# Design standards — Part C

# Education facilities technical specifications

Version 4.0 | January 2024

The *Landscape of Learning* is a custom embodied design for the Queensland Department of Education and was produced in collaboration through a co-design process with Iscariot Media (IM) in 2022.

Queensland Government

# Version control

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| 1.00–1.80† | 2020–2021 |

†Part A internal draft 1.80 issued in 2021.

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| 1.00–9.00‡ | 2004–2021 |

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# Contents

# 1.0 The purpose of this document

This document is one of three documents developed by the Queensland Department of Education that set out the principles and minimum standards for the planning, design and construction of new facilities and the refurbishment or maintenance of existing facilities for Queensland state education settings:

1. *Part A: Education Facilities Design Principles and Generic Functional Brief* outlines the overarching education rationale, principles and framework for designing and developing contemporary Queensland state education settings that respond to context and place and provide access for all. It also describes the generic functional requirements for different education settings.
2. *Part B: Master Planning, Architectural and Landscape Design Principles* details the master planning, architectural and landscape design principles and includes the minimum requirements for the external learning environment and traffic management.
3. *Part C: Technical Specifications and Standards* details the minimum performance standards for the building fabric and finishes, building and site services, services and utilities, structural and civil works, acoustic performance, security, information and communications technology and ecologically sustainable design.

All references to sections and tables in the *Technical Specifications and Standards* are references to sections and tables in this document unless expressly stated otherwise.

Designs must have an emphasis on quality and reliability by using materials, plant and fixed furniture and equipment:

- from reputable suppliers
- from standard production lines that guarantee continuing availability of replacement products, particularly in regional and remote locations
- available in a range of configurations within a common product family to allow consistency of quality and supply across a range of installation locations and conditions
- with robust, integrated and matched components appropriate to the task and the environments within which they are installed
- installed and commissioned in accordance with all relevant Australian Standards and laws.

The engineering services must complement the delivery of the education services and the day-to-day operations of the schools.

The department is committed to annual reviews and updates of the *Education Facilities Design Principles and Generic Functional Brief, Master Planning, Architectural and Landscape Design Principles*, and the *Technical Specifications and Standards*. These reviews will be informed by the lessons learned and feedback provided by project consultants, department staff and schools, and other stakeholders involved in the design, construction, and occupation of new and refurbished educational facilities. Feedback can be provided to the department's Infrastructure Services Division project representative and the project team at: admin.projectplanning@qed.qld.gov.au.

## 1.1 Compliance with Acts, regulations and standards

The design of school buildings and facilities must comply with all relevant Acts, regulations and standards, and the National Construction Code. Designs must also comply with and satisfy:

- all requirements set by local, supply and any other authority which has jurisdiction over the site, buildings and facilities
- all recommendations, warranty conditions and installation instructions by the manufacturer of any material, product, fitment or fixture being used.

Where a standard is referenced in this document designs are required to comply with the referenced standard and all other associated and related standards.

Standards will only include a reference to the number, with reference to a specific version being excluded. Designs must comply with the most current version in use at the time that detailed planning commences.

Should a referenced standard become redundant designs must comply with any replacement standard/s.

Where *Education Facilities Design Principles and Generic Functional Brief, Master Planning, Architectural and Landscape Design Principles* or *Technical Specifications and Standards* specify a requirement or performance standard which exceeds those specified in any relevant Act, regulation, standards or the National Construction Code the designs must comply with the higher requirement or performance standard.

## 1.2 Design life expectancies

The design, the selection of systems, plant, equipment, fixtures and fittings and construction works must achieve the design life expectancies and warranties listed in Table 1.

## 1.3 Design criteria

School buildings and facilities are subjected to heavy and demanding usage by young and adolescent students manifesting in a range of behaviours and attitudes to their peers and to their surroundings.

The selection of building structures, claddings, finishes, services, elements, fitments, detailing and the like, must allow for the user behaviours and use demands that can be expected.

## 1.4 Ecologically sustainable design and energy efficiency

School buildings and facilities must be ecologically sustainable, energy efficient and respond to a site's opportunities and constraints. ESD initiatives must be based on the following in order of priority:

- compliance with the ESD principles and objectives detailed in the *Technical Specifications and Standards*
- compliance with National Construction Code, Section J Energy efficiency requirements
- implementing ESD initiatives that support and enhance sustainability outcomes, including initiatives that support learning outcomes by way of the built form.

The design and construction of building and facilities must also consider wide ranging sustainable solutions including material selection and sourcing, landscaping and ecological impacts, waste minimisation, and transportation.

***Table 1*. Design life expectancies and warranties**

| Item | Minimum design service life/warranty period (years) |
|---|---|
| Building fabric and finishes | |
| Carpet — broadloom | 10 |
| Carpet — tiles | 15 |
| Ceilings (including suspended ceilings) | 20 |
| Roofing | 20 |
| Sports, dance and drama flooring | 5 |
| Termite protection | 10 |
| Civil engineering | |
| Asphalt pavements | 20 |
| Concrete pavements | 40 |
| Stormwater sub-surface drainage | 50 |
| Electrical services, plant and equipment | |
| Inverters | 15 |
| Lighting | 15 |
| Photovotaic panels | 20 |
| Power outlets | 15 |
| Sub-mains | 30 |
| Switchboards | 30 |
| Engineering services distribution systems | |
| Ductwork and fittings | 30 |
| Pipework, fittings and valves | 30 |
| Hydraulic services, plant and equipment | |
| Boiling/chilled water units | 10 |
| Gas monitoring systems | 25 |
| Hot water units | 10 |
| Pipes and fittings | 50 |
| Rainwater storage tanks | 20 |
| Sanitary fixtures – porcelain | 25 |
| Sanitary fixtures – stainless steel | 25 |
| Tapware | 25 |
| Landscape | |
| Artificial grass and synthetic carpets | 10 |
| Shade barriers and fabrics | 10 |
| Playground soft fall:<br>– Modular soft fall mats<br>– Permanent soft-pour soft fall | <br>10<br>15 |
| Mechanical services, plant and equipment | |
| Air compressors | 20 |
| Air-conditioning plant | 15 |
| Boilers | 20 |
| Chillers | 25 |
| Evaporative coolers | 20 |
| Fans — ceiling | 15 |
| Fans — extraction and ventilation | 20 |
| Pumps | 20 |
| Structural engineering | |
| Roof structures | 50 |
| Sub-structure and floor structures | 50 |
| Super-structures and internal structure walls | 50 |

### 1.4.1 Sustainability principles

The design and installation of passive solutions and energy conservation measures are integral to the department's long term environmental objectives. Energy, thermal comfort, and lighting requirements must be primarily achieved through integrated passive and environmentally sensitive design initiatives.

Buildings and facilities must comply with the following sustainability principles:

- Passive design.
- Energy conservation and water efficiency measures targeting active reductions in energy use and water consumption, through sustainable engineering design.
- The use of sustainable, and where appropriate recycled, materials. Embodied energy should be considered when selecting materials.

Passive design solutions must be fully explored and utilised to reduce the reliance on the building services and to contribute to the efficient use of resources and energy. Solutions must include:

- building orientation to maximise thermal gains during winter, minimise thermal gains during summer and reduce the reliance on artificial lighting
- external shading to exclude direct sun light from spaces during warmer months
- improved thermal insulation
- natural ventilation
- ceiling fans.

### 1.4.2 Alternative ESD initiatives

Where alternative or additional ESD initiatives to those detailed in the Technical Specifications and Standards are proposed, they must be designed in accordance with recognised standards and benchmarks, including Green Star and other similar schemes were approved by the department.

Performance solutions must demonstrate equivalent or improved sustainability through industry recognised tools and standards, including

- Alternative performance solutions as prescribed in the National Construction Code.

## 1.5 Excise of land

Where any part of a site is proposed to be excised to a local government or another entity (e.g., car parks, areas for public bus parking, etc.) no building, structure, service, or any other infrastructure that will remain under the school's or the department's control or is directly associated with the operation of the school (including any authority service connection or meter) must not be in or encroach upon the area to be excised.

# 2.0 Building fabric

Buildings must be windproof, watertight, resistant to ingress by animals, birds, insects and vermin, efficient to operate, durable, adaptable and fit for their intended purpose.

Consideration must be given to the potential effects of climate change and variability on the building fabric. The design of the building and the fabric of the building must mitigate such impacts.

The selection of materials and finishes must consider the most cost-effective materials and installation systems available while achieving appropriate levels of service, buildability and durability.

The selection of fixtures and fittings must consider the make and model of existing fixtures and fittings as a means of minimising maintenance costs and the duplication of parts, servicing contracts, etc. Where alternative makes and models are proposed they should only be selected if the proposed alternative is more cost-effective.

## 2.1 Roof

Simple roof forms must be provided with all roof drainage and guttering located outside the line of external walls. Box gutters and internal eaves gutters must not be used. Where possible, the design of the roof form must avoid the need for valley gutters.

All roofing must be of continuous sheets wherever possible. Roofs over fully enclosed spaces shall have a minimum pitch of 10 degrees and over unenclosed areas (e.g., covered play, covered walkways, verandas, etc) shall have a minimum pitch of 3°.

Storm loadings for roof catchment areas and the likely impact on guttering and roof drainage systems must be calculated and allowed for and due consideration must be given to recent trends of more frequent and severe rainstorms and hailstorms.

Roofing systems must be low maintenance to avoid unnecessary maintenance costs and future disruption to school operations.

The design must provide a roofing system and associated works that:

- Are low maintenance, complete, windproof, watertight and possum, bird and vermin-proof.
- Remain intact and waterproof under local and regional ambient climatic conditions.
- Accommodate the wind loads applicable to the site.
- Provide adequate means of dealing with vapour pressure, condensation, corrosion and thermal movement.
- Accommodate all short and long-term movements and deflections.
- Supports the specific imposed loads without visible damage or impairment of performance, including the pooling of water and dinting of roof profiles.
- Does not emit airborne fibres or dust.
- Provides roof glazing with safe means of access and control of solar gain and glare.
- Incorporate additional natural lighting through clerestory windows or similar devices where insufficient natural lighting is provided by external windows. Where clerestory windows or similar devices are used careful consideration must be given to their security, operation and maintenance (including any manual or automatic closure systems).
- Prevent unauthorised access to roofs.

- Prevent the impact of rain noise and other external noise sources (aircraft flight paths, trains, roads and freeways, etc.) exceeding the acoustic performance requirements set out in Section 5 *Acoustic engineering*).
- Allow for the discharge of all water and moisture, including leakage and condensation, outside the line of the building or eaves and into the drainage system.
- Provide for emergency overflow and relief systems to prevent flooding in the event of blockage or malfunction of roof drainage systems.
- Incorporate suitable insulation that minimises heat gain or loss and that satisfies the minimum thermal performance requirements specified Section 2.3 *Insulation and barriers*. Suitable roof ventilation above the level of ceiling insulation should be considered for summer cooling and circulation of air within roof spaces.
- Coordinates the location downpipes with the proposed location of rainwater tanks.
- Do not incorporate downpipes that descend within any internal areas (downpipes must not be off-set in ceiling areas).
- Incorporate appropriately located and sized sump and overflow roof drainage systems.
- Incorporates all necessary provisions for any roof-mounted photovoltaic (PV) systems where briefed. The roofing system must be capable of supporting such loads without damage or distortion, failure of fixings or loss of watertightness.
- Minimises roof mounted equipment such as heating, cooling and ventilation systems (such equipment shall only be installed with the approval of the department).

Safe roof access systems (including access-ways, safety railings, safety anchor joints, fall arrestor systems and the like) shall be installed to service roof mounted equipment.

### 2.1.1 Guttering and downpipes

Guttering and downpipes must be designed to provide adequate drainage for expected local rainfall events while minimising risk and disruption to site users. Designs must be based on the minimum requirements specified in *AS/NZS 3500.3 National plumbing and drainage code Part 3: Stormwater drainage*. Rainfall data must be sourced from the Bureau of Meteorology and must be based on observations captured by the weather station nearest to the site.

The design of gutters and downpipes must provide a roof drainage system and associated works that:

- is robust, securely fixed and capable of withstanding damage from maintenance, students, and potential vandalism
- is not climbable or vulnerable to vandalism, through being kicked or otherwise crushed
- uses standard, commercially available gutter profiles that provide the required capacity (custom profiles should not be used so as to mitigate difficulties in replacing damaged gutters in the future)
- prevents accidental blockages and directs storm overflow and ‘first flush’ discharge away from doorways and pedestrian paths
- installed in the longest lengths possible.

Eave gutters must have a minimum base width of 150 mm. Overflow relief shall be provided at the front of the gutter to prevent overflow at the back of the gutter. High front gutters with slotted overflows must not be installed.

The use of box and valley gutters must be avoided and are subject to the department’s review and approval.

The height of guttering from paving or garden areas must be a minimum of 2400 mm.

Where roof areas are used as catchment for rainwater harvesting downpipes must comply with the Queensland development code.

Where mesh covers are fitted to gutters to prevent blockage by leaves, metal mesh compatible with roofs and gutters must be used. The mesh must be secured in a way that prevents the ingress of leaves and fixed to the underside of the roof sheeting. Plastic mesh must not be used. The use of mesh covers must not deflect water across the gutter so that it discharges onto the ground or path below.

Downpipes to all buildings must have a minimum diameter of 150 mm and be in protected areas away from heavy student traffic. Downpipes to covered walkways, sheds and similar structures must have a minimum diameter of 100 mm.

Downpipes must be installed against walls or posts and be restrained by fixing brackets. Downpipes must not be concealed in wall cavities due to the risk of structural and aesthetic damage.

Consideration should be given to locating downpipes over grated pits and stopping downpipes short of ground level to prevent balls entering the stormwater drainage system. Where a downpipe or any part of a stormwater drainage system supplies water to a rainwater storage tank, grated pits must not be present in any part of the system on the supply side of the tank.

## 2.1.2 Material selection

Consideration must be given to longevity and continuing availability when selecting roofing and roof plumbing materials. The exposure severity category for the site must be determined and consideration must be given to local risks of corrosion from environmental or industrial sources.

### 2.1.2.1 Roofing

Roofing materials and products (including adhesives and sealants) must be selected that:

- are chemically and electrolytically compatible with adjacent materials and/or are appropriately separated to avoid galvanic reactions with each other, substrates, and adjacent work
- do not stain, contaminate, or cause visual or structural defects in adjacent materials
- can withstand damage from someone walking on the roof
- are light in colour, where appropriate for the surrounding environment, to reduce summer overheating.

To reduce the heat island effect roofing materials:

- roofs pitched <15° must achieve a minimum three-year solar reflective index (SRI) of 64
- roofs pitched >15° must achieve a minimum three-year SRI of 34.

In circumstances where a three-year SRI is not guaranteed by a manufacturer, roofing materials:

- roofs pitched <15° must achieve a minimum initial SRI of 82
- roofs pitched >15° must achieve a minimum initial SRI of 39.

Sandwich panel roof/ceiling combinations must not be used in habitable areas, but may be used in covered walkways and covered areas. Panels must be fire-rated and have an expanded polystyrene core. Aluminium composite panels with a polyethylene core must not be used.

#### 2.1.2.2 Gutters and downpipes

Guttering and downpipe materials and products (including adhesives and sealants) must be selected that:

- are chemically and electrolytically compatible with adjacent materials and/or are appropriately separated to avoid galvanic reactions with each other, substrates and adjacent work
- do not stain, contaminate, or cause visual or structural defects in adjacent materials
- can withstand accidental damage.
- Downpipes should also be able to withstand vandalism through being kicked or otherwise crushed.

All downpipes below 2100 mm shall be robust, heavy duty and constructed of material strong enough to withstand abuse (e.g., fibre reinforced concrete, hot dipped galvanised CHS steel).

**Note:** PVC material is not acceptable as a robust material.

All downpipes shall discharge cleanly into grated stormwater inlets, without spilling on to paths or walkways.

Downpipes shall be minimum 150 mm internal diameter. Gutters and downpipes are to be designed (sufficient number, spacing and size) for rainfall and storm events of Average Recurrence Interval (ARI) 20-year, in accordance with all relevant Australian Standards. The designer is to provide on the plans all calculations for the sizing and spacing's of the gutters and downpipes. Minor roof structures shall have their downpipes sized as per the Australian Standards.

## 2.2 External walls and cladding

External walls and cladding must be durable, long-lasting and of low maintenance to avoid unnecessary maintenance costs and future disruption to school operations.

The design and selection of external walls must consider corrosion from environmental and industrial sources, adjacent activities and the risk of inadvertent damage from school activities and students and vandalism.

The design of external walls and selection of cladding must provide external cladding systems and associated works that:

- are low-maintenance, complete, windproof and watertight
- remain intact under local and regional ambient climatic conditions
- are robust, durable, and suitable for long-term performance in high-exposure conditions and resilient to intentional damage
- accommodate all permanent and temporary loads
- accommodate all short and long-term movements and deflections
- satisfy the minimum acoustic and thermal performance requirements specified in Section 5 *Acoustic engineering* and *Section J1.2-J1.6* of the *National Construction Code*
- provide adequate means of dealing with condensation, corrosion, and thermal movement
- discharge all water and moisture, including leakage and condensation, into a drainage system
- are fire-resistant and designed to mitigate the spread of fire
- minimise heat gain and loss due external temperatures
- minimise air leakage and infiltration

- function noiselessly under all conditions including substrate movements, temperature changes, wind, maintenance, and cleaning operations
- provide continuous electrical conductivity within the framing for connection to a lightning protection system
- prevent access to and existence of breeding places for vermin (concealed or otherwise)
- do not enable the growth of algae, mould, or fungus
- are easily cleaned, maintained, and replaced (if damaged).

Cladding used on external walls must have a high impact resistance to a minimum above ground height of 2100 mm (door head height).

The permeability and transparency of the external walls to light, heat and air must be controllable and capable of modification to respond to climatic conditions (with solar screening, protection against glare, light deflection, shading, temporary thermal protection, and adjustable natural ventilation).

### 2.2.1 Material selection

Consideration must be given to longevity and continuing availability when selecting wall cladding materials. The exposure severity category for the site must be determined and consideration must be given to local risks of corrosion from environmental or industrial sources.

External wall and cladding materials and products (including adhesives and sealants) must be selected that:

- are chemically and electrolytically compatible with adjacent materials and/or are appropriately separated to avoid galvanic reactions with each other, substrates, and adjacent work
- do not stain, contaminate, or cause visual or structural defects in adjacent materials
- do not require regular cleaning or maintenance
- enable the removal of graffiti without damage to the appearance, finish, and durability of the substrate.

Aluminium composite panels with a polyethylene core of greater than 30% by mass and expanded polystyrene (as external insulation or rendered-finish cladding) must not be used.

Timber used for external walls and cladding must comply with the following requirements:

- timber must be appropriate to the conditions of use and exposure (or preservative-treated timber of the required durability)
- free from live borers, insects, pests, and from rot and fungus infection
- where required, has had preservative treatment and/or water-repellent treatment
- must have adequate dimensional stability for the ambient conditions and must not change size or shape in a manner that will detract from appearance, performance and durability of the work, or damage adjacent or applied work.

Externally, pre-finished surfaces should be used. External painting and the use of post-applied finishes must be minimised.

The use of unpainted/unsealed concrete block and other materials prone to dirt and scuffing or which are otherwise difficult to clean or to remove graffiti from must be avoided.

## 2.3 Insulation and barriers

Designs must incorporate suitable insulation to roofing and external walls to provide a continuous thermal and vapour barrier suitable to local environmental conditions:

- all sarking vapour barriers are properly lapped and taped to inhibit all wind and vapour penetration
- that all bulk insulation complies with relevant OHS legislation and current accepted industry practice with respect to airborne fibres
- that all reflective foil must be suitable reinforced aluminium foil suitable for the location and the intended function
- enables the minimum acoustic and thermal performance requirements specified in Section 5 *Acoustic engineering* to be achieved.

Where internal walls face onto breezeways that are open at both ends, they must be treated as external walls.

Thermal insulation must also be provided to internal walls and floors at the edge of all air conditioned (or likely to be air conditioned) zones.

The thermal insulation calculation methodology used must comply with Section J of the National Construction Code.

### 2.3.1 Exposed roof insulation

Buildings, including gymnasiums and sports halls without a ceiling lining concealing the roof insulation must have roof insulation with a layer of perforated, white, polythene-coated foil as an outer facing to the visible underside (in addition to foil facing of the insulation blanket).

## 2.4 Windows

The design and selection of windows must be based on standard commercial designs and availability, standard construction techniques and maximum user safety.

Windows should be orientated so that the majority face north and south with east and west-facing windows being minimised.

Designs must provide adequate natural ventilation (preferably crossflow ventilation) and must, wherever possible, provide natural lighting from two opposite sides of an activity area.

The design of windows and window systems must provide window systems and associated works that:

- are weather-tight, water-tight and exclude water and moisture from entering the inside of buildings in all weather and rainfall conditions
- are suitable for the location and the intended function and accommodate the wind loads applicable to the site
- accommodate all permanent and temporary loads (including human impact, wind, earthquake, maintenance, and service loads as applicable), individually and in combination, without failure, deflection, damage (including cracking, distortion, looseness, dislodgement, or visible movement at any joint) to adjacent or applied work, or risk to human safety
- remain stable without deflection, damage or rattling under normal conditions of use and slamming of doors
- allow thermal movement to occur freely in the plane of the glazing system and do not cause stressing or induced loading in the installed work, or buckling, failure of joints or other damage

- allow the discharge of water and moisture, including leakage and condensation, outside the building and into the drainage system
- allow for easy cleaning and maintenance
- are not hazardous to those passing by windows internally or externally when opened
- be appropriately shaded during summer and shoulder seasons through means of external fixed sun-shading devices and systems to suit the orientation, view opportunities and size of the window or windows being shaded.

Awning type windows should be avoided where there is a risk that someone may walk into an open window. Where an awning type window is installed, it must include a mechanism to limit the extent of opening to mitigate any impact risk.

Full height glazing and custom glazing (such as circular windows) must be avoided wherever possible to minimise safety hazards and maintenance requirements.

### 2.4.1 Shading and sunlight controls

Shading must be provided to ensure that direct sunlight does not penetrate windows during summer, including 1.5 months either side of the defined summer season.

Shading and sunlight controls must comply with the following requirements:

- Horizontal shading must be provided to all north facing windows ideally using extended eaves and be based on a maximum vertical shading angle of 52°. In areas north of the Tropic of Capricorn horizontal shading must also be provided to south facing windows. Shading must extend a distance equal to the shading projection either side of the affected window or have a ‘hood’ return on both sides of the window
- East and west facing windows must be minimised. Where glazing is provided, vertical shading must be provided based on a maximum horizontal shading angle of 60°. Shading of east and west facing windows should be provided by articulation of the building facade in preference to dedicated shade structures or similar devices.

### 2.4.2 Security

Openable windows and louvres must have inbuilt window protection, with control mechanisms that can be operated by all potential users and must ensure continued security of the building.

Openable windows and louvres must be:

- Fitted with a means of securely limiting the window opening.
- Designed to prevent the unauthorised removal of the window sash.
- Fitted to prevent the risk of children falling or climbing in or out of the window.
- Fitted with a stainless-steel security mesh screens with anti-tamper screws or welded steel security bars installed with a key operated push-button plunger lock. These must be installed in accordance with the requirements detailed in the room data sheets.

### 2.4.3 Blinds

Windows must be designed to permit the installation of internal blinds that cover the full extent of the glazing. When selecting internal blinds or shade solutions consideration must be given to the impact on exterior views from inside the building. Roller blinds with metal components and other robust systems with few moving parts are preferred.

Manual blinds should be installed with cord restraints that are fixed to the window frame. Cords should be easily accessible, and all potential users must be able to reach them without leaning over furniture or joinery.

### 2.4.4 Insect screens

Insect screens where briefed are to be fitted on windows or openings to provide protection from mosquitoes and other insects. Screens must be provided in any food preparation areas, including food technology areas.

Screens must be of commercial quality and fitted with aluminium or stainless-steel mesh. The installation of screens must allow for easy cleaning and maintenance.

### 2.4.5 Material selection

Consideration must be given to longevity and continuing availability when selecting windows and window systems. The exposure severity category for the site must be determined and consideration must be given to local risks of corrosion from environmental or industrial sources.

#### 2.4.5.1 Glazing

Glass thicknesses and safety glass materials selected must be appropriate to the safety risk, performance requirements and conditions, including wind loads and internal air pressures and deflections.

All glazing must comply with the deemed to satisfy requirements of Section J2 of the National Construction Code or achieve compliance in accordance with the methodology detailed in Section JV3.

All glazing must have a total system minimum visual light transmittance level of 40%.

#### 2.4.5.2 Window frames

Window frames, materials and products (including adhesives and sealants) must be selected that:

- are pre-finished and corrosion resistant
- are chemically and electrolytically compatible with adjacent materials or are appropriately separated by spacers to avoid galvanic reactions with each other, substrates, and adjacent work
- do not stain, contaminate, or cause visual or structural defects in adjacent materials
- enable the minimum thermal performance requirements specified in Section J1.2–J1.6 of the National Construction Code to be achieved.

The colour and finish of windows frames should be selected to minimise solar radiation absorption and be resistant to fading.

## 2.5 Doors

Doors, door hardware and associated works must:

- be able to cope with heavy and constant usage without failure or sagging
- maintain good quality finish, structure, and appearance under heavy and constant use
- prevent impact to adjoining surfaces
- be simple and convenient to use for all users regardless of their ability
- be designed for their intended purpose and users and sized to meet the anticipated movements into and within each building.

Doors comprised of large external glazing, such as sliders, should only be used to create outdoor or open learning opportunities. These doors should not be used for primary access due to potential weight and accessibility issues (e.g., in windy conditions).

Glass fitted in any door must be laminated glass of a thickness and safety properties appropriate to the safety risk, performance requirements and conditions, including wind loads and internal air pressures and deflections.

Doors, side panels or panels shall have safety marking if the presence of glazing is not apparent. The glass must be marked to make it readily visible in accordance with the NCC.

### 2.5.1 External doors

External doors are subject to continual heavy use and must be constructed both for strength and resilience against wear, and against accidental and deliberate damage. Doors should also have appropriate handles and fixtures for school-age children of all abilities.

External doors must be:

- water-tight and weather-tight and protected from climatic influences, including rain and strong winds
- sufficiently robust to provide appropriate security to the building security and to withstand high wind conditions without any stress or damage to the door, glazing or hinges
- provided with locks keyed to a master-key system
- fire-rated or smoke-sealed where required
- weather sealed to prevent ingress of dust and debris
- provided with restraints and door stops to prevent impact to adjoining surfaces
- low maintenance, such that there is only minimal disruption to school operation.

Glazed external doors must have at least one cross-rail to stiffen the door and reduce the size of glass panels.

Doors that are required emergency exits must be a single action opening door, operable from the inside.

Doorstops must not be located close to the hinge to avoid damage to the door hinger from the door striking the stop. In those locations where a floor-mounted door stop creates a trip hazard, a door stay can be used, fixed to the head of the door.

Doors must be fitted with closers with the capacity to close and latch the door without slamming and to retain the door against wind gusts, however doors must be operable by any user that can be expected to be at a school.

### 2.5.2 Automatically operated doors

For all new schools, major upgrades, special schools and special development schools, external entry must be provided to a reception lobby via automatically operating glazed sliding doors.

Automatic doors must be complete with all necessary hardware and accessories, including:

- movement sensors that are not affected by drift or indefinite cut-off points
- a fail-safe device to open doors during times of power failure or fire alarm
- an internal after-hours release button (mushroom-cap push-button door release)
- external after-hours release by electronic key system (where provided)
- adjustable dwell time for door operation.

### 2.5.3 Internal doors

Internal doors:

- must be solid-core and have a durability consistent with adjacent activities and use
- satisfy the minimum acoustic performance requirements specified in Section 5 *Acoustic engineering*
- must be operable by young students and students with a disability.

Glass viewing panels must be installed in internal doors where two-way traffic is expected and where staff may need to check the occupancy and activities in a room, but where a degree of privacy is needed. The design and extent of viewing panels must account for the differing heights of all users. Locations include principal offices, senior personnel offices, bursar offices, conference and meeting rooms, general offices, airlocks and lobbies, interview rooms, specialist consulting rooms, first aid rooms, and general teaching and learning areas where spaces are accessed via a hinged or sliding door.

For buildings or parts of buildings specifically designated for use by students with high needs, door/door hinge frame junctions should include protection against finger injuries.

Air transfer grilles must not be used in doors where their installation will compromise necessary privacy or the required acoustic isolation of a space.

Doors connecting the school reception area with the school internal circulation network must be a security door with electric strike, controlled by release button from reception and by key. These doors must have an internal afterhours release button (mushroom-cap push-button door release).

If sliding doors are used, they must be high-quality, easy to open by students and staff of all abilities, and able to deal with general wear-and-tear.

### 2.5.4 Operable walls

Where operable walls between spaces are proposed they must be provided complete with support framing, fixings, seals, finishes, hardware, and trim suitably selected and installed to be fit-for-purpose.

Where necessary, a passage door within the operable door must be provided to facilitate direct access between spaces.

Operable walls must be operable by all potential users without requiring undue strength.

Operable walls must have an acoustic performance rating to match adjoining partition systems as specified in Section 5 *Acoustic engineering*

### 2.5.5 Roller shutter doors

External roller shutter doors shall comprise chain driven planetary geared drum roller and continuous pressed steel curtain fitted with nylon slide clips and steel tension strips, with chain drive or with electric motor drive to suit operational needs.

All metal work must be powder-coated over a galvanised substrate.

The door assembly must be complete with all equipment and fixings, guides, locking devices, weather seal at bottom rail, and steel corner guards at jamb openings. Roller door guides must be heavy duty to prevent to roller door being forced from the track.

In high-risk locations, additional locking mechanisms should be provided at the centre of the roller shutter to prevent forced entry.

The roller shutter in its closed position must be capable of withstanding a site's positive or negative wind pressure on the surface without impairment of the shutter's ability to function under ambient temperature.

### 2.5.6 Multi-panel overhead lift doors

Overhead lift doors must:

- not create a risk of injury to adults or children when the door is being opened or closed
- include guards around all operating mechanisms below 2.1 m high
- include structural support framing sufficient for the size and weight of the door panel
- provide a complete seal against wind, rain and wind-blown dust and debris when closed
- allow easy and convenient unassisted single-user operation and operation by all potential users
- include an accessible emergency stop button (where the door size of weight requires an electric motor drive for opening and closing).

### 2.5.7 Toilet partitions

Toilet partitions shall:

- be either blockwork or a proprietary system with full height, dividing walls, front panels and doors constructed of minimum 13 mm compact laminate with a scratch resistant, patterned, graffiti resistant finish on both faces and shall have a random patterned colour (no plain colours) that hides marks.

Doors and walls to contrast in colour.

Panels shall be joined with clear anodised aluminium channels.

All fixings shall be vandal resistant, stainless steel, concealed fixings.

Cubicle doors shall be mounted on three lift off gravity safety hinges with 90° hold open and fixed with bolt through type, tamper proof fixings.

Cubicle doors shall have suitable rebated or profiled overlapping jamb edges at junction with frontal panels to provide a visual privacy.

To ensure visual privacy and effective ventilation, doors to student individual toilet cubicles shall be full height 2040 mm high and with a maximum of 40 mm gap at the floor and have a ventilation panel above the door up to 2400 mm high.

Cubicle doors shall be inward opening with lift off hinges and shall have a privacy indicator latch that can be opened from the outside in an emergency.

Angle or U channel floor fixings to bottom of partitions shall be sealed via a suitable sealant.

## 2.6 Door and window hardware

All door, window and other finishing hardware and related items must be provided. Without limitation, hardware is to include hinges, pivots, locks and strike plates, latches, padlocks to gates and enclosures, master-key systems, door furniture, door closers, door stops, window latches and locks, weather seals, acoustic seals, fire and smoke seals, and other hardware necessary to the required functionality and security.

All door and window hardware and all associated work must be:

- robust, heavy-duty, durable and fit-for-purpose
- suitable for a school environment
- suitable for the location and the intended function
- suitable for the mass of the doors or windows
- corrosion-resistant or have a protective coating to prevent corrosion.

### 2.6.1 Kick plates

Kickplates should be provided to both sides of flush panel doors in heavy traffic locations where the door is at risk of damage.

Kickplates must be 300 mm high Type 304 satin finish stainless steel and cover the complete width of the door.

### 2.6.2 Doorstops

Metal doorstops must be provided to prevent doors or door furniture striking adjacent walls, fixtures or other surfaces.

## 2.7 Security locking

Keyed security locking must be provided to all external doors and to internal doors where the privacy or security of the function or contents of the space requires protection and access control. These internal spaces include:

- All private offices, shared staff workrooms, general offices, library workrooms, and interview and conference rooms.
- Doors that form boundaries to zones that need to be isolated for use outside school hours.
- Secure stores, storage rooms, server rooms, ICT technicians' offices, sports stores, cleaners' stores, music stores, electrical and mechanical switch rooms, service cupboards, plant rooms and similar.
- Rooms/spaces that contain expensive equipment or where unsupervised access is not permitted (such as rooms containing computers, music rooms, materials technology rooms, instrument rehearsal rooms, science laboratories and science prep rooms, gymnasium halls, theatrettes and similar).
- Rooms/spaces where in-progress or completed student creative work might need to be secured.
- Canteens, food storerooms, pantries, and associated spaces.
- Rooms/spaces that may contain valuables or controlled substances (e.g., first aid rooms and chemical storerooms).
- Storage cupboards and secure drawers in rooms (keyed alike within a room only).

