Department of Education

Queensland Good jobs Better services Great lifestyle

Design standards for Department of Education Facilities

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Queensland Government

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† Part A internal draft 1.80 issued in 2021.

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‡ Part B and C internal draft 9.00 issued in 2021.

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Preface

The Queensland Department of Education is committed to inclusive education. The diversity of our staff, students, school and early childhood communities is our greatest strength. By valuing culture and creating inclusive teaching and learning environments, we are driving our *Equity and Excellence: realising the potential of every student* strategic goals across every state education setting.

Our commitment to *Equity and Excellence* means that children and young people across Queensland, from all social, cultural, community and family backgrounds, and of all identities and all abilities are able to:

Attend their local state school or education centre and be welcomed.

Access and participate in a high-quality education and fully engage in the curriculum along-side their similar-aged peers.

Learn in a safe and supportive environment, free from bullying discrimination or harassment.

Achieve academically and socially with reasonable adjustments and supports tailored to meet their learning needs.

The Infrastructure Services Division's (ISD) Infrastructure for learning plan includes a priority action for state schools and early childhood centres to drive social equity through good design and asset management to deliver welcoming, culturally safe and accessible learning environments. Every state education setting in Queensland will have fit-for-purpose facilities that maximise inclusion and accessibility and facilitate the widest array of flexibility in teaching, learning and social educational activity.

Acronyms

NCC	National Construction Code
AFFL	Above finished floor level
Prep	Preparatory year (first year of school in Queensland)
WHS	Work Health and Safety
RPEQ	Registered Professional Engineer of Queensland

Glossary

Accessibility[1]	An accessible building is one where people of all abilities are able move and carry out activities independently, safely, in comfort and with dignity. Key principles include: • easy entry and exit into a building • easy navigation and functionality in and around the building • potential for easy adaptation in response to changing needs of occupants.
Accessible learning environments[2]	Our schools, educational settings and classrooms will be designed to enable students of all backgrounds, identities and abilities to access and fully participate in learning. We ensure that students can access and participate in school activities and events.
Disability[3]	The *Disability Discrimination Act 1992* (DDA) defines disability broadly as: • total or partial loss of the person's bodily or mental functions; or • total or partial loss of a part of the body; or • the presence in the body of organisms causing disease or illness; or • the presence in the body of organisms capable of causing disease or illness; or • the malfunction, malformation or disfigurement of a part of the person's body; or • a disorder or malfunction that results in the person learning differently from a person without the disorder or malfunction; or • a disorder, illness or disease that affects a person's thought processes, perception of reality, emotions or judgement or that results in disturbed behaviour.
Discrimination	Can be both direct and indirect. Discrimination involves treating someone less favourably that another in similar circumstances because they have a characteristic, for example a disability or impairment, their gender, age, race, parental status, sexuality or cultural background. Indirect discrimination occurs when everyone is treated the same way even though this unreasonably disadvantages someone because they, or their associate, have a characteristic.
Inclusive education[2]	Students experience inclusive education when they can access and fully participate in learning, alongside their similar-aged peers, supported by reasonable adjustments and teaching strategies tailored to meet their individual needs. Inclusion is embedded in all aspects of school life, and is supported by culture, policies and everyday practices.
Learning space	The term learning space applies to an area that may be used for any form of teaching and learning. It is a generic term that applies to a range of areas in a school or early childhood centre – a Science Lab is a special purpose learning space; a large open collaborative area can be a learning space, an indoor play space in a kindergarten is a learning area. The term replaces the word ‘classroom’ that is no longer used in contemporary learning environments.
Queensland state education settings	Queensland state education settings refers to all education facilities owned or operated by the Department of Education, including state primary, secondary, P-10/12 and special education schools, state outdoor and environmental education centres, Queensland Academies, Hospital schools, schools of distance education, Queensland pathways state colleges and early childhood education centres owned by the Department of Education.
School	School refers to the Queensland education assets used to deliver education to students from Prep-year 12. References in this document to school will exclude early childhood centres and may not apply to some of the more unique schooling models (e.g., Hospital schools, schools of distance education).
Universal Design[4]	Universal Design is the design of buildings, products and environments to be accessible to as many people as possible, regardless of age, ability, cultural background or other differentiating factors, without the need for adaptation or specialised design. The Seven Principles of Universal Design were developed in 1977 by a working group of architects, product designers, engineers and environmental design researchers.

1 Disabled World, Accessibility News and Information, https://www.disabled-world.com/disability/accessibility/
2 Department of Education Policy Statement, https://ppr.qed.qld.gov.au/pp/inclusive-education-policy
3 The Disability Discrimination Act 1992 https://www.nccd.edu.au/wider-support-materials/definitions-disability-and-nccd-categories
4 What is Universal Design? The 7 Principles, https://universaldesign.ie/about-universal-design/the-7-principles

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Introduction

Purpose

The *Design Standards for Department of Education Facilities* document is intended to provide coherent, integrated information to guide the planning, design and construction of education facilities.

The document is broken into three sections.

A. The *Design Principles* outlines the overarching education rationale, principles and framework for designing and developing contemporary Queensland state education settings[5] that respond to context and place and provide access for all.

B. The *Master Planning Design Principles* section details the master planning, architectural and landscape design principles and includes the minimum requirements for the external learning environment and traffic management.

C. The *Technical Standards* section 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.

The department is committed to annual reviews and updates of the *Design Standards for Department of Education Facilities* to ensure they reflect contemporary practice. These reviews will be informed by the lessons learned and feedback provided by project consultants, department staff, facility users, 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 team at: POE.DesignStandards@qed.qld.gov.au.

Structure of the document

This document is structured to move from the macro to the micro—from vision, values and purpose → design principles → implementation of the principles → Technical Standards for:

- master planning functional zones
- defining relationships between functional zones
- designing spaces, settings and fit out to meet the functional requirements of teaching, learning, leadership and administration.

The education priorities outlined in the strategy documents referenced, have clear implications for the design of the physical environment and the complementary technical standards. The Design Principles and Technical Standards guide all stakeholders in every aspect of the physical design of facilities to support modern teaching and learning.

Reference documents

The mandate for the education rationale that underpins the design of Queensland state education facilities, draws its authority from the vision, values and educative purpose expressed in:

- The Queensland Plan[6]

5 See a list of Queensland state education settings in the Glossary p.iii

6 Queensland Government (2018) The Queensland Plan Queenslanders' 30-year vision https://www.queenslandplan.qld.gov.au/assets/images/qld-plan.pdf

- Department of Education Strategic Plan 2024–2028[7]
- *Equity and Excellence – realising the potential of every student*[8]

The Queensland *P–12 curriculum, assessment and reporting framework* (CARF), and supporting documents, provide detail for the implementation of the education principles in learning and teaching.

A suite of policies and strategies also articulate the Department's commitment to deliver on its strategic plan.

- The Inclusive education policy statement[9], the Student Wellbeing Framework[10] and the Staff Wellbeing Framework[11] outline the Department's commitment to inclusion and wellbeing.
- Our story, our future[12], the Queensland Government's multicultural policy promotes and inclusive, harmonious and united Queensland.
- The Department of Education's Disability Service Plan: Every Queenslander Succeeding[13], provides clear direction to ensure that Queenslanders with disability succeed.
- The Digital Strategy 2019–2023[14] outlines the Department's strategy to ensure appropriate IT solutions and digital-rich learning spaces.
- The Community use of school facilities procedures[15] provide a process whereby state schools can be recognised as valuable community resources and play an important role in community building and the development of community hubs.

7 https://alt-qed.qed.qld.gov.au/publications/strategies/strategic-plan
8 https://education.qld.gov.au/initiatives-and-strategies/strategies-and-programs/equity-and-excellence
9 Queensland Department of Education (2020) Inclusive education policy statement https://education.qld.gov.au/student/inclusive-education/Documents/policy-statement-booklet.pdf
10 Queensland Department of Education (2018) Student Wellbeing Framework, https://education.qld.gov.au/student/Documents/student-learning-wellbeing-framework.pdf
11 Queensland Department of Education (201) Staff Wellbeing Framework, https://intranet.qed.qld.gov.au/Services/HumanResources/payrollhr/healthwellbeing/Documents/staff-wellbeing-framework.docx [accessed 22 October 2020]
12 Queensland Government (2017) Queensland Multicultural Policy: Our story, our future, https://cabinet.qld.gov.au/documents/2016/Dec/MPlan/Attachments/Policy.pdf
13 Queensland Department of Education (2020) Every Queenslander Succeeding: Disability Service Plan https://qed.qld.gov.au/publications/strategies/disability-service-plan
14 Queensland Department of Education (2022), Digital Strategy 2022–2026, https://qed.qld.gov.au/publications/strategies/digital-strategy
15 Queensland Department of Education (2021) Community use of school facilities, https://ppr.qed.qld.gov.au/pp/community-use-of-state-school-facilities-procedure

Part A

Design Principles

1. Guiding vision, goals and strategies

1.1 The Queensland plan[16]

The Queensland plan sets out Queenslanders' vision for 2040. The vision articulates the key role education plays in making Queenslanders' 30-year vision a reality.

