide a 1500mm clearance zone from the edge of the bouncing surface that has impact attenuation provided within this zone
- provide Impact attenuating softfall in accordance with AS 4422
- have a layer of suitable drainage material underneath the trampoline
- agricultural drainage may also be required, depending on the soil type at the proposed site

Supporting documents

Addendum: Guiding requirements for effective ongoing Lead exposure management

Details the guiding requirements, design standards, and strategies that must be incorporated or implemented when designing new or refurbishing existing department infrastructure located within the City of Port Pirie.

The Addendum is available here.

Glossary

A glossary of terms is available here.

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Contact

Team: Asset Planning, Standards and Sustainability
Email: Education.AssetStandards@sa.gov.au
Phone: 8226 0717