Physical key lock systems must be provided that meet the following requirements:

- Keyed and integrated with a site-wide master-key and access hierarchy.
- Cylinders must be interchangeable between different lock manufacturers.
- Cylinders are appropriately mounted to allow for user requirements such as childcare areas.
- Keys are fitted with generic identification tags. Tags should not identify the school to reduce the risk of lost keys being associated with the school by a non-staff member.
- Keys and key lock cylinders are stamped with relevant key codes.
- The keying system can accommodate any future expansion and does not require the replacement of existing locks.

Key codes must be arranged under a master key hierarchy that separates key paths according to access for school use, community use and that controls key access to individual locations and purposes. The master key hierarchy must limit and contain the risk of re-keying if any single key (excluding a master key) is lost.

## 2.8 Ceilings

Minimum height of ceiling in habitable rooms shall be 2700 mm AFFL and sloping/raked ceilings shall be minimum 2400 mm AFFL at the lowest point.

Ceilings must be provided to every space or room unless noted otherwise in room data sheets. Ceiling construction and finishes must be consistent with and suit the function and use of the space or room. Ceiling linings must return into cupboards, reveals, recesses, niches, and the like.

Ceilings to teaching, office and administration zones must support simple ceiling space access and the reconfiguration of lighting and cabling throughout the life of the building. Suspended mineral fibre acoustic tile ceiling systems are to be used in these areas (NRC 0.70 minimum).

Flush painted plaster ceilings must be provided in storerooms, service rooms, student toilets, kitchens and changing rooms. Ceilings and installations must be durable, serviceable, and resistant to vandalism and vapour (where applicable).

Ceilings and support structures must be designed to support ceiling mounted fixtures and fittings including, but not limited to, lighting and ceiling fans.

Ceiling installations must assist in the management of the acoustic performance of the space, including moderating reverberation within a space, and controlling acoustic isolation of a space by controlling noise leakage and noise intrusion.

Ceilings to teaching, office and administrative zones must have a minimum noise reduction coefficient (NRC) of 0.6. This requirement does not apply to gymnasiums and multipurpose halls.

Ceilings must provide light reflection unless this is inconsistent with the function of the space.

External eaves and building projections must be fitted with eave linings that are durable, serviceable, and resistant to vandalism, exposure, and vermin.

Steel protection mesh must be installed in roof cavities to prevent access via the roof cavity to those functional areas nominated in the Room data sheets. Steel protection mesh must have openings no larger than 150 mm × 150 mm and have wires with a diameter no less than 4 mm.

### 2.8.1 Suspended ceilings

Suspended ceilings, where provided, must:

- be braced against lateral movement and uplift
- not attach the suspension system to the lip of purlins
- provide space for support members as required by the loads on the system and the type of ceiling
- allow for the installation of services and accessories throughout the life of the building, including ductwork, light fittings and diffusers and provide additional back-support or suspension members for the fixing of such items
- incorporate accessories including hatches and curtain tracks
- set out tiles so that opposite margins are equal
- set out patterned or heavily textured materials to give consistency in direction of pattern or texture
- provide specially sized, purpose-made panels to fill non-standard margins, openings, and penetrations.

### 2.8.2 Access hatches

Where it is necessary to provide access through flush ceilings to ceiling spaces, access hatches must be provided that:

- are of a material that matches the adjacent ceiling in appearance
- are fitted with a security latch
- have a surface that is flush with the ceiling surface
- are aligned to the location of services
- are a propriety system sufficiently durable to accommodate frequent use.

The installation of access hatches in spaces occupied by students and staff must be avoided.

## 2.9 Stairs and ramps

The design of stairs and ramps and associated works must satisfy the following requirements:

- Widths, tread and riser dimensions, handrails, balustrades, kerbs, luminance contrasts, slip resistance and hazard tactile ground surface indicators and associated works must comply with the minimum requirements of the applicable Acts, regulations, Australian Standards, and the National Construction Code.
- Stair treads must have slip-resistant surfaces and a contrasting texture or colour.
- All walking surfaces must have safe gradients.
- Ramps must be designed for safe and accessible wheelchair use with a maximum gradient of 1:14 and a preferred gradient of 1:20. Ramps and landings must comply with the minimum requirements of the applicable acts, regulations, Australian Standards, and the National Construction Code.
- All steps (internal and external) shall be uniform throughout the flights and where possible, throughout the school.
- Steps shall not have open risers.
- Going of steps shall be preferably 300 mm but where this is not possible, 270 mm as minimum.
- Riser height shall be maximum 175 mm. For P–6 schools the preferable height of the riser is 150 mm.

**Note:** The department's preference is for handrail terminations to be extended to ground at ninety degrees as per AS1428.1 to suit visually impaired students.

Fire-isolated stairways and fire-isolated ramps must be provided where required.

Where stairs and ramps are being used by adults and young children two handrails at different heights must be provided to suit comfortable use by both adults and children.

At the head and foot of each flight of stairs or each section of ramp and change in level as required by the relevant Australian Standards, regulations and codes, compliant panels of multiple tactile ground surface indicator (TGSI) tiles must be installed. TGSI tiles panels must be a colour that contrasts with the adjacent flooring colour to enhance visibility. TGSI tiles must be mechanically fixed. Fixing with an adhesive is not allowed.

**Note:** The department's preference is for yellow TGSI's to suit visually impaired persons where NCC contrast requirements are able to be met.

At least 2100 mm clearance must be provided in all accessible areas under stairs and bulkheads. Areas that do not provide this 2100 mm clearance should be barricaded and not be trafficable.

### 2.9.1 Fall prevention barriers

The following minimum requirements, which exceed National Construction Code requirements, have been specified to ensure the safety of all students, staff and visitors.

All required internal and external barrier/balustrades lacking purchase points (handrails or baseboards) must have a minimum height of 1500 mm above the finished floor level.

All barrier/balustrades must be non-scalable, with no horizontal rails or potential footholds, which could be used for climbing. Where historical barriers/balustrades do have a horizontal handrail or baseboard then the barrier/balustrade must be 1800 mm high above the finished floor level.

Design a top rail that discourages students from sitting on barrier/balustrades by avoiding flat surfaces.

No furniture or joinery is to be attached to barriers/balustrades or placed within close proximity. Seating or any other furniture near a balustrade must be fixed, so it cannot be used as a foothold.

Barriers/balustrades must be provided, in addition to handrails, on stairs and ramps.

For balcony seating within an auditorium, barriers/balustrades must comply with the National Construction Code.

## 2.10 Sanitaryware

Suitable sanitary fittings and fixtures must be provided to support and complete the delivery of functional spaces and to meet the needs of users based on the student and staff populations resulting from the school's long-term enrolment determined by the department. Provision of sanitary facilities is expected to support inclusive access and be distributed for the convenience of all users.

The design must include all sanitary fixtures and fittings connected to service pipe work and include all required anchorages, fixings, lugged elbows, and the like as necessary for a robust, durable, impact resistant installation.

Amenities for staff, students and visitors must be provided as below:

- The layout of toilet areas must allow for supervision of open areas from the entrance door, with preference for a design where an entrance door is not required.
- Toilet facilities should be located so there is a choice of facilities accessible, either from inside or outside the school building.
- Staff and student toilet and shower facilities should be separate from each other, but can be integrated.
- Only cold water is to be provided to student basins and hand-wash troughs. Hot water may be provided for other fittings and fixtures, including accessible sanitary facilities for people with disabilities where briefed.

Sanitary fixtures and fittings must be selected and specified that:

- are new, free from defects, damage, corrosion, and surface blemishes
- are chemically and electrolytically compatible with adjacent materials and products, substrates and adjacent work or separated by suitable spacers. Adjacent materials and products including adhesives and sealants must not stain, corrode, or contaminate and must not cause visual or structural defects in adjacent materials
- are appropriately sized and fixed at a height that is suitable for the location and anticipated users
- are of similar models and manufacturers throughout to achieve design coherence
- comply with the Water Efficiency Labelling and Standards (WELS) star ratings specified in Table 10.

### 2.10.1 Toilets

Toilets may be floor-mounted vitreous china or stainless steel with wall-faced concealed-trap pan and have a strong vandal-proof fixing between the seat and pan with an in-duct or concealed in-wall cistern with anti-vandal fixing accessories. Toilet cisterns must be dual flush with flush capacities of 4.5 litres per full flush and 3 litres per half flush.

Toilets provided for adults must have a double-flap toilet seat. Single-flap toilet seats must be provided for student toilets.

Accessible toilet pans must be provided complete with concealed in-wall cistern, wall extension pedestal and easily accessible flush button.

### 2.10.2 Urinals

Urinals may be provided for students and adults with automatic water-efficient flushing.

Ventilation, flooring, and all detailing must to be designed to control odours.

Urinals for students and staff may be:

- wall-mounted white vitreous china or stainless steel urinals with concealed in-wall cisterns and anti-vandal fixing accessories
- wall-mounted white vitreous china urinals with compliant cistern-less systems and anti-vandal fixing accessories.

Where wall-mounted student urinals are installed in primary schools, installation heights and urinal configuration must be suitable for use by male students from Prep to Year 6.

### 2.10.3 Hand wash basins

Staff hand wash basins must be vitreous china basins, wall-mounted or self-rimming inset into joinery benchtops, with chrome plated brass grated waste outlets.

Student hand wash basins must be vitreous china or stainless steel basins, wall-mounted, mounted at an appropriate height and with chrome plated brass grated waste outlets

Basin support brackets must be fixed into a solid substructure and resist damage by vandalism (including climbing).

Basins provided for students require cold water only. Basins provided in staff-assisted student bathrooms must be provided with cold and tempered hot water (below 45° C) to reduce the risk of scalding.

No plugs are required for hand wash basins.

### 2.10.4 Hand wash troughs

Hand wash troughs may be provided for student use where it is more economical and secure to install hand wash troughs as an alternative to hand wash basins.

Hand was troughs must be:

- wall-mounted 1.2 mm thick satin-finish Type 304 stainless steel with a rear upstand and trap cover to conceal pipework and fixings, and holed for wash taps
- nominally 300 mm wide × 150 mm deep with taps set at nominal 450 mm centres
- fixed into a solid substructure and resist potential damage by vandalism (including climbing).

Cold and tempered hot water must be provided in accordance with Section 2.10.3 *Handwash basins*.

### 2.10.5 Drinking troughs and fountains

Drinking troughs and fountains must be provided and distributed across both internal and external areas to ensure students have access to drinking water at any time. Specific provision must be made for drinking fountains for students with disabilities.

One drinking tap must be provided for every:

- 25 Year P–6 students
- 50 Year 7–12 students

based on the long-term enrolment approved by the department.

Drinking fountains must be:

- stainless steel, floor or wall mounted with single bubbler and bowl (diameter 200 mm) with an integrated bottle refill station
- fitted with chrome plated shielded bubbler with self-closing push button valve
- drained to a floor waste gully when installed within a building
- fixed into a solid substructure and resist potential vandalism (including by climbing)

Drinking troughs must be:

- wall-mounted 1.2 mm thick satin-finish Type 304 stainless steel with a rear upstand and skirt to conceal pipework and holed for bubbler faucets with an integrated bottle refill station
- nominally 300 mm wide × 150 mm deep with taps set at nominal 450 mm centres
- fixed into a solid substructure and resist potential vandalism (including by climbing).

Drinking fountains and troughs must be installed at heights suitable for the ages of the students using them. Consideration should be given to installing drinking fountains and troughs at different heights in primary schools to cater for the needs of students from Prep to Year 6.

### 2.10.6 Sinks

General purpose sinks must be provided to support teaching and learning activity spaces and other functional areas of the school.

General purpose sinks must be:

- inset type 304 stainless steel sinks with single or dual bowls and integral single or double drainers
- supplied with integral tap holes to suit the selected tapware.

### 2.10.7 Laboratory sinks

Deep-bowl laboratory sinks must be provided to support teaching and learning activities. The number of sinks in any activity space must support the intended teaching and learning activities and cater for the number of students using the activity space at any one time.

Laboratory sinks must be:

- chemical resistant or Type 316 stainless steel
- designed and installed to mitigate the build-up of chemicals (e.g., under the lip of a sink mounted on the top of a benchtop)
- designed and installed to facilitate cleaning.

### 2.10.8 Emergency eyewash and shower

Emergency eyewashes and showers must be provided where functions or activities present a risk to users. This includes science laboratories and materials technology spaces and associated preparation areas.

Emergency eyewash and shower stations must include:

- integrated eyewash and shower functions designed and installed to comply with *AS 4777 Emergency eyewash and shower equipment*
- a small pedestal stainless steel bowl with lever-actuated twin eye-drench faucets
- lever-actuated hand-held shower hose
- safety warning signage.

### 2.10.9 Interceptor sinks and traps

Inceptor sinks must be provided where there is a risk that clay, paint, or similar residues may enter the sewer.

Inceptor sinks must be:

- Type 304 stainless steel with an extended standing drain outlet
- installed with an interceptor trap where required.

Interceptor traps must be:

- sized to suit the intended activities and to mitigate the need for too frequent emptying by schools
- installed in a location accessible for maintenance purposes and where odours emitted will not affect the use of teaching and learning activity spaces or other functional areas
- fitted with an airtight lid and have couplings installed on the inlet and outlet to allow the trap to be removed for maintenance or replacement
- approved by the relevant trade waste authority.

### 2.10.10 Laundry troughs

Laundry troughs must be:

- inset Type 304 stainless steel 45-litre capacity with a single tap hole and rinse bypass co-ordinated with the washing machine location.

### 2.10.11 Cleaners’ sinks

Cleaners’ sinks must be provided in dedicated spaces appropriately designed in terms of floor and wall finishes and ventilation.

Cleaners’ sinks must be:

- Type 304 stainless steel or vitreous china
- floor or wall mounted and installed complete with wall brackets or legs to floor, hinged stainless steel grate and chrome-plated trap and waste.

## 2.10.12 Showers

Showers must be provided to student and staff changing rooms and to accessible student change facilities. Showers must be safe, self-draining and designed to allow for privacy for each user.

Accessible showers must be fitted with stainless steel grab rails, a shower seat, shower curtains and all other associated fittings required to satisfy the applicable Australian Standards. Where shower rooms are fitted with overhead hoists and ceiling-mounted hoist tracking, curtain solution must be provided that does not rely on ceiling support brackets.

Shower heads to general purpose showers must be anti-vandal fixed head type outlets.

Shower heads for accessible showers must comprise a vertical wall rail, hand shower on flexible hose, integral soap dish, and wall bracket, and must be located so that the shower head cannot be placed in the bowl of any toilet pan.

## 2.10.13 Floor waste gullies

Floor waste gullies must be provided where floor wash down is required or where required by regulation.

Gullies must include a clamping rim suitable for installation into sheet vinyl flooring. Where installed, a shower recess gully integral with the graded floor surface can serve as a floor waste gully.

Floor waste gullies must be chrome-plated brass and sized to suit the area being serviced. Adjacent floors must be graded towards the floor waste gully.

Floor waste gullies must have minimum gully riser and grate diameters of 100 mm.

Floor waste gullies are to be connected to a tap fixture to allow charging.

Floor waste in Home economics or kitchen areas must be bucket trap with stainless steel basket and secondary strainer.

## 2.10.14 Tap fittings and fixtures

Robust, tamper-proof tap fittings and fixtures must be provided with either timed delivery or otherwise designed to satisfy the water saving requirements specified in Table 11.

Tap fittings and fixtures must be chrome-plated finish on metal.

Cold water tapware must be coded ‘blue’ and hot water tapware must be coded ‘red’. Cold water tapware must be fixed on the right-hand side of the fixture and hot water tapware must be fixed on the left-hand side. Where tempered warm water is being provided, tapware must be coded ‘yellow’.

Laboratory-type tapware must be high goose-neck type with a tube nozzle outlet, bench-mounted or sink-mounted, and must be chemical resistant to suit the particular application.

Drinking fountain tapware must be lever spring-action drinking cocks with mouthguard and 100 mm-long flanged horizontal extension to tap. Taps and troughs must be located to minimise potential damage or vandalism.

Consistent with the principles of inclusion, taps should be controlled by lever handle. Taps in kitchen situations must be pillar mixer taps.

Where cleaners’ taps are provided, these must be positioned at a height to allow a bucket to be easily filled and be fitted with anti-vandal tap spindles.

All external (not in a secure area) taps must be fitted with anti-vandal tap spindles.

External taps that deliver non-portable rainwater or recycled water shall have ‘Not for Drinking’ signs attached.

Hands-free tap operation must be provided at hand wash basins where required by health regulations and by-laws for food service areas.

## 2.11 Joinery and fixtures

Joinery must be provided to support the functional requirements of each space as detailed in *Room data sheets*. Joinery works must include finishes, hardware, coordination with services, required fixings, skirtings, mirrors, glass panels and glass doors and associated trims, conduits or recesses and gaps for electrical equipment, integral lighting, wiring, data cabling and the like, including built-in GPOs, data outlets, audio visual outlets and inputs and all necessary support and sub-framing necessary to complete the works.

The scope of joinery works must include:

- custom-fitted joinery, vanity benches, kitchen and kitchenette joinery, cupboards, storage units, display units, document pigeonholes, built-in student lockers and the like
- changing room benches
- stainless steel and chemical-resistant laminate work benches and cabinets in science and technical areas and areas with similar functions.

Designs must ensure that:

- cut-outs to accommodate fixtures (such as sinks and hand basins) and equipment (such as fridges, microwave ovens and the like) take into consideration the required equipment size and installation tolerances
- where required, joinery can accommodate roller shutter doors or grilles
- accessories and trims necessary to complete installations are provided
- joinery units are fixed to substructure backgrounds, provide sufficient support to prevent injury from failure of components and are securely, mechanically fixed to walls (all mechanical fixings are concealed from view)
- junctions with structures, scribe bench tops, splashbacks, ends of cupboards, kickboards and returns follow the line of the structure
- all carcass junctions with walls and floors, and to cable entries, are sealed with silicone beads for vermin-proofing to all food handling areas and voids at the backs of units to all areas for hygiene requirements
- all service penetrations are sealed and made vermin-proof
- joinery is provided with 16 mm white melamine faced medium density fibreboard (MDF) backboards
- plinths are mechanically fixed to the floor structure and kick rails 100 mm high ex 38 mm F8 KDHW are provided with the visible face finished in 0.8 mm laminate or similar robust finish
- all screws, nails, bolts, anchors, brackets, adhesives, and other fixing devices required for neat and secure fixing throughout are provided and are concealed from sight in the finished work.

Benchtops must be constructed of an MDF substrate with a minimum thickness of 25 mm and be finished and edged in materials suited to the functional requirements of the installation. The default benchtop must be finished with 1.0 mm coloured laminate with solid-colour, rigid, high-impact PVC edging to match the selected laminate colour or freeform edge. Other surfaces which may be used include:

- stainless steel
- chemical-resistant compact laminate (13 mm minimum thickness) for science laboratories and similar.

Handles must be robust, simple, satin chrome-plated meta, and sourced from generally available production lines. Consistent with the principles of inclusion, handles must be easy for any user to operate. Door and drawer handles and pulls are to be selected and detailed with no sharp edges or protrusions that may cause injury.

Joinery doors and drawer-fronts must have common substrate and finishes and be a minimum thickness of 18 mm MDF. There must be a white melamine finish to all interiors including drawers and shelves in enclosed cupboards. Finishes must be applied to all surfaces and edges, including edges facing floors.

Shelves must be adjustable, with shelf thickness and provision of supports as required to ensure the shelf can support applied loads without deflection exceeding 3 mm in 1000 mm. Adjustable shelf supports must be metal shelf-pins fitted into pre-drilled internal face on sides and vertical divisions of carcasses and fitted into routed underside of shelving panels to avoid accidental tipping.

Joinery doors must be hung on 110° or 180° fully concealed and adjustable hinges with catching action. Doors must open and close easily and shut tightly to a neat line and flush finish. The number and type of hinges specified must withstand the weight of the door leaf and anticipated heavy use.

Joinery drawers must be fitted with steel and ball bearing full extension sliding drawer runners.

Impervious splashbacks must be provided above benchtops where there is a risk of splashing from sinks or spillage of liquids.

Benchtops that are subject to water spills (such as kitchen counters and vanity benches) must be detailed to ensure durability and resistance to water ingress and degradation.

Where possible, storage must be incorporated under benchtops, except where accessibility provision is required.

Formaldehyde emission limits for engineered wood must comply with the relevant Australian Standards.

### 2.11.1 Accessibility and inclusion

Benchtops and counters (and related and ancillary spaces) must be designed to allow and facilitate access and use by students and staff who may use wheelchairs or other disability supports. All reception and canteen counters must facilitate use by students and visitors who use wheelchairs or other disability supports. The wheelchair accessible areas of reception and canteen counters must be readily identifiable, easily accessible and provide equitable access.

### 2.11.2 Special joinery fittings

Where necessary to deliver or complement the required functionality, special joinery fittings must be provided:

- Cutlery dividers — five-compartment white moulded-plastic drawer inserts, trimmed to suit size of drawer carcass.
- Stationery dividers — as for cutlery dividers above, except seven compartments in four different sizes.
- Tea towel rail — two chrome-plated steel arms on slide-out frame fixed to the side of a cupboard.
- Library book return slot and book slide.
- Adjustable-height computer keyboard ledge.
- Cable entry caps — moulded-plastic circular sleeve with swivelling cover plate, colour-matched to benchtop colour.
- Wardrobe hanging rails.
- Joinery locks — generally keyed alike to locks on each unit or in each room and keyed to differ for joinery in separate rooms.

### 2.11.3 Gymnasium change bench framing

Changing room benches provided in gymnasiums must be constructed with tubular galvanised or powder-coated steel frames and slatted hardwood seats.

## 2.12 Bird-proofing

Designs must limit or eliminate ledges and bird perches at all exposed areas such as window sills, external eaves, under-croft areas, covered walkways, sunhoods, window edges and any exposed services such as cable trays and pipework to avoid possible nesting and roosting positions.

Deterrents must not be based on the application of chemical treatments.

## 2.13 Termite protection

Termite protection must be provided to all school buildings.

Termite protection must be:

- installed under concrete slabs, foundations, and cavity walls to the building perimeter
- installed and sealed around concrete slab penetrations for pipes, cable conduits and the like
- a mechanical barrier (chemical barriers are not to be used for termite protection to avoid the need for chemicals to be reapplied at regular intervals).

# 2.14 Way finding and signage

## 2.14.1 Entry structures

- The main street frontage of the facility shall be enhanced by landscaping and entry statement to provide a focal entry point for the facility with a path leading primarily to the Administration block.
- Entry structure shall promote the image of the facility and include signage to identify the facility within the community.
- The entry structure and signage shall be powered to enable changeable message electronic signs to be provided at the school's expense. Refer to the general location and operation fact sheet for *Small Electronic Devices within School Zones Fact sheet* on the Department of Transport and Main Roads website.

## 2.14.2 Building signage

Individual buildings shall have external signs that are:

- easily read from all circulation paths
- located to identify the building entry
- generally indicative of the building function
- unique to each building.

Administration block:

- Signage shall be visible from the common visitor entry point or provide additional directional signage.

Wording/naming of signage shall be determined by the school in consultation with the community.

Where signage is required for a new building on an existing site, the existing type and sequence of building identification shall be continued.

Provide signage to all external storage facilities where hazardous or flammable materials are located.

## 2.14.3 Room signage

Provide each room with a standard room number and name. Numbers are to be checked with the Project Manager prior to installation.

Name or function signs to all Service rooms (e.g., cleaners' cupboards, plant rooms, electrical risers, and to Administration spaces such as 'Director' and 'Student Counsellor').

Ensure room signage has appropriate placement and fixings to inhibit vandalism

Internal signage shall comprise a messenger type system that lends itself easily to updating change of room function.

### 2.14.4 Building directory/level boards

Provide inside each major building entrance, a building directory board listing the main users of each floor. Generally signs are to be located in view of the lifts and main paths of traffic.

In large buildings a number of building directory boards may be required to direct visitors to the main entrance.

Provide on each level a floor directory board providing a location plan, and room numbers of individual spaces with directional signage. Generally signs are to be located in view of the lifts and main paths of traffic.

### 2.14.5 Braille and raised tactile signage

Incorporate Braille and tactile signage complying with specification 15 of the National Construction Code (NCC).

Raised Tactile and Braille signs must be provided within new buildings/developments to:

- all room identification signage
- all directional or way finding signage
- all signage which identifies the building occupants such as directory boards/level boards
- all sanitary facilities
- all accessible spaces with a hearing augmentation system
- all signage which identifies emergency exits and the location of these exits.

# 3.0 Building finishes

Building finishes must:

- be durable and resistant to exposure, weathering and general wear and tear
- be fire-resistant, where required
- enable the minimum acoustic and thermal performance requirements specified in Section 5 *Acoustic engineering* and Section J of the National Construction Code to be achieved
- provide suitable colours schemes and contrasts
- use re-generable materials, from sustainable sources
- have minimal embodied energy content
- afford the maximum recyclability at end of life.

External finishes must be selected to suit the functional and service requirements of the individual building. External walls will be subject to abrasion and impact damage from students, and durable materials must be used.

## 3.1 Masonry

Masonry brickwork and blockwork for structural walls and wall claddings must use materials, detailing and construction work that complies with all relevant Australian Standards, regulations and codes and the material manufacturers' recommendations.

Masonry works must include all associated mortar, lintels, ties, control joints, embedment, joint insertions, and sealants.

Brickwork and blockwork must:

- accommodate all permanent and temporary loads
- accommodate all short and long-term movements and deflections in the base structure (or substrates to which the work is fixed) and within the work, including thermal movements, without failure or damage or the transfer of loads from the base-structure to the brick or blockwork
- provide fire-resistant construction to adjacent and concealed work, where required for continuity
- be corrosion-resistant or coated to prevent corrosion
- use suitable moisture-resistant materials and construction details
- allow thermal insulation to be integrated into the drywall framing
- prevent the formation of condensation on the inside surfaces of external cladding systems from warm humid air on cold surfaces by the correct selection and location of insulation and continuous vapour barriers
- include an anti-graffiti paint finish that allows the removal of graffiti without adverse impact on the durability or finish of the substrate material.

## 3.2 Structural steel finishes

Structural steel finishes and associated work must:

- be corrosion-resistant or coated to prevent corrosion
- use decorative coatings that are UV-stable and moisture-resistant
- use appropriate coating systems for the substrates, exposure, required finish (including paint) and prevailing conditions
- provide a finished surface quality free of defects and smooth over each element and have a consistent appearance over the entire work.

All exposed steel columns must be hot-dipped galvanised, in accordance with the exposure category in *AS/NZS 2312.2 — Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings Part 2: Hot dip galvanizing*.

For structures in an atmospheric corrosive category of C4 or above (refer *AS 4312 Atmospheric corrosivity zones in Australia*) a protective coating system in lieu of galvanising must be used.

Galvanizing must be continuous, smooth and evenly distributed, and be free from visual and surface defects including dip lines, lumps, blisters, gritty or uncoated areas, spots, dross or flux.

Hot dip galvanizing visible in the installed location must be carried out to architectural grade and a have uniform patina and texture over the entire visible surface without defects or rough patches.

Where pre-coated materials are subject to on-site welding, cutting or similar work, the applied protective coating must be repaired to deliver equal protection, equal durability and performance, and a visual appearance identical to the undamaged adjacent surfaces.

## 3.3 Metalwork

Fabricated metalwork, including anchorages, fixings, finishes and trims must be selected and installed to suit local conditions and performance requirements.

Metalwork must:

- be protected against corrosion
- be chemically and electrolytically compatible with adjacent materials or be appropriately separated by spacers to avoid galvanic reactions with each other, substrates and adjacent work
- use materials, products, sealants or adhesives that do not stain, contaminate, or cause visual or structural defects in adjacent materials
- incorporate fixings and framing that accommodates all permanent and temporary loads, individually and in combination, without failure, deflection, damage to adjacent or applied work, or risk to safety
- have visible fixings evenly and neatly located and aligned
- use visible fixings in accessible areas that are vandal resistant
- be finished free of sharp edges or projections, which could cause injury to users.

Where required to be finished flush with adjacent surfaces, visible fixings must be countersunk.

Cut edges, drilled holes, joints and surfaces must be finished clean, neat, and free from burrs and indentations. Sharp edges must be removed without excessive or uneven radius.

Surface finishes, colour and texture must be continuous and without variation.

Exposed fixings that are subject to human contact must be recessed, smooth and flush.

**Stainless steel**

Stainless steel finishes and fabricated elements must be resistant to corrosion and staining.

Type 316 stainless steel must be used in all food preparation and handling areas.

Type 304 stainless steel should be used in bathrooms, shower rooms, toilets and similar wet or humid areas.

Type 316 stainless steel should be in schools located within an atmospheric corrosive category of C4 or above (refer *AS 4312 Atmospheric corrosivity zones in Australia*).

## 3.4 External timber finishes and decking

External timber finishes including cladding, decking, panelling, screens, rails, furniture and similar must:

- be constructed of timber from certifiably sustainable sources
- have a natural durability appropriate to the conditions of use and exposure, or are preservative-treated timber of equivalent durability
- be free from live borers, insects, and other pests, and from rot and fungus infection.

Where required, timbers must have received a preservative and/or water-repellent treatment. *Timber that has been pressure or dip-treated with copper chromium arsenate (CCA) preservative must not be used in any circumstances*.

Structural members must be 'building grade' if concealed or 'appearance grade' if visible.

Timber decking must have:

- a bushfire resistance appropriate to the site’s bushfire zoning
- a minimum P4 wet pendulum slip rating.

Timber decking must be selected in consideration of a school’s obligations to maintain the slip resistance and decking in accordance with manufacturers’ instructions and warranties.

Clip-fix decking must not be used on steps or stairs due to the risk of movement.

Timberwork must:

- accommodate all permanent and temporary loads, individually and in combination, without failure, deflection, damage to adjacent or applied work, or risk to safety
- accommodate all short and long-term movements and deflections in the base-structure, substrates to which the work is fixed, and within the work, including thermal movements, without failure or the transfer of loads from the base-structure to the timberwork
- have adequate dimensional stability for the ambient conditions, and must not change size or shape in a manner which will detract from appearance, performance and durability of the work, or damage adjacent or applied work
- use fixings for timber framing of suitable corrosion resistance as required to assemble and hold the work in place and are selected for correct size and spacing.

## 3.5 Walls and linings

Every space or room must be provided with appropriate walls and wall linings with wall construction and linings suitable for and consistent with the function and use of the space.

Wall sheeting of internal walls and partitions from floor level to ceiling in all student accessible spaces shall be equal in impact/scuff resistance to 9 mm fibre cement.

**Note:** Plasterboard is not acceptable in classrooms due to ease of damage to the surface. Wall sheeting in non-student accessible areas shall be equal in impact/scuff resistance to 6mm fibre cement.

Linings must be able to cope with normal school usage without needing constant maintenance or repair. Walls, linings and associated work must:

- have provision for controlled expansion and contraction
- have fire resistance properties compliant with National Construction Code requirements
- enable the minimum acoustic performance requirements specified in Section 5 *Acoustic engineering* to be achieved
- not be damaged by structural building movements and must remain rigid and safe under all loading and height conditions, including when work is later applied by other trades
- remain stable without deflection, damage or rattling under normal conditions of use and slamming of doors
- where subject to impact damage or loading, be durable, resilient and have additional support provided
- have wall framing and furring systems that are complete and which are suitable for the location and the intended function
- have smooth junctions between lining components, finishes, and adjacent surfaces
- have flush wall and ceiling joints
- permit thermal movement for embedded items required to be sheathed, such as water pipes
- have seal joints and junctions to adjacent work that maintain the integrity of fire, smoke, acoustic and moisture barriers.
- have continuous thermal insulation provided to minimise heat loss or gain or loss.

Wall surfaces and finishes must be selected for durability and ease of cleaning and maintenance:

- Impervious wall surface (sheet vinyl or glazed ceramic wall tiles) must be provided behind wall mounted hand wash basins, urinals, toilet pans and cleaner's troughs from floor level to minimum height of 2100 mm.
- Waterproof, seamless resilient wall finishes must be provided in shower compartments to a minimum height of 2100 mm.
- Waterproof and easily maintained resilient finishes must be provided to a minimum of 500 mm above benchtops where there is risk of splash or liquid spills.

The heights of these finishes must be increased so that wall mounted fitments (e.g., paper towel dispensers, hand driers, etc.) do not bridge two material backgrounds.

Careful consideration must be given to the selection of wall linings in locations where impact and damage can be expected. Without limitation, the types of impacts that should be considered are impacts from chairs and furniture, mobile trolleys, and wheelchairs and mobility aids. Walls in gym and fitness areas will be subject to impact from sports equipment and from users.

Wall layouts must maximise the area available for display space, including fitted pinboards and applied display board materials.

For schools supporting students with high needs, walls in corridors and within learning areas and activity spaces must include tactile sensory stimulation in various forms such as bands and panels of materials incorporating a range of colours and tactile surfaces.

## 3.6 Wall tiling

Wall tiling, including substrate preparation, priming, bedding and adhesives, joints, and grouting, tiled or coved skirtings, trims and control joints must be consistent with the function and use of the space.

Wall tiling and associated work must:

- accommodate applicable live and dead loads
- accommodate movements and deflections in the base-structure and substrates, without failure or loss of adhesion, performance, or durability
- be chemically and electrolytically compatible with adjacent materials and substrates or be appropriately separated by spacers to avoid reactions with each other, substrates, and adjacent work
- use materials, products, sealants, or adhesives that do not stain, contaminate, or cause visual or structural defects in adjacent materials
- use mould-resistant grout when installed in wet areas
- in wet areas, include a waterproof membrane that provides a permanent barrier to moisture and water, be resistant to water and vapour pressure, condensation, and corrosion, and that remains intact and properly fixed to the substrate under all conditions.