> *We will value education as a lifelong pursuit where we gain practical skills, enrich our lives, find secure jobs and improve the competitiveness of our economy. Our brightest minds will take on the world and we will work collaboratively to achieve the best results for Queensland.*

The Queensland Plan targets literacy and numeracy and skills for life. It specifically highlights the need for active experiential learning, learning for life, learning as an enriching experience and the need to work collaboratively.

1.2 Queensland Department of Education strategic plan[17]

The Queensland Department of Education's Strategic Plan 2024–2028 outlines the Department's vision for Queensland education through five strategic objectives:

- A strong start for all children
- Every student realising their potential
- Capable people delivering our vision

For each of these strategic objectives, related strategies, plans and initiatives are spelled out from which the education principles outlined in the next section are derived.

In addition, the Plan identifies three focus areas and their associated challenges and opportunities as shown blow in Table 1.

Table 1. Queensland Department of Education's focus, challenges and opportunities 2024–2028

Our focus	Our challenges	Our opportunities
Achievement Continually improve our services to deliver great outcomes for Queenslanders	**Skilled workforce** Ensure workforce design, supply, retention and capability meet our service delivery needs	**Leadership** Empower leaders at every level through high-quality development opportunities
Wellbeing and engagement Create safe and positive environments to strengthen health and wellbeing	**Digital security** Enhance capacity and capability to maintain the integrity and security of our information and systems	**Integrated services** Work across government and foster meaningful partnerships to respond to changing communities
Culture and inclusion Embrace diversity to deliver welcoming, inclusive and accessible services	**Building resilience** Strengthen our prevention and preparedness for disruptive events and climate impacts	**Performance improvement** Support a culture of continuous improvement to enhance outcomes
	Future-proofed investment Respond to the needs of diverse communities and invest for future generations	**Innovation** Embed future focused approaches to drive outcomes and innovation

16 Queensland Government (2014) The Queensland Plan: Queenslanders' 30-year vision, https://www.queenslandplan.qld.gov.au/assets/images/qld-plan.pdf

17 Queensland Department of Education (2020) Strategic Plan 2024–2028 https://alt-qed.qed.qld.gov.au/publications/strategies/strategic-plan

Our focus	Our challenges	Our opportunities
	Safety and wellbeing Address complex issues impacting the wellbeing and safety of children, students, communities and workplaces	**Investment** Target responses and investment to meet community need

The Queensland Department of Education Strategic Plan and associated focus, challenges and opportunities capture Queensland's response to the educational mandate provided by the Education Council of Australian Education Ministers, the Alice Springs (Mparntwe) Education Declaration.

1.3 Equity and Excellence

Queensland's education strategy, *Equity and Excellence: realising the potential of every student*, responds to the national commitment to equity and excellence in education as outlined in the Alice Springs (Mparntwe) Education Declaration.

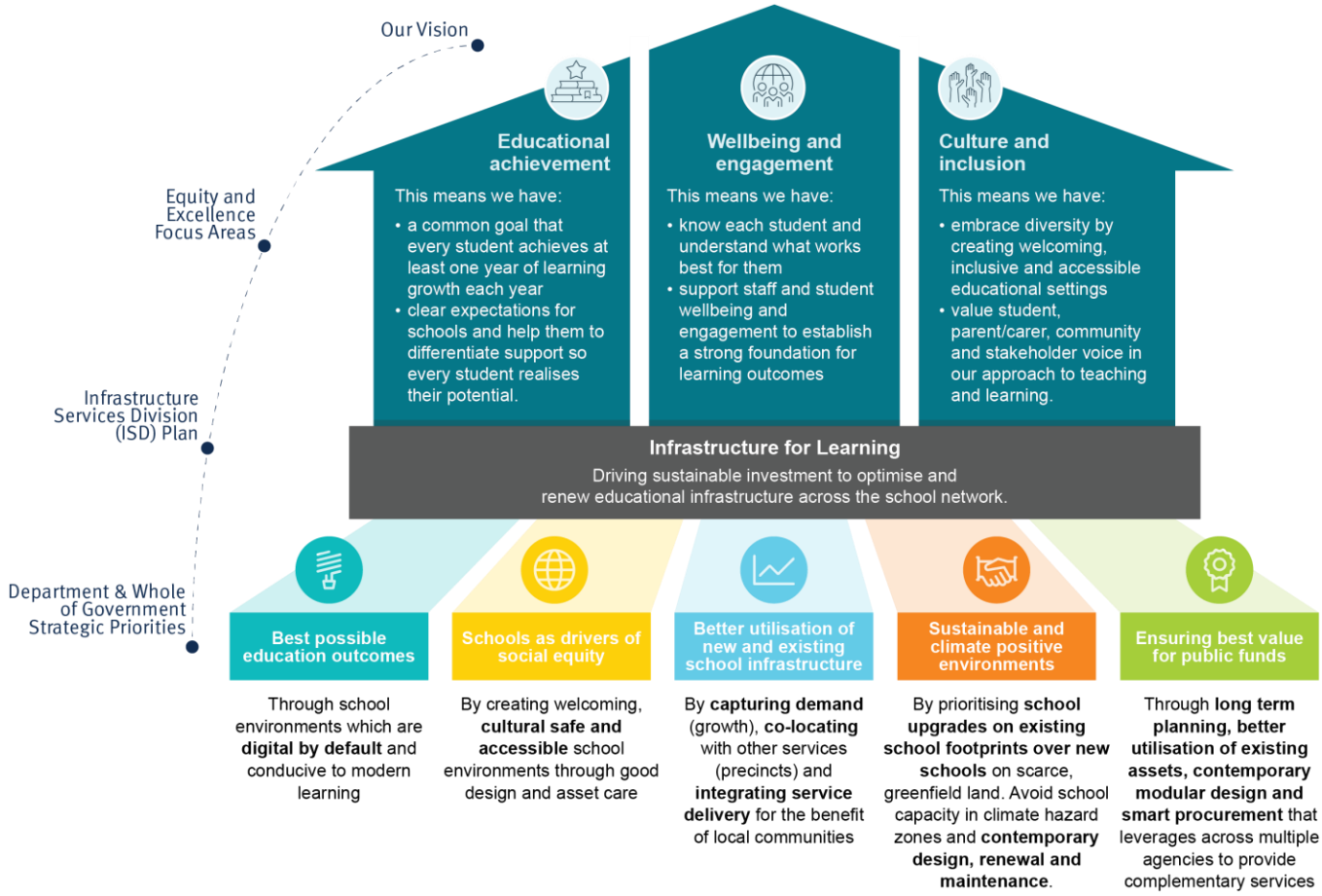
Equity and Excellence outlines the Government's vision for a progressive, high performing education system to realise the potential of every student. It provides clarity for schools about priorities and expectations, and delivers a roadmap of key system initiatives to enable sustainable improvement. The Department of Education undertook extensive research into the factors that lift learning outcomes, partnering with educational experts to undertake literature reviews and scanning of other jurisdictions' education systems and commissioning market research into factors that influence parents' choice of school. The strategy was co-designed in consultation with education leaders, principals and key stakeholders.

At the centre of *Equity and Excellence* are initiatives that will build educational leadership and teaching expertise, leverage digital innovation in teaching and learning, strengthen educational performance and support models, deliver integrated service responses and educational precincts, and revitalise educational infrastructure.

The following actions are intended to revitalise educational infrastructure

- implement a future-focused and long-term infrastructure plan to ensure our state education facilities can meet the learning demands of the future
- deliver a clear investment prioritisation approach that effectively balances need for new facilities and renewal of existing facilities to meet contemporary learning needs
- enhance transparency and accountability in management of enrolments to ensure the system can provide for growing enrolments and changing communities.

Figure 1. *Equity and Excellence* in Action – System View



1.4 Infrastructure for learning

Infrastructure for learning is the Department of Education's plan to put *Equity and Excellence* into action across the state's educational infrastructure and provide for Queensland's diverse and growing communities. Aligned to the *State Infrastructure Strategy*, it details the department's plan to invest wisely and leverage the collective strengths of school and early childhood communities. It aims to ensure every child, young person and staff member has access to inclusive, safe and fit-for-purpose facilities that open a world of teaching and learning opportunities.