### 3.6.1 Splashbacks

Splashbacks must be provided in wet areas and rise a minimum of 300 mm above the benchtop or fixture.

Splashbacks shall be extruded semi-rigid PVC sheet, stainless steel or glass as indicated in *Room data sheets.*

Joints between splashbacks, benches and walls must be sealed using a silicon sealant or coved.

## 3.7 Floor finishes

Flooring, including substrate preparation, adhesives, skirting, covings and trims and control joints must be consistent with the function and use of the space.

Floors and floor finishes must be level and smooth, stable, slip resistant, free of trip hazards and suitable for heavy pedestrian traffic and the passage of mobile trolleys, wheelchairs and users reliant on mobility aids.

Division strips must be provided at junctions of dissimilar flooring materials. The finish of adjacent floor finishes must be to a common surface datum, so that no trip hazard is formed. Metal movement control cover plates must be provided in floor finishes where structural control joints have been formed in concrete slabs.

Floor finishes and associated work must:

- be highly durable and appropriately sealed to minimise dust
- be slip-resistant particularly on steps and stairs and in wet areas or where water, oil, grease, sawdust or similar may be present
- acoustically compatible with the background and activity noise levels within the space
- provide thermal and tactile comfort in relation to the usage of the space
- be easily and readily cleaned and maintained
- be installed with minimal undulations.

Floor finishes must be of a suitable standard grade and type and be readily available.

Brickwork laid flat or on-edge is not an acceptable internal floor finish.

Flooring in server rooms must be anti-static.

### 3.7.1 Carpets

Flooring to teaching, office and administration zones must be anti-static carpet or carpet tiles consistent with room use and the high levels of wear associated with schools.

Carpets and mats, carpet tiles and associated components and work must comply with the following requirements:

- Have an Australian Carpet Classification Scheme grading of Contract Extra Heavy Duty and Stairs and an environmental certification scheme rating of Level 4.
- Have textile dyes and pigments that are colour-fast and fade resistant to day-light and resistant to water.
- Avoid the accumulation of undesirable electrostatic charges.
- Contain an appropriate substrate to be prepared to receive the carpet installation.
- Contain a smooth transition between adjacent flooring types.
- Have edges between carpet and other flooring materials finished with mouldings suitable for the particular use. Plastic edge strips or non-flush materials are not acceptable.
- In a single area, be of a single specified type, quality, colour, and design and come from one manufacturing batch and dye-lot.

Small cut portions of carpet tiles should be avoided and must be glue-fixed into place using construction adhesive. Tack adhesive generally used for whole carpet tiles must not be used for small cut portions.

Light-coloured carpet tiles should be avoided as they show stains.

## Carpet – broadloom

| Criteria | Minimum requirements |
|---|---|
| Description | • Interlocking tufted loop pile, direct stick carpet |
| Australian Carpet Classification Scheme (ACCS) Grading | • Contract Extra Heavy Duty and Stairs (CEHDS) |
| Face yarn | • 100% nylon (polyamide)<br>• No polypropylene or polyester |
| Colour and pattern | • Colours to be of the darker range with disruptive patterning |
| Width | • Nominal 3660 mm |
| Total pile mass | • Minimum 745 g/m² (22 oz/yd²) |
| Machine gauge | • 1/10th (39.4 needles/100 mm) and finer |
| Pile height | • Nominal 4mm but not to exceed 6mm |
| Primary backing | • Minimum 100 g/m² synthetic backing |
| Secondary backing | • Minimum 90 g/m² synthetic backing |
| Bonding | • Direct to substrate or dual bonding over underlay |
| Anti-static | • Less than 3.5 Kv at 21º C and 20% relative humidity |
| Flammability rating | • Critical Radiant Flux (CRF) greater than or equal to 2.2 kW/m²<br>• Smoke development rate less than 750%-minute |
| Environmental rating | • ACCS Environmental Certification Scheme (ECS) Level 4 |
| Warranty | • Minimum 10 years commercial wear |
| Installation | • Follow manufacturer's guidelines and AS/NZS 2455-Part 1<br>• Ensure concrete floors are tested for moisture and pH levels<br>• Adhesive to be low-VOC, 'cross linked' water-based acrylic<br>• Supply 5% area additional over for replacement purposes |

## Carpet — tiles

| Criteria | Minimum requirements |
|---|---|
| Description | • Interlocking tufted loop pile, direct stick carpet |
| Australian Carpet Classification Scheme (ACCS) Grading | • Contract Extra Heavy Duty and Stairs (CEHDS) |
| Face yarn | • 100% nylon (polyamide)<br>• No polypropylene or polyester |
| Colour and pattern | • Colours to be of the darker range with disruptive patterning |
| Width | • Nominal 3660 mm |
| Total pile mass | • Minimum 745 g/m² (22 oz/yd²) |
| Machine gauge | • 1/10th (39.4 needles/100 mm) and finer |
| Pile height | • Nominal 4 mm but not to exceed 6 mm |
| Primary backing | • Minimum 100 g/m² synthetic backing |
| Secondary backing | • Minimum 90 g/m² synthetic backing |
| Bonding | • Direct to substrate or dual bonding over underlay |
| Anti-static | • Less than 3.5 Kv at 21º C and 20% relative humidity |
| Flammability rating | • Critical Radiant Flux (CRF) greater than or equal to 2.2 kW/m²<br>• Smoke development rate less than 750%-minute |
| Environmental rating | • ACCS Environmental Certification Scheme (ECS) Level 4 |
| Warranty | • Minimum 10 years commercial wear |
| Installation | • Follow manufacturer's guidelines and AS/NZS 2455-Part 1<br>• Ensure concrete floors are tested for moisture and pH levels<br>• Adhesive to be low-VOC, 'cross linked' water-based acrylic<br>• Supply 5% area additional over for replacement purposes |

### 3.7.2 Floor tiling

Floor tiling and associated work must:

- be durable products suitable for the location and the intended function
- accommodate movements and deflections in the base-structure and substrates, without failure or loss of adhesion, performance, or durability
- be chemically and electrolytically compatible with adjacent materials and substrates or be appropriately separated by spacers to avoid reactions with each other, substrates, and adjacent work
- use materials, products, sealants, or adhesives that do not stain, contaminate, or cause visual or structural defects in adjacent materials
- for tiled pedestrian surfaces, be stable, safe and minimise risk of slipping or tripping due to slippery or uneven surfaces
- be flush with adjacent work unless a stepped level change is required
- use mould-resistant grout when installed in wet areas
- in wet areas, include a waterproof membrane that provides a permanent barrier to moisture and water, be resistant to water and vapour pressure, condensation, and corrosion, and that remains intact and properly fixed to the substrate under all conditions.

### 3.7.3 Sheet vinyl flooring

Sheet vinyl flooring with an upper surface treatment suited to the function or activity must be provided in storerooms, amenity rooms and the like and in rooms or spaces where wet activities occur.

A chemical resistant grade resilient floor finish must be used where there is a risk that staining liquids or corrosive chemicals will be spilled.

Sheet vinyl flooring and associated work must:

- set out within a space to minimise the number of joints and seams
- be firmly bonded to the substrate, with no bubbles, undulations, or defects
- be appropriate for heavy pedestrian traffic
- be stable, safe and minimise the risk of slipping or tripping due to slippery or uneven surfaces
- have specific non-slip properties in wet areas and in areas where users may be barefoot
- have all seams welded and sealed and all junctions between different vinyl types finished flush
- contain junctions between vinyl flooring and other flooring that are finished flush (plastic junction strips or junction devices which are not flush are not acceptable).

## Sheet vinyl flooring

| Criteria | Requirements |
|---|---|
| Grade | • Fully flexible heavy public/commercial use quality |
| Surface finish | • A surface treatment to give a 'low maintenance' finish, not requiring sealers or polish for the life of the sheet with written guarantee to this effect |
| Maintenance requirements | • Limited to damp mopping, neutral cleaners, machine cleaning and dry buffing |
| Construction type | • Either homogeneous consolidated vinyl with non-directional pattern or heterogeneous multi-layered vinyl sheet with vinyl chips in transparent wear layer bonded to moisture proof backing |
| Warranty | • Minimum 10 years including 'low maintenance' finish |
| Thickness | • Minimum 2 mm thickness |
| Joints | • All joints shall be heat or chemically welded to achieve a water proof joint |
| Flexibility | • Ability to form sheeting into a continuous surface from floor to walls with a 25 mm radius coving with suitable fillet backing |
| Adhesive | • Adhesive suitable for wet areas and have low VOC emission |
| Colour | • Mid to darker colours and disruptive patterns to disguise marks (not plain charcoal or black) |
| Slip resistance | • Vinyl floors as briefed and scheduled below shall comply with AS 4586-2013<br>• Slip resistance classification of new pedestrian surface materials be one of the following types:<br>**Type A – General use vinyl** (e.g., resource prep rooms, store rooms)<br>– AS/NZS4586: 2013<br>– Appendix A Wet Pendulum – Y<br>– Appendix D Oil-wet ramp R9<br>**Type B – Slip resistance vinyl** (e.g., canteen prep and serving areas, HE food & catering kitchens, science labs, art studios, practical learning areas etc.)<br>– AS/NZS4586: 2013<br>– Appendix A Wet Pendulum – X<br>– Appendix C Wet/ barefoot ramp – A<br>– Appendix D Oil-wet ramp R10<br>**Type C – Barefoot/wet-area vinyl** (e.g., staff amenities, shower rooms, PWD shower/toilets)<br>– AS/NZS4586:2013<br>– Appendix A Wet Pendulum – X<br>– Appendix C Wet/ barefoot ramp – B<br>– Appendix D Oil-wet ramp R10 |

### 3.7.4 Concrete floor sealers/epoxy floor

Where concrete slab floors are provided, the concrete slab must be finished with a permanent applied sealer that has an integral colour and non-slip finish.

Where applied epoxy flooring coating are applied to concrete slab substrates they must be:

- applied in accordance with the material manufacturer's recommendations
- formed to coved integral skirtings
- formed to fall to grated gullies where required
- safe and appropriate for their particular use
- durable and easily cleaned.

To avoid possible incidents of ill-health due to the fumes from coatings used on floors, only coatings approved as complying with the Australian Paint Approval Scheme's (APAS) specification AP-VS0209 may be applied to floors in buildings owned by, or being built for, the Queensland Government. These requirements apply to surface coatings only. They do not apply to coatings such as waterproofing that will be covered by a concrete topping pad.

Contractors applying these coatings must be suitably qualified in terms of knowledge and quality assurance, so it is also a requirement that they be accredited under the Painting Contractors Certification Program (PCCP) for the application of Class 18 floor coatings to qualify for work on Queensland Government building projects.

For more information on the list of products that comply and the list of contractors with the required PCCP accreditation, please refer to:

https://www.business.qld.gov.au/industries/building-property-development/building-construction/supply-queensland-government/special-requirements-building/floor-coatings-vocs

### 3.7.5 Timber flooring

Timber flooring must be:

- appropriate for the intended use
- firmly supported on a suitable substrate with strength sufficient for the function
- durable
- slip resistant and have minimum undulations.

### 3.7.6 Sports, dance and drama flooring

The selection of flooring must comply with the functional requirements detailed in the *Room data sheets*

For sites located in high rainfall and high humidity regions, consideration should be given to using cushioned polyurethane flooring in lieu of a sprung timber floor. Where cushioned polyurethane floors are installed, they must be selected with properties appropriate to the types and levels of use proposed.

Sprung timber flooring must be:

- hardwood flooring boards, seasoned select grade with a minimum Janka hardness rating of 4.49, ex. 21 mm thick × ex. 60 mm wide
- laid on battens that incorporate resilient synthetic pads at 450 mm centres
- laid with expansion joints in the floor in accordance with local humidity conditions and the anticipated behaviour of the flooring, and include a 5 mm gap to the full perimeter and at all vertical obstructions

- installed with a timber skirting that facilitates ventilation to the sub-floor space
- sanded smooth and finished with a clear multi-coat sealer or applied finish appropriate to the types and levels of use proposed
- for sports flooring, line marked in different colours to delineate the courts markings of the specified sports.

### 3.7.7 Skirtings

Skirtings must be provided over floor finishes to all internal walls. Skirtings must be:

- Flat satin anodized aluminium or finished stainless steel sheet skirting with a minimum thickness of 1.6 mm and adhesive fixed to the wall lining.
- Vinyl skirting profile adhesive fixed to the wall lining.
- Resilient vinyl flooring material turned up over a shaped coving profile backing and adhesive fixed to the wall lining to form self-coved flooring. This form of skirting should be used in areas that will be cleaned with a wet wash-down.
- Timber skirting sections fixed through the wall lining into the sub-frame and finished with an applied paint coating.

The longest possible skirting sections for each situation must be used. Skirtings must be installed to a level horizontal line fitting flush against floors. Edges must butt together to form tight neat joints showing no visible open seam. Skirtings must be sealed at internal corners and at junctions with door frames and vertical abutments. Skirtings must be a minimum 100 mm minimum high and align with the height of kick-rails in adjacent joinery.

## 3.8 Painting and applied coatings

All external and internal surfaces (other than surfaces reasonably left uncoated such as face brickwork or materials that have a factory applied coating) and non-building elements must be finished with an appropriate applied protective coating system. This requirement includes installations and works associated with building engineering services including pipework.

Paints and applied coatings must be:

- Very low in Volatile Organic Compounds (VOC) as defined by the Australian Paint Approval Scheme and free from toxic ingredients.
- Approved under the Australian Paint Approval Scheme.
- The highest or premium grade available. Trade quality paints and coatings must not be used.
- Colour tinted by the manufacturer or supplier. Where this is not possible, tinters and stains must only be added if this is without detriment to the durability or aesthetic performance of the product.
- Products and finish types used in each installation must be from the same product batch. Inconsistency in finishes is not acceptable.
- Ultra-violet resistant paints and coating products must be used where they are subject to direct and reflected sunlight, including internal locations, to prevent colour fading.

Paints and coatings must not be a Schedule 1 paint or coating as defined by or used in specified human contact areas prohibited by the Uniform Paint Standard issued by the National Health and Medical Research Council.

Handrails and other metal surfaces subject to wear should be galvanised, not painted.

Consideration must be given to using a protective coating system rather than paint in environments classified in accordance *with AS 4312 Atmospheric corrosivity zones in Australia* as being C4 or higher.

External paint colours that increase heat absorption to the detriment of the underlying substrate must be avoided.

# 4.0 Utilities and associated infrastructure

## 4.1 Demand requirements

All services must be sized to meet the demand requirements based on a school's peak enrolment plus spare capacity as shown on the master plan where available. Consideration must be given to the demand requirements of all permanent and relocatable buildings including any community or other third-party facilities located or proposed to be located on the site.

This requirement applies to services for electricity, natural gas, sewerage, stormwater drainage, telecommunications, and water. Specific requirements regarding the spare capacities to be provided are detailed in the relevant services section of these *Technical Specifications and Standards*.

## 4.2 Water

Liaison must be undertaken with the relevant local water authority to determine the location, size, and adequacy of existing authority water mains within the streets surrounding the site. Applications for new water and fire service connections must be made to the relevant local water authority in accordance with their requirements.

Water and fire service connections must be metered in accordance with the relevant local water authority requirements.

Each water and fire service connection must be provided with appropriate backflow prevention in accordance with the relevant local water authority and local council requirements.

Sites should be connected to an authority's recycled water main where these exist.

Where existing water mains or connections require relocation, removal or upgrade application must be made to the relevant local water authority.

## 4.3 Sewage

Liaison must be undertaken with the relevant local sewer authority to determine the location, size and adequacy of existing sewer mains and available branches within the streets surrounding the site.

Sewer connection branches and extension of any sewer main must be constructed to all authority requirements

Where existing sewer mains require relocation or removal, application must be made to the relevant authority to purchase and abandon the sewer, cut-and-seal the disused sewer and for the connection of a new sewer main.

## 4.4 Stormwater drainage

Liaison must be undertaken with the relevant local authority to determine the location, size, and adequacy of existing stormwater systems (pipes or open channels) and available branches within the streets or properties adjacent to the site and to determine the legal point of discharge.

Stormwater connection branches and extension of any existing stormwater systems must be constructed to all authority requirements.

Where existing stormwater systems require relocation or removal, application must be made to the relevant authority to purchase and abandon the system (pipes) or fill in the system (open channels).

Where the site discharge is restricted to pre-development flow rates, designs must incorporate suitable onsite retention and detention to the satisfaction of the local authority.

## 4.5 Natural gas

Liaison must be undertaken with the relevant local gas authority to determine the location, size and adequacy of existing gas mains and available branches within the streets surrounding the site.

Gas connection branches and extension of any gas mains must be constructed to all authority requirements.

Where existing gas mains require relocation or removal, application must be made to the relevant authority.

## 4.6 Electricity

Liaison must be undertaken with the relevant local authority to determine the location, size and adequacy of the existing electricity supply to the site.

A supply strategy must be developed which considers both the short and long-term development of the site.

Each site must be provided with underground conduits (to the relevant authority's requirements) from the authority's proposed connection point to the site's main switchboard. Overhead supply infrastructure should not be installed.

Calculation of the maximum demand, for the sizing of electrical supply and substations, must be based on the requirements detailed in *AS/NZS 3000 Electrical installations*.

## 4.7 Telecommunications

Liaison must be undertaken with the local telecommunications supply authority to establish permanent, reliable broadband data and telephony services to the site.

Communication conduits must be provided from the school boundary to the point of connection in the Network Centre. Carrier lead-in terminations must be provided within the server cabinet for connection to the department's WAN equipment.

# 5.0 Acoustic engineering

Good acoustic design for general learning and teaching spaces is essential. Unwanted or excessive noise can lead to difficulties with communication and concentration. Designs must provide an acoustic environment in which clear communication between teachers and students is achieved, while disturbance from other activities is minimised. Designs must also consider the acoustic impact of school activities, and plant and equipment on adjacent properties and residents.

Acoustic designs are to be in accordance with the higher requirement of this standard or AS2107 and the Association of Australasian Acoustical Consultants ‘Guideline for Educational Facilities’.

Acoustic consultants are recommended to be commissioned in the early design phase of a project to determine acoustic requirements and conduct impact assessments from adjoining properties, traffic etc.

Factors affecting acoustic performance and internal noise levels, which require appropriate acoustic treatment include:

- Site location in relation to noise sources, such as roads and industry, railways and aircraft flight paths.
- Relationship between varying noise levels anticipated in different buildings (such as sport centres, workshops, and libraries).
- Activity and equipment noise within spaces (such as music, playground activities in covered areas and machinery noise).
- In multi-level buildings, impact and vibration noise from foot traffic and machinery from rooms above and below.
- Impact noise from rain on roof sheeting.
- Impact noise, vibration, and resonances in light metal framed structures from foot traffic.
- Sound travel paths through openings, joints or gaps between walls, floors, ceilings and openable joints in operable walls, doors, and view panels.
- Sound travel between rooms over the partitions via the ceiling space, where partitions do not extend full height.
- Noise from mechanical ventilation and air-conditioning fans and compressors.
- Noise from gravity and pumped drainage and waste services.

## 5.1 Noise limits

Limits are provided for background noise levels including noise from building services and from external noise intrusion. These are presented as separate limits i.e., the noise limit for building services does not include noise ingress due to external noise sources and the noise limit for noise ingress does not include noise due to building services noise. Noise associated with school activities is not included.

### 5.1.1 Building services

Building services must comply with the noise limits detailed in Table 2

The following requirements apply to the noise limits for building services:

- $L_{Aeq}$ is the A-weighted equivalent continuous sound pressure level.
- Levels apply to finished, furnished but unoccupied spaces.
- Noise must be absent of tonal or intermittent characteristics.

- Limits apply to all building services operating normally and together including lighting, fans, ceiling fans operating at their design duty and any other plant items that would operate occasionally during a typical school day.
- The night-time noise limits must be met for plant operating out of school normal hours.
- The noise criteria for equipment only operating during emergencies may be relaxed by 10 dB from that nominated in Table 2.

Vibrations from building services plant must not result in the noise limits detailed in Table 2 being exceeded.

Mechanical services must be located outside of and away from noise sensitive spaces and positioned away from openable windows and doors, and boundaries to noise sensitive neighbours.

Ductwork should be routed to provide smooth airflow so that regenerated noise from bends, take-offs and transitions is low enough to ensure that noise limits are met. Self-balancing systems should be used thereby minimising the need for volume control devices. Air velocities in ducts should also be minimised.

Services must not undermine acoustic performance and must comply with the following requirements:

- Flexible ductwork must not pass through full height partitions.
- Flexible ductwork should be avoided in areas where high levels of sound insulation is required.
- Cross talk attenuators may be required where ductwork serves adjacent noise sensitive spaces.
- Above ceiling penetrations may require attenuation if walls are full height.
- Air transfer grilles in any sound insulating partitions and doors must be avoided or attenuated.
- All ductwork, pipework and cable penetrations must be sealed effectively.
- Pipework located in or above occupied spaces may need to be acoustically lagged to meet building services noise limits.
- Plant and equipment should be provided with appropriate anti-vibration mounts to meet vibration limits.
- Toilet and plumbing components must not be fixed to any wall shared with a teaching, learning or office space without incorporating additional acoustic treatment to control noise and vibration.
- Electrical penetrations (such as Switched socket outlets) must be staggered across wall studs. If back-to-back electrical penetrations are unavoidable, an appropriate acoustically rated backing box should be installed.

### 5.1.2 External noise intrusion

Noise intrusion from sources outside of buildings must be limited to achieve the acoustic performance standards detailed in Table 2.

The following requirements apply to external noise intrusion limits:

- $L_{A10}$ is the A-weighted noise level exceeded for 10% of the measurement period and is representative of the ‘average maximum’ noise level and applies for the whole of normal teaching hours.
- The noise limit must not be exceeded with the windows closed on the basis that teachers must have the option of opening or closing the windows.

Where noise levels with open windows are expected to exceed the noise limits regularly (e.g. because of regular sources such as aircraft, trains, or road traffic), sufficient ventilation and cooling must be provided to enable an acceptable internal comfort environment to be achieved with the windows closed.

Where sports activity spaces or gymnasium are used for assemblies or examinations, noise limits more appropriate to these activities must be applied.

### 5.1.3 Rain noise

Roofs and ceilings must be designed to control excessive noise from rain and the impact this has on occupied spaces. The noise effect from rain on a roof must not exceed the ambient noise levels detailed in Table 2 during a moderately heavy rain event (at a rate of up to 15 mm/h).

***Table 2.*** **Noise limits**

| Space type | Building services ($dBL_{Aeq}$) | Rain noise @ 15 mm/h | Noise intrusion ($dbL_{A10,\ 30\ mins}$) |
|---|---|---|---|
| *Enclosed learning spaces: general learning areas:* Seminar rooms, tutorial rooms, language laboratories, small group rooms | 35 | 40 | 35 |
| *Meeting rooms:* Interview and counselling rooms, video conference rooms | 40 | 45 | 40 |
| *Open collaborative learning spaces:* Resource and breakout areas | 40 | 45 | 40 |
| *Performance and rehearsal spaces:*<br>• Drama studios, assembly halls, multi-purpose halls — drama, physical education, dance, audio/visual presentations, assembly, occasional music<br>• Music and dance activity spaces<br>• Small and large practice rooms<br>• Performance and recital rooms<br>• Fitness and exercise spaces | 35 | 40 | 35 |
| *Designated quiet work areas:* Study areas, individual teacher preparation areas, yoga, prayer and meditation spaces | 40 | 45 | 40 |
| *Laboratories and workshops:*<br>• Materials and technology workshops — electronics, systems, textiles, food<br>• Art and graphic design studios<br>• Project spaces<br>• Science laboratories<br>– Fume cupboards @ 1 m from sash | 40<br><br><br><br><br>55 | 45 | 40 |
| *Circulation spaces:*<br>Atria, spaces used for circulation and socialising (but not teaching and learning), corridors, stairwells, coat and locker areas | 45 | 50 | 45 |
| Sports halls (for sport use only) | 50 | 55 | 50 |
| Hydrotherapy swimming pools | 50 | 55 | 50 |
| Dining rooms | 45 | 50 | 45 |
| Kitchens and laundries | 60 | 65 | 50 |
| Offices, medical rooms and staff rooms | 40 | 45 | 40 |
| Change rooms | 50 | 55 | 50 |
| Toilets | 50 | 55 | 50 |

## 5.2 Sound insulation between rooms

Walls, ceilings and floors separating adjacent rooms and spaces must be insulated to attenuate noise transmission and to mitigate the impact that the activities in one room or space has on another.

The sound insulation requirements are based upon the activity noise rating in the source room and the noise tolerance rating in the receiving room. The sound insulation ratings are detailed for the various room and space types found in schools in Table 3.

Based on an assessment of the sound insulation ratings of the adjacent rooms and spaces, sound insulation must be provided to satisfy the sound insulation requirements detailed in Table 4. The sound insulation requirements are provided in terms of the weighted standardised level difference $D_{nTw}$ values between two spaces.

***Table 3.*** **Sound insulation ratings**

| Space type | Activity noise (source room) | Noise tolerance (receiving room) |
|---|---|---|
| *Enclosed learning spaces:* Seminar rooms, tutorial rooms, language laboratories, small group rooms. | Average | Low |
| *Meeting rooms:* Interview and counselling rooms, video conference rooms | Low | Medium |
| *Open collaborative learning spaces:* Resource and breakout areas | Average | Medium |
| *Performance and rehearsal spaces:*<br>• Drama studios, assembly halls, multi-purpose halls — drama, physical education, dance, audio/visual presentations, assembly, occasional music<br>• Music and dance activity spaces<br>• Small and large practice rooms<br>• Performance and recital rooms<br>• Fitness and exercise spaces | Very high | Low |
| *Designated quiet work areas:* Study areas, individual teacher preparation areas, yoga, prayer and meditation spaces | Low | Low |
| *Laboratories and workshops:*<br>• Science laboratories<br>• Electronics, systems, textiles, food, graphics and art and design studios | Average | Medium |
| Materials and machine workshops | High | High |
| *Circulation spaces:*<br>Atria, spaces used for circulation and socialising (but not teaching and learning), corridors, stairwells, coat and locker areas | Average | Medium |
| Sports halls (for sport use only) | High | Medium |
| Hydrotherapy swimming pools | High | High |
| Dining rooms | High | High |
| Kitchens and laundries | High | High |
| Offices, medical rooms and staff rooms | Low | Medium |
| Change rooms | High | High |

***Table 4.*** **Sound insulation requirements (minimum $D_{nTw}$)**

| Noise tolerance in receiving room | Activity noise in source room, | | | |
|---|---|---|---|---|
| | Low | Average | High | Very high |
| High | Not applicable | 35 | 45 | 55 |
| Medium | 40 | 45 | 50 | 55 |
| Low | 45 | 50 | 55 | 55 |

It must be noted that the:

- $D_{nTw}$ must be calculated according to *AS/NZS ISO 717.1 Acoustics — Rating of sound insulation* in buildings and of building elements Part 1: Airborne sound insulation
- prediction of $D_{nTw}$ between two spaces must be conducted in both directions
- values of $D_{nTw}$ include glazing and doors
- $D_{nTw}$ is the required onsite performance and the reduction between laboratory sound insulation performance and onsite construction must be taken into consideration in the selection of materials and construction detailing.

Spaces with incompatible acoustic requirements should be located as far apart as practicable. Where open-plan teaching spaces are proposed, dedicated quiet rooms or pods should be included to cater for small groups needing acoustic separation from the main group.

The location of toilet and amenity spaces must minimise the impact of hydraulic noise transfer to teaching, learning and administration spaces. Where teaching, learning and administration spaces are adjacent to walls containing in-wall cisterns or noisy pipework, or where noisy appliances are on the opposite side of the wall, the walls must be constructed (likely separated construction) and insulated to prevent noise intruding on adjacent spaces.

Music rooms will be noisy and must be carefully planned to avoid them being located close to noise-sensitive spaces. Rooms for brass or percussion are particularly noisy.

All flanking paths need to be considered and appropriate treatments provided to stop noise travelling via these paths and reducing the level of sound insulation provided. This is particularly relevant at junction points and where partitions contain penetrations.

Flanking noise travelling between spaces via open windows must be specifically considered where spaces are not mechanically ventilated. Where there is risk of disturbance the windows must be placed as far apart as practicable.

Doors and glazing between sensitive spaces should be avoided as they may limit the acoustic separation between the spaces.

Consideration must be given to on-site acoustic performance being lower than sound insulation ratings (based on laboratory tests conducted under ideal conditions) due to workmanship and noise-flanking paths.)

All building services penetrations must be appropriately sealed (including those in the ceiling cavity barriers.

Partitions must be built ‘slab to slab’ unless it can be shown that the overall performance can be achieved with a common ceiling or floor void.

### 5.2.1 Sound insulation between floors

Where school buildings are multilevel, floors must attenuate the noise associated with impact sound from footfall.

The maximum weighted standardised impact sound pressure level $L'_{nT,w}$ (in accordance with *AS ISO 717.2 Acoustics—Rating of sound insulation in buildings and of building elements Part 2: Impact sound insulation*) must not exceed:

- teaching and learning spaces, 60 dB
- music rooms and spaces specifically designated for students with impaired hearing, 55 dB.

Sports facilities should not be located above teaching and learning spaces unless there are compelling reasons to do so.

### 5.2.2 Operable walls

When selecting an operable wall based on laboratory ratings, it should be noted that, when tested on site, operable walls perform significantly lower than rated and performance of acoustic seals will deteriorate over time.

Consideration must be given to the viability of installing operable walls where sound insulation requirements exceed 45 $D_{nTw}$.

### 5.2.3 Doors

Doors must comply with the following requirements:

- Interconnecting doors between adjacent spaces must be selected so that the overall acoustic performance of the partition including the door achieves the performance requirements specified in Table 4. Where required, acoustic door seals must be installed to achieve the overall acoustic performance of the partition. Typical areas requiring acoustic door seals include music rehearsal and practice rooms
- Door-sealing mechanisms must accommodate building tolerances and floor-level variations and must be site-adjustable and maintainable.
- Air transfer grilles must not be installed in acoustic doors.

Lobbied or back-to-back door-sets can be used to provide a higher level of sound insulation using doors with a lower acoustic performance.

Where sliding doors are used, a proprietary system must be provided to meet the acoustic performance requirements for interconnecting doors and doors to corridors.

Doors to adjacent spaces must be placed as far apart as practicable. Doors in rooms opposite each other must be offset.

Doors, including those with acoustic seals, must be easily opened by all users including those with disabilities.

## 5.3 Internal acoustic performance

Reverberation is the persistent prolonged reflection of sound in a space. It can impact speech intelligibility and have a significant impact on students with special hearing needs or learning difficulties and for students with English as a second language.

Spaces must be designed to achieve the mid frequency reverberation times based on spaces being finished, furnished but unoccupied (detailed in Table 5).

The mid frequency reverberation time is the arithmetic average of the values in the 500 Hz and 1 kHz and 2 kHz octave bands.

Rooms must be free of acoustic defects such as echoes, flutter echoes and focussing.

***Table 5.*** **Mid-frequency reverberation time values**

| Space type | Mid-frequency reverberation time |
|---|---|
| *Year P–6 levels:* classrooms and general learning areas, small group spaces, sensory calming rooms | ≤ 0.6 |
| *Year 7–12 levels:* classrooms and general learning areas, seminar rooms, tutorial rooms, language laboratories, study room (individual study, withdrawal, remedial work, teacher preparation), science laboratories, materials technology, CAD and design areas, electronics and systems, textiles, food, graphics, design and resource areas, ICT rooms, art | ≤ 0.8 |
| *Open plan teaching and learning activity areas:*<br>• General teaching and learning<br>• Resource and breakout areas | <br>≤ 0.5<br>≤1.2 |
| *Music:*<br>• Music activity space<br>• Practice/group room — volume ≤ 30 $m^3$<br>• Practice/group room — volume > 30 $m^3$<br>• Ensemble room<br>• Performance, recital and dance | <br>≤ 1.0<br>≤ 0.6<br>≤ 0.8<br>0.6–1.2<br>1.0–1.5 |
| Teaching spaces specifically for students with special hearing or communication needs and spaces for specifically designated for use by students with disabilities or high-needs. | ≤ 0.4 averaged from 125 Hz to 4 kHz octave band centre frequencies and ≤ 0.6 in every octave band in this range |
| Libraries and learning resource areas | ≤ 1.0 |
| Assembly halls, multi-purpose halls (drama, audio/visual presentations, assembly, occasional music) | 0.8–1.2 |
| Indoor sports halls, hydrotherapy swimming pools | ≤ 2.0 |
| Gymnasium and physical activity spaces | ≤ 1.5 |
| Meeting rooms, Interviewing/counselling rooms, video conference rooms | ≤ 0.8 |
| Dining rooms | ≤ 1.0 |
| Kitchens and laundries | ≤ 1.5 |
| Offices, medical rooms, staff rooms | ≤ 1.0 |
| Corridors, stairwells | Provide a robust sound absorptive finish to at least 70% of the ceiling in all fully enclosed corridors |
| Locker areas, changing areas | ≤ 1.5 |
| Toilets | ≤ 1.5 |

## 5.4 Noise impact on external environments

Noise from emanating from buildings and plant and equipment must be attenuated to ensure that the noise impact on neighbouring properties comply with the *Environmental Protection Act* and the requirements of the relevant local authority. Where attenuation relies upon windows being kept closed sufficient mechanical ventilation must be provided to the affected spaces.

Noise emission levels must be sufficiently low to allow for extended out of school hour use of buildings by community groups.

Plant that operates at night such as extraction fans must have sufficient noise attenuation to ensure that night-time noise limits are not exceeded.

Noise from mechanical services must not exceed the following levels in the school grounds:

- 55 $dBL_{Aeq,30mins}$ - in playing fields or other outdoor areas
- 50 $dBL_{Aeq,30mins}$ - in outdoor teaching areas.

Rooms to be used for music performance or rehearsal must be provided with sufficient ventilation to allow windows to be kept closed for extended periods.

# 6.0 Civil engineering

## 6.1 Stormwater drainage

A stormwater drainage system must be provided to fully drain each site, considering all contributing catchments.

Stormwater drainage systems must be fully coordinated with other external designs and features to ensure that all areas are adequately drained, there is no ponding of stormwater and overland flows are not detrimental to the functioning of the school.

Designs must comply with:

- the Australian Rainfall and Runoff guidelines.
- the Queensland Urban Drainage Manual published by the Institute of Public Works Engineering Australasia (Queensland)
- all relevant Acts, regulations and standards, and the National Construction Code.

The legal point/s of discharge must be obtained from the relevant authority and stormwater drainage systems must be designed to discharge stormwater only to the locations and to the requirements stipulated by the relevant authority.

Drainage systems near buildings and paved areas may be a combination of open inverts, kerb and channel and underground drains. Surface drainage in grassed areas may be collected by swale drains.

Unless site constraints dictate, drainage pipes and pits must not be installed under floors due to the odour created and the damage to building sub-structures caused by leaks.

Drainage systems must be readily accessible for maintenance, cleaning, and the clearing of blockages.

### 6.1.1 Designing for storm events

Drainage systems must be designed and constructed to cater for the higher of the design storm events listed in Table 6 or those stipulated by the relevant authority and have sufficient capacity to accommodate the design flow in accordance with the required drainage condition.

Consideration should be given to the potential impacts that climate change may have on the design storm events.

Provide overland flow paths, as a back-up to the underground drainage system, to cater for 1% Annual Exceedance Probability (AEP) design storm events. Design of overland flow paths shall be such that it avoids inundation of all pathways and buildings.

### 6.1.2 Water sensitive urban design

The quality of water discharged from a site must comply with the stormwater management design objectives set out in Appendix 2 — Table B to the State Planning Policy[1].

Sediment traps, trash screens and similar must be provided as a means of controlling the quality of stormwater discharged from a site. Appropriate protection measures must be provided to prevent access to these devices by students.

Drainage systems and the management of overland flows must be designed to avoid erosion of the site.

[1] https://dsdmipprd.blob.core.windows.net/general/spp-july-2017.pdf

***Table 6.*** **Drainage system design parameters**

| Drainage system | Design storm event AEP | Drainage condition |
|---|---|---|
| Underground drainage | 5% | Pipes flowing full but not under pressure. Minimum 200 mm freeboard to pit covers. |
| Kerbs and channels | 5% | Maximum flow width as per Austroads Guide to Road Design Part 5A. |
| Swale drains | 5% | Freeboard 20% of the flow depth. |
| Overland flow path | 1% | No flooding of school buildings. |

## 6.1.3 Site detention

Where stormwater must be detained on-site to manage the rate of stormwater being discharged from the site the location, depth and design must mitigate any adverse impact on the functionality of the site and the safety of students, staff, and other users of the site.

## 6.1.4 Floor levels

Consultation must be undertaken with the relevant local government authority and the water authority that have jurisdiction over the site to ascertain whether the site is affected by land subject to inundation overlays, overland flow or is within an area predicted to be impacted by flooding.

If the relevant authority has designated floor levels or has designated criteria for the setting of floor levels, floor levels must be sets at or above the mandated levels. During construction, the as-constructed floor levels must be verified to conform to the design and the mandated requirements as soon as the floor level has been set.

All works abutting a building's perimeter must be coordinated and set at levels which comply with the requirements of the relevant authority, which manage overland flow around the building, and which mitigate the risk of a building flooding during a storm event.

If the relevant authority does not have designated floor levels or designated criteria for the setting of floor levels, floor levels must be set at least 500 mm above the 1% AEP flood event level.

## 6.1.5 Pipework

### 6.1.5.1 Pipe sizes

Pipe must not be less than:

- DN (diameter nominal) 150 for connection direct to downpipes
- DN150 downstream of any grated pit
- DN300 downstream of any side entry pit.

Junctions of pipes DN300 or smaller must be made either with oblique or sweep junction proprietary fittings, or at pits.

Junctions of DN150 pipes with DN375 or larger pipes may be made with saddle-type fittings.

Junctions of pipes DN225 or larger with DN375 or larger pipes must be made at pits. Bandage type junctions are not acceptable.

#### 6.1.5.2 Pipe materials

Pipe work materials must be:

- For DN150: Solvent-jointed uPVC sewer-grade minimum (except as noted below).
- For DN225 and greater: Rubber ring jointed steel-reinforced concrete, rubber ring jointed fibre-reinforced concrete or rubber ring jointed HDPE.

In areas of expansive soils, uPVC pipes must be rubber ring jointed.

The pipe class must be appropriate to the design and construction loading conditions.

### 6.1.6 Stormwater pits

The construction of all stormwater pits must conform to the relevant authority's standards. Pits may be constructed from in-situ reinforced concrete or pre-cast concrete units. The use of other materials such as plastic for pit construction must comply with any restrictions imposed by the relevant authority.

Pit covers and grates must be of a tight-fitting, bolted-down design or have sufficient weight to prevent easy removal. The classification of the cover or grate must meet the loading expected for the pit location, including those that may be encountered during construction.

Heel-proof type grated pit lids must be used for stormwater pits set into footpaths and pavements subject to pedestrian traffic. All other grated pit lids must not have clear bar spacings greater than 89mm.

Pits must not be spaced more than 100 m apart.

Consideration must be given to possible damage to stormwater pits and pit covers where these are in the expected path of vehicle movements including those located in the delivery and removal paths for relocatable classrooms. Where pits are in the expected path of vehicle movements they must be designed and constructed to accommodate the anticipated weight of these vehicles.

## 6.2 Vehicle and pedestrian pavements

### 6.2.1 General

Geotechnical investigations must be carried out to support the design of vehicle and pedestrian pavements. The investigations must include a site classification and determination of California Bearing Ratio values.

Pavements must be designed to accommodate anticipated loads and consideration must be given to heavy vehicle access associated with construction activities, delivery and removal of relocatable buildings, firefighting, goods deliveries, waste removal, buses and any other activities that could reasonably be associated with the operation of the school.

The design of pedestrian pavements, hardcourts and other pavements must be coordinated with the possible routes for heavy vehicle access including vehicles transporting relocatable buildings to and from the site.

Pavements must be able to support the anticipated loads without damage to the structural integrity of the pavement or damage to the pavement surface which compromises its use.

All pavements must have appropriate concrete edge restraints such as kerb and channel or edge strip. Where disability access is required appropriate kerb and channel combinations, along with pavement shaping, must be adopted.

Appropriate subsoil (agricultural) drainage pipes must be used to avoid pavement failure due to water infiltration. In situations where there is an expansive (high swell potential) subgrade, subsoil drainage pipes must not be permitted to come into contact with the expansive subgrade material, and not less than 100 mm of capping material must be provided around the floor of the subsoil drainage trench.

Kerb and channel and subsoil drainage must be designed and installed in accordance with requirements of the relevant local authority and the applicable standards specified by Austroads and the Department of Transport and Main Roads.

Turning areas, hard standing areas and car parking must be designed to provide a robust and long-lasting construction that is fit-for-purpose.

### 6.2.2 Vehicle pavements

Vehicle pavements must comply with all relevant regulations and standards including, but not limited to:

- Department of Transport and Main Roads codes of practice and standard sections
- Austroads Pavement Structural Design Guide
- Austroads Guide to Road Design
- Austroads — Guide to the Design of New Pavements for Light Traffic.

Vehicle access roads, car parks and associated pavements must:

- be constructed from either asphalt, concrete or segmental pavers
- incorporate kerbs, ramps and other features which comply with accessibility requirements and provide equitable access for users of all abilities
- be edged with kerb and channel that directs water run-off to the site’s stormwater drainage system and be of a suitable depth to maintain the integrity of sub-grade materials
- have a surface texture that is appropriate for the intended use and to ensure the safe passage of pedestrians and vehicles.

Recycled concrete aggregate and asphalt may be used where feasible but it must comply with the requirements of the standard specifications issued by the Department of Transport and Main Roads.

Where the sub-grade material is classed as expansive (high-swell potential), pavement design must take into consideration the requirements of Department of Transport and Main Roads requirements.

Speed traps, signage and bollards should be considered in the interests of safety.

### 6.2.3 Pedestrian footpaths

Pedestrian footpaths must be constructed from concrete or asphalt.

All pedestrian footpaths must comply with and be installed in accordance with the higher requirement of the relevant Australian Standards or local authority standards. Where no local authority standards exist, these are replaced with the applicable standards published by the Institute of Public Works Engineering Australasia Queensland (IPWEAQ).

Particular attention must be given to ensuring footpaths comply with accessibility requirements and provide equitable access for users of all abilities. Consideration must be given to needs of people with mobility or visual impairment. The edges of paths should be colour marked or constructed with a defined edge to provide wayfinding assistance to users with visual impairment.

Pedestrian footpaths must:

- provide a continuous even surface free from trip hazards
- be of an appropriate thickness, jointing and reinforcement to meet design life requirements without excessive cracking
- allow for surface water run-off, both on and across the footpath surface
- be protected from root growth
- have a surface texture that is appropriate for the intended use of the footpath and to ensure the safe passage of pedestrians (and vehicles, if required).

Footpaths must include an isolation joint between the footpath and buildings to cater for differential movement and to prevent water ingress. The upper edge of the joint must be sealed with silicon sealant (colour matched to the concrete pavement). The footpath surface must grade away from the buildings.

At building entrances adequate drainage must be provided to mitigate the risk of water ingress.

Surfaces such as gravel and granitic sand are not recommended due to associated maintenance problems and the creation of slip hazards. Where gravel or granitic sand is used, it must not be used near a building entrance.

### 6.2.4 Hard courts

Hard courts must be:

- asphalt with coloured line marking and an effective and durable edge restraint extending for the full depth of the pavement including base course, or
- concrete with an acrylic coating suitable for the types of sports using the hardcourts.

The design and selection of the pavement material must be based on an assessment of the geotechnical investigations of the ground conditions at the site.

Surface grades must direct stormwater runoff to the edges of the paved area without affecting the functional use of the hard courts. Hardcourts must be designed and construction so that stormwater does not pond on the surface of the hardcourts.

Positive drainage systems must be installed at the boundary of the hardcourts and must capture and convey runoff away from the hardcourt area. Hard courts must be bounded by a subsoil drainage system that will isolate the hardcourt foundation material from subsoil seepage and the effects of seasonal ground movement.

# 7.0 Electrical services

Electrical services comprise electrical supply, main switchboard/s, power distribution services, lighting services, infrastructure services, earthing, and protective services.

The design of the electrical services must consider the built form, the characteristics of the building, the occupancy trends, and orientation of spaces.

Consideration must be given to the possibility that areas within the school will be used outside of school hours by third parties and designs should include separate sub-metering of these facilities.

## 7.1 Incoming electrical supply

Incoming supply infrastructure, including the consumer mains incoming from the substation to the main switchboard and the main switchboard, must be sized to accommodate the load maximum demand for the site. The incoming supply must be run underground and located outside of any area identified for future expansion on the site.

For existing schools, the condition and capacity of the incoming supply must be assessed.

The incoming supply and substations must comply with the following requirements:

- Full design load based on the estimated load for the permanent and relocatable buildings and facilities associated with the school's peak student enrolments and any third-party or community facilities.
- Substations should be located to minimise energy transmission losses.
- Located as a stand-alone proprietary unit near the site boundary and not as an integral part of any building.
- Electrical supply parameters must be in accordance with the relevant supply authority requirements.
- The incoming mains from the substation to the main switchboard must be sized to at least the full rated output of the transformer/s.

All incoming supply, substations, cable routes and all other works directly associated with the incoming electrical supply must comply with the requirements of the relevant authority.

Supply authority metering at the low-voltage entry to the site must be provided in a location that complies with the requirements of the relevant supply authority's policies and standards and the Queensland Connection and Metering Manuals[2].

2 https://www.energex.com.au/__data/assets/pdf_file/0003/1015932/Queensland-Electricity-Metering-Manual-QEMM.pdf

## 7.2 Design and infrastructure capacities

Electrical services and infrastructure must comply with the requirements detailed in Table 7.

***Table 7.*** **Electrical services capacities**

| New item | Requirement | Spare capacity |
|---|---|---|
| Consumer main cables | Current carrying capacity (above calculated maximum demand) | 25% (minimum) spare current capacity, or where a new transformer is being installed, size the cables to at least the full current capacity of the transformer. |
| Mains and submains conduits | Spare space in a new conduit | As a minimum, provide spare space in conduits allowing for the future installation of double the amount of the same sized cables.<br>**Note: Electrical conduits are to be sized so that the cross-sectional area of the cables (and the required spare allowance) does not exceed 40% of the internal cross-sectional area of the conduit.** |
| Submains cables | Current carrying capacity (above calculated maximum demand) | 25% (minimum) |
| Main switchboards | Rated load capacity | 25% (minimum). More spare capacity to be considered allowing for future site developments. |
| | Short circuit fault withstand (3 phase, 1 second) | 10 KA minimum for switchboards less that 250A, 3 phase rated. 36 KA minimum for larger rated main switchboards. Must in all cases be greater than the expected maximum fault level at the site. |
| | Physical space in unoccupied circuit breaker poles per chassis | Allow spare capacity for the expected future submains. Generally upon completion, leave 30% (minimum) spare pole capacity, rounded up to the next distribution busbar frame size. |
| Distribution switchboards | Rated load capacity | 25% (minimum) spare current capacity. |
| | Physical space in unoccupied circuit breaker poles per chassis | Upon completion, 50% spare pole capacity, up to a maximum of 15 spare poles. |

## 7.3 Main switchboards

The main switchboard is to be located so that it is readily accessible and in a location that allows for the economical distribution of services.

The main switchboard may be free standing mounted externally, or mounted internally in a dedicated room or cupboard. For new schools, locating the main switchboard in a dedicated room is preferred.

When the main switchboard is located in a room or a cupboard, the room or cupboard is to be fire-rated, where required by the NCC, and contain smoke detectors (no sprinklers) where a fire detection system is also installed in the building. An emergency luminaire should also be provided in front of the main switchboard to facilitate safe viewing in the event of a partial power failure.

The main switchboard must be of a metal clad cubicle construction that complies with the relevant regulations and Australian Standards.

Electromagnetic fields generated at the main switchboard must be considered. They are not to cause interference to school systems, or to exceed a magnetic field strength of 5 micro-Tesla (50 milli-Gaus) in any occupied areas.

Main switchboards (greater than 250A, 3-phase rated) must not be located in or immediately adjacent to occupied areas including, but not limited to:

- learning spaces
- offices
- sick bays
- staff rooms and lounges.

Main switchboards must comply with the following requirements:

- Be provided with at least 100 KA, 8/20 µs surge protection from each Phase to Ground.
- Surge protection must have visual indication of failure that can be seen without opening up escutcheons.
- Full-sized neutral and earth bars must be provided in all compartments.
- Neutral bars must be located within the same compartment as the active bars.
- Fitted with energy meters.
- All equipment must be provided with durable labels, clearly marked with details of the equipment's function and designation.
- All escutcheon panels are to be hinged and able to be lifted off.
- All panels on the switchboard must be able to be removed for inspection.
- All doors (except for supply authority metering panel doors) are to have Lowe and Fletcher 92268 locks.
- Where mounted externally, must be weatherproof, constructed from marine grade stainless steel (or approved equivalent), and must also be vandal resistant.
- Have a short-circuit rating of not less than the maximum symmetrical RMS short-circuit current.

Main switchboards with greater than 250A, 3-phase rating must also comply with the following requirements:

- Form 3B construction or of a form providing functionally equivalent separation, as determined in accordance with *AS/NZS 3000 Electrical installations, and AS/NZS 61439.1.*
- Design Verifications and Routine Verifications as required by AS/NZS 61439.1 to be provided.
- Full discrimination curves to be provided from the supply authority protective device to the final sub-circuit protection.
- Fitted with current and maximum demand indicators.
- Busbars passing through insulation barriers to be provided with a secondary layer of insulation on the busbars.
- Provided with sufficient spare physical space to allow for future without compromising safe access and egress.
- Laminated site distribution schematics and main switchboard schematics must be installed on the inside wall of the switchboard enclosure, room, cupboard or cabinet.
- Switchgear must be capable of being padlocked in the 'off' position.

## 7.4 Distribution switchboards

Distribution switchboards must not be placed in a location which affects the day-to-day use of a space or building. They must not protrude into circulation spaces.

Distribution switchboards must comply with the following requirements:

- Distribution boards must clearly delineate and identify all circuits.
- All outgoing circuits from the distribution board must have circuit breakers (minor control circuits may use fuses).
- The fault current must be calculated, and appropriately rated circuit breakers selected.
- The minimum fault interrupting capacity must be 6 kA on existing switchboards and 10 KA on new switchboards.
- All new distribution switchboards and new distribution switchboard extension panels must include a label with the text set in DIN font.
- Where cupboards are used, no other services are to be in or cross over the electrical distribution board cupboards.
- Must have a lockable door covering all control and protection devices with hinged escutcheon.
- Must be constructed from painted zinc annealed steel where located inside buildings, and constructed from marine grade stainless steel where located externally.
- Be weatherproof when mounted externally.
- Separate specialised load equipment must be served by dedicated distribution boards (for facilities such as canteens, food technology areas and materials technology areas).
- Separate circuits must be provided for external power outlets and which allows for the isolation of these outlets.
- Must be labelled with the incoming sub-main number, rating of the circuit protective devices and the size of the incoming sub-mains.
- An accurate circuit schedule must be housed within a proprietary holder and securely fixed to the inside of the distribution board door.
- A label must be provided on the switchboard door indicating upstream source switchboard, protection circuit breaker size, submain cable size, approximate cable route length.
- All labelling must be engraved Traffolyte or equivalent material and be securely fixed to the doors (adhesive labels not acceptable).
- Surge protection rated 40 kA, 8/20 µs must be provided covering each Phase to Ground, and the Neutral to Ground.
- All distribution switchboard doors are to have Lowe and Fletcher 92268 locks.
- In all new designs where able to achieve, all switchgear from and including the main switchboard to the final circuit protection must be of a common manufacture for ease of maintenance and adequacy for circuit discrimination.
- All loads on distribution switchboards must be balanced as evenly as possible.
- Dog tags must be provided on critical circuits that must not be accidentally turned off.
- On new distribution switchboards greater than 18 pole capacity, the distribution busbar rating is to be 250 amps minimum.

Residual current devices must be selected to suit the harmonic distortion and in-rush current characteristics of the load, and sub-circuits arranged, such that nuisance tripping is mitigated as far as reasonably practical.

RCD protection is to be provided by using individual combined overload/RCD circuit breakers (RCBOs) for each circuit requiring protection.

Air conditioning, fan systems, refrigerators and freezers must be supplied via separate circuits and circuit breakers.

**Specific label required in all new Department of Education school distribution switchboards**

Figure 1 shows the label that is to be provided in all new distribution switchboards and new distribution switchboard extension panels.

The label is to be machine engraved plastic laminate type (or equivalent permanent label), black letters on white background, and is to be permanently fixed in place. The first and second row of letters should be set in DIN font and are to be 5 mm high, and the third row 3.5 mm high. Fix the label on the front of the switchboard door.

***Figure 1.*** **Label to display on all new Department of Education's school distribution switchboards (not to scale)**


### 7.4.1 RCD protection scope

Provide RCD protection of all sub-circuits with the exception of the following circuits:

- Three phase circuits feeding stage lighting socket outlets and dimmer units, in halls and performing arts blocks.
- Circuits connecting Solar PV panel system inverters to the supply authority system.
- Circuits supplying loads that the manufacturer advises are not capable of being put on RCD protection. This may include variable frequency drives associated with large 3 phase ceiling fans.

All other 230V/400V circuits are to have RCD protection.

**Note:** For non-RCD protected circuits & submains particular attention is required as to the cable installation practices with regards to compliance with AS 3000 requirements for mechanical protection and cable location within the building elements and structure.

## 7.5 Energy metering

Energy metering shall be provided as a minimum, to comply with the requirements of the National Construction Code (NCC), Part J9. The subsequent paragraphs under this clause are applicable to new schools, new buildings and where significant electrical upgrades are occurring to existing buildings.

Energy meters must be installed to all building main distribution boards, excepting for amenities and sheds, and must enable energy consumption data to be captured and stored for future analysis.

The energy meters on a site must be compatible and able to be interconnected.

All energy meters must come complete with a RS485 port allowing for high-level interfacing to a building management or energy monitoring system.

For all new schools, and on other building projects where required by the NCC Part J9, provide an energy metering interlinked communication system that collates the time-of-use energy data to a single interface monitoring system where it can be stored, analysed and reviewed.

The Energy Metering interlinked communication system, when provided, is to include a network gateway device and web application interface which facilitates simple retrieval and interpretation of recorded data.

**Note:** ModBUS RTU or TCP protocols are preferred, however interface solutions should consider the integration of any existing and proposed energy meters.

Energy meters and metering systems must comply with the following requirements:

- Record voltage, demand in Amps, power factor, V and I harmonic distortion percentages and kWh consumption.
- Class 1 accuracy for kWh and Class 2 or better for other metrics.
- Current transformer metering must be provided for all loads greater than 100 amps.
- All current transformer units and protection devices must be readily removable for maintenance.

Should a building or facility or parts thereof be used by a third-party or a community group, consideration should be given to also providing sub-meters to allow the energy consumed by third-party or community use to be captured.

## 7.6 Underground pits and conduits

Underground pits and conduits are to be used to provide cable connections between buildings (including relocatable buildings). Aerial cables are not acceptable.

Underground pits and conduits must comply with the following requirements:

- Conduits must be a minimum of 100 mm diameter orange rigid heavy-duty PVC type suitable for the installation of the incoming power cabling and sub-main cabling in accordance with the requirements of the relevant authority.
- All conduit joins must be glued into place to prevent water entering the conduits.
- Conduits running between a building entry point and a pit shall be sealed internally at both ends with expanding non-caustic foam to prevent the entry of vermin and water.
- All pit systems are to be drained.
- All conduits to a building that has a concrete floor slab must be installed under the slab, directly to the main switchboard or distribution board they are supplying.
- The conduit system must link all buildings.
- The conduit must be marked ‘Power Cabling’ along the length of the conduit.
- Conduits must be installed with tracing wiring to facilitate future detection after installation. The location of conduits must also be clearly identified by the installation of acceptable above-ground cable markers.
- All conduits must have a minimum of two draw ropes installed within the conduit.
- A pit must be used for each change in direction greater than 45°.
- Pre-manufactured bends must be used for each change in direction less than or equal to 45°.
- Pits must be spaced at 50 m or less with consideration given to the need to easily install additional sub-main cabling at later stages.

- Pits and pit lids in trafficable areas (including student trafficable) must be heavy-duty (Class D to AS3996) and be able to sustain the weight of a heavy vehicle without damage to the pit or pit lid.
- Pit lids must be lockable (or unable to be lifted without specialized tools), vandal-proof, clearly marked 'Electrical Services' and not allow debris to enter the pit.

## 7.7 Cable reticulation

The distribution system between the main switchboard and distribution switchboards must be concealed as much as practicable and be accessible for its entire length without disturbing the building fabric. Galvanised cable trays, cable ducts or conduits must be used at buildings to carry electrical distribution cables or final sub-circuit cabling.

All cabling systems in buildings must be fully supported over the cable route length via either cable ladders, ladder trays or catenaries. Cable ladders and trays must be designed and sized for all sub-main cabling and cable supported based on the permanent and relocatable buildings and facilities associated with the peak student enrolment and any anticipated third-party or community facilities, plus a spare capacity of 25%.

Separate cable support systems must be provided for each type of functional cabling.

Where high levels of electromagnetic interference are produced, the offending source must be shielded. All occupied areas must have magnetic fields measurements of less than 5 micro-Tesla (50 milli-Gaus).

As the use and configuration of spaces may vary over time consideration should be given to designing a flexible cabling reticulation and support system.

Cable reticulation must comply with the following requirements:

- New cables must be double-insulated, or fire-resistant polymer insulated and sheathed.
- The voltage drop from a point of supply to the final outlet must comply with *AS/NZS 3000.*
- Sub-main cabling must be fully supported on cable-ladder and Unistrut systems.
- All cables with their origin and destination within the same building must be run internally.
- Sub-main cables from the main switchboard must be sized in accordance with the calculated maximum demand on that cable, plus the nominated spare capacity.
- Sub-main cables must incorporate neutral cables the same size as the active conductors or sized based on the maximum current generated by the harmonics, whichever is the greater.
- Moulded case, and air circuit breakers on large main switchboards (greater than 250A rated MSB's), must have adjustable current capacity.
- Cables must be positioned and segregated to avoid interference with other cabling systems.
- High-capacity power cables must be located and configured to minimise electromagnetic interference.
- Where aluminium conductors are used, they must be installed with suitable termination and jointing hardware such that there is no reduction in termination integrity or risk of fire over the life of the cable.
- Electrical earthing must be provided in accordance with local authority requirements and the applicable codes, regulations, and standards, and must eliminate the risk of earth potential transfer between structures via covered walkways, handrails, fences and the like.
- Lighting sub-circuits must be a minimum of 16A with a minimum cable size of 1.5 $mm^2$.
- Power sub-circuit must be a minimum of 20A with a minimum cable size of 2.5 $mm^{2.}$
- All outgoing sub-mains must be tagged using proprietary write-on nylon labels at their origin and at the destination point with the breaker number, cable size, approximate length and the originating switchboard.

- No cabling is to be laid on the ceilings.
- No new cabling is to be fixed to any ceiling support system.
- Sub-main cables to mechanical services equipment must be designed for the full connected load of the mechanical services equipment with the neutral cable sized the same as the active conductor.

## 7.8 Power outlets

Power outlets must be provided to support intended functions and user requirements. This includes power outlets and isolators for:

- Networked devices including computers, WAPs, interactive whiteboards, audio visual projectors, display screens, printers, photocopiers, etc.
- Tools and equipment in specialist teaching and learning areas such as tools and machines, amplified musical instruments, food technology appliances, etc.
- Drama and performance functions such as performance lighting, public address, music amplification, etc.
- Power-operated doors, louvres or other opening devices.
- Heating, ventilation, air conditioning and hydraulic services plant and equipment.
- Communications, security and control equipment.
- Specialist equipment used by students with disabilities including change tables, hoists, etc.
- Canteen and catering equipment.
- Appliances and powered equipment.
- Cleaning and maintenance purposes.
- Dental vans, trade training trucks and similar visiting services.

The number and distribution of Switched Socket Outlets must meet the functional requirements of each space.

Power circuits must comply with the following requirements:

- Residual current device protection against electric shock and circuit overload must be provided to all socket outlets.
- Circuits must minimise interference to computers caused by electrical faults or failures.
- Outlets must be positioned safely away from potential dangers.
- Outlets must be mounted 500 mm above the finished floor level or 150 mm above benchtops.
- For ceiling-mounted equipment such as projectors, outlets must be mounted on the ceiling or high on the adjacent wall.
- In external locations outlets must be corrosion resistant and weather-proof.
- Weather-proof outlets (minimum IP56) must be installed in plantrooms.

In science laboratories, applied science rooms, technology activity spaces, design studios and similar activity spaces power outlets must be mounted on wall-mounted multiple compartment cable-ducting, ceiling suspended outlets or benchtop-mounted pedestals.

In physical education spaces and spaces where physical activities are undertaken, outlets must be flush-mounted and protected from impact damage.

Power outlets and isolators located in change-rooms for water heaters, water boiling units and the like must be suitably rated and switched with neon indicators. 7-day timers must be provided in these areas to eliminate standing losses outside of school hours.

All new switched socket outlets in student occupied areas must be fitted with safety shutters to prevent access to active conductors.

Cleaners' outlets must be installed on separate circuits.

All fume cupboards must incorporate a double power outlet on the external top or side of the unit.

Every power and data wall plate must be permanently marked with either the power circuit or the data port/ cable number/s.

## 7.9 Electrical safety

Buildings and facilities must incorporate appropriate electrical safety measures that ensure the safety of students, staff and visitors.

### 7.9.1 Power emergency stop (E-Stop)

Refer *QBuild, Electrical Minor Projects — Standard Document* for detailed E-Stop specification and wiring diagrams.

Emergency stop (off) push buttons (E-Stop) must be provided adjacent to each exit door for specialist rooms such as materials technology, science laboratories and food technology areas.

The emergency stop button system must trip off all power circuits within the respective room or laboratory.

The push button emergency stop system must require manual unlatching once it has been triggered.

For science laboratories and food technology areas, the emergency stop button must not isolate power circuits that serve separate adjacent spaces where power interruption is not needed (for example, spaces containing refrigerators, fume cupboards or freezers).

To prolong contactor life, adjustable time clocks must be installed which automatically de-energise emergency stop button contactors outside of teaching hours.

LED indicator lamps must be installed which show the contactor status of the emergency stop button system.

### 7.9.2 Permanently connected equipment

Isolating switches must be provided for each item of permanently connected equipment and must be:

- rated at not less than the circuit protective device
- mounted adjacent to each item of equipment.

### 7.9.3 Earthing systems

Earthing systems must be provided to all sub-mains, sub-circuits, metallic wall-framing systems, electrical cabling, electrical cable support systems and communications systems.

Earthing systems must comply with the following requirements:

- A multiple earthed neutral system must be installed in accordance with *AS/NZS 3000 Electrical Installations* and the requirements and standards of the relevant authority.
- The only bond between the neutral and earth is to occur within the site main switchboard.

- Dedicated earthing conductors must be provided for each sub-main and sub circuit.
- Earth impedance must be provided with test results provided on completion.
- All metallic wall framing systems supporting general power outlets or electrical cabling must be bonded to the electrical earth system to provide an equipotential zone.
- Covered walkways must be considered as a building for the purpose of Section 5.5.3.1 of *AS/NZS 3000* and earthing systems installed to prevent the circulation of earth current within walkway structures.
- Ensure all sections of cable ducts and similar (cable tray, cable ladder, cable troughing, metal hat sections etc), are electrically continuous. Provide jumper earth cables between sections where necessary to achieve this.
- All electrical cable support systems must be electrically earthed.
- Telecommunication systems and components must be earthed in accordance with *AS/CA S009 Installation requirements for customer cabling (wiring rules)*.
- At the main distribution switchboard in each 'out building' (i.e., a separate block remote from the site main switchboard), an additional earthing electrode connected to the earthing bar of that switchboard is to be provided. The earthing cable used is to be stranded 10 $mm^2$, Cu, PVC insulated cable minimum, unless otherwise required by AS/NZS3000. This earth is provided to ensure that the earthed equipment in the remote Block are kept at the same potential as the soil/ground around that Block and also to ensure that the switchboard surge protection devices have a local connection to earth to enable them to operate correctly.
- Provide equipotential bonding to pools and other areas as required by Australian Standards.

## 7.10 Lighting systems

All internal areas including plant rooms must be supplied with artificial lighting. The lighting of external areas must consider night-time access and security.

Lighting systems must suit the environment and conditions where luminaires will be installed.

LED luminaires must have:

- a colour rendering index (CRI) ≥ 80, including R9
- standard deviation colour matching (SDCM) ≤ 3 Macadam steps
- luminous efficacy for general and task lighting — ≥ 80 lm/W at 3000 K and ≥ 90 lm/W at 4000 K
- TM-21 lifespan ≥ 50,000 hrs L80 B10.

The selection of luminaires must consider the needs of all users, including those with a sensitivity to lighting stimuli. Consideration must be given to the:

- provision of simple dimming controls which allow for the temporary reduction in lighting levels
- selection of LED luminaires and drivers which guarantee zero perceptible flicker

Fluorescent lamps, mercury-vapour, sodium-vapour, tungsten and incandescent lamps must not be used in new facilities.

Existing fluorescent tube type fittings must be replaced with suitable complete LED luminaires. Existing fluorescent light fittings must not be converted to use LED globes.

Lighting in classrooms and offices is to generally be 4000 K (neutral white) colour temperature.

Accessibility for maintenance and ease-of-replacement must be considered when selecting luminaires. The need for elevated work platforms or other high-access equipment and ladders must be avoided. Where the use of elevated work platforms or other high-access equipment or ladders cannot be avoided, the selection of the proposed luminaires must have the prior approval of the department and the school.