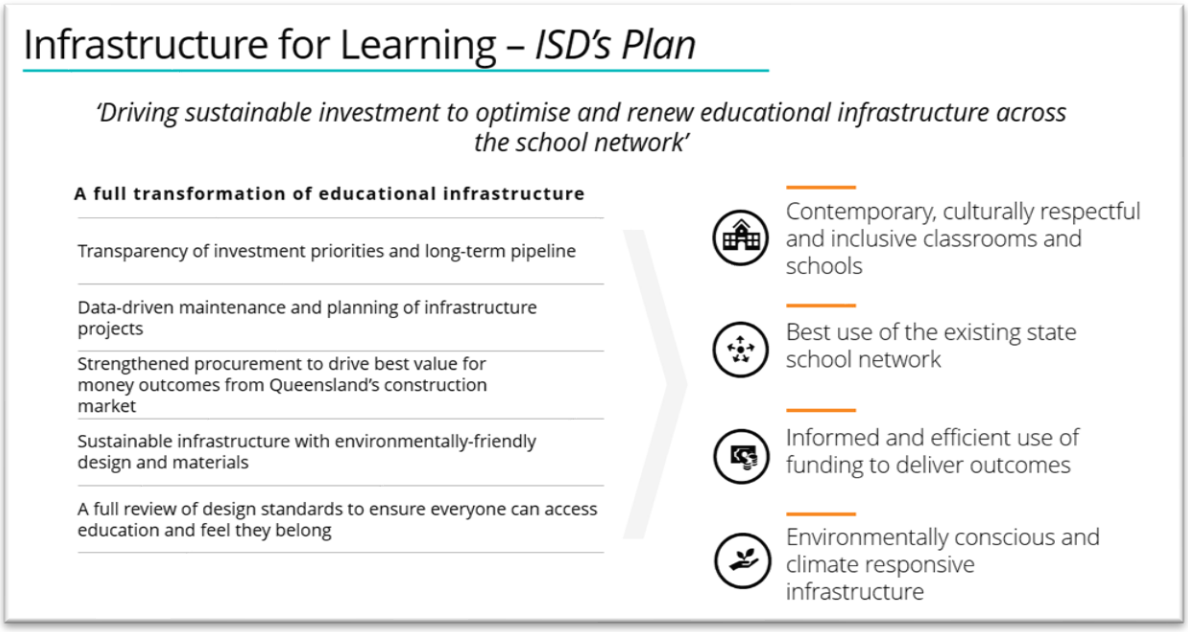
Infrastructure for learning recognises the important role schools and early childhood centres have in connecting and strengthening communities, but also realises learning is changing and that learning environments must keep pace.

The plan seeks to embrace recent innovations in teaching and learning and make best use of our existing infrastructure. The department will prioritise smarter and more sustainable approaches to planning, renewal and delivery, and focus on how to better meet the needs of Queensland communities now and into the future.

The *Infrastructure for learning* plan aims to achieve five objectives:

1. **Best possible education outcomes** through learning environments that are digital by default and facilitate modern learning.
2. **Schools as drivers of social equity** through good design and asset management to deliver welcoming, culturally safe and accessible learning environments.
3. **Sustainable and climate-positive environments** through contemporary design, renewal and maintenance that builds climate resilience and embeds environmental sustainability.

4. **Better utilisation of new and existing school infrastructure** through collaborative planning with other services and the community, and harnessing the influence of education settings as the centre of local communities.
5. **Ensuring the best value for public funds** through evidence-based strategic planning, transparent investment decisions and using contemporary design and building methods, and where possible expanding and renewing our existing facilities and network before delivering new facilities.



2. Design principles

The Design principles set out in this section provide guidelines that must be addressed in all aspects of the design of education facilities.

There are three sets of principles spelled out in the next three sections that guide:

1. The design process to ensure it is aligned to the Department of Education commitment to improvement, collaboration, future focused investment and place-based responses[18] — *the Overarching Principles.*
2. The design of contemporary learning facilities that reflect the six education principles derived from the Queensland Department of Education's strategic plan, vison, goals and priorities — *Education Facilities Design Principles.*
3. Design principles that aim to make the built environment usable by everyone — *Universal Design Principles.*

2.1 Overarching design principles

The overarching principles set out the expected approach for planners, architects and designers.

Overarching Design Principle 1: Responsiveness

Embed the potential for adaptability to ensure that the design does not impose on users but rather is responsive to:

18 Queensland Department of Education (2020) Strategic Plan 2020-2024

• individual school and early childhood communities – their context, place, culture and curriculum[19]
• varied requirements for use – e.g. different organisational structures, readiness to adopt contemporary pedagogical approaches – and enables individual schools and early childhood centres to implement their own learning and teaching approach.

This means:

- The process for design must include an analysis of the context, place, culture, curriculum and pedagogical approach.

Overarching Design Principle 2: Collaboration

Improve all outcomes through collaborative efforts of all departments, community, key stakeholders, including specialist support staff and students/children.

This means:

- Representatives from all stakeholder groups need to be involved in every stage of the process from design to construction to occupation and post occupancy evaluation.

Overarching Design Principle 3: Informed risk-taking

Balance opportunity and risk in the pursuit of innovation and continuous improvement

This means:

- Planners, architects, designers and construction companies must, while weighing up risks and potential budgetary constraints, look for opportunities to improve the ability of education facilities to give full effect to the education and design principles.

Overarching Design Principle 4: Harness technology

Leverage technology to engage modern learners, provide access for all learners to advance teaching and learning. Provide learning environments that are digital by default.

This means:

- Educators, planners, architects, designers and construction companies must be abreast of all available technology which can facilitate engagement of modern learners, remove barriers to access for all learners and advance teaching and learning. There is an onus on educators to inform planners of emerging new technologies on the market and to test these developments.

Overarching Design Principle 5: Reconfigurability

Be future focussed and design-in the ability to accommodate changed needs, new learning technology, curriculum changes and changing demands for use that might occur over the long term, without major re-construction and expense.

This means:

- Planners, architects, designers and construction companies must incorporate elements of adaptability in construction techniques, fitout and features, such as adaptable walls and doors, in addition to having a mindset as to how the education facilities might be altered while still adhering to the facility design principles.

19 It is important to note that 'responsiveness' does not imply responding to personal whim. First and foremost, design of facilities must universally adhere to the Education Facilities Design Principles but have inbuilt adaptability to respond to the context, place, culture, curriculum and pedagogical approach of the school.

2.2 Education Facilities Design Principles

The Education Principles have clear implications for the design of the indoor and outdoor physical environments. The Facilities Design Principles outlined in Table 2, along with the Universal Design Principles, guide planners, architects, engineers and school stakeholders in all aspects of the physical design.

Table 2. The implications of the Education Principles for facilities design — Facilities Design Principles

Education principle/s	Education Facilities Design Principles
Learners Encourage the development of a sense of identity, purpose and belonging that enables them to thrive in their learning environment and ensures the confidence, capability and resilience to pursue learning throughout life. **Learning** Provide varied, challenging, and stimulating learning experiences that enable all learners to explore and build on their individual abilities, interests, and experiences.	Create contemporary indoor and outdoor learning environments that facilitate a learning and learner-centred approach through: • designing integrated purposeful and multi-purpose learning settings and spaces that support and enhance a full range of learning and teaching activities. Activities that must be supported are: – direct, explicit teaching, demonstration and presentation – dialogue, storytelling, community of inquiry – meetings for discussion, planning and decision-making – structured and unstructured – interactive and collaborative creative activities with media, general and specialised equipment and materials – interactive and collaborative investigative activities with general and specialised equipment and materials – construction, modelling and simulation through play-based learning and/or authentic settings – display of learning resources and student work – quiet reflective activities and/or individual research – rehearsal and performance – gatherings, assemblies, ceremonies – low sensory spaces **Note:** Where possible, learning settings and spaces are used for multiple purposes. A different space is not required for each of the activities above. The overall floor area is determined by a universal formula for Queensland state education settings. • support disciplinary and interdisciplinary learning within and between curriculum areas for each stage of learning • ensure age-stage appropriate fit out of spaces for learning, recreation and socialisation • provide seamless access to learning by ensuring virtual connectivity locally, nationally and globally • ensure ease of access to learning and teaching resources at the point of use through distribution of appropriate storage throughout learning spaces • activate, invigorate and enrich learning spaces - indoor and outdoor – to support activities that the spaces are designed for • ensure all areas of the site are assets for learning and maximise the use of the outdoor environment as an integrated component of the total learning environment paying particular attention to sustainability education • ensure circulation paths can be navigated by all learners and that they do not disturb learning activities. Support collaborative learning and teaching for professionals by: • making provision for meeting spaces for professional collaboration, data display and planning in small, medium and large groups. • enabling modelling, mentoring and peer observation by ensuring teacher/educator is visible and can be observed unobtrusively in situ. • designing learning spaces for seamless flow of users between integrated learning settings and spaces. • the deliberate layout of the learning settings to provide for seamless access to and from required resources and ease of flow between spaces. • the juxtaposition of spaces ensuring continuity and appropriate merging of atmosphere and acoustic requirements.