Lighting systems must comply with the following requirements:

- Lighting systems and their controls must comply with Section J of the National Construction Code (NCC).
- Luminaires must be sourced from proven production runs with demonstrated performance levels, be of good quality and be easy to maintain.
- Lighting must suit the intended tasks to be performed and luminaire glare must be controlled.
- Custom-made luminaires must be avoided.
- Light fittings should be assembled locally, and it is preferable that they are manufactured locally.
- Standardisation and minimisation of lamp-types is preferred.
- Luminaires must have an Ingress Protection (IP) rating appropriate for the installation location.
- External luminaires must be suitable for their installed environment and have a minimum rating of IP54 and be resistant to weather, insects, and vandalism.
- Internal luminaires in high-moisture environments must be water-resistant (minimum rating of IPX4).
- Luminaires in general learning and teaching, administration and office areas must be fitted with low-glare diffusers which achieve a unified glare rating less than UGR 19.
- Feature lighting for noticeboards, display cabinets and other specialist display areas should be provided.
- Suspended luminaires must be rigidly suspended, especially in areas affected by draughts from windows, heating and cooling systems or ceiling fans.
- Luminaires in high-risk locations (such as gymnasiums) must be protected from impact damage.
- Internal security lighting must be provided at building entries, changes of direction to external pathways and stairs in corridors.
- Adequate external security lighting to the perimeter of all buildings must be provided to ensure safe access.
- External security lighting of pathways, car parks and internal roads must be provided to ensure the safe passage of all users.

Lighting switches in accessible toilets must be automatic-sensor controlled and any switches in spaces specifically designed for use by students with disabilities must be large format rocker or switches suitable for use by people with limited dexterity and strength.

Where higher illuminance is required for specific tasks consideration must be given to suspending luminaires over the task. Where suspended luminaires are not considered appropriate, suitable local task lighting should be provided.

### 7.10.1 Design

Lighting must comply with the higher requirements of:

- Relevant regulations and Australian Standards.
- Any authority having jurisdiction over the project (e.g., local government health regulations relating to food premises, etc.).

Lighting must be designed for visual comfort and must comply with the recommendations detailed in the *AS/NZS 1680 series* in relation to:

- discomfort glare
- uniformity of illuminance
- illuminance relationship between adjacent spaces.

Lighting of physical education and gymnasium spaces must consider community use and the types of sport and levels of competition and training.

### 7.10.2 Light pollution to the night sky

Luminaires which must be tilted above 0 degrees from horizontal in order to meet lighting design criteria must not be used.

Upward waste light must not exceed the upward light ratios (ULRs) specified in *AS/NZS 4282 Control of the obtrusive effects of outdoor lighting*.

### 7.10.3 Lighting controls

Lighting controls shall be provided as a minimum, to comply with the requirements of the NCC and ensure that lighting is only operational when required or when insufficient daylight is available. The subsequent paragraphs under this clause are applicable to new schools, new buildings and where significant upgrades are occurring to existing building lighting.

Lighting controls must:

- suit the operational requirements of each space
- zone the luminaires controlled by a single switching control into manageable, logical and functional groups
- be clearly labelled as to the lights they serve where multiple switches are provided
- have two-way switching at both doors for larger spaces that have two entry points
- incorporate manual override facilities to any automatic lighting controls, including a manual master ‘off’ switch covering all activity and administration spaces
- be polycarbonate rocker flush mounted type and located adjacent to closing side of the door. Light switches must not be able to be ‘pushed in’ from the front of the switch
- be controlled by individual timing devices or the school security system with manual overrides for external lighting.

Lighting in each building shall be master controlled by relay inputs from the security system. Functionality as follows:

- When security system is armed, lights in the building shall be switched off.
- When security system is disarmed, lights will be able to be switched on again, as required.

### 7.10.4 Emergency and exit lighting

Emergency lighting must be provided as required by the NCC, to ensure safe evacuation in an emergency or in the event of a supply failure and must be integrated with escape routes and doors.

Emergency and exit lighting must comply with the following requirements:

- Be of the self-contained type.
- Luminaires must be sourced from proven production runs with demonstrated performance levels.
- Testing facilities on local distribution switchboards to the Australian Standard must be provided to all installations.
- Be attractive and be suitable for a school environment.
- Emergency lighting must operate in a non-maintained mode.
- Emergency and exit luminaires must include localised lithium-based batteries with a guaranteed minimum 5-year life.
- Battery and control circuitry must be modular in design to enable quick replacement.
- Exit signs must contain low-energy LED lamps.
- Must be capable of accommodating alterations and additions at any point in the emergency and exit lighting system network.

Any proposed implementation of a new central monitoring (CM) system in an existing school (that does not already have a CM system), is subject to the department's approval as there would need to also be a planned staged transfer (and upgrade) of all existing emergency lighting at the school to the new central monitoring system.

### 7.10.5 Access and security lighting

Access and security lighting must be provided to assist authorised persons to enter, exit and move around the school and to enable the detection of persons approaching school buildings and grounds.

Internal security lighting must be located at building entries, changes of direction to external pathways and stairs in corridors.

External security lighting of street pedestrian entries, pathways, car parks, internal roads and building perimeters must be provided. External security lighting must also be provided at the location of external security system keypads.

The location of security lights must consider the needs and uses of the site, including for out-of-hours tuition and community use, as well as areas at high risk of vandalism. Security lights must not create shadows or glare which might put people at risk. External lighting should be faced inward to the site to avoid glare to persons looking into the school grounds.

Security lighting must:

- be controlled by a photoelectric cell in conjunction with a fully adjustable time controller, with manual master over-ride
- use high-efficiency light sources
- be vandal-resistant and have suitable ingress protection.

Motion detectors may be used to activate security and access lighting, but consideration must be given to avoidance of nuisance activation. Motion detector switching must not be used for any lighting that has start-up or re-strike delay.

Freestanding lighting must be erected above 3 metres in height to reduce the risk of wilful damage or vandalism.

## 7.11 Ceiling fans

Ceiling fans must be provided to all teaching and learning areas, library open areas, internal open plan collaborative learning areas and in administration and office areas.

Ceiling fans must comply with the following requirements:

- Highly efficient models must be provided in sufficient numbers to ensure that adequate air movement and circulation is provided.
- Must be installed with a minimum height to the underside of the fan blades of 2.4 m from the finished floor level.
- Must be installed clear of lights to avoid creating a stroboscopic effect.
- Minimum 1400 mm diameter, minimum four blades.

Fans in high ceiling spaces must have an extended mounting pole to facilitate air movement in the lower occupied strata of the space.

Fans must be provided with controllers with variable speed control or a minimum of three speed. Common ceiling fan controllers may be provided to control ceiling fans within an individual space of zone.

Controllers should be mounted adjacent to room light switches.

Ceiling fans are discouraged in food preparation areas.

Securely mount the ceiling fans so that they are free from excessive wobble and are at no risk of ever falling down.

Wall fans can be considered as an alternative where a ceiling fan is unable to be installed, due to room size of ceiling height limitations.

## 7.12 Photovoltaic (PV) systems

Where on-site renewable energy generation is proposed, PV systems and installations must comply with the following requirements:

- The system must be designed in accordance with the requirements and any connection conditions imposed by the relevant authority.
- Grid export must be able to be limited to any value or completely prevented.
- All cable loops must be minimised to reduce the effects of induction.
- All DC cabling must be double insulated and sized to maintain less than 2.5% energy loss. Cable sheathing must be UV stabilised or the cables must be installed in conduit.
- The current carrying capacity of conductors (and allowable temperature rise of insulation) must be de-rated based on expected ambient temperatures.
- Weatherproof IP54 (minimum) junction boxes must be provided for the termination of all parallel strings.
- Anti-islanding, volt rise, frequency shift and all other network protection measures as prescribed by the relevant authority must be provided.

- The inverters must each have integrated power monitoring of the DC input and AC output with network interfacing for remote monitoring.
- The total photovoltaic electrical system from the DC terminals of the photovoltaic panel to AC output of the photovoltaic array must have an overall efficiency of 85%. This must include all cable, inverter, diodes, and termination losses.
- All solar panels must have an electrical module efficiency of minimum 17%.
- All cables must be strain-relieved when connected to a fixed point.
- Metal oxide varistor (MOV) surge arresters must be installed on each DC circuit within 15 m of the PV modules.
- The PV system must be able to be disconnected from all loads indefinitely without damage to the system under all sunlight and temperature conditions.

PV panels must have a minimum manufacturer guarantee of:

- 90% of nominal power after 12 years
- 80% of nominal power after 25 years.

# 8.0 Fire systems

Fire systems must be provided and include fire hydrants and fire hose reels that comply with the requirements of all applicable codes and Australian Standards and which satisfies the requirements of the relevant local fire authority.

Fire systems must comply with the deemed to satisfy requirement of the National Construction Code. Performance based solutions will only be considered on the basis that the proposed solution does not have a detrimental impact on the functional and operational requirements of the affected building/s.

The systems must include a fire detection and audible alarm system.

Fire systems must be appropriately designed to minimise intentional misuse of the fire systems and fire protection equipment.

## 8.1 Water supply

The water supply for the fire systems must comply with the following requirements:

- The supply must comply with the requirements stipulated in Section 4.1 *Water* and Section 10 *Hydraulic services.*
- The fire hydrant service must be installed as a ring main fed from the supply mains and must allow for the extension of the ring main for future buildings.
- Where water supply pressures and flows are inadequate for fire-fighting purposes an alternative supply comprising storage tanks and pumps must be installed.
- The capacity of storage tanks must be sufficient to satisfy the required flows.
- Bypass lines around storage tanks and pumps must be provided.

Actual water supply pressures and flows should be obtained to inform the design of the fire system.

Where actual supply pressures and flows are not available or cannot be tested, advice should be sought from the relevant water supply authority as to the design pressures and flows. Where design pressures and flows are relied upon suitable pressure and flow losses should be allowed, particularly in those instances where the supply mains in the areas surrounding the site are incomplete and result in dead-leg branch main supplying the school.

All fire system test water must be reused where possible. Fire system test water should be captured for re-use within the fire system, toilet flushing, irrigation or other end use that does not require potable water.

## 8.2 Suction and booster connections

A booster assembly must be provided in a location which complies with the relevant Australian Standards and the requirements of the relevant local fire authority.

The booster assembly connection must allow firefighting appliances to connect to the fire system. A hard stand area for firefighting appliances must be provided adjacent to the booster assembly in accordance with the relevant Australian Standard. The use of an adjacent public road as a hard stand area must have the prior approval of the relevant local fire authority.

## 8.3 Pipework, valves and fittings

Fire services pipework, valves and fittings must include:

- A site fire services' ring main that provides reliability and continuity of supply.
- Valves and fittings located to ensure control of supply to buildings and to all hydrants and hose reel outlets. Valves must enable individual sections of the ring main to be isolated for maintenance purposes or for the connection of new branches while the remaining sections of the ring main and associated fire services remain operational.
- Hose couplings that are compatible with relevant local fire authority requirements.
- The provision of all necessary signage and notices.

Fire services pipework, valves and fittings must comply with the requirements detailed in Table 8.

***Table 8.*** **Fire services pipework, valves and fittings**

| Service | Location | Material | Jointing | Nominal pipe size (mm) |
|---|---|---|---|---|
| Fire hydrant | In-ground | HDPE Type PE100 SDR 11 | Butt welded, electrofusion | 100–200 |
| | Above-ground | Galvanised mild steel medium gauge | Roll grooved joints with coupling | 80–150 |
| Fire hose reel | In-ground | HDPE Type PE100 SDR 11 | Compression, butt welded electrofusion | 25–50 |
| | Above-ground | Copper Type B | Silver soldered, press fit | 25–50 |
| Fire sprinklers | In-ground | HDPE Type PE100 SDR 11 | Compression, butt welded, electrofusion | 100–150 |
| | Above-ground | Black steel | Roll grooved joints with threaded coupling | 25–150 |

## 8.4 Fire hydrants

Fire hydrants are only to be installed as required by the National Construction Code noting the requirement for a fire station to be no more than 50 km from the building as measured along roads and equipped with equipment capable of utilising a fire hydrant.

Fire hydrant systems must comply with the following requirements:

- External hydrants must be external dual-head individually controlled outlets.
- External hydrants must be located within the prescribed distance from a hard stand area, with appropriate access between the hydrant and the hard stand area for fire-fighting purposes. Hard stand areas must be accessible by fire-firefighting appliances and vehicles.
- External hydrants must be installed in suitable locations that provide adequate hose coverage to all buildings with consideration for minimal safe distance requirements from buildings.
- External hydrants should not be located near sports fields, active play, or other areas where they create an injury hazard. Where these locations cannot be avoided, external hydrants must be housed in a metal cabinet which complies with the relevant local fire authority's requirements. Where external hydrants are exposed to possible vehicular impact, they must be protected by suitable bollards.
- External hydrants must be appropriately secured to prevent unauthorised use.
- External hydrant placement and coverage must consider the possible and planned locations for the relocatable buildings associated with a school's peak student enrolment.

- Consideration may be given to the use of street hydrants where appropriate and prior approval has been provided by the relevant local fire authority.
- Internal hydrants must not be installed in any building, except in buildings of three or more storeys where compliant coverage cannot be achieved using external hydrants.

## 8.5 Fire hose reels

Fire hose reels must be provided in accordance with the relevant regulations and Australian Standards, and any requirements stipulated by the relevant local fire authority noting the National construction code *does not require fire hose reels to be installed to classrooms and associated corridors in a primary or secondary school.*

Internal fire hose reels must be individually controlled outlets installed within a cabinet located to suit building architecture. Cabinets shall preferably be installed in secure areas and remain unlocked to avoid stolen OO3 fire keys installed on the front of the cabinet.

Fire hose reels must not be provided in external unsecured areas.

The fire hose reel service must be fitted with a flow switch connected to the school's security system to enable monitoring of use. In high risk situations (refer to the department's Security advisers), a reed switch connected to the security system shall also be installed to the cabinet to activate outside of school hours.

Fire hose reel cupboard signage shall not be provided by self-adhesive vinyl decals. Signage shall be vandal proof and securely fixed to the cupboard.

## 8.6 Fire sprinklers

Fire sprinkler systems must be provided as required by the National Construction Code and relevant Australian Standards.

Fire sprinkler systems must comply with *AS 2118.1 Automatic fire sprinkler systems Part 1: General systems* and local fire brigade requirements.

The fire sprinkler system must be fitted with flow switches connected to the school's security system and shall be arranged to match designated smoke zones.

Fire sprinkler valve sets and flow switches must be in secure cupboards or cabinets and must be accessible to the local fire brigade and maintenance personnel at all times with direct external access provided.

## 8.7 Fire extinguishers

Fully charged hand-held Standards Australia approved fire extinguishers must be provided throughout a school in accordance with the requirements stipulated in the National Construction Code and be mounted on appropriate fit-for-purpose brackets.

Extinguisher capacity and extinguishing agent must be selected to suit the risk profile of the area being protected.

Installation must include the provision and installation of appropriate extinguisher location and use-instruction signage.

## 8.8 Fire blankets

Fire blankets must comply with and be installed in accordance with the relevant Australian Standards.

Fire blankets must be installed proximate to any stove or cooking appliance.

Installation must include the provision and installation of appropriate fire blanket location and use instruction signage.

## 8.9 Fire detection systems

Notwithstanding a National Construction Code requirement to install a fire detection system, a fire detection system compliant with the requirements of *AS 1670 Fire detection, warning, control and intercom systems* must be installed where required by the *Department of Education Security Design Requirements Appendix 4,* which can be found here:

https://qed.qld.gov.au/our-publications/standards/Documents/design/security-design-requirements.pdf

## 8.10 Sound alert and intercom systems for emergency purposes

A sound alert and intercom system for emergency purposes must be provided as required by the National Construction Code. The system must be capable of automatic voice messaging, manual announcements from trained fire wardens and the transmission of evacuation signals, and must comply with all applicable codes and standards including:

- *AS 1670.1 Fire detection, warning, control and intercom systems — System design, installation and commissioning Part 1: Fire.*
- *AS 2220.1 Emergency warning and intercommunication systems in buildings Part 1: Equipment design and manufacture.*

The system must receive signals from fire indicator panels upon a general fire alarm and transmit the evacuation signals through the buildings. Alert and evacuation tone sequences must comply with Queensland Fire and Emergency Services' requirements and site evacuation plans.

The sound alert and intercom system must be installed separate from any public address or emergency tone warning systems used for daily operational and security purposes.

The system must include:

- An evacuation control panel located immediately adjacent to the site's main fire detection control indicating equipment (FDCIE).
- Zoning that is the same as the fire detection system. At least one zone per block must be provided regardless of whether a FDCIE or a sound system and intercom system for emergency purposes (SSISEP) is required in that block.
- SSISEP tones originating from any building must be played across all buildings.
- Separate amplifiers for each SSISEP zone, all of the same rated output power.
- Ceiling mounted speakers installed in all finished ceiling areas and speaker horns in all non-ceiling areas.
- Sufficient speakers to achieve a minimum average volume of +75dB over each individual area.
- Speaker horns and visual alert devices in all areas where ambient noise levels exceed +75dB.

Visual alert devices must be provided in areas and spaces:

- Where annunciation speakers are undesirable or ineffective (e.g., audio visual production and recording studios, manual arts workshops and construction courts, etc.).
- Used by persons with hearing impairment including lift lobbies, public waiting areas, corridors, interview rooms, etc.

The control panel must be in the school's administration area in a location and be of a type, construction and include switches that prevent accidental operation.

To reduce the opportunity for the system to be vandalised and rendered ineffective, speakers must be located out of reach of any adjacent ground, floor or support structure.

Fire detection and alarm systems must be capable of extension to accommodate future relocatable buildings.

## 8.11 Smoke and fire doors

Smoke and fire doors must be installed in accordance with the requirements of the National Construction Code and the relevant Australian Standards.

Magnetic hold-open devices must be installed to smoke and fire doors where required. These devices must deactivate on a fire alarm signal.

## 8.12 Fire indicator panels

Where required, fire indicator panels (FIPs) must be installed in accordance with the requirements of the National Construction Code and the relevant Australian Standards.

FIPs must be an analogue addressable type and include a site master FIP and sub-building mimic or FIP panels in outlier buildings networked to the site master FIP.

Each FIP shall have a minimum spare capacity of 10% to allow for future changes and possible additional circuits. Every FIP must identify all connected alarm circuits and be equipped with auto-testing and check-alarm facilities.

A single common alarm and fault output from each FIP must provide an individual and separate input into the school's security system (see Section 15.1 *Intruder detection and alarm systems*) allow remote monitoring of the fire detection system.

# 9.0 Gas supply

## 9.1 General

For each building containing a gas supply system:

- A fail-safe gas security and safety control system must be provided to effectively isolate supply at the gas source using a master control panel located in a staff-only accessible area.
- The master control panel must be keypad operated and allow the flow of gas to be regulated to those times set by staff. The master control system must include a 24-hour, 7-day digital timer control switch.
- The master control panel is not to be located within a distribution switchboard. Refer *Room data sheets* for typical location.
- Gas supply system to shut down automatically upon activation of any fire alarm system.

Each teaching space supplied with gas (for purposes other than heating) must:

- Be fitted with an independent pressure proving system with an integrated emergency shut-off button located adjacent to the teaching position or demonstration bench. Emergency shut-off buttons must not be located where they can be easily bumped or tampered with by students.
- Have a secondary emergency shut-off button or room control panel located elsewhere in the building on the same level. Room control panels may be grouped into one location per floor per building.
- The emergency shut-off system must include a manual reset key switch.
- The pressure proving control system must be key operated and isolation of the system must be student tamper proof.
- Test mode operation must operate via a key system and must not require the operator to maintain pressure on a test button, with the maximum test time of each system being 35 seconds.
- Gas leakage detection sensors must be installed to shut-off the solenoid isolation valves if gas is detected. Sensors must be located 300 mm above floor level for LPG installations and 300 mm below the ceiling for natural gas installations.

Gas pipework and fittings must comply with the following requirements:

- Pipework must be concealed from view where practicable, with additional protection provided where concealment is not possible.
- Quarter turn isolation valves must be provided to each floor level take-off in visible and accessible locations.
- Natural gas connections must be provided to the intended location of future relocatable buildings.
- Gas booster devices must not be used.
- All underground piping must be adequately protected from damage from vehicular traffic.
- Pipework must comply with the requirements detailed in Table 9.

***Table 9*. Gas services pipework**

| Location | Material | Jointing |
|---|---|---|
| In-ground | PE Pressure Gas PE100 Yellow Stripe SDR11 | Butt welded, electrofusion |
| Above-ground | Copper Type B | Silver soldered, press fit |

## 9.2 Natural gas

Natural gas infrastructure must comply with the following requirements:

- An independent gas distribution system must be provided and sized to accommodate the requirements of mechanical plant, domestic hot water plant, heating and cooking appliances, catering equipment, teaching labs and workshops.
- The gas distribution pipe work must be arranged so that there is one single entry point to a building.
- Distribution piping in a building must be located in compliance with ventilation requirements.
- Natural gas connections must be provided to the intended location of future relocatable buildings.

Where LPG is to be used and natural gas is likely to be available within five years, pipework must be designed and installed to allow for the future connection of natural gas.

Gas infrastructure and pipework must be sized for the permanent and relocatable buildings associated with a school's peak student enrolment and any third-party and community facility, plus a spare capacity of 20%.

## 9.3 LPG

LPG installations must comply with the following requirements:

- A minimum of two cylinders should be installed and connected in parallel with individual valves and regulators installed for each cylinder.
- A secure mesh or vented enclosure must be provided, sized to suit the gas cylinders with lockable gates or doors.
- The enclosure must be located as close as possible to high usage rooms and near an access road for ease of bottle replacement or on-site refilling.
- The enclosure shall be mounted on a concrete plinth above adjacent garden beds, with hard pavement access.
- Enclosures must be located suitable distances from buildings and similar structures that could be fire sources. Where an enclosure is located against or adjacent to nearby buildings, blank, fire-proof walls must be provided to protect these buildings from the risk of fire.
- Appropriate hazardous material signage must be installed.

## 9.4 Selection of gas appliances

Gas appliances must comply with the following requirements:

- Gas appliances should have electronic ignition.
- Gas appliances should be sealed combustion units.
- Gas appliances must not have atmospheric burners or pilot lights.
- Central plant must have modulating heat output in response to changing load requirements.
- Units should operate by simple on/off control or by time duration.

# 10.0 Hydraulic services

All plumbing fixtures, materials and fittings installed in Queensland schools must be certified under the WaterMark Certification Scheme.

All hydraulic fixtures and fittings must have the minimum Water Efficiency Labelling Scheme (WELS) rating or maximum flow rates specified in Table 10.

***Table 10.*** **Hydraulic fixtures and fittings — minimum WELS rating**

| Fixture | Minimum WELS rating |
|---|---|
| Clothes washing machines | 4-star |
| Dishwashers | 5-star |
| Showers | 3-star ≤ 9.0 L/min |
| Taps | 5-star |
| Toilets | 4-star |
| Urinals | 5-star |

## 10.1 Domestic water services

Domestic water services must be provided and sized to accommodate the permanent and relocatable buildings associated with the school's peak student enrolment and any third-party or community facilities, plus a spare capacity of 20%.

### 10.1.1 Potable water services

Each domestic water tapping from the mains should extend complete with all necessary isolation valves, backflow prevention and pressure-limiting valve systems, and be interconnected at the boundary with appropriate control valves in accordance with the requirements of the relevant authority.

The domestic water supply system must comply with the following requirements:

- The water supply must comply with the requirements stipulated in Section 4.2 *Water.*
- Where water supply is inadequate for domestic water supply purposes, an alternative supply comprising storage tanks and pumps must be installed.
- Domestic water supply pumps of sufficient capacity must be installed to supplement water supply pressure where inadequate pressure is available. Supply pumps must be sized for 120% of the maximum simultaneous demand.
- Bypass lines must be provided around storage tanks and pumps.
- Sealed branches must be provided proximate to the planned location of future relocatable buildings.
- Valved potable water point must be provided to allow for temporary supply to dental vans, trade training trucks and similar visiting services.

### 10.1.2 Non-potable water services

Where recycled water is available from the local authority, recycled water must be used for end uses that do not require potable water.

Sites must be provided with a separate pipe system for non-potable water from the source of supply to points of use including toilet and cistern flushing and irrigation. Sources may include reticulated recycled water supplied by the relevant water authority or rainwater captured and stored on site.

Non-potable water systems must comply with the following requirements:

- Rainwater harvest systems must include filtration and disinfection to remove health risks from water spray or accidental ingestion and to ensure water quality is visually clear.
- Safety warning signage must be installed on all controlled points of use.
- Rainwater storage tanks supplying water for toilet and cistern flushing must be provided with domestic water make-up supply to be used when the tanks are assumed empty.
- Where reticulated recycled water is available this must only be used for non-potable purposes.

Recycled water and rainwater must be reticulated in purple-coloured pipes in accordance with the relevant Australian Standard.

Recycled water and rainwater must not be connected to the potable water supply.

Where tank water is reticulated for toilet and cistern flushing or where potable water is connected to top-up rainwater storage tanks, appropriate back-flow prevention valves must be fitted to ensure no cross-contamination of the potable water supply occurs.

Rainwater collection and storage systems must comply with *Part 4 (MP 4.3 — Supplementary water sources — commercial buildings) of the Queensland Development Code*[3].

### 10.1.3 Use of lead

Piping, tapware or fittings that hold or distribute potable water that may be a source of drinking water must, where suitable products are available in Australia, be either:

- not contain lead
- not allow contact between brass containing lead and water (commonly referred to as ‘lead-safe’ products).

This requirement applies to pipe fittings, breeches and thermostatic mixing valves, hot and cold tapware, boiling water units and any other component that drinking water will come into contact.

This requirement does not apply to fixtures such as sinks, troughs and basins, external vandal-proof taps used for irrigation or infrastructure associated with fire, trade waste or sewerage plumbing systems.

### 10.1.4 Pipework, valves and fittings

Pipework, valves, and fittings for domestic water services must comply with the following requirements:

- Valves and fittings must be located to ensure control of supply to all buildings and must also enable new branches to be ‘cut in’. Valves must be capable of operating at not less than 1.5 times the working pressure of the heated water system.

[3] https://www.hpw.qld.gov.au/__data/assets/pdf_file/0023/4829/qdcmp4.3supplementarywatersourcescurrent.pdf

- Service valves must be located to minimise the risk of tampering by users and visitors. Valves must be installed at a safe working height in locations that meet all relevant occupational health and safety regulations, principles, and guidelines, and be appropriately labelled.
- Valves must be provided on all systems to control the supply to groups of outlets, as well as to each individual point of demand, fixture, item of plant and equipment to allow isolation or service.
- Systems must maintain water pressure between 250–500 kPa at each item of plant or equipment, fixture outlet and point of demand, as a general minimum requirement.
- Systems must minimise differences in cold and hot water pressure at any item of plant or equipment, fixture, or outlet to ± 50 kPa.
- Systems must provide flows and pressures in accordance with the Institute of Plumbing Australia — Selection and Sizing of Water Piping Systems guidebook with pipes sized based on a maximum waterflow velocity of 3/sec for 1% of annual peak hour.
- Pipes must be supported to reduce structure-borne noise levels and lagged to provide protection to piping from elements or other damage, with compliant acoustic and thermal properties.
- Pipework must not be cast in concrete and water pipe work must be designed to eliminate any risk of ‘blue water’.

All isolation valves installed in locations accessible to students and the community must be vandal proof.

### 10.1.5 Taps, outlets and fixtures

Taps, outlets and fixtures must be installed in the locations and in sufficient numbers to satisfy operational requirements and the functional requirements detailed in the *Room data sheets* and in Table 11.

The must be a general distribution of external taps for garden watering, irrigation and general use.

### 10.1.6 Water storage

Where water storage tanks are installed, the system must comply with the following requirements:

- Potable storage required due to an inadequacy in the main supply must be sized to store a minimum of 24 hours of supply.
- Infill supply for each tank must include a high-pressure ball float shut-off valve for each supply.
- Storage tanks must be constructed in durable high-impact material of potable water supply quality heavy-duty PVC, galvanised, epoxy coated steel, or reinforced concrete tanks that may be installed and fitted with heavy duty liner specifically designed for potable water.
- Have filtration and disinfection to remove health risks from water spray or accidental ingestion and ensure water quality is visually clear.
- Must prevent mosquitoes and other fauna from breeding inside the tank.
- Must prevent vermin from entering the tank.

Bladder-type tanks must not be installed.

***Table 11.*** **Plumbing fixtures**

| Code | Description |
|---|---|
| S1 | *Science gas turret*<br>• Dual outlet gas turret, 90º, with push-turn or lift-turn handles, bench mounted generally 100 mm from splashback and 600 mm distance from GPOs. |
| S2 | *Lab bench sink (student side bench)*<br>• Single bowl, inset type, 300 × 300 × 200 nom deep, stainless steel 316 grade (or approved resin type), acid resistant grated outlet and waste.<br>• Bench mounted lab type tap, gooseneck spout with tube nozzle outlet, chrome plated, 5-star WELS rated, cold water only, backflow prevention valve, concealed trap and waste pipe with screw off drain plug. |
| S2h | *Lab bench sink (demonstration bench)*<br>• Sink as for S2.<br>• Bench mounted lab type combination tap set, gooseneck spout with barbed tube nozzle outlet, chrome plated, 5 star WELS rated, hot & cold water, backflow prevention valve. |
| S3 | *Emergency eyewash & hand-held hose unit*<br>• Stainless steel bowl with lever operated twin aerated eye/face wash nozzles and hand-held aerated hose, cold water only. |
| S4 | *Fume cupboard sink*<br>• Sink and tap as for S2. |
| S5h | *Preparation glassware wash-up sink*<br>• Double bowl sink unit, nom 2700 long with one 725 × 350 × 300 deep bowl and one 725 × 350 × 170 deep bowl, with 450 long drainers both ends and integral lip at back for splashback, stainless steel 316 grade (or approved resin type), acid resistant grated outlet and waste, SS lid for one bowl.<br>• 2 × lab combination tap sets (1 per bowl), swivel gooseneck spout with barbed tube nozzle outlet, hot & cold bib cocks with barbed tube nozzle outlets, chrome plated, 5-star WELS rated, hot & cold water, backflow prevention valve, concealed trap and waste pipe with screw off drain plug. |
| S6h | Preparation Chemistry/Biology bench sink<br>• Double bowl sink unit, 450 × 350 × 170 deep bowls, stainless steel 316 grade (or approved resin type), acid resistant grated outlet and waste with 450 long drainers both ends and integral lip at back for splashback.<br>• Lab combination tap set, gooseneck spout with barbed tube nozzle outlet, hot & cold bib cocks with barbed tube nozzle outlets, chrome plated, 5-star WELS rated, hot & cold water, backflow prevention valve, concealed trap and waste pipe with screw off drain plug. |
| S7 | *Cleaners' sink*<br>• Stainless steel cleaners sink nom 560 × 475 × 200 deep with swing grate, chrome plated brass grated waste outlet, mounted on SS SHS frame with adjustable feet, nom 500 × 600 stainless steel splashback.<br>• Wall mounted hose cock chrome plated, 5-star WELS rated, cold water only. |
| S8 | *Sink — student practical learning areas*<br>• Single, double or 1 ½ bowl (refer brief or layout) sink unit, in-set type, nom 1500 long with nom 390 × 390 × 170 deep bowls, 450 long drainers both ends, single hole for mixer tap, chrome plated brass grated waste outlet.<br>• Lever handle tap, swivel gooseneck aerated spout, 3-star WELS rated, cold water only, concealed trap and waste pipe with screw off drain plug. |
| S8h | *Kitchen sink — staff areas and student food kitchens*<br>• Double or 1 ½ bowl (refer brief or layout) sink unit, in-set type, nom 1500 long with nom 390 × 390 × 170 deep bowls, 450 long drainers both ends, single hole for mixer tap and hole for auto boiler tap where required, chrome plated brass grated waste outlet, flick mixer tap, 5-star WELS rated, hot & cold water. |

***Table 11.*** **Plumbing fixtures (continued)**

| Code | Description |
|---|---|
| S9h | *Commercial pot sink — canteens and student catering kitchens*<br>• Single or double bowl (refer brief or layout) pot sink unit, nom 500 × 400 × 300 deep bowls, 450 long drainers both ends integral with SS bench, integral 300 high splashback, chrome plated brass grated waste outlet, spring action pre-rinse spray hose (6-star WELS rated) and combination pot filler, swivel spout, lever handles (3-star WELS rated), hot & cold water. |
| S10 | *Art sink*<br>• Double bowl sink unit, nom 2400 long with nom 2 × 550 x 400 × 300 deep bowls, 450 long drainers both ends, integral splashback, inset into bench top, chrome plated brass grated waste outlet,<br>• Lever handle taps, swivel gooseneck aerated spouts (one per bowl), 3-star WELS rated, cold water only.<br>• CP copper or concealed waste pipes to nom 40-litre paint/clay trap under sink. |
| S11 | *Sculpture/printmaking sink*<br>• Single bowl sink unit, nom 2400 long with nom 1200 × 400 × 300 deep bowl, 450 long drainers both ends, integral splashback, chrome plated brass grated waste outlet.<br>• Spring return, pre-rinse spray hose (5-star WELS rated) and combination pot filler, swivel aerated spout, lever handles (3-star WELS rated), cold water only.<br>• CP copper or concealed waste pipes to nom 40-litre paint/clay trap under sink. |
| S12 | *Soap dispenser*<br>• Wall or splashback mounted stainless steel, vandal resistant, lockable. |
| S13 | *Paper towel dispenser*<br>• Wall or splashback mounted stainless steel, vandal resistant, lockable. |
| S14 | *Vanity basin*<br>• Vitreous china basin, white semi-recessed type chrome plated brass grated waste outlet (not plastic).<br>• Flick mixer tap 5-star WELS rated, cold water. |
| S15 | *Toilet and in-duct/in-wall cistern*<br>• Vitreous china pan white with wall faced concealed trap, white closed front seat with flap.<br>• In-duct mounted (or in-wall with vandal resistant cover plate) 4.5/3-litre dual smart flush cistern with CP stopcock, cold water, push buttons mounted at max 1200 H. |
| S16 | *Food rinse/wash sink*<br>• Single bowl (refer brief or layout) sink unit, nom 390 × 390 × 170 deep bowl, 450 long drainers both ends integral with SS bench, integral 300 high splashback, single hole for mixer tap, chrome plated brass grated waste outlet, flick mixer tap, 5-star WELS rated, hot & cold water. |
| S17 | *Auto boiler and chilled water unit*<br>• Under bench commercial filtered boiling and chilled water unit, with hob combination tap on sink, sized to suit usage, cold water supply. |
| S19 | *Hand basin – cold water*<br>• Vitreous china wall mounted white basin, chrome plated brass grated waste outlet (not plastic).<br>• Flick mixer tap, 5-star WELS rated, cold water only.<br>• Alternative for PWD/access basin (Enware SLM606D or equal). |
| S19h | *Hand basin — hot & cold water*<br>• Basin as for S19.<br>• Flick mixer tap, 5-star WELS rated, hot & cold water. Alternative tap for food areas — knee operated. |
| S20 | *Drinking fountain*<br>• Floor mounted stainless steel nom 200 mm diameter top bowl, with separate side bottle refill station, to conceal fixings and pipework, mounting height 700 mm high for Years P–3 and 800 mm high for Years 4–12.<br>• Chrome finish shielded bubbler with self closing push button valve, cold water only. |

***Table 11.*** **Plumbing fixtures (continued)**

| Code | Description |
|---|---|
| S21 | *Wash basin/s — student amenities*<br>• Wall basin unit (single, double, triple or quadruple bowls — number of bowls as per brief) 304 grade stainless steel, bowl/s integral with countertop, splashback, trap covers to conceal pipework and fixings.<br>• Single tap per bowl, timed flow pillar cock, 5-star WELS rated, cold water only. |
| S28 | *Toilet suite — persons with disabilities*<br>• Vitreous china pan, white, with wall faced concealed trap (for easy cleaning).<br>• In-wall/in-duct 6-litre dual smart flush cistern, push buttons at max 1000 mm above floor, with CP stopcock, cold water supply.<br>*Shower*<br>• Shower installation to comply with AS1428.1, provide 1500 mm hose, mechanical hose retraction device is NOT to be used. |
| S30 | *Wash/quench trough*<br>• Wall mounted stainless steel trough, nom 1200 × 300 × 200 deep with 600 high SS splashback, mounted on heavy duty stainless steel frame, 3 CP hose cocks at 600 above trough bottom, cold water only. |
| S33 | *Utility tub*<br>• Single bowl sink unit, inset type, nom 1200 long with nom 48-litre bowl, drainer one end, chrome plated brass grated waste outlet (not plastic).<br>• Lever handle tap, swivel gooseneck aerated spout, 3-star WELS rated, cold water only.<br>• Waste to nom 40-litre pain/clay trap under sink (where applicable). |
| S39 | *Laundry tub — inset type*<br>• Single SS 70-litre chrome plated brass grated waste outlet (not plastic).<br>• Lever handle tap, swivel gooseneck aerated spout, 3-star WELS rated, cold water only. |
| S40 | *Pot filler laundry arm*<br>• Splashback mounted telescopic laundry arm (for filling large pots in situ on stove), cold water only. |
| S57A | *Urinal — wall mounted*<br>• Wall hung vitreous china urinal stall, white, concealed trap, cold water only. |
| S57B | *Urinal waterless — wall mounted*<br>• Wall hung vitreous china urinal stall, white, concealed trap. |
| S58 | *Safety drench shower with eyewash*<br>• Combination overhead drench shower and eye/face wash, hand and foot operated, cold water only. |

### 10.1.7 Pressure boosting pumps

Where pressure-boosting pumps for potable and non-potable water are required they must comply with the following requirements:

- Pump sets must comprise dual multi-stage variable speed constant pressure pumps of stainless steel construction connected in parallel with Type 316 stainless steel inlet and outlet manifolds.
- Control panels must be touch-screen programmable logic controllers (PLC) interface mounted on front panel showing operational and alarms status.
- Pumps must have integrated variable speed drives.
- Minimum functions must include:
  - manual override outside control panel
  - low and over-pressure shut down
  - standby pump redundancy with automatic changeover
  - separate transducer for each pump
  - automatic alternating duty-standby operation with manual override
  - dry-running protection for each pump
  - bypass valve assembly
  - positive suction head
  - stainless steel non-return valve to each pump
  - isolation valves on each valve for removal of pump and non-return valve from manifolds
  - duplicate diaphragm tanks
  - vibration dampers on each pump
  - safety switch on individual pumps
  - phase failure protection on each pump
  - voltmeter, ammeter on key-pad interface
  - operation and fault lights for each pump
  - emergency operation switch
  - radio frequency interference (RFI) filters on each pump
  - shield cables from motors to controllers.
- Duty pumps must be sized to cater for the estimated maximum system demand based on the permanent and relocatable buildings associated with the school’s peak enrolment and any third-party or community facilities.

Pump equipment and assemblies must be mounted on hot-dipped galvanised and painted skids.

## 10.2 Heated water

In primary schools, heated water is generally supplied to staff and administration areas, student showers, canteens, art activity area, accessible toilets and staff-assisted student bathrooms and toilets.

In secondary schools, heated water is to be provided to basins, sinks and wash fixtures in all areas except hand wash facilities in student toilets.

Heated water systems must comply with the following requirements:

- Flow and return circulating loops must be provided where central hot water plant systems are installed. Piping must be installed with dead-legs to any outlet being no longer than 5 meters.
- Single-leg systems may be installed where standalone local hot water generation systems are installed.
- Hot water supplies must be generated and delivered through main pipelines at a minimum of 60° C to inhibit the growth of legionella bacteria.
- A maximum supply temperature of 45° C must be provided at all outlets used for personal hygiene purposes, those accessible to students and all other outlets that are likely to be used where temperature control is required to minimise the risk of scalding to users. Thermostatic mixing valves (TMVs) must be used, with TMVs being accessible for testing and maintenance.
- A maximum supply temperature of 50° C may be provided to other outlets where a minimal scalding risk may be demonstrated, and a higher temperature is required for delivery purposes.
- Warm or tepid water generation systems must not be installed.
- Wall-mounted or under-bench boiling water units should be provided where considered appropriate. Typically, these will be installed in staff areas and other areas not normally accessible to students. Where installed, the capacity of the unit must be matched to the application with the capacity not exceeding five litres. All boiling water units must have a five-star energy rating or better, incorporate a timer for energy efficiency and deliver water at a maximum of 95° C.
- Hot water pipes exceeding 5 m in length must be provided with thermal insulation, with a minimum wall thickness of 25 mm, incorporating a factory applied reinforced aluminium covering for optimum fire performance that complies with *AS 1530 Methods for fire tests on building materials, components and structures.*
- Flow and return circulation pumps must be installed in a 100% duty/standby arrangement with 24-hour/7-day timer control to allow systems to be programmed to shut down as required.

Timers that shut down heated water systems and boiling water units during holidays, weekends and other non-school days should be installed. Provide a flushing procedure in operation manuals for schools to implement after school holidays.

### 10.2.1 Heated water systems

The most suitable method of generating heated water must be determined and sized to meet the needs of the permanent and relocatable buildings associated with the school's peak student enrolments and any third-party and community facilities, plus a spare capacity of 20%.at each site.

Systems must be selected from:

- gas fired or electric central plant comprising multiple hot water units coupled with storage tanks and pumps for supply to main flow and return systems
- stand-alone electric or gas hot water units supplying satellite fixtures and outlets
- combined boiling, chilled, cold, and hot water units for isolated single sinks.

Base heating systems must be sized to provide full capacity without solar contribution.

Heated water systems should be provided with a solar preheat system configured to provide the maximum solar contribution possible, based on the available roof space.

Circulating pumps must include mechanical seals, be fitted with variable speed drives, and have high-efficiency motors.

All external hot water plants and flues must be provided with appropriate protection to prevent injury or theft.

### 10.2.2 Pipework, valves and fittings

Pipework, valves, and fittings for heated water systems must comply with the following requirements:

- Isolation and balancing valves must be provided to each heated water system installed.
- Valves and fittings must be located to ensure control of supply to all buildings and must also enable new branches to be ‘cut in’. Valves must be capable of operating at not less than 1.5 times the working pressure of the heated water system.
- Service valves must be located to minimise the risk of tampering by users and visitors but must be readily accessible for maintenance purposes. Valves must be installed at a safe working height in locations that meet all relevant occupational health and safety regulations, principles, and guidelines, and be appropriately labelled.
- Valves must be provided on all systems to control the supply to groups of outlets, as well as to each individual point of demand, fixture, item of plant and equipment to allow isolation or service.
- Systems must maintain water pressure between 250–500 kPa at each item of plant or equipment, fixture outlet and point of demand, as a general minimum requirement.
- Systems must minimise differences in cold and hot water pressure at any item of plant or equipment, fixture, or outlet to ± 50 kPa.
- Systems must provide flows and pressures in accordance with the Institute of Plumbing Australia — Selection and Sizing of Water Piping Systems guidebook with pipes sized based on a maximum waterflow velocity of 1.2 m/sec.
- Thermostatic mixing valves must be installed where heated water must be delivered at 45° C. Tempering valves are acceptable in other areas.
- The system must include the capability of measuring and confirming circulating pump water flows on each return loop and the return from each building level to validate adequate circulation.

## 10.3 Sanitary plumbing and drainage

Sanitary plumbing and drainage systems must accommodate the permanent and relocatable buildings and estimated sewage volumes associated with the school’s peak student enrolment and any third-party or community facilities or uses, plus a spare capacity of 20%.

Sanitary plumbing and drainage systems must comply with the following requirements:

- The system must be based on a gravity design wherever possible with the pipework incline beginning from outlier buildings and the most remote of the planned future relocatable buildings.
- The system must discharge to the site boundary and connect to the authority sewerage system at the legal point of discharge approved by the relevant authority.
- Main drains must be ventilated to atmosphere in locations that do not cause nuisance to users.

- Inspection openings must be provided for maintenance purposes.
- Inspection openings under pavements must have inspection shafts.
- Inspection openings at the end of each pipeline in each building must be extended to surface level with sealed risers to act as clear out points. Openings must be in accessible locations to allow clearing of blockages with minimum disruption to the school's operations.
- Inspection chambers must be provided immediately inside the property boundary where the site system connects with the authority sewer, at the end of lines outside buildings, at changes of direction and at intervals no greater than 60m for cleaning and maintenance purposes.
- Sealed branches must be provided proximate to the planned location of future relocatable buildings.
- Sealed drainage points must be provided to allow for the temporary discharges from dental vans, trade training trucks and similar visiting services.

Where systems cannot discharge via gravity to the legal point of discharge a local pump well system must be installed of sufficient capacity to suit the volume to be discharged. The pump discharge must be directed via a pressure line to the legal point of discharge at the site boundary or other gravity drain with sufficient capacity for the discharge from the pump chamber.

Pump stations must be designed to 100% duty and standby. Pump chambers must not exceed 24 hours discharge storage capacity.

### 10.3.1 Wastewater treatment systems

A wastewater treatment system must be provided where a sewerage authority system is not available.

Wastewater treatment systems must comply with the following requirements:

- Systems must be of sufficient capacity to cater for the entire sewage volume that may be generated from a site based on the school's peak student enrolment (expected 5-year growth) and any third-party or community facilities or uses plus spare capacity.
- The treatment plant must include all necessary chambers, filters, and the like to ensure that the discharged treated wastewater has been treated correctly.
- The quality of discharged treated wastewater must comply with the applicable codes and regulations and the requirements stipulated by the relevant local authority and the Department of Environment and Science.
- Discharged treated wastewater must outfall via appropriate measures and in quantities that comply with the requirements stipulated by the relevant local authority and the Department of Environment and Science.

### 10.3.2 Sanitary plumbing and drainage systems

Sanitary plumbing and drainage systems must comply with the following requirements:

- Soil and waste stacks and risers must be located to ensure that a gravity connection can be made to a stack or riser from any part of a floor. The gravity connection must provide appropriate pipe gradients and avoid services and structural obstructions.
- A minimum pipe size of 100 mm diameter must be provided for the dedicated connection of water closets.
- A minimum pipe size of 100 mm diameter for drain and wastes serving more than one sanitary fixture.
- Shower outlets must have a minimum diameter of 100 mm.

- For multi-storey construction, all soil and waste stacks must be fitted with at least one branch connection at each floor level as low as possible in the false ceiling.
- All stacks (including stacks only serving sullage fixtures) must have a minimum diameter of 100 mm.
- Ground-level and above ground-level fixtures that are unable to be connected by gravity to the authority sewer must be connected to dedicated ground-level or above ground-level sewer pump stations.
- All stacks must be located against structural elements such as columns.
- All internal exposed drainage pipe work shall be chrome plated copper unless briefed otherwise.

### 10.3.3 Pipework and fittings

Pipework and fittings must comply with the following requirements:

- Pipework must be concealed where possible.
- Overflow relief gullies must be installed at a minimum of 150 mm below the finished floor level for each building and 75 mm above the adjacent ground level. A vandal proof hose tap must be installed above overflow relief gully to enable charging.
- All sanitary plumbing and drainage must be acoustically treated when passing through sound sensitive areas.
- Vents must not be installed flush with or at the building facade.
- Tundishes must be visible for inspection.

Articulation joints must be installed on all sanitary drainage services exiting a building and suit the site's soil classification and expected soil movement.

## 10.4 Trade waste plumbing and drainage

Trade waste plumbing and drainage systems must be installed to remove harmful chemicals, fats and residues from waste created from activities including art, science, materials technology, food technology, canteen, and hospitality operations, etc. before the waste is discharged to an authority's sewerage system.

Trade waste drainage systems must accommodate all permanent and relocatable buildings associated with a school's peak student enrolment and any third-party or community facilities that generate trade waste, plus a spare capacity of 20%.

Trade waste installation is to comply with water authority requirements.

Trade drainage waste systems must comply with the following requirements:

- The system must be based on a gravity design wherever possible with the pipework depth to include the most remote of the planned future relocatable buildings that may connect to the system.
- The system must be fitted with 'full-way' inspection openings and, where concealed, must be accessible through access panels.
- Inspection openings and access panels must be provided to allow blockages to be cleared with minimum disruption to and impact on the operation of a facility and users. Inspection openings and access panels must not be in teaching or administration areas, or in areas where the odours emitted from the trade waste system will affect these areas.

Acid wastes from laboratories must discharge to neutralisers installed to the requirements of the relevant authority prior to discharge to the sanitary waste system.

### 10.4.1 Trade waste apparatus

Trade waste system apparatus must meet the following requirements:

- Neutralising tanks as ‘treatment’ apparatus must be provided in lieu of mixing tanks and be in dedicated plant rooms or other secure locations for maintenance purposes.
- Grease and chemical treatment apparatus must be provided.
- Common apparatus must only be used for groups of activity spaces where small amounts of trade waste are generated. Where grease drains run more than 30 m to a grease trap arrestor, provide flushing points.
- Separators must be installed to minimise the risk of extraneous material entering the trade waste and sewerage systems. Separators must be installed where they can be easily serviced. Provide an RPZD protected hose tap for cleaning of trap.

### 10.4.2 Pipework and fittings

Pipework and fittings must comply with the following requirements:

- Pipework, fittings, and other trade waste apparatus must be made from materials suitable for the waste entering and the chemicals used in the trade waste system.
- Pipework must be acoustically treated when passing through sound sensitive areas.
- Pipework must not be cast-in concrete.
- Incorporate the principles for ventilation, pumping and overflow relief as described in Section 10.3 *Sanitary plumbing and drainage*

Air Admittance Valves (AAVs) must not be installed in trade waste systems where chemicals are to be discharged.

## 10.5 Material selection

Hydraulic services pipework must comply with the requirements detailed in Table 12.

***Table 12.*** **Hydraulic services pipework**

| Service | Location | Material | Jointing | Nominal pipe size (mm) |
|---|---|---|---|---|
| Sanitary plumbing and drainage | All areas | UPVC DWV grade | Solvent welded | 40–225 |
| Trade waste plumbing and drainage | All areas | HDPE | Butt welded, electrofusion | 40–150 |
| Trade waste vent | Above ground | UPVC DWV grade | Solvent welded | 50–150 |
| Trade waste fixture traps | Concealed | HDPE | Butt welded or fused | 40–50 |
| | Exposed | Chrome plated copper or Type 316 stainless steel | Screwed | 40–50 |
| Potable cold water | In-ground | HDPE Type PE100 SDR 11 | Compression, butt welded, electrofusion | 15–150 |
| | Above-ground | Copper Type B<br>Copper Type B<br>Crosslinked polyethylene (PEX) | Silver soldered<br>Silver soldered, press fit<br>Compression sleeve | 15-150<br>15–20<br>15–20 |
| Hot water | In-ground | Copper Type B | Silver soldered | 15–150 |
| | Above-ground | Copper Type B<br>Crosslinked polyethylene (PEX) | Silver soldered, press fit<br>Compression sleeve | 25–150<br>15–20 |
| Rainwater and non-potable water | In-ground | HDPE Type PE100 SDR 11 | Compression, butt welded, electrofusion | 15–150 |
| | Above-ground | PVC-U Pressure Pipe PN18 | Solvent welded | 15–150 |

# 11.0 Information and communication technology

All information and communication technology systems must comply with the requirements detailed in the department's *Network Infrastructure Procedures & Standards (DNIPS) V4.0*.

The document outlines the standard to which all network cabling and supporting infrastructure within the department's environments shall be installed and the procedures and processes to follow.

## 11.1 Television, satellite and radio signal distribution

Where the use of free-to-air television or satellite services are deemed necessary to meet the functional requirements, a system that distributes free-to-air television and satellite to locations throughout the school must be provided. The system must allow coverage to be expanded or modified to meet changing curriculum, learning and operational needs, and relocatable buildings as these are delivered and installed on-site.

The system may be a master antenna television system or use the LAN to distribute signals.

The system must include:

- all associated cabling infrastructure for distribution to serviced locations
- fly leads for each outlet
- all active data equipment required to operate the system.

## 11.2 Audio visual systems

Audio visual systems and devices must be provided to support a school's operational and functional requirements and the functional requirements detailed in the *Room data sheets*

Audio visual systems must comply with the following requirements:

- Screen sizes must be matched to suit the size of the room and viewing distances.
- Cable pathways must allow for easy installation and maintenance.
- All cabling must be concealed and installed in continuous lengths.
- Display screens must be positioned to provide a minimum 100° (diagonal) viewing area.
- Projectors must be readily accessible for maintenance purposes and not require specialist access equipment.

The location of digital screens must be coordinated with the building structure to ensure the structure can accommodate the weight of the largest screen that may be installed by the school.

## 11.3 Public address systems

A digital zoned public address (PA) system suitable for announcements and media information must be provided which covers all permanent and relocatable buildings associated with the school's peak student enrolment, sports fields, and outdoor areas.

The system must comply with all relevant standards, codes and regulations of the authorities having jurisdiction over such works, including those issued by the Department of Environment and Science.

The system must incorporate a lockdown warning facility with dedicated push button controls.
The lockdown warning facility must override all other public address functions when in use.

The public address system must be automatically muted in all areas when the SSISEP system (see Section 8.10 *Sound alert and intercom systems for emergency purposes*) is in use.

The system must be zoned logically and simply, with a minimum of one zone per building, car park or outdoor area. The system must be capable of directing messages to selected zones, while minimising the audibility of these messages in adjacent zones.

Controls must enable the selection and de-selection of zones in a simple and efficient manner.

The PA system must comply with the following requirements:

- Be simple and logical to operate for staff.
- Must be capable of providing a minimum sound level in all normally occupied areas of not less than 75 dB(A).
- The Rapid Speech Transmission Index (RATSI) must not be less than 0.5 in at least 75% of each area of coverage and should not fall below 0.45 for the remaining 25% of each area.
- Provide a facility for the broadcast of pre-recorded routine, situational and emergency announcements and warning tones. The system must be able to store at least 200 default messages.
- Allow the simultaneous broadcasting of different announcements to different zones.
- Allow the broadcasting of music and sounds (including the school ‘bell’) to all or selected zones.
- Enable the selection and de-selection of zones simply and efficiently.

The system must only allow one microphone to announce a message in a selected zone. Any other microphone that tries to select the same zone must not be able to announce their message until the first microphone has de-selected the zone.

The system must include all cabling infrastructure, speakers, microphones, amplifiers and all other devices and controllers necessary for the operation of the system.

## 11.4 Hearing augmentation

A hearing augmentation system which satisfies all National Construction Code requirements and complies with the spirit and intent of the *Disability Discrimination Act* must be installed. The system must be installed in any space where it could reasonably be expected that a projector, television, LCD or LED display, or any other device equipped to transmit sound, other than one solely used for emergency warning, will be installed.

The system must:

- provide a simple and reliable method of pairing receiving devices with transmitters
- provide a simple and reliable method of grouping audio inputs and assigning their output transmitters
- include all amplifiers, wireless transmitters, wireless receivers, wireless microphones, active data equipment and all other equipment and devices required to provide a fully functioning system.

Consideration must be given to installing networked systems with an IP back-bone that readily allow equipment including amplifiers, wireless transmitters, wireless receivers, wireless microphones, and any other equipment or devices to be relocated from one space to another to meet operational and user needs.

Systems must include the provision of all electrical and data systems and outlets which will allow hearing augmentation to be provided in any area of a permanent building where it could reasonably be expected that a person with hearing loss may require access to hearing augmentation. The hearing augmentation

system should be designed to allow the system to be extended to relocatable buildings as they are delivered and installed on site.

A minimum of two sets of amplifiers, wireless transmitters, wireless receivers and wireless microphones per permanent teaching and learning building must be provided. Additional sets should be provided for each location where there will be a higher public presence including reception areas, conference rooms, libraries, gymnasiums and performing arts facilities.

Signage must be installed indicating that a hearing augmentation system is available. This signage must be placed at each of the doors or entries into the space where hearing augmentation is available. The signage must include the international symbol for deafness in accordance with the applicable Australian Standard indicating a hearing augmentation system is provided and must identify:

- the type of hearing augmentation
- the area covered within the room
- if receivers are being used and where the receivers can be obtained.

# 12.0 Landscape architecture

Well-designed external environments can improve the functionality, durability and flexibility of open spaces, the thermal performance of buildings, and offer shade and shelter in playgrounds.

Landscape architecture is a means of enhancing an existing site's features. Landscape must not be treated as an add on but as an integral aspect of the learning environment. The whole site has potential as a landscape for learning.

This section describes specific technical aspects required for landscape elements specified in the companion documents *Education Facilities Design Principles and Generic Functional Brief* and *Master Planning, Architectural and Landscape Design Principles*.

## 12.1 Soft landscaping

Soft landscaping should be used to improve the landscape of both the site and surrounding area and should improve the overall functionality and aesthetics of the site while necessitating an acceptable level of maintenance.

Any area of soft landscaping that is rarely used by the school community for learning should require minimal maintenance. Conversely, high use areas should consider the availability of maintenance resources and labour.

Soft landscaping must comply with the following requirements:

- falls must be provided across landscaped surfaces and suitable sub-surface drainage installed to avoid water ponding on landscaped areas and landscape areas becoming water-logged
- soil and mulch from garden beds must be prevented from spreading to adjacent pavements or turfed areas
- plant selection must consider longevity, suitability for the site and climatic conditions, and extant landscape
- garden beds, trees and shrubs must not encroach on any roads, pavements or access paths including those used by emergency services vehicles.

Soils, composts, mulches, and potting mixes must comply with:

- *AS 3743 Potting mixes*
- *AS 4419 Soils for landscaping and garden use*
- *AS 4454 Compost, soil conditioners and mulches*

Services must be provided to landscaped areas to support potential learning opportunities. Consideration must be given to the functional requirements detailed in the *Education Facilities Design Principles and Generic Functional Brief* and suitable services installed e.g., water connection points for applied science learning, electrical and communication infrastructures for augmented hearing, etc.

### 12.1.1 Turfed areas

Areas of the site not required to fulfill the functional requirements detailed in the *project brief* must be turfed to support the broader recreational needs of students and to control and suppress dust. Where it is not considered practical to turf these additional areas of the site due to climatic or geotechnical conditions, approval must be sought from the department.

Turfed areas and the selection of turf must comply with the following requirements:

- Provide high-wear resistance for high-use areas.
- Ensure rapid recovery for high-use areas.
- Be tolerant to soil compaction based on anticipated use throughout the school year and be responsive to amelioration.
- Be a warm-season grass suited to the site's climatic conditions.
- Be drought tolerant.
- Minimises the use of any fertilisers.
- Be shade tolerant.
- Avoids the inclusion of any flowering species (such as clover) to minimise the attraction of bees.

Turf must not be used on slopes greater than 1 in 4 (25% gradient).

Soil and subgrades must be selected and/or improved to suit the turf selected and the climatic conditions and allow water infiltration and retention so that turf root systems can develop and establish.

Different species of turf should not be placed immediately adjacent to each other for ease of maintenance.

Where turfed areas are subject to vehicular traffic or are at risk of erosion, suitable reinforcement must be installed to stabilise the soil and subgrade while maintaining appropriate water infiltration and drainage.

Subject to the department's approval and the availability of a suitable non-potable water supply, these turfed areas or parts thereof may be irrigated.

Concrete mowing strips 200 mm to 300 mm wide are to be installed between turfed and vertical surfaces (i.e., immediately adjacent to the perimeter of buildings).

Edging is to be installed between mass planted areas and grassed areas to facilitate maintenance and contain mulch.

### 12.1.2 Sports playing fields

Sports playing fields must comply with the functional requirements and dimensions detailed in the *Education Facilities Design Principles and Generic Functional Brief* and the *Master Planning, Architectural and Landscape Design Principles*. Departures from these requirements and dimensions may be endorsed by the department in circumstances where an agreement has been entered into between the department and another government department, agency or third-party.

Sports playing fields and the selection of turf must comply with the following requirements:

- Be a warm-season sports turf suitable to the climatic conditions and extent and frequency of use. As a minimum the grasses selected should comply with the grasses used by the relevant local authority for community-use sports grounds.
- Be tolerant to soil compaction based on anticipated use and be responsive to amelioration.
- Be drought tolerant.
- Sub-surface drainage and soil profiles must provide a free-draining surface that is suitable for use one hour after a 20% annual exceedance probability rain event.
- The playing surface must have a Clegg Hammer GMax hardness rating of no greater than 100 GMax.
- The playing surface must have a minimum grade of 1:120 and a maximum grade of 1:80 and should have a two-way slope from a ridge running either diagonally, lengthways or width ways.
- Be free of rock and other deleterious materials that may cause injury.

- Provide an even playing surface free from trip hazards such as undulations, divots, bumps, and depressions.
- Playing surfaces must finish flush with adjacent surface levels.
- Where swales drains are used, all parts of the swale must be located outside of the run-off zone surrounding the playing field.
- Any communications, site drainage, electricity, gas, waste, or water service which passes under a sports field must be installed the greater of the depth required by the relevant act, regulation or standard or the depth needed to allow replacement and/or maintenance of the turf, turf sub-grade and sub-surface drainage.

Topsoil stripped from the site should be used in the construction of playing fields subject to the soil satisfying the above requirements. Fill from other sites must not be used without the department's prior approval.

Permanent pegging must be installed to identify the width, length and radii of ovals and running tracks and the corners of sports fields. Pegs must be 75 mm × 50 mm × 400 mm long and be driven 25 mm below the finished topsoil surface.

#### 12.1.2.1 Sports lighting

Lighting of sports playing fields may be approved by the department where an agreement has been entered into between the department and another government department, agency or third-party that includes community-use of the sports playing fields at night.

Sports lighting must comply with the following requirements:

- Mitigate the potential obtrusive effects of the lighting on nearby residents, users of adjacent roads and transport signalling systems and comply with *AS/NZS 4282 Control of the obtrusive effects of outdoor lighting.*
- Illuminance and uniformity must comply with *AS 2560.2.3 Sports lighting Part 2.3: Specific applications — Lighting for football (all codes)* for the level of play (recreational, training, amateur or professional) nominated by the department.

Lighting control systems must comply with the following requirements:

- Lights must be able to be remotely controlled.
- Secure local manual override control must be provided allowing schools and other authorised users to override the remote-control system.
- Feedback must be provided to the controller and include the contactor state and the state of manual override switches.

### 12.1.3 Artificial grass and synthetic carpet

Artificial grass or synthetic carpets may be used in small spaces and areas subject to high use, where grass is difficult to establish and maintain.

Artificial grasses and synthetic carpets must comply with the following requirements:

- Selection and installation must comply with *AS 3541.1 Synthetic sporting surfaces Part 1 — General principles.*
- Must not be installed on grades exceeding 1:1.
- A flat transitional pad a minimum of 300 mm wide must be provided between any pavement and a change in grade in the artificial grass or synthetic carpet.

- Where installed on soft landscape, a crushed rock base with a fine grain top layer must be installed to reduce impact forces and provide a well-drained surface. Grasses and carpets must be mechanically secured ensuring that the grass or carpet is held firmly in place and does not create a slip or trip hazard.
- Where installed on pavement, suitable cushioned underlays must be installed to reduce impact forces. Grasses and carpets must be secured using an adhesive that will not cause skin irritation once cured, retains the mechanical bond between the grass or carpet and the substrate, and ensures that the grass or carpet is held firmly in place and does not create a slip or trip hazard. Adhesives must be endorsed by the supplier of the artificial grass or synthetic carpet for use in the intended application and location. Suitable gradients must be provided to ensure rain does not settle or pond.
- Pile length between 19 mm and 35 mm with the length being selected to suit the intended use (e.g., sport or general-purpose use).
- Minimum pile density of 15750 stitches $m^2$
- Be filled with sand to stabilise and assist in holding the grass or carpet in place. Double washed sand free of silica dust must be used.
- Be non-flammable
- Be UV stabilised and retain its' structure and colour (subject to fair wear and tear) throughout the warranty period.

## 12.1.4 Mass garden beds

Mass garden beds must be planted with hardy evergreen and flowering perennial groundcovers, low bushes, plants, shrubs, and trees. Species that are drought tolerant or require minimal irrigation should be provided.

Areas subject to shade or low light levels should be planted with shade tolerant species. Areas subject to high exposure should be planted with full-sun species not adversely affected by climatic conditions.

Mass garden beds must comply with the following requirements:

- Garden beds must not be located against the perimeter of buildings, to mitigate termite risks and allow visual inspection of weepholes. A minimum separation of 300 mm is recommended between garden beds and buildings.
- The finished level of garden beds including any mulch cover must be minimum of 200 mm below the finished floor level of adjacent buildings.
- Plants must not obscure sight lines, with visual access being maintained between 700 mm and 2200 mm above ground level.
- Planting of groundcovers, climbers and shrubs must use 140 mm diameter pots.

Irrigation should be provided to massed garden beds using sub-surface drip-line systems that evenly distribute water over the entire garden bed.

### 12.1.4.1 Raised planter beds

Raised planter beds can assist in taking up level change, provide enclosure and provide better access to planting to students with disabilities.

Raised planter beds must comply with the following requirements:

- A minimum soil depth of 900 mm must be provided for trees.
- A minimum soil depth of 500 mm must be provided for understory species.

- The top of the planting media must finish flat and level with the top of the bounding edge of the planter bed.
- The combined height of the raised planter and the understory species must not to exceed 1000 mm high in areas occupied by students with limited supervision.

The design of raised planter beds must also consider Crime Prevention Through Environmental Design principles.

#### 12.1.4.2 Trellis planting

Trellis planting can provide visual softening to the built form, screen unsightly areas, act as a natural backdrop in confined areas, reduce glare and define/separate space.

Trellis plantings must comply with the following requirements:

- Trellis frames must be constructed from non-flammable materials.
- Trellis plantings must not create a path of travel for fire to spread between building levels and buildings.
- Trellis frames and cables must not be climbable. Horizontal footholds and handholds must be spaced a minimum of 2 m apart.
- Stainless steel cables, fixtures and fasteners must be used.
- Plant species must be selected to match the height and spread of the trellis.
- Trellis plantings and structures must not negatively impact internal daylight levels of occupied spaces.
- Sightlines must be maintained, and consideration given to Crime Prevention Through Environmental Design principles.

Irrigation should be provided to trellis plantings using sub-surface drip-line systems that evenly distribute water over plant root zones.

### 12.1.5 Sensory gardens

Sensory gardens must stimulate students' five senses in a safe, accessible environment. They should incorporate plants, shade and accessible circulation routes that give students the opportunity to safely interact and engage with the setting by:

- seeing, touching, and smelling the planting
- listening to wind, water, birds, insects, and other natural-environment noises
- watching the passage of sunlight over planting and through leaf canopies
- allowing the harvesting of plant foliage, flowers, and fruit as part of the learning experience.

Sensory gardens should comprise plants that are drought-resistant, where possible.

Irrigation should be provided to sensory garden beds using sub-surface drip-line systems that evenly distribute water over the entire garden.

Aromatic plants should be used in sensory gardens and throughout the landscape to allow users with visual impairment to identify different locations throughout the site.

## 12.1.6 Irrigation systems

### 12.1.6.1 General

Appropriate water reticulation should be provided to enable maintenance of grassed and gardened areas. Systems should be carefully chosen using expert advice where appropriate.

Where available, irrigation water must be sourced from mains-supplied recycled water.

At sites where recycled water is not available, irrigation water may be from water harvested from site surfaces such as roofs and impermeable pavements or other sustainable sources. Where rainwater is collected from impermeable pavements or other surfaces where there is risk of contamination, this rainwater must not be used for toilet flushing or spray irrigation.