Education principle/s	Education Facilities Design Principles
Access and inclusion Provide all users with access so they can participate safely in educational activities that are inclusive and free from any form of discrimination.	Design and fit out indoor and outdoor spaces that enable all users — staff, students, children and visitors to participate safely in all experiences: • go beyond minimum compliance and employ the Universal Design Principles (Section *Universal Design Principles — 'design for all'*) that aim to make the built environment (indoor and outdoor) accessible and usable by all users from the outset (retrofitting is not a fall back or solution). • in the context of inclusive education, deliberately plan environments which enable full participation of all students in all stages of the design process. • engage with professional support staff and parents, students/children to ensure designs and fit out provide direct, or indirect access, for participation by users with a range of abilities. • ensure that all settings, spaces and amenities which students will access are able to exited by all students under their own power and at their own discretion. • be mindful of the need for order and routine for all users while not stifling creativity and spontaneity. • prohibit the construction of spaces intended for purpose of seclusion. • ensure physical access of facilities and utility of equipment for people with varying physical and sensory abilities e.g. electronic door opening and width allowance for those with physical impairment; varying height desks and benches. • ensure physical travel and circulation between learning spaces and zones is intuitive, unencumbered and level. • ensure that settings, spaces and amenities are 'all access' and do not segregate or stigmatise individuals or groups. • ensure acoustic properties of spaces support the activities that will be conducted in the space and suit the hearing and visual status and needs of the users. • ensure lighting properties of spaces are adjustable to enable adequate control of glare and visual contrast and support the activities that will be conducted in the space. • where possible incorporate sensory enrichment without overstimulating the senses. • ensure dignity of all students/children and staff is maintained through appropriate design. • apply universal design features to facilitate freedom and independence and provide opportunities for children and students to self-regulate emotions and behaviour.
Diversity Embrace diversity — diversity in learners and social and cultural diversity – within the school and wider community	Design and fit out indoor and outdoor facilities that reflect and celebrate the cultural make-up of the school or early childhood community: • engage with the school or early childhood community to determine cultural needs and the specific needs of different groups (e.g. different socioeconomic, different abilities) • provide settings and spaces that support different cultural practices of the school or early childhood community • provide signage, display areas, meeting and gathering spaces to honour and celebrate cultural diversity and contribute to the development of intercultural understanding • provide for equal user privacy, security and safety — this might include, for example, use of flashing lights as part of the emergency warning systems for staff and students/children with hearing loss who cannot hear the more traditional auditory-based warning systems.
Wellbeing Create a positive culture and embed wellbeing in all aspects of school and early childhood life through connecting the learning environment, curriculum and pedagogy, policies, procedures and partnerships for learning and life.	Design facilities that are aesthetically pleasing, welcoming and support the physical, emotional and social wellbeing of the students/children and staff by: • providing a welcoming entry to all facilities • providing indoor conditions and amenity that support and enhance learning • promoting delight and inspiration among students, children and the broader school or early childhood community • educating the aesthetic imagination and the senses • including informal community and social spaces and hubs and thus opportunities for students and children to further develop personal and social capability • providing a continuum of learning and recreation • actively promoting the safety and security of all students, children, staff and visitors and minimise security risks for buildings and other assets • integrating facilities with the natural and urban environment

Education principle/s	Education Facilities Design Principles
	• actively promoting safe and easy access by all modes of transport and encourage users to travel by sustainable modes of transport wherever possible.
Community Support a sense of community and belonging.	Support a sense of community and belonging both within the school or early childhood centre and the school/early childhood centre within the wider community. In collaboration with the school or early childhood community, design facilities that: • are welcoming and promote inclusion of the community • actively promote community access and engagement • have a human, family feel as opposed to an institutional feel • have community focal points that create wholeness and oneness through gatherings, incidental crossroads and serendipitous social interaction • involve the sharing of resources and learning spaces • inspire participation in, and responsibility for the learner's community and respect for others and property • provide facilities that can be shared by the community to host a variety of purposes, including out of hours support, for building a community culture • respond to the local context and assist in creating a local context for new communities • promote integration over segregation including integration of prefabricated buildings through innovative design and effective master planning

2.2.1 *Access and inclusion*

Queensland is committed to providing all young Queenslanders with equitable access so they can participate in education that is inclusive and free from any form of discrimination. Too often in the design of facilities, accessibility is an afterthought.

To achieve the Department of Education's commitment to inclusive education, the design of Queensland education facilities will need to go beyond minimum compliance and employ the Universal Design Principles that aim to make the built environment (indoor and outdoor) usable by all users — staff, students, children and visitors.

2.3 Universal Design Principles — 'design for all'[20]

Universal Design is the design of products and environments to be usable by all people, without the need for adaptation or specialised design. The Universal Design Principles are fundamental, non-negotiable design principles to be applied to all aspects of education facilities.

The wording of the principles has been amended slightly from the original wording of the Centre for Universal Design to make the meaning of each principle clear in educational settings.

Universal Design Principle 1: Equitable use

The design is useful to people with diverse abilities.

This means:

- provide effective means of use for all users regardless of abilities: identical whenever possible; equivalent when not
- avoid segregating or stigmatising any users
- provide for equal user privacy, security and safety
- make the design appealing for all users.

Universal Design Principle 2: Flexibility in use

20 Centre for Excellence in Universal Design http://universaldesign.ie/What-is-Universal-Design/The-7-Principles/ - p1

The design accommodates a wide range of student/child, staff and visitor preferences and abilities.

This means:

- provide choice in methods of use, taking into account safety and security
- accommodate access and use for all people taking account of varying abilities, body sizes, posture, mobility or handedness
- facilitate the user's accuracy and precision
- provide adaptability to the user's individual movement needs such as pace.

Universal Design Principle 3: Simple and intuitive

Use of the design is easy to understand, regardless of the user's experience, age, knowledge, language skills, or current concentration level.

This means:

- eliminate unnecessary complexity
- be consistent with user expectations and intuition
- accommodate a wide range of literacy and language skills.
- arrange information consistent with its importance
- provide effective prompting and feedback during and after task completion.

Universal Design Principle 4: Perceptible information

The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

This means:

- use different modes (visual – pictorial and text, aural, tactile) for presentation of essential information
- provide adequate contrast between essential information and its surroundings
- maximise legibility of essential information
- differentiate elements in ways that can be described (i.e., make it easy to give instructions or directions)
- provide compatibility with a variety of techniques or devices used by people with sensory disabilities.

Universal Design Principle 5: Tolerance for error

The design minimises hazards and the adverse consequences of accidental or unintended actions.

This means:

- arrange elements to minimize hazards and errors: most used elements, most accessible; hazardous elements eliminated, isolated, or shielded
- provide warnings of hazards and errors
- ensure equipment and fittings have built-in fail-safe features
- discourage unconscious action in tasks that require vigilance.

Universal Design Principle 6: Low physical effort

The design can be used efficiently, comfortably and independently with a minimum of fatigue.

This means:

- allow user to maintain a neutral body position
- use reasonable operating forces

- minimise repetitive actions
- minimise sustained physical effort.

Universal Design Principle 7: Size and space for approach and use

Appropriate size and space are provided for approach, reach, manipulation, and independent use regardless of user's body size, posture, or mobility.

This means:

- provide a clear line of sight to important elements for any seated or standing user
- make reach to all components comfortable for any seated or standing user
- accommodate variations in hand and grip size, strength and diversity
- provide adequate space for the use of assistive devices or personal assistance
- ensure that younger/smaller students and children are considered in the context of height/size/space.

Part B

Master planning design principles

3. Introduction

3.1 Facilities Design Principles

The implications of the Education Principles for facilities design are set out in the Facilities Design Principles summarised below It is imperative that the implications of each of these principles is considered in master planning, architectural design and landscape design:

- Create contemporary indoor and outdoor learning environments that facilitate a learning and learner-centred approach.
- Support collaborative learning and teaching for students and professionals.
- Design and fit out indoor and outdoor spaces that enable all users — staff, students, children and visitors to the school to participate in all school experiences.
- Design and fit out indoor and outdoor facilities that reflect and celebrate the cultural make-up of the community.
- Design facilities that are aesthetically pleasing, welcoming and support the physical, emotional and social wellbeing of all students, children and staff.
- Support a sense of community and belonging both within the school or early childhood centre and the school or early childhood centre within the wider community.

3.2 Compliance with Acts, regulations and standards

The design of school buildings and facilities and all works in Queensland schools must comply with all relevant Acts, regulations and standards, and the NCC.

Early childhood centres must comply with additional legislative requirements as well as those applicable to schools. Early childhood services in Queensland are predominantly regulated under the National Quality Framework (https://www.acecqa.gov.au/nqf/about). As part of the National Quality Framework, these services must comply with building and physical environment requirements outlined in the following legislation and code:

- Education and Care Services National Regulations[21]
- National Quality Standard (particularly Quality Area 3 – Physical Environment[22]
- NCC

The requirements of the National Quality Framework are distinct from and additional to the requirements of the NCC and local council planning approval.

A small number of Early Childhood services are regulated under the Education and Care Services Act 2013. These services do not need to comply with the National Quality Standard but have similar building and design requirements, including complying with the requirements of the NCC.

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.

21 https://www.legislation.qld.gov.au/view/html/inforce/current/sl-2011-ecsnr
22 https://www.acecqa.gov.au/nqf/national-quality-standard

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

Where, the *Design Standards for Department of Education Facilities* specify a requirement or performance standard which exceeds those specified in any relevant Act, regulation, standards or the NCC, the designs must comply with the higher requirement or performance standard.