Proposals to use harvested rainwater for irrigation must include analysis of volumes captured (based on Bureau of Meteorology data for the nearest weather station) during those periods when irrigation will be required, the volume and frequency of irrigation, and proposed storage volumes.

To maintain turf areas during times of drought, irrigation water may need to be supplemented by mains supply when harvested rainwater is exhausted (subject to water restrictions).

Where irrigation systems are using multiple water supplies (harvested rainwater, recycled water and/or potable water) back-flow prevention devices must be installed to prevent cross contamination.

### 12.1.6.2 Sports playing fields

Sports playing fields should be irrigated subject to the availability of recycled water and any restrictions imposed by the relevant authority on the use of potable water for irrigation purposes.

The use of harvested rainwater for the irrigation of sports playing fields is not considered viable due to the significant volumes of water consumed. Proposals to use harvested rainwater for the irrigation of sports playing fields must include analysis of volumes captured (based on Bureau of Meteorology data for the nearest weather station) during those periods when irrigation will be required, the volume and frequency of irrigation, and proposed storage volumes.

Where there are insufficient water pressures and flows, storage tanks and pumps must be provided. The tanks and pumps must be sized to match irrigation volumes and frequencies and the irrigation system being installed.

Irrigation systems must comply with the following requirements:

- Systems must irrigate and provide uniform coverage over the entire sports playing field inclusive of all run-off zones.
- Valves and controllers must not be in the sports playing field or the run-off zones.
- Where in-ground irrigation systems are installed, pop-up sprinklers must not create an injury or trip hazard when retracted.
- Where self-propelled irrigators are proposed, sufficient water connection points must be provided allowing the entire sports playing field inclusive of all run-off zones to be irrigated.

Irrigation control systems for sports playing fields must comply with the following requirements:

- Irrigation must be able to be remotely controlled.
- Secure local manual override control must be provided allowing schools and other authorised users to override the remote control system.
- Feedback must be provided to the controller and include the state of manual override switches.

### 12.1.7 Plant selection

Plant selection must comply with the following requirements:

- Annual, biannual, and herbaceous perennial species should not be used due to the need for constant replacement.
- Declared weed species, plants that cause irritation or contain allergens, and plants that are toxic or poisonous must not be planted.
- Plants with sharp spines or projections, that tend to shed limbs, that drop flowers, seeds, or fruit likely to cause slip hazards on pathways, or that are wind pollinated should be avoided.
- The use of plants that attract stinging insects must be avoided in external gathering areas and areas frequently used by students.
- Highly flammable plants, particularly those planted adjacent to buildings must be avoided.
- Selection must minimise the risk of root systems penetrating drainage systems.
- Plants must be selected to suit the local soil types and climatic conditions.

The following species must not be planted in Queensland education settings:

- eucalyptus botryoides — mahogany gum
- eucalyptus camaldulensis — river red gum
- eucalyptus cladocalyx — sugar gum
- eucalyptus mannifera — white brittle gum
- eucalyptus viminalis — manna gum (ribbon gum)
- fraxinus species — some ashes
- hedera helix —English ivy
- kalmia latifolia — kalmia
- laburnum species — golden rain tree
- lantana species — lantana
- ligustrum vulgare — common privet
- melia azedarach — white cedar
- myoporum insulare — boobialla
- nerium species — oleander
- populus species — poplars
- prunus laurocerasus — cherry laurel
- rhododendron ponticum — common rhododendron
- salix babylonica — weeping willow
- ulmus procera — English elm
- wisteria sinensis — wisteria
- any tall forest tree species with a mature height exceeding 25 m in cultivation
- restricted invasive plants shall not be planted. Refer to: https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/biosecurity/plants/invasive/restricted

**Landscaping in bushfire-prone areas**

Bushfires are a reality of the Australian landscape.

Site landscapes must be designed and managed to reduce the impacts and risks associated with bushfires:

- Avoid plants that produce fine fuel which is easily ignited.
- Do not use fines mulches or similar combustible mulches.
- Avoid trees with ribbon bark, open crowns, fine leaves or high oil content. Select fire resistant or evergreen species that do not dry out during bushfire seasons.
- Create horizontal and vertical breaks in the landscape and tree understoreys to inhibit the spread of fire. Where a wildlife corridor is proposed these should be designed to maintain the corridor intent while minimising bushfire risk.

Plants which grow to a height greater than four metres should not be planted closer than ten metres from any building or structure.

### 12.1.8 Wetlands

Wetlands may be provided:

- as a managed natural environment, for use as an educational resource
- as a retention basin for the capture of stormwater and reuse in landscape irrigation
- for stormwater detention and controlled release to the legal point of discharge.

Where the wetlands are intended as an educational resource, they must comply with the functional requirements detailed in the *Room data sheets*

Wetlands must comply with the following requirements:

- Comply with and be endorsed by the relevant authority.
- Be designed and constructed to not adversely impact buildings and structures.
- Plant species selection must exclude declared nuisance weeds and be complimentary to native wetland species relevant to the site.
- Be designed and constructed to facilitate safe routine maintenance and cleaning.
- Be securely fenced and signposted.

Where wetlands are adjacent to sports fields, screening should be provided so that balls do not land inside the wetland compound.

Where wetlands are a continuation of a wetland system outside of the site:

- the wetland system must be protected/buffered from direct untreated site runoff
- the wetland must not have a detrimental impact on flow downstream of the site
- the soil profile of the wetland must match the soil profiles of up and down stream wetlands.

## 12.2 Shade

Shaded areas must:

- provide a combination of built and natural shade to protect students and staff, particularly when UV radiation reaches damaging levels (3 and above)
- consider patterns of use (time, duration, and level of use), activity types, daily and seasonal movements of the sun, safety, structures, wind-loads, access and maintenance
- provide inviting spaces that students will want to use.

Shade should be designed to offer the greatest protection during peak UV radiation times and peak periods of use.

Further guidance on the provision of shade is provided in the SunSmart Shade Guidelines[4].

### 12.2.1 Natural shade and trees

Natural shade should be a major element of shade provision within a school.

Natural shade should be provided around high-use areas (such as lunch and passive play areas) and must consider the location of the sun and the time of day that the external space will be used.

Trees should not be planted that will encroach on sports playing fields, cast shadows that will affect the sports being played or affect the growth and health of sports turf.

Where possible, all existing, suitable trees should be retained. Existing trees that represent a safety risk must be identified and appropriate strategies implemented to mitigate the risk e.g., trees that are prone to dropping limbs should be removed or, if retained, the fall zone should be fenced off.

During construction, existing trees must be protected in accordance with *AS 4970 Protection of trees on development sites*.

Where trees are removed, they should be replaced by new trees to balance out canopy loss. The total canopy cover provided by new trees should match or exceed the canopy loss after five years of trees being removed.

Trees must comply with the following requirements:

- Trees must be planted so that the canopy at maturity is no less than 2 m from the eaves of buildings, shade structures and play structures; with the trunk not being closer than 1.5 times the mature tree height from any building sub-structure.
- Plants must not obscure sight lines, with visual access being maintained between 700 mm and 2200 mm above ground level.
- Trees must not encroach on any roads, pavements or access paths including those used by emergency services vehicles.
- In cyclone-prone areas, the retention of existing or the planting of new large trees close to buildings must be avoided due to the potential damage that can occur from falling branches and trees.
- Advanced species must be planted. The minimum size at time of planting is 100 litres for feature of large trees and 45 litres for small trees.

The selection of tree species must comply with the requirements detailed in Section 12.1.7 *Plant selection.*

[4] https://www.sunsmart.com.au/downloads/resources/booklets/shade-guidelines.pdf

Trees that have broad canopies and dense foliage should be planted to maximise the shade being provided. Where appropriate, deciduous trees that permit winter sun should be planted.

Tree species with invasive root systems must not be planted near buildings or structures where there is risk that the sub-structures and foundations will be impacted. Where an existing tree with an invasive root system is being retained, adequate root barrier protection must be provided to affected buildings and structures.

### 12.2.2 Built shade

Built shade should be provided to compensate for the lack of natural shade and delays in the provision of natural shade as trees mature. Consideration must be given to initial and final natural shade cover in the design of built shade.

Built shade must comply with the following requirements:

- Be located with due cognisance of existing services, such as drainage, power lines, gas and water.
- Withstand a variety of weather conditions and wind loadings as per the National Construction Code.
- Provide a minimum solar exclusion of 90%. For shade structures using a knitted or woven shade fabric, fabrics must have a shade factor of 90% measured and tested in accordance with *AS 4174 Knitted and woven shade fabrics.*
- Have a minimum clearance height of 3 m in height.
- Not impede the vision of supervisors,
- Include supports that are clearly visible, with rounded edges and/or padding and placed to minimise risk of collision.
- The use of cables and guy ropes must be avoided. Where required, these must be in garden areas and be provided with marking and padded protection.
- Include vertical supports that are not scalable and that do not make fences scalable.
- Minimise thermal transfer to the area being shaded to no greater than 70% heat transmission.
- Be non-flammable.
- Resistant to hail up to 25 mm.
- Designed to accommodate expected wind conditions.
- Use barriers or fabrics which are readily available should replacement be required.
- Use tamper-proof fittings and fixtures.

The design of shade structures and the surrounding landscape must reduce indirect UV radiation by:

- avoiding surfaces that are highly reflective
- ensuring that shade structures are adequately sized
- using a combination of overhead and side shade barriers
- using soft landscaping in combination with the shade structure.

Built shade must comply with and be installed in accordance with the following Australian Standards:

- *AS 4685.1 Playground equipment — General safety requirements and test methods.*
- *AS 4174 Knitted and woven shade fabrics.*

#### 12.2.2.1 Heat island effect

To reduce the heat island effect, shade structure:

- roofs pitched <15° must achieve a minimum three-year solar reflective index (SRI) of 64
- roofs pitched >15° must achieve a minimum three-year SRI of 34.

In circumstances where a three-year SRI is not guaranteed by a manufacturer, shade structure:

- roofs pitched <15° must achieve a minimum initial SRI of 82

## 12.3 Hard landscaping

### 12.3.1 Heat island effect

Unshaded landscaping pavements must achieve a minimum three-year solar reflectance index (SRI) of 34 or a minimum initial SRI of 39.

### 12.3.2 Multi-purpose courts

Where the construction of multipurpose courts as hard courts is endorsed by the department they must comply with the following requirements:

- The design and construction of the hard courts must comply with *AS 3727.1 Pavements Part 1: Residential.*
- Constructed of asphalt or concrete (selected to suit the site's geotechnical conditions) with a 100% acrylic latex coating and an effective and durable edge restraint. The edge restraint must extend for the full depth of the pavement, including the base course.
- The edge restraint must be set flush with the surface of the hard-court.
- The hard court must be bounded by a subsoil drainage system that will isolate the hard-court foundation material from subsoil seepage and the effects of seasonal ground movement.
- The surface finish must direct stormwater run-off to the edges of the paved area without affecting the court's function.
- The requirements detailed in Section 6.2.4 *Hard courts*.

Hard courts are to be marked in accordance with the guidelines published by the relevant sport's governing body.

Basketball and netball fittings must be provided, and sleeves should be supplied for any other types of posts. All post holes must be installed with a flush lid to cover the hole when posts are removed.

### 12.3.3 Fencing

Fencing must be used to define the school site and identify the boundaries and areas where outsiders are not permitted.

Fencing and associated gates must be fit-for-purpose, robust, durable, and be able to withstand climbing.

Security and the type of fencing installed must consider the topography of the site, adjacent land uses and Crime Prevention Through Environmental Design principles.

Dark colour fences should be used to prevent glare and improve the visual connection between the interior and exterior of the site.

Table 13 identifies the types of fencing to be installed. Further detail regarding the specific requirements for Security Fence types is provided in the *Specification for Security Fencing in State Schools*[5].

A concrete mowing strip must be provided below or on each side of all fencing panels.

***Table 13.*** **Fence types**

| Area | Requirement |
|---|---|
| Perimeter fencing: Main street frontage | • Type 1 security fence<br>• Type 2 security fence (large sites in rural areas)<br>• Lockable gates at each point of pedestrian, cyclist and vehicle entry |
| Perimeter fencing: Rear and side street frontages | • Type 2 security fence<br>• Lockable gates at each point of pedestrian, cyclist and vehicle entry |
| Perimeter fencing: Not visible to the public<br>Fencing of high-risk areas: Creeks, dams, flood risk gullies, retention basins, etc.<br>Agricultural areas | • Type 3 security fence<br>• Lockable gates at each point of pedestrian, cyclist and vehicle entry |
| Play areas for students of all abilities | • Palisade fencing<br>• Minimum height 1800 mm<br>• Set back from street alignments<br>• Screened by planting |
| Sports playing fields: Ball drop-zones within 10 m of a site boundary | • Chain mesh fencing<br>• Minimum height 6000 mm<br>• Located outside of the run-off area |
| Hard courts | • Chain mesh fencing<br>• Minimum height 3600 mm<br>• Located outside of the run-off area |
| Car parks located within site boundaries | • Only provided where adjacent to an activity area or accessible to students<br>• Palisade or chain mesh fencing with a flat top<br>• Minimum height 1200 mm |
| School bus parking for students with high needs | • Palisade or chain mesh fencing with a flat top<br>• Minimum height 1800 mm |
| Pool fencing | • Conform to *AS 1926.1 Swimming pool safety Part 1: Safety barriers for swimming pools*<br>• Latches and controls must be operable by students and staff with a disability |
| Immediate change in levels greater than 900 mm | • Palisade fencing with a flat top<br>• Minimum height 1200 mm |

[5] https://qed.qld.gov.au/our-publications/standards/Documents/design/fencing-specification.pdf

In addition to any gate requirements set out in the *Specification for Security Fencing in State Schools* for Type 1–3 security fences, gates must comply with the following requirements:

- Pedestrian, cyclist, and vehicle access gates must open inwardly with an opening width matched to the pavement width.
- Sliding gates must only be installed where the terrain does not allow for inwardly opening swing gates. Where sliding gates are not appropriate, outwardly opening swing gates may be installed subject to the gates in the opened position not encroaching into any area outside of the property boundary or any footpath or roadway.
- All gates must be fitted with latches and/or pad bolts which allow the gates to be secured using a padlock keyed to the site's master keying system.

### 12.3.4 Pathways

Pathways and the interconnectivity between buildings, outdoor learning areas, car parks, sports playing fields, multipurpose courts, playgrounds, etc. must comply with the higher requirements of:

- the functional requirements and dimensions detailed in the *Master Planning, Architectural and Landscape Design Principles*.
- *AS 1428 Design for access and mobility Parts 1 and 2*.

Designs must also address the spirit and intent of the *Disability Discrimination Act 1992* (Cth).

The alignment and configuration of paths must account for natural desire lines and must mitigate pedestrian traffic across landscaped and turfed areas.

Paths must be free of obstructions such as plant and equipment.

The design and construction of pavements must comply with Section 6.2.3 *Pedestrian footpaths.*

## 12.4 External equipment

### 12.4.1 Seating

Formal and informal seating must be provided to encourage and facilitate social interaction outdoors. Seating configurations must consider vistas and shade, the ages of users, and their benefit in terms of social development and interaction. Seating must be configured to accommodate people with disabilities and their mobility aids.

Seating must be provided based on 100 mm per student and the long-term enrolment approved by the department.

Seating should be provided for a variety of group sizes.

Small group seating areas should be provided for primary students for storytelling, outside eating and quiet activities. These should be pleasant areas with winter sun and summer shade. Ideally, these should be separated from busy parts of the play area.

Seating should not be in high-risk locations such as adjacent to protective fencing, near or adjacent to the top of retaining walls, etc.

Seating heights must suit the age of students. Recommended heights are:

- 350 mm for Year P–6 students
- 450 mm for Year 7–12 students.

Seating must be shaded between 9:00 am and 3:00 pm by natural or built shade.

Seating materials and finishes must minimise heat gain and heat transference to users.

Seat support frames should be embedded in a concrete footing, in preference to being bolted or bracketed to a foundation or pavement.

All seat fasteners and fixtures must be tamperproof.

Informal seating or ‘perching’ spaces for staff and students should be created on the edge of low decks, on sleeper-style timbers, and on low retaining walls.

### 12.4.2 Play

All playground equipment must comply with and be installed in accordance with the relevant Australian Standards, including *AS 4685 Playground equipment and surfacing — Development, installation, inspection, maintenance and operation*.

Play equipment and play areas must offer students opportunities for socialising, for adventurous and creative play, and for encounters with challenging tasks and activities that develop and enhance courage, self-belief, physical strength and dexterity, cognitive development, balance, sensory and motor skills, and similar capabilities.

The selection and configuration of play equipment must:

- encourage and support active, cooperative, and adventurous play, creative discovery and development of physical strength, balance and coordination
- promote accessibility and inclusiveness by providing multiple play options for all students, regardless of their individual circumstances.

Play equipment must not include:

- flying foxes
- merry-go-rounds or roundabouts
- seesaws
- swings (except for swings that are enclosed and enables a wheelchair to swing from its frame or which specifically cater for students with limited mobility).

Playground equipment must comply with the following requirements:

- Apparatus must be fixed unless specifically designed to be portable.
- Segregated into age specific groupings, with the design of the playground equipment tailored to the needs of each age group.
- Spaced to provide safe separation between items of equipment and clear travel paths to and around access points.
- Be located a sufficient distance from any building, shed or structure to mitigate the risk of someone climbing from the play equipment onto a roof or other structure.
- Covered to provide appropriate protection from the sun and inclement weather. The bottom edge of shade sails must be a minimum of 1.5 m above the highest accessible point of the play equipment.
- A double hose cock must be installed adjacent to playground.

Play equipment must be considered within the context of the whole site, including the provision of other locations for organised and free play and sports and activities.

Buildings, pavements, and landscape should be used to supplement the role traditional play equipment has in encouraging physical activity and recreational learning. Consideration should be given to:

- lines or targets installed on the sides of buildings for ball games
- coloured pavement markings for multiple uses in the same space (e.g., hopscotch, handball, etc.)
- landscapes activated through simple equipment, paths, or panels suggesting exploratory activities.

#### 12.4.2.1 Soft fall

Soft fall must be provided to all playground equipment and must comply with and be installed in accordance with the relevant Australian Standards, including *AS 4685 Playground equipment and surfacing — Development, installation, inspection, maintenance and operation*. This includes any fitness equipment or similar apparatus with a fall height over 500 mm.

Soft fall must comply with the following requirements:

- Soft fall must consider the needs of users of all abilities with accessible circulation paths being provided through and around play spaces.
- Soft fall must be constrained by edging which finishes flush with surrounding surfaces.
- The selection of soft fall must consider the maintenance required to maintain compliance with *AS 4685*, including the availability of loose soft fall required maintain the required soft fall depth, the availability of replacement modular soft fall mats and the repair of permanent wet-pour soft fall.
- The depth of loose soft fall must exceed the minimum required by *AS 4685* by at least 50 mm to allow for day-to-day disturbance.
- Loose soft fall must be separated from other sources of soft fall or garden mulches to avoid mixing that may affect impact ratings.
- Loose soft fall should not be located closer than 5 m from any building entry to avoid soft fall being tracked into buildings.
- Modular soft fall mats must be anchored or fixed to a substrate to prevent movement during use.
- Permanent wet-pour and modular soft fall mats must provide minimal heat gain and heat transference to users.

#### 12.4.2.2 Sandpits

Sandpits should be provided as part of the play opportunities for primary aged students.

Sandpits must comply with the following requirements:

- Accessible to users restricted to wheelchairs and allow for equipment and fixtures to enable inclusive engagement.
- Level paved access from at least one side.
- Protected from wind gusts.
- Minimum sand depth of 400 mm.
- Contain an approved sand with a uniform particle size less than 1.5 mm, double-washed and free of silica dust, and which moulds together when damp.
- Covered to protect the sand outside of school hours. Covers must be able to be fixed or tied down from all sides to prevent children from entering the sandpit with the cover on, breathable to facilitate air exchange and minimize moisture build up, cut and puncture resistant, and non-flammable.

#### 12.4.2.3 Drainage

Sub-surface drainage must be provided under soft fall and sand pits to ensure play areas do not become waterlogged and unusable. Stormwater drainage systems and overland flow paths must be designed to divert stormwater around and away from play equipment and sand pits.

Drainage pits and any other service pits must not be installed within the fall-zone of any play equipment or any sand pit.

# 13.0 Mechanical services

Mechanical services, including heating, ventilation, cooling, extraction systems, etc., must be provided to all permanent buildings and community-use facilities.

## 13.1 General requirements

The services must deliver user comfort and address the functional requirements detailed in the *Room data sheets*

Mechanical services must consider the microclimate of the site, the building forms and orientation of spaces, the thermal performance characteristics of the buildings, the occupancy trends, restrictions on pollutant emissions, occupancy, equipment heat gains, and all other factors impacting the design and installation of mechanical services.

Mechanical services must comply with the following requirements:

- Adequate space must be provided for mechanical services' plant and equipment. Access and clearances must as a minimum comply with those recommended by the manufacturer or supplier.
- Plant and equipment must not encroach on, reduce or in any way affect any functional area.
- Mechanical services' plant and equipment including associated electrical isolators must be appropriately protected and only permit access by authorised personnel.
- Appropriate controls must be provided that are easy to use, allow connection to a broader central building management and control system, and that are easy to or automatically reset in the event of a power failure.
- Noise produced by mechanical services' plant and equipment must not cause noise limits applicable to teaching, learning and administration areas, neighbours, and the local community to be exceeded. Appropriate acoustic insulation must be provided to ensure the applicable noise limits specified in Section 5.3 *Internal acoustic performance* are not exceeded.
- The provision of air-conditioning or evaporative cooling must not preclude the use of natural ventilation when this can effectively maintain thermal comfort conditions.
- The provision of natural ventilation only must not preclude the future installation of air-conditioning or evaporative cooling should the requirements of a teaching space or the needs of users change.
- Systems controlling the operation of heating, cooling and ventilation systems must permit local user temporary over-ride of controlled systems for out of hours use. Consideration must be given to providing local control for adjustment to individual spaces specifically designated for use by students of high needs where the ability to regulate the temperature within the space is critical.
- Installed mechanical services must be zoned to support out-of-hours use of individual buildings and individual parts of buildings.
- Electrical supply to mechanical plant must be via separate circuits and circuit breakers. In the event of a power failure, after reinstatement of power, all equipment must automatically return to its operational state prior to failure.
- Labelling and markings must be provided to all mechanical equipment including associated electrical isolators.
- Plant equipment and their power supplies must be installed in locations with suitable protection to seasonal weather events including installation above 1% AEP flood levels, condensers fitted with hail guards, etc.
- Concrete plinths must be provided for floor mounted external equipment.

The mechanical services must cater for the immediate and future needs. Allowances must be provided for mechanical services to be expanded or augmented in the future as demands, needs and the uses of spaces change:

- Spatial considerations including location, noise, and screening.
- Pipework reticulation.
- Structural considerations including supports and penetrations.
- Electrical supply.
- Hydraulic drainage.

Mechanical services must be supplied via separate circuits and circuit breakers. In the event of a power failure, after reinstatement of power, all equipment must automatically return to its operational state prior to failure.

## 13.2 Sustainability

### 13.2.1 Demand-based control

Air conditioning and ventilation systems must be designed to meet the heating and cooling needs of the space when utilised at the intended maximum demand. During periods where the usage and demand is less than the intended maximum, demand-based control must be used to reduce the air conditioning and ventilation provisions to conserve energy.

Demand based control must be provided to the following areas:

- Outside air introduced as part of an air conditioning system to variable occupancy areas that also have a high occupant to floor area ratio, must be capable of being modulated in response to actual occupancy. Areas that must be provided with outside air modulation include assembly areas, performing art centres, and spaces of a similar nature.
- Air conditioning and ventilation systems provided to transient and low usage areas must be capable of being switched off automatically, if no occupant is detected within the space for a set period. The air conditioning and ventilation system must immediately return to normal operation once occupants are detected within the space.

### 13.2.2 Energy reclaim

Air-conditioned spaces that require high volumes exhaust or spill air must be provided with an energy reclaim system. The energy reclaim system must precondition the outdoor air to minimise air conditioning load on the associated air conditioning system to conserve energy.

Energy reclaim must be provided to the following areas:

- performing arts centres
- indoor hydrotherapy pools
- assembly halls.

# 13.3 Design day temperatures

## 13.3.1 Design day external temperatures

Local external temperatures must be used as the basis of sizing heating (winter design day) and cooling (summer design day). The winter and summer design day external temperatures define a temperature range which is expected to be exceeded for only a small proportion of the year.

When determining the design capacity of any air conditioning, heating, cooling or ventilation system, the design day external temperatures listed in Table 14 for a representative geographic location in the Australian Institute of Refrigeration Air-Conditioning and Heating Design Application Manual 09 Air Conditioning Load Estimation applicable to the site must be used.

***Table 14.*** **Design day external temperature**

| Area | External temperature |
|---|---|
| All areas (with the exception of network centres) | AIRAH DA09 comfort data set |
| Network centres | AIRAH DA09 critical data set |

## 13.3.2 Design day internal temperatures

Air conditioning, heating, cooling and ventilation systems must achieve the temperatures listed in Table 15 based on the design day external temperatures listed in Table 14.

***Table 15.*** **Design day internal temperatures**

| Space type | Winter (°C) | Summer (Maximum °C) |
|---|---|---|
| Communications and network centre | <21 | 24 |
| General learning areas | 23 | 24 |
| Staff and administrative areas | 21 | 26 |
| Libraries and learning resource centres | 21 | 24 |
| Food technology, canteen and hospitality areas | 21 | 26 |
| Performing arts auditorium | 21 | 24 |
| Change rooms | 18 | 26 |
| All other occupied areas | 21 | 26 |
| Physical education spaces, gymnasiums and multi-purpose halls | — | 26 |
| Special developmental schools and facilities specifically denoted for use by students with disabilities or high needs | 23 | 24 |

Design day internal temperature is measured as the air temperature in each thermal zone of a building where the temperature is controlled by one thermostat.

When external temperatures exceed the design day external temperature for summer, the design day internal temperature for the relevant area listed in Table 15 may exceed the required design day internal temperature in Table 15 based on the following formula:

*Maximum permitted internal temperature*

*= Design day internal temperature + Actual external temperature – Design day external temperature*

The maximum permitted internal temperature does not apply to server rooms, special developmental schools and facilities specifically denoted for use by students with disabilities or high needs which must always achieve the temperatures set out in Table 15.

## 13.4 Heating

Heating must be provided to achieve the design day internal temperatures listed in Table 15 and maintain even temperatures within each space or zone. The most suitable heating system for a space or zone, considering the nature of the space or zone and its intended use, must be installed.

Where direct expansion or variable refrigerant systems are installed, reverse cycle functionality must be used for heating purposes. Where heating is not required, the heating functionality of the air conditioning system must be disabled.

Heating systems must comply with the following requirements:

- Systems must be robust, durable, highly efficient, and easy to maintain.
- Systems must be zoned to ensure efficient and effective operation. Zoning must also permit spaces used out of hours to be isolated and remain operational during these times.
- Systems must have a minimum 4.5-star energy rating or better.
- Surface temperatures of heat emitters and associated pipework must be safe and not cause injury when in contact with exposed skin.
- Winter temperature variations must be less than 2 °C within the physically occupied space or zone.
- Excessive vertical temperature gradients must not be created and the temperature difference 2 m above finished floor level must not exceed 3 °C.
- Systems must be secure, not complex in operation, flexible enough to achieve multi-functional use without loss of energy efficiency and the use of complex control and operating systems.
- Routing of heating or natural gas pipes must be visually satisfactory.
- Heating or natural gas pipes must be routed such that major disruption to users is avoided during minor system failures or routine maintenance.
- Access to the piped services for maintenance and repair must be available without major disruption to the building structure. Piped water or gas main service routes must avoid rooms or areas where leaks would disrupt a school's operations.

### 13.4.1 Heating system controls

Heating system controls must comply with the following requirements:

- Control systems must have a centralised master clock to ensure after hours switch off as well as local controls allowing variations to suit local conditions.
- Thermostat settings must be adjustable, and the thermostat located in a representative area not affected by direct sun, draughts, proximity to heating or cooling sources, etc.
- Heater controls must be robust, tamperproof, and accessible only by authorised staff.
- Heating controls must consider climatic conditions and for centralised and hydronic systems an allowance for early morning warm up to modulate temperature according to space conditions must be included.

- Control system reset must be a simple procedure after a power failure.
- Heating controls must be easy to use by untrained school staff, reliable and as far as possible automatic.

Heating controls and thermostats must be set to maintain internal temperatures at the winter temperatures listed in Table 15.

## 13.5 Cooling

Comfort air conditioning must be provided to:

- all learning spaces used by students, staff work rooms, administration areas and any other space, room or building designated by the department
- network centres and cupboards whose sole function is to house computer servers, communication racks and associated active data equipment
- buildings designated as community bushfire refuges
- relocatable buildings used for the above purposes.

Plant and equipment providing comfort air conditioning must continue operating without shutting down up to an external temperature of 45 °C. Air conditioning to server rooms, special developmental schools and facilities specifically denoted for use by students with disabilities or high needs, must continue to operate when external temperatures exceed 45 °C.

Air conditioning systems must comply with the following requirements:

- Systems must be robust, durable, highly efficient, and easy to maintain.
- Systems must be zoned to ensure efficient and effective operation. Zoning must also permit spaces used out-of-hours to be isolated and remain operational during these times.
- Systems must be from a reputable brand manufacturer pre-approved under the QBuild supplier panel with a well-established local service and parts network.
- Systems must not be reliant upon pumped condensate drains.
- Systems must be capable of maintaining operation at external temperatures 5 °C above the design temperatures (summer) and at external temperatures 5 °C below the design temperatures (winter) listed in Table 15.

The location of outdoor condenser units must consider the noise generated by the units and the impact this has on building users and neighbours, visibility, clear air paths, minimisation of air recycling, occupational health and safety and potential vandalism. Where possible, sun protection must be provided to ensure the efficient operation of outdoor units.

The placement of condenser units on roofs must be avoided, where possible, to mitigate the occupational health and safety risks when maintenance is required and to lessen the visual impact of mechanical plant.

## 13.5.1 System selection

Cooling systems must be selected considering environmental conditions, the nature and use of the space to be cooled and energy efficiency.

### 13.5.1.1 Air conditioning systems

Air conditioning systems must be installed complete with replaceable filters and insulation sufficient to prevent condensation in all operating conditions.

Air conditioning systems must comply with the following requirements:

- Units must be able to achieve the design conditions specified in Table 14 at an external ambient temperature of 40 °C.
- Systems must be capable of operating continuously at 45 °C and full solar load without excessive head pressure or unstable operation.
- Systems must be capable of operating continuously at the ambient external temperatures listed in Table 15 without excessive head pressure, unstable operation, or icing.
- Must have hermetically sealed rotary compressors with reverse-cycle capability and an automatic de-icing cycle.
- Anti-vibration mounts must be provided under all outdoor units.
- Exposed external wiring and refrigerant pipework must be protected from weather by Colorbond steel metal top hat sections.
- Each conditioned space or zone must be provided with a temperature sensor for the purpose of monitoring temperatures. Temperature sensors must be in representative locations for the space or zone monitored and be free from confounding influences such as direct sun, conduction through external walls, local heating or cooling sources, etc.
- Installed with replaceable filters and insulation sufficient to prevent condensation in all operating conditions.
- All printed circuit boards in electrical and control panels must be treated to prevent damage from vermin.
- Condensers installed north of Cairns or within 200 m of a coast must have ex-factory corrosion inhibitor coatings to all metal unit casings, coils, and fans.

Noise generated by room or packaged plant systems in internal building spaces and rooms must not cause the limits specified in Section 5.3 *Internal acoustic performance* to be exceeded.

## 13.5.2 ICT air conditioning

Air conditioning must be provided to network centres and cupboards whose sole function is to house computer servers, communication racks and associated active data equipment.

Air conditioning of these spaces must comply with the following requirements:

- A standalone system must be provided to each room or space.
- Wall-mounted split air-conditioning units or similar must be provided.
- Systems must have a capacity to function continuously, regardless of actual external temperatures.

### 13.5.3 Cooling systems controls

Cooling system controls must comply with the following requirements:

- Control systems must have a centralised master clock to ensure after hours switch off as well as local controls allowing variations to suit local conditions.
- Thermostat settings must be adjustable, and the thermostat located in a representative area not affected by direct sun, draughts, proximity to heating or cooling sources, etc.
- Controls must be robust, tamperproof, and accessible only by authorised staff.
- Cooling controls must be easy to use by untrained school staff, reliable and as far as possible automatic.
- On-board controls must be able to allow inputs and outputs to third-party control panels without warranties being compromised.
- A single control point must simultaneously operate all associated air conditioning units serving a common area or zone.
- Local control adjustment of thermostat and operational modes must be able to be restricted.

Cooling controls and thermostats must be set to maintain internal temperatures at the temperatures listed in Table 15.

## 13.6 Ventilation

Natural ventilation must be provided throughout all buildings where the external air quality is of an acceptable standard.

Where necessary, natural ventilation systems should be supported by mechanical ventilation and extraction systems to achieve required air quality. Mechanical ventilation should be provided to areas:

- that do not meet the requirements of natural ventilation
- that generate airborne odour or particulate contaminants, and may include amenities, food preparation, workshops, and similar specialist rooms
- where outside environmental factors such as noise, dust or odours would limit the ability to rely upon natural ventilation.

Outside air intakes for natural and mechanical ventilation systems must be:

- located to avoid proximity to obnoxious vents and exhausts, loading areas, vehicle exhausts, heating exhausts, and fume discharges
- arranged to minimise the risk of air recirculation under prevailing wind conditions
- screened to prevent the entry of insects of animals.

### 13.6.1 Natural ventilation

Natural ventilation solutions must comply with the following requirements:

- Habitable rooms must have minimum natural ventilation openings equivalent to at least 10% of the floor area being ventilated.
- Openings should be located to promote crossflow and stack effect ventilation. Buildings should include limited areas of higher volumes to act as hot-air drains.
- Appropriate and easy to operate mechanisms must be provided at low level for high window openings.
- Out of hours operated ventilation openings must be secure against vermin and unauthorised access.

- Ventilation air speeds must not cause disturbance to normal activities in functional areas.
- Consideration must be given to seasonal use of natural ventilation to ensure that heating and cooling loads are not increased.

The design of natural ventilation systems must minimise the entry of dust and other pollutants into buildings

Non-habitable rooms such as stores should have permanently open, fixed, weather-proof louvres installed.

### 13.6.2 Mechanical ventilation

Mechanical ventilation must be provided to ensure that airflow rates and ventilation complies with the relevant regulations and Australian Standards. Ventilation must also be provided to all chemical and flammable stores to ensure compliance with the *Dangerous Goods Safety Management Act 2001*.

Mechanical ventilation systems and exhaust fans must comply with the following requirements:

- Extraction systems must be designed with a spare capacity of 10%.
- Fans are located with regard to adequate security, maintenance access and acoustic performance.
- Extraction fans should be operated using variable speed controllers.
- All components must be corrosion and weather-resistant.
- Fans must statically and dynamically balanced.
- Direct drives, in lieu of belt drives, must be used where possible.
- Motors must be rated to a minimum of IP54.
- Phase failure, over and under-voltage protection relays, auto reset must be provided to fans with a three-phase power supply.
- Designed to limit internal room temperatures to within 3°C above ambient external temperatures.
- Fans must be effectively sealed off when not in use to eliminate unwanted infiltration and exfiltration, where the fan serves a conditioned space.

Systems must be localised with minimum ducting and local exhaust louvres. Extraction ducting from one teaching space or habitable room through adjacent teaching spaces or habitable rooms should be avoided.

All ducting must be formed and installed neatly and, where exposed, must be coordinated to achieve a consistent and aesthetically acceptable outcome.

Permanent vents must be provided independent of the window systems in all areas.

Extract ventilation must be via wall or ceiling grills. Floor grilles or low-level door transfer grilles must not be used, where make up air is required to rooms. This must be achieved by undercut doors or high-level wall transfer grilles. Make up air grilles and undercut doors must not cause the limits specified in Section 5.3 *Internal acoustic performance* to be exceeded.

### Toilet and change room exhaust systems

All toilets and change rooms must have permanent natural ventilation and controllable mechanical ventilation.

Mechanical ventilation must be controlled based on presence detection in conjunction the operation of lighting. Control systems must be tamper-proof.

Where practicable, make up air to the toilets and change rooms in physical education buildings must be drawn from adjacent conditioned spaces.

### Food preparation exhaust systems

Exhaust hoods and systems must be provided in all areas where food is cooked. This includes staff rooms, canteens, and food technology classrooms.

Exhaust hoods and systems must comply with the following requirements:

- Hoods must have dimensions at least equal to the dimensions of the cooking appliances below plus a minimum overhang of 150 mm.
- Exhaust flowrates must not be less than 200 L/s.
- Include internal perimeter gutters with threaded cap drain points.
- Grease filters must be readily accessible for cleaning and maintenance.
- Include vapour proof luminaries that provide 320 lux at the work surface and that are switched independent of the general room lighting.

Where appliances are in a back-to-back arrangement, each side must have a separate exhaust hood.

Commercial kitchen exhaust hoods must be provided for cooking appliances within Certificate II food preparation areas and must incorporate within the hood design make-up air connections and associated filtered ventilation systems.

Where provided, food preparation area air conditioning systems must shutdown on activation of commercial kitchen exhaust hoods.

### Fume cupboards

Fume cupboards must be installed where there is a risk associated with the use of appliances, flammable and noxious gases, chemicals, and dangerous processes.

Fume cupboards must comply with the following requirements:

- Must comply with the requirements of *AS/NZS 2243.8 Safety in laboratories Part 8: Fume cupboards and AS/NZS 60079.10 Explosive atmospheres*.
- An adequate supply of replacement air must be provided to compensate for the volume exhausted.
- Must be suitable for and have appropriate protection and resistance to the chemicals being handled.
- Suitable lighting with separate light and fan controls must be provided.
- Fumes must be discharged to the outside atmosphere at 3 m above the highest point of the building roof.

The fume cupboard exhaust system within the building must be at a negative pressure when in use. Fume cupboard extraction fans and all runs of positively pressurised ductwork must be located external to the building.

Recirculating fume cupboards must not be installed.

### Chemical stores

Ventilation must be provided to all hazardous chemical and flammable stores in accordance with the:

- Dangerous Goods Safety Management Act.
- *AS1940 The Storage and Handling of Flammable and Combustible Liquids.*
- *AS/NZS 3833 The Storage and Handling of Mixed Classes of Dangerous Goods in Packages and Intermediate Bulk Containers.*
- *AS/NZS 60079 Explosives Atmospheres*.

Mechanical ventilation must comply with the following requirements:

- High and low-level exhausts must be provided to draw both lighter and heavier than air gases.
- Minimum air flow rate of 40 air changes per hour must be provided.
- Must be discharged to the outside atmosphere at 3m above the highest point of the building roof.
- Fans must be selected for the application based on the dangerous good manifest.
- Fans, ductwork, and fittings must be corrosion resistant.
- Variable speed or 2-speed control must be provided to allow for continuous low speed exhaust or short periods of high-speed exhaust for purging.

### Spray paint booths and alcoves

Spray painting booths or alcoves must be provided where there are work, health and safety risks associated with the use of dangerous goods in aerosol forms, or similar Class 2 Flammable Gases in the form of pressurised gas used as a propellant.

Spray painting booths and alcoves must comply with the following requirements:

- Must comply with the requirements of *AS/NZS 4114 Spray painting booths, designated spray painting areas and paint mixing rooms* and *AS/NZS 60079.10 Explosive atmospheres*.
- Must be fitted with an exhaust capture and ventilation system that includes a filter for removing airborne contaminants.
- An adequate supply of replacement air must be provided to compensate for the volume exhausted.
- Maintain sufficient separation to electrical ignition sources as per manufacturers' recommendations.

### Localised fume extraction

Local fume extraction systems must be provided where there are work, health and safety risk associated with the use of appliances or process that release dangerous airborne chemicals, or irritants.

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.
- Localised fume extraction fans must not be in teaching spaces.

### Kiln exhaust systems

Kiln exhaust systems must be provided to kilns located within a building and to external kilns where there is a risk of fumes affecting nearby facilities.

Kiln exhaust systems must comply with the following requirements:

- An adequate supply of replacement air must be provided to compensate for the volume exhausted.
- Extraction must be provided to the kiln in accordance with the manufacturer's requirements.
- Local of discharge must consider prevailing wind and impact to adjacent spaces.
- Hoods must provide appropriate coverage of kiln openings and discharge points.
- Local manual control must be provided adjacent to the exhaust hood, complete with LED-run indicators.

Sufficient clearances and separation of services must be provided in accordance with manufacturers' recommendations.

### Other ventilation

Rooms where photocopiers that generate airborne odour and contaminants are installed, and are used for continuous reproduction purposes, must also be provided with mechanical exhaust ventilation.

Gymnasiums, physical education, and assembly spaces where natural ventilation is not achievable, must be provided with appropriate mechanical ventilation.

## 13.6.3 Mechanical outside air

Where the natural ventilation openings meet the mandatory requirements of the National Construction Code, the following mechanical outside air must be supplied at the rate nominated in Table 16 to improve indoor air quality.

***Table 16.*** **Mechanical outside air flow rates**

| Area | Outside air flow rate (L/s per person) |
|---|---|
| Student areas | 5 |
| Staff areas (0–4 occupants) | — |
| Staff areas (5–15 occupants) | 7.5 |
| Staff areas (16+ occupants) | 130 |

Where the natural ventilation openings do not meet the mandatory requirements of the National Construction Code, the outside air flow rate supplied to the space must comply with *AS 1668.2 The use of ventilation and airconditioning in buildings Part 2: Mechanical ventilation in buildings*.

The air conditioning control panel for one area, must be interlocked to the operation of the outside air fan serving that area.

Outside air must be filtered prior to introduction into the space.

## 13.7 Dust extraction systems

Dust extraction systems must be provided to remove dust particle generated by cutting, sanding, and similar activities.

Systems must be self-contained mechanical-clean type and located with due consideration to acoustic performance, equipment security and serviceability. The position of external units must consider the acoustic impact on adjacent buildings and activities, and neighbouring properties.

Dust extraction systems must comply with the following requirements:

- Statically and dynamically balanced centrifugal mild steel fans.
- woven fabric media with abrasive resistant properties, selected for optimal performance with due consideration to operating cost, collection efficiency and service life.
- Electrical-driven shaker assembly to clean filter media.
- Bin-type dust collector with robust sealing assembly.
- Explosion relief vent with minimal ductwork and changes in direction to a safe discharge area.
- Ductwork should be of circular-type galvanised steel, suitable for high pressure application, sized appropriately for transport velocities not less than 18 m/s, with radiused bends and angled take-offs to main ductwork.
- Automatic gate-dampening must be provided in the duct connection to each machine.
- Steel flange type bolt clamps on duct joints enabling easy removal for clean out, with additional access panels and removable caps at end of duct runs, where required.

Acoustic attenuation of fan assemblies and discharge ductwork must be provided to satisfy the requirements detailed in Section 5.0 *Acoustic engineering* and the requirements stipulated by any relevant authority.

Where located externally, the dust extraction plant must be contained within a secure enclosure.

De-centralised local dust filtration and extraction systems must only be considered where installation of a centralised dust extraction system is not practical.

## 13.8 Ductwork

Ductwork must comply with *AS 4254 Ductwork for Air-Handling Systems in Buildings*.

Rigid ductwork must be provided and must comply with the following requirements:

- Must have no burrs or sharp edges, and there must be no protrusions into the airways.
- Appropriate supports must be provided adjacent all changes in direction to fix the ductwork in position and prevent noticeable sag.
- All exposed ductwork joints must be sealed using watertight protective shields with all reinforcement attachments sealed so that moisture cannot be retained in any gap or crevice.
- Ductwork exposed to weather must have a profile or cover which will shed water.

## 13.9 Air grilles

Air grilles must be mounted with secure and concealed fixings, with flanges lining corners neatly mitred and buffered, and with no joint gaps.

Air grilles must comply with the following requirements:

- Must be commercially proven, free from distortion, bends, surface defects, irregular joints, exposed fastenings, and operation vibration.
- Dampers and visible ductwork behind the grilles must be painted black.

## 13.10 Pipework reticulation systems

Pipework reticulation systems must comply with:

- *AS 1571 Copper — Seamless tubes for air-conditioning and refrigeration.*
- *AS 4809 Copper pipe and fittings — Installation and commissioning.*
- *AS/NZS 5149 Refrigerating systems and heat pumps.*

Systems must be industry-standard, fit-for-purpose and must all associated fittings to enable safe and stable operation of the refrigeration system.

Pipework reticulation systems must comply with the following requirements:

- Pipework must be refrigerant-quality deoxidised phosphorus copper tube with brazed connections, with appropriate insulation, galvanised mild steel brackets and tagged and labelled appropriately.
- Where the pipework is not concealed, continuous and enclosed Colorbond metal covers must be provided to conceal pipework.
- Floor mounted pipework must be avoided.

Pre-insulated refrigeration pipework that does not conform to the National Construction Code must not be installed.

## 13.11 Noise and vibration

All mechanical services must comply with the performance requirements detailed in Section 5 *Acoustic engineering*.

# 14.0 Hydrotherapy pool services

Hydrotherapy pools must include all ventilation system and water filtration and sanitisation systems needed for compliance with the relevant regulations and Australian Standards and relevant authority requirements.

Services for hydrotherapy pools must comply with the following requirements:

- Water filtration systems must be provided and include membrane filters, sand filter beds and backwash, with the designed capacity suited to manage the filtration load of users who wear high amounts of skin lotions and skin creams.
- Water sterilisation systems must be provided and include UV sterilisation and chlorine dosage, with the system maintaining water quality and safety for human exposure, and having the ability to provide quick recovery to safe use levels in the event of a major contamination incident.
- Water heating and temperature control must be provided with high degrees of accuracy and capacity to maintain temperatures to pre-set levels.
- Systems must be provided to eliminate the risk of legionella in warm water and humid air.
- Indoor ventilation and air-conditioning systems must have the capacity to manage high levels of humidity, to maintain air temperatures to pre-set levels, and to manage air for aerosol contaminant and bacterial and fungal control.

# 15.0 Security technology

Schools must provide a safe and secure environment for students, staff, and visitors, including parents and service personnel.

Security technology provides mechanisms to ensure that intruders can be detected, and assets appropriately protected.

Security systems must address a school's risk rating as determined by the department's Disaster, Emergency and School Security Unit, Infrastructure Services Division.

Any installation of electronic security systems at schools must be by providers who have a current:

- Electrical licence and;
- Security Firm Class 2 (security equipment installers) licence.

## 15.1 Intruder detection and alarm systems

Electronic intruder detection and alarm systems complying with *AS 2201 Intruder alarm systems* must be installed in all new schools.

As part of the department's partnership with the Queensland Police's Protective Services Group (PSG), intruder alarm systems are to be connected to PSG for monitoring. Forms to provide information to PSG of updates to system users, after-hours activities, or intruder alarm dispatch instructions can be obtained from PSG or found on One Portal (Department of Education employees only).

For existing schools:

- Where an existing system is present an assessment of the technology and capacity of the existing system must be undertaken. Where the existing system is viable the existing system must be extended to incorporate new or refurbished facilities. Where the existing system is not viable the existing system must be upgraded to provide coverage of existing, new, and refurbished facilities via a single monitored control module.
- where there is no existing system, a system must be installed to provide coverage of at least any new and refurbished facilities via a single monitored control module.

Systems must comply with the following requirements:

- Installation of a new or upgraded electronic intruder detection systems must include provision of all necessary equipment, materials, installation and commissioning for the following:
  - one single and unique alarm control module
  - a Local Area Network (LAN) communications system utilising school's fibre optic network
  - fibre modems
  - power supply equipment including battery back-up for the entire system and surge protected GPOs
  - expander panels in each building as required for inputs to report to a single reporting system
  - internal keypads
  - external keypads
  - internal sirens
  - intruder detection devices
  - fixed duress buttons
  - fire hydrant and hose reel water flow switches, fire pump alarms and fire indicator panel connection

  - new workstation to be supplied with applicable manufacturer software installed for system management.
- Coverage must be provided to the buildings and spaces approved by the department's Disaster, Emergency and School Security unit.
- Smoke or fire detection devices must be monitored by a dedicated Fire Indicator Panel (FIP), (see Section 8.12 *Fire indicator panels*) with two outputs from the FIP (alarm and fault status) being monitored by the intruder detection system.
- An alarm control panel must be provided and be installed in the same space as the centre of network for the campus.
- The alarm control panel must be connected to a dedicated dual redundant 4G + ethernet communication device, with battery back-up, for dial-out and interrogation by remote monitoring services. No other devices or systems are to be connected to the communication device used by the alarm system.
- Hi-gain antenna is to be installed if required for adequate communication.
- The alarm control panel must have sufficient capacity to accommodate all permanent and relocatable buildings associated with the school's peak student enrolment, third-party and community facilities, plus a spare field device capacity of 10%.
- An uninterruptible power supply must be provided to ensure the continued operation of the system during any disruption to the mains power supply.

The system must support the relocatable classrooms associated with the school's peak student enrolment and must include conduits and pre-wiring leads to pits located near the planned locations for the future installation of relocatable classrooms.

The installation or upgrade of intruder detection and alarms systems must be performed by specialist security contractors registered as pre-qualified suppliers for the provision of electronic security services for state government schools. Details of pre-qualified suppliers can be obtained from the state government protective security services.

### 15.1.1 Keypads

Keypads must be provided to allow the system to be activated and de-activated by users. Keypads must comply with the following requirements:

- Keypads must provide an easy-to-read visual indication of the status of the various security zones controlled by the keypad.
- At a minimum, keypads should typically be installed in the following locations:
  - internal of administration adjacent to the main entry (mandatory)
  - external of administration (mandatory)
  - external of the hall or performing arts block
  - external of facilities shed
  - external of canteen
  - staff rooms.
- Dedicated keypads must be provided to each building used outside of school hours. The total number of keypads over an entire school campus should be limited to minimize long term maintenance requirements. System design should aim to have no more than eight keypads in total connected to a single control module. Where additional keypads are required for normal school operations,

assistance should be sought from the department's Disaster, Emergency and School Security unit (ISD.EmergencySecurity@qed.qld.gov.au).

External keypads must be installed:

- Undercover from the weather and in well-lit locations.
- In IP66 rated enclosures fitted with a cylinder lock which is keyed to the school's master key system. A tamper switch must be installed to detect attempts to remove the enclosure from its mounting surface.

### 15.1.2 Sirens

Sirens interfaced with the intruder detection and alarm system must be installed as per the following:

- Sound Level capacity of 105 dB/m.
- Sirens are to be installed internally, ceiling mounted and centrally located within the room.
- Sirens are not to be installed adjacent to motion detectors.
- Sirens are not to be secured to suspended ceiling T-Bar frames. In instances where the ceiling is suspended tiles, the siren is to be screw fixed to the centre of the tile.
- Each siren is to be connected to an individual relay, with the relay connected to a separate and individual output on the ACP or expander.
- Sirens are to be configured to operate for no more than 2 minutes on each alarm activation.
- Piezo top hat sirens should be installed in internal areas.

External sirens should not be installed as part of a standard intruder detection system. Where a specific purpose for external sirens is identified, assistance should be sought from the department's Disaster, Emergency and School Security unit (ISD.EmergencySecurity@qed.qld.gov.au) for more information.

### 15.1.3 Intruder detection and duress devices

Table 17 shows the standard for detection device types based on building block/area type. Assistance for proposed exceptions to the below should be sought from the department's Disaster, Emergency and School Security unit (ISD.EmergencySecurity@qed.qld.gov.au).

Motion detection devices must not be installed where they may be subject to draughts or environmental disturbances which result in a false alarm. In such locations, multi-criteria (e.g., passive infrared and Doppler microwave) detectors with digital signal processors must be installed.

Duress buttons must be installed:

- At reception desks in a school's administration area and any other location where money is stored or handled. This may include canteens, multipurpose hall kiosks or uniform shop points of sale.
- In all assisted amenities.

In each building containing a duress call button, a single dedicated, silent internal strobe must be installed and positioned to attract the attention of nominated duress response personnel. The strobe shall operate for a set period of 5 minutes on activation of any duress button within that building.

A duress alarm mimic panel must be provided in the administration area in a discreet location readily visible to staff. The mimic panel must indicate the room location and activation status of every duress call button in all buildings.

The intruder detection system must support the integration of mobile duress pendants capable of coarse location reporting via wifi triangulation or dedicated beacons designed for external use.

***Table 17.*** **Building block/area type and detection device standards**

| Block | Room/area type | Device/s |
|---|---|---|
| Administration | Resource and photocopy rooms, meeting rooms, interview rooms, offices, staff rooms, store rooms (with windows) | • Motion detection |
| | Data rooms, secure store rooms (no windows) | • Reed switch<br>• Motion detection |
| | Reception, cash counters | • Motion detection<br>• Duress button |
| Prep | General learning areas, practical learning areas, store rooms (with windows), preparation areas, withdrawal rooms, offices, staff rooms | • Motion detection |
| | Storage areas (no windows), external doors | • Reed switch |
| General teaching and special education | All offices, classrooms, staff rooms, teacher preparation areas, resource stores, computer rooms, withdrawal rooms, wet/dry areas, A/C equipment storage | • Motion detection |
| | Secure store rooms | • Reed switch |
| Music | Offices, classrooms, preparation areas | • Motion detection |
| | Instrument store rooms | • Reed switch |
| Resource/library | Reading areas, book shelving, resource stores, computer areas, A/V rooms, loans desk area, teacher preparation areas, all offices, staff rooms, work rooms | • Motion detection |
| | Secure store rooms | • Reed switch |
| Tuckshop/canteen | Servicing areas, preparation areas, uniform storage and sales, stationery storage and sales | • Motion detection |
| | Servery counter shutters | • Dual reed switch |
| | Money handling areas | • Motion detection<br>• Duress button |
| Hall | Staff rooms, sports equipment storage, A/V equipment storage, lightning equipment, kitchens | • Motion detection |
| | Fire doors and roller doors | • Dual reed switch |
| Manual arts | All offices, classrooms, staff rooms and workshops | • Motion detection |
| | Secure stores, spray paint booths, flammable liquid stores | • Reed switch |
| Performing arts | All offices, classrooms, staff rooms, A/V equipment storage, preparation areas, lightning equipment | • Motion detection |
| | Box office, money handling areas | • Duress button |
| Home economics | All offices, classrooms, staff rooms, kitchens, food and equipment storage areas | • Motion detection |
| Commerce block | All offices, classrooms, staff rooms, computer rooms | • Motion detection |
| | Secure stores | • Reed switch |
| Art | All offices, classrooms, staff rooms, paint and equipment storage, media/graphics rooms, dark rooms | • Motion detection |
| Sciences | All offices, classrooms, staff rooms, A/V equipment storage, preparation rooms, chemical storage | • Motion detection |
| Staff rooms | All offices, classrooms, staff rooms | • Motion detection |
| Ancillary staff | All offices, store rooms, workshops | • Motion detection |
| | Chemical/fuel storage | • Reed switch |

***Table 17.*** **Block type and detection device standards (continued)**

| Block | Room/area type | Device/s |
|---|---|---|
| Agricultural unit | Staff rooms, workshops | • Motion detection |
| | Grounds equipment sheds, chemical/fuel stores | • Reed switch |
| Swimming pool | Canteen | • Motion detection |
| | Plant rooms, chemical stores | • Reed switch |
| Shed (facilities) | Equipment/storage area | • Motion detection |
| | Shed entry/roller door | • Reed switch |
| Sheds (general use) | Physical education storage, grounds equipment storage, preparation storage | • Reed switch |

## 15.2 Access card systems

Electronic access control systems may be installed subject to the department's approval and must be designed in consultation with and to the standards required by the Disaster, Emergency and School Security unit (ISD.EmergencySecurity@qed.qld.gov.au).

The system should be installed to control access to buildings and may be extended to include controlled access to lifts and to long-term car parks used by staff, visitors and parents and carers of students with special needs.

Access control systems must comply with the following requirements:

- A single electronic security system must be installed such that all access control and intruder detection functions are performed by the same system.
- The access control system must not arm, disarm, or override the intruder detection system.
- The access control system must be expandable.
- The access control system must control the external access doors to all buildings.
- The access control system must interface with the fire panel to automatically release controlled doors along fire evacuation paths during a fire emergency.
- Electronic door locks must be configured as 'fail safe' to provide free egress during power supply (including backup battery) failure, while remaining secure externally.
- Door controllers are to be capable of switching between access, secure and pending status based on schedules programmed from the intruder detection system.
- External electronic locks are to be fitted with matching striker plate in the door frame.

Readers with manual key override function, keyed to the school’s key system, should be installed at any staffroom entry, as well as at least one main access point into each building which can internally access all rooms in the block.

A break glass unit must be installed at the secure side (inside) of a door. The break glass unit must be connected directly in series with the power supply unit of the electronic door lock. When the glass of the unit is broken, it must cut off power supply to the electronic door lock and release the lock immediately. The status of the break glass unit must be monitored by the control system.

Access card readers must be robust and have a minimum vandal-proof rating of IP67/IK10.

## 15.3 Closed circuit television systems

As a crime prevention tool, Closed Circuit Television (CCTV) systems are a good aide but are not necessarily effective as a deterrent and are not mandated for all facilities.

A risk assessment must be undertaken in consultation with the Disaster, Emergency and School Security unit to determine whether the installation of a CCTV system is justified.

The location of cameras will typically provide coverage of:

- site boundary access points
- pathways and other natural paths of pedestrian traffic
- public counters and cash collection points
- pathway intersections
- doors and points of access to rooms or spaces containing high value assets.

Where approval is granted to install a CCTV system, the system must comply with the following requirements:

- Coverage must be restricted to the buildings, grounds and spaces approved by the Disaster, Emergency and School Security unit.
- Clour cameras must be installed.
- Cameras must have a minimum video capture resolution of 6 mega pixels, night time infrared range of at least 30 m, and 2.8 mm lenses.
- Where varifocal cameras are installed, 2.8 mm to 12 mm varifocal lenses are required.
- Fixed cameras must be installed. Pan tilt zoom cameras and controls must not be installed.
- Cameras and lenses must achieve optimal coverage of the areas under surveillance 24 hours per day.
- Cameras must be installed out of reach from any adjacent ground, floor or support structure (between 2400 mm and 5000 mm above fixed floor level). Where this is not possible, cameras must be under the surveillance of at least one other camera.
- Cameras must be installed in high quality, heavy duty, vandal-resistant protective enclosures specifically designed for this purpose. Cameras installed below 3000 mm must have a minimum vandal-proof rating of IP67/IK10.
- Cameras should not be installed to directly face lighting or sunlight.
- The system must have inbuilt alarm trigger options for motion detection, tampering, network communications failure, illegal login, HOD full, and HOD error.
- Security lighting must be provided to ensure that optimal images can be captured during night time operation.
- A network digital video recording system comprising two recorders must be installed in secure locations.
- One in the centre of network and the second in a secure room in separate building which is covered by the intruder detection system. Cloud-based recording systems must not be installed. The recording system should have sufficient channels to allow for expansion of the system.
- Where systems are expanded, or existing cameras are being integrated to a new system, all cameras are to be migrated to record to a single compatible recording system wherever possible.
- The CCTV system and equipment must not be connected to any active data equipment connected to any other equipment or system.

- The recording system must use a true real-time operating system with wavelet data compression. 'Windows' based operating programs must not be used.
- Data rack-mounted UPS capable of delivering a minimum of 1–2 hours power must be installed where NVRs are installed and at each block where cameras are connected.

The recording system must be capable of storing recordings for all cameras for a duration of one week, with all cameras recording at the maximum possible frame rate for 24 hours a day, seven days a week. Motion activated recording must record at a minimum rate of 12.5 frames per second (fps) and at a minimum rate of 2.5 fps at all other times.

Recorded images must be able to be retrieved for post-incident review and exported for provision to law enforcement agencies where required.

Cameras must not be installed in areas such as toilets, showers, changing rooms and staff rooms, classrooms, student learning areas, study rooms, or to monitor student and staff performance.

The management and operation of CCTV cameras and systems must comply with:

- *AS 4806.1 Closed circuit television (CCTV) Part 1: Management and operation.*
- The department's ‘CCTV use in schools procedure’.

# 16.0 Structural engineering

## 16.1 Site conditions and investigations

Sub-structures and superstructures must be based on an appropriate and detailed understanding of the geotechnical conditions and the terrain category applicable to the site.

Geotechnical and site investigations must include:

- Land surveys to determine slopes and above-ground site features.
- Investigations of watercourses, areas subject to inundation and overland flow paths, and water table and levels.
- Borehole and geotechnical investigations to determine, as best as possible, subsurface conditions including acid sulphate soils and asbestos in soil.
- An examination of past construction records in the area, sourced from local authorities and schools.

## 16.2 Design criteria

All structures must have a maintenance-free service life of at least 50 years.

Structures must provide safe access for the performance of maintenance of services, systems, plant, equipment and the like installed within a building.

## 16.3 Substructure

Substructures and footing systems must be designed to limit differential settlements to levels consistent with the relevant Australian Standards.

Articulation of the substructure and footing systems must be sufficient to prevent cracking or dislocation of building elements.

Reinstatement and fill material and compaction must comply with the relevant Australian Standards.

The use of suspended concrete slabs or raised lightweight sub-structures for ground floor storeys should be considered where:

geotechnical investigations recommend minimal ground disturbance such as excavation in rock

- steep slopes make the formation of building platforms not economically viable
- overland flows or flood risks cannot be mitigated.
- sub-surface drainage and surface contours must ensure that water is diverted away from and does not settle in sub-floor areas.

## 16.4 Superstructure

The superstructure must reflect the building plan and align with the most appropriate foundation system.

The structure must address future flexibility requirements, where possible, by providing clear internal spans that allow internal re-planning. Roof structures must be designed to accommodate all roof mounted equipment and allow for the future installation of solar panels.

Load-bearing structures and the external building envelope must have a durability appropriate for the nominated design life.

Materials and form of construction must:

- use re-generable materials, from sustainable sources
- use building elements that serve the passive or active harnessing of solar energy
- have minimal embodied energy content
- afford the maximum recyclability at end of life.

## 16.5 Deflection

Structures must be designed and constructed so that deflections, vibrations, and resonances do not adversely affect the performance, serviceability, stability or appearance of the structure, facades, services, equipment, applied finishes or secondary construction such as partition walls.

Deflections must be within the tolerances specified in the relevant Australian Standards. In-service deflections of structures supporting operable walls must not exceed the lesser of 5 mm or the length of the span divided by 1000.

Where there is a possibility of wind or machine induced vibration, structural elements (such as floors, walls and roofs) must be designed to withstand the loadings and movements without adversely affecting the building's use or the experience of users.

## 16.6 Structural provision for access aids

First aid rooms at schools supporting students with disabilities or high needs and any space designated as a 'Changing Place' facility must have roof structures capable of supporting and facilitating the installation of an overhead rail mounted electric lifting hoist and overhead tracking rails with the installation covering the full area of the room or rooms.

The structure must allow for the future simple installation of overhead rail mounted electric lifting hoist and overhead tracking rails where these do not form part of a school's immediate needs.

## 16.7 Gymnasiums

All surfaces must be capable of withstanding a horizontal impact of 0.75 kN.

Walls must be capable of providing adequate support for basketball backboard units, fixed seating platforms, retractable seating, and the like.

The ceiling and roof structure must be capable of supporting the loads of any equipment that might from time to time be suspended there from.

## 16.8 Covered walkways

Covered walkways must be used to provide protection to students and staff moving throughout a school.

Covered walkways shall not impede vehicular access to buildings for fire and maintenance.

Covered walkways must:

- Have a width to reflect the anticipated pedestrian traffic concentration, with particular attention to adequate width of main circulation spines (nominal width of link to be 3600 mm, minimum width of link to be 2400 mm).
- Provide maximum weather protection, particularly at changes of level. Generally, maximum height at link edge to be 2400 mm above floor level.

**Note:** Exposed or upper level links may require extension of eaves or side screens for weather protection.

- Have a minimum height to underside of link framing or to light fittings over path of travel shall be 2100 mm.
- Be stable, robust, and durable and provide protection against extreme events.
- Have roofs drained to gutters and downpipes connected to the stormwater drainage system.
- Have framing which is hot dip galvanised and left unpainted.
- Include lighting along the length of the walkway to facilitate safe travel during poor light conditions.
- Not impede vehicular access including emergency services access.
- Not facilitate any unauthorised access to roofs of buildings.
- Have a minimum height of 2400 mm above the finished pavement to the any part of the underside of the walkway including light fittings.
- Have framing designed to deter birds from roosting.
- Have columns spaced no less than 4800 mm apart to minimise the number of columns that students need to avoid.
- Have columns at intersections with other walkways or changes of direction set back no less than 1200 mm from the intersection or change in direction.
- Have framing, roof sheeting and gutters that are designed to prevent students swinging on frames.
- Have roof sheeting fall across links to deter skateboard use.

# 17.0 Vertical transportation

Vertical transportation must be provided to ensure that buildings and facilities are accessible and compliant with all relevant regulations.

Vertical transportation must comply with the following requirements:

- Lifts must be key protected providing controlled access and use for disabled students, visitors and staff only.
- Lifts must contain alarm communication devices so Protective Services Group are aware of a trapped person, and communication can be made with a 24-hour help line via a direct link to notify an appropriate party of their location and thereby initiate their release.
- Provide lift telephone cabling from the lift to the location of the Pixel Gateway 3G wireless device as per standard drawings, checklists and forms provided in the contract.
- Lift capacity must be appropriate for its intended use. Lift car minimum dimensions to be 1400 mm wide × 1600 mm deep × 2200 mm high.
- Lift doorway clearance to be minimum 900 mm wide × 2100 mm high.

> **Note:** Larger lift cars may be required for emergency evacuation purposes, materials handling or vertical schools.

- Ensure that all lifts and lift pits are protected from the ingress of wind rain, inclement weather and overland flow paths.
- Lift car control panels, landing buttons and hall indicators to be vandal resistant.
- In the event of power loss car will return to the nearest level and open doors (or to ground floor if required by relevant standards).

Lifts must comply with and be installed in accordance with:

- *AS 1428.2 Design for accesses and mobility — Enhanced and additional requirements — Buildings and facilities.*
- *AS 1735.12 Lifts, escalators and moving walks — Facilities for persons with disabilities.*

Low-rise wheelchair platform lifts providing an accessible transition between split floor levels (nominal maximum 1200 mm difference) must comply with:

- *AS 1735.14 Lifts, escalators and moving walks — Low rise for passengers.*

Provide to the department a completed lift registration form with applicable completed sections. The department will lodge the registration electronically and pay all fees.