Food premises areas in Canteens, Tuckshops, kiosks, early childhood centre kitchens and Catering Kitchens (for teaching catering and hospitality to students in years 10 to 12), shall comply with the '*Design and fit-out guide for food business - Food Act 2006 - September 2015*' published by Queensland Health.

4. Education facilities in Queensland

The Department of Education owns and manages a range of different education facilities to suit the diverse needs of Queensland's learners, these can generally be categorised as schools or early childhood centres. The *Design Standards for Department of Education Facilities* are intended to be mandatory standards applied to all the education facilities owned by the Department of Education and should be applied to all new construction as well as work to existing facilities with exceptions to be approved by the department.

4.1 Primary schools

Primary schools provide students from Prep to Year 6 with compulsory learning in a common, yet broad, curriculum that teachers adapt to suit local and individual needs. Students develop skills and knowledge relevant to their present and future needs and gain a greater understanding of other cultures and technology.

4.2 Secondary schools

Secondary schools provide educational programs to students of compulsory school age and provide a further two years of senior education for those wishing to continue formalised learning in school as their compulsory participation option. Students are offered a broad range of academic and vocational subjects enabling them to pursue a course of study that will further their educational and career goals. Secondary schools require a number of specialist learning areas with specific requirements to support the curriculum delivery.

4.3 P–10/12 schools

P–10/12 schools provide education to students from Prep to Year 10 or Year 12 depending on the school's location. Generally, P–10/12 schools provide students with a seamless transition across the phases of learning, and are innovative in the way they offer the curriculum.

4.4 K-6 and K-10/12 schools

Nominated schools, which are prescribed under the *Education (General Provisions) Act 2006* (Queensland) and the *Education (General Provisions) Regulation 2017*, provide a Kindergarten program in addition to providing education to students from Prep to Year 6, Year 10 or Year 12. This is called a State Delivered Kindergarten program and the school may be called a K-6, K-10 or K-12 school.

4.5 Enriched education — Queensland Academies

The Queensland Academies aim to accelerate learning opportunities for Queensland's best and brightest students in Years 10, 11 and 12. The educational program offered by the academies is the International Baccalaureate Diploma Program. This program is a world-recognised preuniversity qualification and characterised by accelerated studies, extension and enrichment work with universities, industry experience and personal and social development.

4.6 Special schools

Special schools provide highly specialised and individualised programs to cater for students with intellectual disability which, alone or in combination with other disabilities, severely affects the student's ability to attend and learn at school.

4.7 Hospital schools

Hospital schools provide either classroom or ward-based specialised educational programs for students from Prep to Year 12. A student can be an admitted patient, a sibling of a patient or a child of a patient. Hospital school teaching staff, in liaison with medical staff, provide a warm, supportive and flexible educational environment for students during their hospital stay.

4.8 Schools of distance education

Schools of distance education provide educational programs for students from Prep to Year 12, who are unable to attend a traditional school setting due to geographic isolation, illness or other special circumstances. Schools of distance education also provide services to families who choose home-based learning, adults who are completing their schooling, and students living overseas. School-based students who are unable to access desired subjects locally and students attending alternative education settings are also provided with educational programs. There is an increasing emphasis in schools of distance education on the use of information and communication technologies and digital learning resources to maximise learning opportunities and improve teacher and student interaction.

4.9 Outdoor and environmental education centres

Outdoor and environmental education centres (OEECs) develop and deliver outdoor and environmental education programs for schools and the community, and provide professional development for teachers. Programs are linked to the school curriculum and student leadership objectives. These centres provide information about local environmental issues, and serve as venues for school excursions and camps. Many are available for hire on weekends and school holidays. The centres offer specialised learning programs such as archaeology and heritage interpretation, environmental arts, urban renewal, and water-watch investigations.

4.10 Queensland pathways state colleges

Queensland Pathways state colleges offer an alternative schooling model for students needing additional support to remain engaged or become re-engaged in learning and those involved in youth justice. These colleges play an important role in supporting vulnerable students in years 10-12 to complete their year 12 education, and create pathways to tertiary education and training.

4.11 Early childhood centres

The Department of Education owns early childhood centres that accommodate a range of different early childhood service types, this includes regulated services providing education and care for children in a centre-based environment and non-regulated services, providing support for families and their children. Early childhood centres are often run by a third-party provider under a leasing arrangement with the department, however, in some instances, i.e. State Delivered Kindergartens, may be delivered by the school.

4.11.1 *Regulated services*

Services regulated under the *National Quality Framework* or the *Education and Care Services Act 2013* must comply with a range of legislative requirements in order to provide education and care for children. This

includes physical environment requirements such as those relating to fencing, supervision, toilet and hygiene facilities and minimum indoor and outdoor space requirements. Regulated services include:

- Long day care - Education and care for children from birth to school age, generally delivered by a third-party provider.
- Kindergarten - Educational program for children in the year before Prep, may be delivered by the school as a State Delivered Kindergarten or by a third-party provider.
- Outside Schools Hours Care - Care for children before school, after school or during school holidays (typically school age children but may include kindergarten aged children in certain circumstances), generally delivered by a third-party provider.

4.11.2 *Non-regulated services*

Non-regulated early childhood services provide access to support and services that assist families and their children to have a successful transition from home to kindergarten and later, to school, including playgroup, adjunct care, family and parenting support and health services. These are generally known as integrated services. These facilities, while not legislated to do so, are expected to meet the same physical environment standards as regulated services, wherever possible.

5. Urban Design

As part of the Queensland Government's commitment to achieving better urban design outcomes across Queensland, principles were developed to guide design, development and improve the quality of urban outcomes. These principles are published in QDesign, *Principles for good urban design in Queensland, December 2018*[23].

5.1 Education facilities and the public environment

Schools and early childhood centres provide a community focus and contribute to the urban structure, legibility and coherence of a place. Good urban design integrates education facilities with surrounding communities through careful consideration of.

- site planning
- building form and scale
- the location of access routes and surrounding infrastructure
- by exploring opportunities for shared or joint use of facilities.

Schools, at their best, function as the centre of the community and offer the opportunity to share facilities. Many schools and communities work together to share library facilities, sporting facilities, meeting spaces and performance spaces on school grounds.

Close links between a school or early childhood centre and its community can enhance public safety, health and economic wellbeing and encourage sociability in culturally diverse and disadvantaged areas. A strong relationship with the community will result in the community advocating for the needs of the school or early childhood centre and the students and children, supporting fund-raising activities, volunteering for activities and providing passive security.

Good urban design is not just about space planning. It is also about context over time. Consideration must be given to the:

23 Principles for good urban design in Queensland, December 2018

- past — origins and early development
- present — current condition
- future — informed, evidence-based speculation on future development and the place of a dynamically evolving school in it.

5.2 Urban design principles applied to education settings

Queensland is a region of diverse scale and character. Covering an area of 1,722 000 km^2, its urban landscapes are a rich mix of thriving cities, bustling regional and coastal towns, and remote communities settled across a natural landscape of bushland, beaches, ranges, rivers, rainforest and lakes. As part of the Queensland Government's commitment to achieving better urban design outcomes across Queensland, principles were developed to guide design, development and improve the quality of urban outcomes. These principles are published in QDesign, *Principles for good urban design in Queensland* [23].

The QDesign *Principles for good urban design in Queensland* have been integrated with the overarching principles and the *Education Facilities Design Principles* to guide master planning, architectural design and landscape design of education facilities specifically.

Responsiveness

- be climate responsive
- be inspired by local place, character, form, and culture
- work with and enhance natural systems, landscape character and biodiversity
- create attractive, human-scale places and deliver a well-integrated facility that successfully blends the old and the new.

5.2.1 *Be climate responsive*

Climate responsive design is essential in managing the environmental impacts of urban areas and establishing the resilient communities of the future:

This means:

- buildings and spaces should be designed to work with and respond to the local climate to create places that are resource efficient and deliver climate resilient, comfortable and cost-effective living.

Strategies

- Take advantage of the local climate and adopt passive design strategies to significantly reduce or eliminate the need for mechanical and electrical systems, using natural elements such as sunlight and breezes to heat, cool and light buildings.
- Maximise natural light. Apply design strategies to maximise natural light in habitable spaces, reducing reliance on artificial lighting, improving amenity for occupants and reducing energy demand.
- Reduce the extremes of temperature. Use building layout design and architectural features, such as hoods, louvres, screens, awnings, and hard and soft landscape elements to reduce the extremes of temperature and urban heat island effect in buildings, streets and spaces.

Use movable elements — maximise comfort opportunities. Use movable elements such as adjustable openings and sliding screens, allowing occupants to manually control the temperature, shading and comfort of their environment.

5.2.2 *Be inspired by local place, character, form and culture*

Memorable places, places with their own identity, reflect the distinctive qualities of their physical setting, heritage and community values. This means:

- buildings and spaces should be designed to reflect the distinctive qualities of a place by identifying landscape, heritage and cultural assets worthy of protection, and working with these to enhance natural systems, landscape character and biodiversity.

Strategies

- Engage with the school community to determine cultural needs and the specific needs of different groups (e.g., different socioeconomic, disability).
- Create contributory community value by understanding the characteristics, traditions and values of the local community, and explore opportunities to work with these, and extend benefits beyond the development site boundary and back into the community.
- Map the valued assets (landscape, heritage and culture) and work with these features to create places with a strong relationship to their context.
- Work with the natural topography of the area to minimise requirements for cut and fill and create development that contributes positively to the environmental and visual experience of a place.
- Interpret locally distinct building traditions. Work with and interpret locally distinct building traditions, materials and craftsmanship to create development that draws on local practices and physical qualities.

5.2.3 *Work with and enhance natural systems, landscape and biodiversity*

The health of our urban environments and our personal health are interlinked. Well planned and maintained green spaces and waterways have been shown to improve community health and wellbeing, and significantly improve the liveability of places. Their inclusion supports biodiversity, delivers opportunities for sustainable water management, contributes to better air quality, mitigates noise, moderates temperature, provides enhanced recreational opportunities and comfort through shade. This means:

- buildings and spaces enable the protection and enhancement of established ecologies and hydrological systems, delivering a connected network of ‘working’ landscapes that support the physical, emotional and social wellbeing of the students and staff and provide a landscape for learning.

Strategies

- Work with established ecological and hydrological systems to improve urban biodiversity and create a ‘working landscape’ of connected green corridors and waterways.
- Apply best practice Water Sensitive Urban Design (WSUD) in the design of buildings, and spaces, working with established topography to sustainably manage surface water run-off at the source and deliver improved biodiversity and landscape amenity.
- Conserve and protect healthy trees, plants of scale and significant species as valuable community assets.

Ensure there is adequate space for vegetation. Provide areas of deep soil for planting within the site and along the site boundary to ensure there is adequate space for vegetation (trees and shrubs) to grow and thrive into maturity.

Diversity, wellbeing, access and inclusion

• create great places to learn

• create attractive human-scale places and deliver building forms that successfully blend the old with the new

• design the built environment to be usable by all users – school staff, students, and visitors to the school.

5.2.4 *Create great places to learn*

Successful education facilities are great places to learn. The whole site is to be considered as a ‘landscape for learning’ which will support a rich mix of learning needs and offer variety and choice. This means:

- buildings and spaces are inclusive and support the needs of a diverse community — the learning needs of students and the professional needs of staff.

Strategies

- Ensure complementary and contrasting land uses are well located and that education, residential, and commercial densities are appropriate and make mixed use viable.
- Easily accessible. Provide a safe environment that promotes walking and/or bike riding to school and active mobility for all.
- Create ‘life on the street’. Use the ground floor of the education facility buildings to clearly address the adjacent street or space, delivering a sense of safety, community ownership and activation.
- Prioritise the needs of young people who use the education facilities.
- Crime Prevention Through Environmental Design (CPTED). Ensure decisions about design and management of places is influenced by the principles of CPTED so that our education facilities and the communities in which they operate are safer, more secure and therefore more sustainable.

5.2.5 *Create attractive, human-scale places and well-integrated building forms that successfully blend the old with the new*

This means:

- buildings and spaces that feel comfortable for the age and stage of the young people who will inhabit them while integrating with the surrounding built environment.

Strategies

- Respond to human scale. Create buildings, streets and spaces that respond to human scale, establishing a walkable urban structure and opportunities for a fine-grain urban form.
- Vary development density. Use diverse building heights and typologies, to avoid the creation of featureless and monotonous scale places.
- Work well with their neighbours. New buildings should work well with their neighbours and respect their local context. This does not mean new development must mimic its neighbour but does require new development to be considered in the way it acknowledges and responds to its neighbour. This approach provides opportunities to use material choice and building massing to ensure developments of different scales are well integrated.
- Create buildings that contribute to the quality and character of the street. Building forms and massing should be used to define streets. Their scale should be used to establish a clear street structure and hierarchy. Windows, terraces, balconies and principal entrances should be designed to contribute to the character and activation of the street, supporting local business and residential activity and positively contributing to a safe and vibrant street life.
- Prioritise occupant amenity. Consider building performance and prioritise occupant amenity through the articulation of building massing, height and forms.

5.2.6 *Design the built environment to be accessible and usable by all users —school staff, students, and visitors to the school*

This means:

- buildings and spaces that are accessible for all users by default and eliminate segregation or separation.

Strategies

- Create places that respond to the diversity of the users of the facility, prioritise the differing ability of children and people.

- Engage with professional support staff to ensure designs provide direct, or indirect access, for participation by different students with a range of different abilities.

Ensure that access and egress to the site, buildings, spaces and amenities are ‘all access’ and do not inadvertently or intentionally segregate or stigmatise individuals or groups.

Explicitly prohibit the creation of spaces designed to seclude individual students.

Reconfigurability

• embed opportunities for adaptation and change

• design buildings and spaces to have inbuilt flexibility and be readily changed to accommodate new uses and users in the long term.

The most resilient places are those that can be repurposed and reoccupied, they are places that are capable of adapting easily to changing social, economic and environmental influences. This means:

- buildings and spaces need to be future focused, designed with an ability to be changed or repurposed without major re-construction and expense.

Strategies

- Locally sourced. Provide facilities to enable the education community to be more resilient and self-sufficient embedding opportunities for a community garden and water and energy to be locally sourced.
- Create flexible buildings, streets and spaces that are capable of adapting to new uses and user needs over time.

Resource efficient, durable and low maintenance. Design places to be resource efficient, durable and low maintenance to reduce energy demand and therefore costs in construction and maintenance in the long term.

6. Master planning and site planning

6.1 Urban context analysis

The master plan for a site must be based on an understanding of the nature of a place. It must be underpinned by a comprehensive analysis of the natural, cultural and built context and the associated opportunities and constraints of the site.

The urban design analysis must take into account:

- key elements of the existing and future proposed context and the nature of the surroundings beyond the site
- existing and future connections between the site and surroundings and the patterns of movement of the users (e.g., pedestrians, cyclists, people with a range of disabilities and vehicles)
- cultural links to the site (e.g., Aboriginal and Torres Strait Islander people; early settlers; migrant communities)
- the existing patterns of built form on the site and around it, including heritage elements existing flora and fauna on and adjoining the site, and characteristics that make it a unique place
- the site topography, historical land use (considering ground condition and contamination risks), hard and soft landscape and ecology).

6.2 Cultural and heritage considerations

The design and development of new sites and the re-development of existing Queensland state education settings must preserve Queensland’s cultural heritage for the benefit of the community and future generations. All planning, consultation, design and works must comply with the:

- *Aboriginal Cultural Heritage Act 2003*
- *Queensland Heritage Act 1992*
- *Torres Strait Islander Cultural Heritage Act 2003*.

The principles and procedures of the Burra Charter[24] must be observed.

Planning and design must preserve all unique and significant natural and cultural features, with works limited to that necessary to care for the place and to make it useable, but otherwise change as little as possible so that its cultural significance is retained.

New work should respect the significance of a place through consideration of its siting, bulk, form, scale, character, colour, texture and material. Imitation should generally be avoided.

Where a Conservation Management Plan (CMP) exists, planning and design must comply with the CMP.

Where planning and design is required to meet departmental goals and is contrary to the CMP, public consultation must be undertaken, and the CMP updated accordingly.

Where planning and design requires a CMP and one does not exist, a CMP must be developed and approved prior to planning and design being undertaken.

Consideration must be given to existing buildings which often have heritage and cultural value without being formally recognised by the Queensland heritage register or local heritage registers. Existing buildings must be treated as if they are of significant heritage and cultural value regardless of formal status, and any modifications must be able to withstand scrutiny for the sequence of investigations, decisions and actions taken.

6.3 Allowing for enrolment growth and flexibility

The department uses prefabricated buildings as an adjunct to permanent facilities, so that schools can accommodate fluctuations in student enrolments and peak enrolments that may be significantly more than a school's long-term enrolment. These are often referred to as relocatable buildings due to their ability to be relocated from one school to another to address peak enrolment trends.

Master plans must consider planning for peak enrolments which can be unpredictable and must propose practical strategies for the positioning of prefabricated buildings, for alignment with the local educational context, landscape elements (hard and soft), service connections, and for integration with community use facilities.

6.3.1 *Master planning for prefabricated buildings*

Master planning must allow planned space for the future installation of prefabricated buildings in a manner which does not detract from the design and functionality of the overall site and ensures integration with the permanent facilities.

The overarching principles, the Education Facilities Design Principles and the Universal Design Principles apply equally to prefabricated buildings and their layout as they do to the design and layout of permanent buildings.

Prefabricated buildings will typically be brought to site progressively to provide accommodation as a school's enrolment exceeds the capacity of permanent buildings. Prefabricated buildings may be on a school site for potentially extended periods of time and deserve the same status as permanent learning and teaching areas. They should read as an integrated part of the school, connected to the open space and circulation networks. Landscape should be used to integrate prefabricated buildings and give status to 'temporary' parts of the

24 https://australia.icomos.org/wp-content/uploads/The-Burra-Charter-2013-Adopted-31.10.2013.pdf

school. As part of the inclusion of prefabricated buildings into the master plan, design consideration must be given to the:

- Constraints and opportunities presented by the site, the proposed placement of permanent buildings, pathways, play areas, civil works, underground services, etc., and the constraints presented by existing and proposed contours and site topography. The height above ground level at entry points to prefabricated buildings should be minimised to minimise the extent of stairs and ramps.
- How the prefabricated buildings can be clustered and distributed to enable similar learning environments to those provided in permanent learning and teaching areas.
- Placement of prefabricated buildings to avoid negative visual and aesthetic impact on the street and public realm. Prefabricated buildings should not be located immediately adjacent to the main frontage or near the main entry to the site.
- Access and logistic space for the planned safe delivery, placement and subsequent removal of those buildings. Sufficient space must be allowed for the size of transport vehicles and lifting equipment used for this purpose and provide unobstructed routes of delivery access across the site, noting that transport vehicles cannot travel over soft ground or deep swales or beneath tree canopies, or negotiate ground with excessive slope and camber. A minimum 6 m wide clear access route must be provided. Access routes must avoid the need for transport vehicles to traverse hard-courts or require the removal of site infrastructure such as covered walkways and playgrounds.
- Positioning of prefabricated buildings to integrate with the site contours, site services, permanent buildings and structures, overflow carparks, play areas, pathways, outdoor learning areas, parent drop off areas, shared facilities, emergency services and utilities including water, power and communication technology.

The master plan must demonstrate that the prefabricated buildings can be simply and safely moved onto and off the site with minimum disruption to school activities and external environments.

6.4 Construction planning and future development

Master plans must provide for the opportunity to deliver future school, early childhood or community infrastructure. These considerations must inform the design of outdoor spaces between buildings and the linkages and opportunities beyond the current facilities.

For existing Queensland state education settings, including new schools with a staged delivery, master plans must demonstrate how facilities can continue to operate during construction without undue disruptions to learning environments.

6.5 Integration of early childhood centres

Primary school master plans should consider a general provision for an early childhood centre. If there is not an immediate need, this should be allocated as a provision for future early childhood or other complementary community facilities.

In planning for this provision, consideration should be given to creating an early years precinct within the school, by locating early childhood facilities near Prep year facilities, to assist children with early integration and a smooth transition from early childhood education into school.

Consideration must also be given to the operation of the early childhood centre and potential for it to be delivered by the school (for example a State Delivered Kindergarten) or by a third-party provider, which has implications for operating hours, the need for an identified street address, connectivity of facilities, metering requirements and for separating power supply, information technology provisions, security systems etc. Regardless of the provider, the centre should feel like an integrated part of the early years precinct of the school.

6.6 Integration of existing community facilities

Master planning should identify nearby community sporting or recreational facilities (existing or planned) and demonstrate ways that the master plan is integrated with and engages with those other facilities and their community of users. The shared use of car parks should also be considered.

6.6.1 *Community use of education facilities*

Opportunities to design facilities with reference to the broader community context and to foster joint use arrangements, sharing and community access for use outside hours should be explored. Parents and other community members should feel that they are welcomed and valued at the school or early childhood centre and that it has a role as a community resource.

The design of facilities must support opportunities for use outside normal hours by small and large groups of users drawn from the community. Spaces and functions suited to community use must be designed to be available for parents and the community to gather and meet, learn, be active and be involved. These spaces may include sports facilities, performance and presentation spaces, the library/learning resource centre, spaces to accommodate out of school hours care programs, community gardens (where provided) and spaces suited for small and medium sized community meetings and social activities.

The design must show that these spaces (and the necessary amenities and services) can be zoned and isolated for contained use out of hours. Provision must be made to secure the limits of suitable community access areas, so that unauthorised persons are prevented from accessing the remaining areas of the facility. When a limited area is secured for community use, it must deliver all user requirements including zoned and sub-metered building services, zoned isolation of security services, emergency egress and access to amenities.

Consideration must be given to direct external access to community use zones, the approach path and safe departure route for users who may be moving across the grounds at night or at weekends, and the proximity to car parking.

6.7 A sense of address

Schools and early childhood centres should invite and welcome the local community through the design and orientation of buildings and through the creation of a well-positioned and obvious point of entry and address. Where community facilities and open space are located adjacent to the school, master planning should, where possible, have reference to the location and design of these facilities so as to create a community precinct that encourages links and interaction between schools and community facilities, maximises ease of use for parents and other community members, and zones the school into public access and secure school zones.

Early childhood centres on school sites operated by a third-party provider require a dedicated point of entry which supports a separate identified street address, to streamline deliveries and access separate to the school, while still integrating the service into the campus as a whole.

6.8 Site circulation

Master planning, particularly the location of entry points and car parks, should:

- ensure that access and egress to the site, buildings, spaces and amenities are ‘all access’ and do not segregate, stigmatise or disadvantage individuals or groups
- have reference to the surrounding footpaths, pedestrian crossings, bicycle paths, disability parking, bus bays, street network and traffic management infrastructure.

Where pedestrian and bicycle paths abut or run close to a site, safe and easy access to the site from these paths must be provided. It is critical that access for students and children arriving by non-motorised forms of transport is encouraged and carefully considered as part of the master planning process.

Each site must be provided with a continuous accessible path of travel linking all habitable buildings with site access, bicycle and car parking, and bus stops.

A continuous accessible path of travel must be provided for stretcher access to all first aid and sick rooms from the kerb of the nearest emergency vehicle parking bay and must comply with the relevant Australian Standards. These paths of travel must consider the widths of doors, circulation spaces, and the slope and cross falls of access pathways.

Site planning must also consider high level links to provide a continuous accessible path between multi-storey buildings for efficient and safe movement around the site, particularly for users with diverse mobility requirements. Where practicable, accessible paths and ramps are preferred over lifts to reduce ongoing costs and prevent operational access issues caused by lift failure.

The traffic flow design must ensure safe vehicular, bicycle and pedestrian access, egress and movement within the site and ensure minimal disruption to surrounding traffic movement. The orientation of entry points should have reference to surrounding drop-off and pick-up areas to maximise accessibility and encourage safe movement of parents, students, children and other users.

The master plan must consider and resolve the space provided for the arrival, departure, parking, loading and unloading of buses. Associated with this function, the master plan must make provision for the safe and convenient circulation of students arriving or departing by bus, including provision of paved sheltered waiting areas (with seating) on the school site and proximate to the bus parking areas.

6.8.1 *Emergency evacuation planning*

Site circulation must also plan for the safe evacuation of building occupants in an emergency situation. Master planning must consider safe egress from all buildings in an emergency event and circulation paths to a dedicated emergency assembly point. The development of detailed evacuation procedures and associated evacuation plan diagrams is an operational responsibility to be managed by the school or early childhood centre.

In planning for the safe evacuation of building occupants, all designs must comply with the deemed to satisfy provisions of the NCC, however, additional provisions may be required to address the needs of building occupants with a mobility impairment. The performance requirements of the NCC, clause D1P4, require that exits appropriate to “the number, mobility and other characteristics of occupants” be provided from a building.

It is recognised that special schools will typically have a higher proportion of building occupants with a mobility impairment and the *Technical note: Special school evacuation guideline,* has been developed to support a consistent approach to safe evacuation planning for new facilities in special schools. When planning new facilities in special schools, the use of stairs via an evacuation mattress or stair chair, should not be considered the primary evacuation strategy for occupants with a mobility impairment and an alternative evacuation strategy is required.

Within this context, the following summarises the hierarchy of preferred evacuation modes (i.e. accessible exits) for occupants with a mobility impairment. (Noting that compliant travel distances associated with these accessible exits are to be achieved in accordance with *NCC clause D2D5 and D2D6*, or addressed through Performance Solution):

- Provision of on-grade exits to road or open space, or to an adjacent building via an elevated walkway, if available.
  - This mode of evacuation allows for occupants with a mobility impairment to freely evacuate with minimal assistance.
- Provision of an externally located ramp complying with accessibility requirements.

  - Again, this mode of evacuation allows for occupants with a mobility impairment to freely evacuate with minimal assistance using pathways that are likely to be familiar.
  - However, in assessing the route of the ramp as an evacuation strategy, a review of potential exposure hazards from the building it serves needs to be considered.
- Use of lifts
  - With appropriate treatment, lifts may serve as the evacuation strategy for occupants with a mobility impairment
  - It is recommended that the access lobbies to the lift be separated from the main building, given potential waiting times for the lift to arrive.
    - Separation and refuge space must be provided in terms of physical fire and/or smoke separation, or physical distance with suitable ventilation.
    - The expected time of evacuation must be reviewed as to define the rating of the refuge space (i.e., fire or smoke rated) if required.
    - The geometry and available area of the refuge space must be reviewed against the potential occupant load and mobility.
    - Provision of fire compartments and horizontal exits may be utilised as forming part of the separation and refuge space.
  - Lifts should be treated in the same manner as fire-isolated stairs in that they need to be fire separated from the building and discharge to a point that this suitably separated from the remainder of the building as to allow continued safe egress. It is recommended that the lifts are designed as evacuation lifts in accordance with NCC.
  - Lifts must be provided with an adequate power supply to ensure reliable operation in the case of an event requiring evacuation, this may be a power supply direct from the national power grid through a dedicated fire separated switchboard, a stand by power supply system or localised battery backup.
- Use of stairs
  - As noted, the use of stairs as a mode of evacuation is not desired for occupants with a mobility impairment as it is in contradiction to the WHS legislation for staff and students. However, stairs should still be installed for able bodied occupants and must achieve compliance with the NCC or be addressed through a performance solution.

It is recommended that the evacuation strategy for the building is reviewed by a suitably qualified fire engineer for the explicit purpose of reviewing evacuation of mobility impaired occupants. For further information refer to the *Technical note: Special school evacuation guideline.*

6.9 Disaster mitigation

Master plans must be developed to mitigate the impact of:

- natural disasters including bushfires, cyclones and storms, earthquakes, floods and storm surges, and landslides
- man-made disasters including chemical and hazardous material spills.

6.9.1 *Bushfires*

To mitigate the impact of bushfires:

- a Bushfire Attack Level (BAL) assessment of the site must be undertaken using the method described in *AS 3959 Construction of buildings in bushfire-prone areas*
- buildings should be in areas of the site with the lowest BAL rating.

6.9.2 *Floods and storm surges*

To mitigate the impact of floods and storm surges:

- Where possible, buildings should be in areas of the site not affected by inundation or overland flows. If not achievable, ensure the building floor levels are above the relevant flood risk levels.
- Building floor levels must be 500mm above the 1% Annual Exceedance Probability (AEP) inundation level as minimum.
- Consideration should be given to the relevant authority's minimum floor level requirements. Projected future 1% AEP flood levels should be considered such as the 0.2% AEP or 0.5% AEP levels.
- overland stormwater flow paths must be designed to ensure that water does not enter buildings during a 1 in 50 ARI rain event
- Due consideration should be given to various activities that may lend themselves to be in flood resilient buildings and spaces that are not above the minimum floor height requirements. Potential risks to occupants and damage to infrastructure must be mitigated as part of the design solution in line with designated floor levels.
- Essential plant equipment must be located 500mm above the 1% AEP inundation level as minimum.
- pedestrian and vehicle access must be designed to allow suitable access and egress and the use of buildings following a significant rain event.

6.9.3 *Emergency shelters*

Subject to the department's prior written approval, a special purpose facility such as a cyclone shelter or bushfire safe haven may be provided.

Where an emergency shelter has been approved:

- The building floor level must be above the 1 in 200 ARI inundation level
- At least one road access must remain passable for emergency evacuation during a 1 in 200 ARI rain event.

6.10 Summary of key considerations for school master planning

A master plan provides the spatial framework for an educational environment fully aligned with a school's vision for learning and opportunities and constraints arising from its site. It helps coordinate diverse considerations into a strategic long-term plan for facilities.

Master planning and site planning must:

- Consider the school's place within the immediate neighbourhood and wider community.
- Consider patterns of pedestrian and vehicular movement to and through the school. Consider how the public, parents and pupils access the school.
- Maximise potential linkages with nearby community facilities and consider potential partnership opportunities.
- Exploit the full extent of land. Every part of the site should be considered and integrated with a view to maximise the use of the total site as a landscape for learning. The development of isolated and unusable parts of the site should be avoided.
- Develop a clear hierarchy of open space and a 'heart' for the school. Outdoor areas must contain areas that vary in scale from larger gathering and active play spaces, to medium play spaces to smaller, intimate areas of refuge and a flow between indoor and outdoor space where appropriate.

- Make best use of the natural assets of the site. Consider how existing ecosystems, topography, vistas and habitats can inform the design response and how these can also become part of the learning experience.
- Develop a clear address and main point of entry. A school entry should be conspicuous and announce itself to the neighbourhood. It is the interface between the school and students, parents and the community. The school's address must be more than just a drop-off point.
- Encourage active transport through the design. The site must integrate with the area's broader cycling and walking path networks.
- Consider provision for the integration of an early childhood centre, creating an early years precinct within the school.
- Consider after hours use and community access to buildings and sports facilities and grounds. Consideration should be given to how these facilities be expressed in the built form and the co-location of facilities potentially being used after hours.
- Consider the impact of after-hours use on site security.
- Consider the requirement to situate buildings to enable installation of isolation fencing, especially the administration building.
- Incorporate gathering spaces for parents and carers at pick-up times to foster the development of the school community and connectedness.
- Minimise potential congestion created by pick-up/drop-off by car or by bus. Position parent car pick-up /drop-off safely, separate from the main pedestrian entry and consider how it can be managed through design.
- Allow for the future delivery and locations for prefabricated buildings for the school's projected long term and peak student enrolments.

7. Architectural design

7.1 Impact of the quality of learning spaces on learning outcomes

Good design plays an essential role in enabling high-quality education environments that support the learning needs and wellbeing of every student and child, and the professional and wellbeing needs of staff.

The department is committed to developing and delivering high quality, innovative, efficient and value-for-money, contemporary education infrastructure assets. High quality design has an important part to play in achieving this objective. High quality design is functional and durable, but it is also comfortable, stimulating, uplifting and inspiring.

7.2 Value for money

Design must take into consideration the whole of life costs of the assets to ensure the overall project is cost effective, whilst paying attention to the individuality and specific qualities of the site and surrounding community.

A well-designed educational facility should provide simple, functional and flexible learning environments. The focus must be on delivering environments that enhance learning and well-being, supporting positive outcomes for all staff and students regardless of their abilities, background or learning style. With a recognition that funding needs to be shared equitably across a wide portfolio of education facilities.

Consideration must be given to:

- using regular building shapes and simple roof forms
- matching the volume of internal spaces with the scales of users and the purpose of the facility
- grouping buildings to minimise circulation requirements and planning to ensure that circulation spaces within buildings is efficient
- grouping buildings and areas within buildings requiring specialised mechanical, hydraulic, electrical and ICT services
- designing sub-structures to suit site contours and geo-technical conditions and balancing the efficiencies of cut and fill and retaining walls with above-ground lightweight sub-structures.
- using materials and finishes that are modest, in keeping with an educational environment, and fit for purpose with functionality and durability at the forefront of decision-making.

7.3 General architectural design considerations

As well as addressing the essential functional requirements and design principles, the design of education facilities must give attention to the detail and the context of the site. The design of buildings must:

- Include building forms and structures that are consolidated rather than fragmented – to provide improved user interaction and flexibility as well as more efficient architectural and engineering design outcomes. Multiple separate building forms and structures connected by extensive external walkways should be avoided.
- Provide spaces that are well-proportioned, and efficient in circulation. Circulation that is efficient has a clear hierarchy and can, where appropriate, be flexible to accommodate other uses such as display, breakout areas or lockers.
- Ensure the layout enhances the operational efficiency of the day-to-day activities. The orientation of each building must take full advantage of the opportunities offered by the site. The architectural design must consider how this can be best achieved using massing, form, materials and architectural expression.
- Apply universal design features to facilitate freedom and independence and provide opportunities for children and students to self-regulate emotions and behaviour.
- Consider the ongoing cleaning and maintenance requirements of the facilities and support these processes through considered design, particularly for multi-storey buildings with more complex cleaning requirements.
- Engage with the natural and constructed landscape through views between interior and exterior spaces.
- Optimise the integration of Ecologically Sustainable Design (ESD) principles.

The general architectural design considerations summarised in Table 3 must be applied.

Table 3. General architectural design considerations

Site plan	Make the best use of the site's natural and physical features, views, orientation, edges, existing flora and fauna, pedestrian and vehicle access.
Master plan	Create a clear hierarchy for the buildings and spaces between, street presentation, lines of sight for staff supervision of students during breaks, capturing opportunities beyond the site boundary and planning for good integration of mobile and prefabricated buildings, anticipating change in the development of the site, and making provision for the staging of works. Ensure buildings are set back from the street where possible. Situate buildings to allow for clear lines of sight to gathering areas, amenities facilities and lines of approach to buildings. Minimise blind spots and opportunities for hiding places.
Functionality	Demonstrate an understanding of the functional requirements and functional relationships and resolving those requirements and relationships (diagrammatically in abstract) as the basis for the further development of planning for buildings and the site.

Buildings	Ensure form, scale, mass, volume, appearance and sustainable design principles work together. The scale of buildings should consider the age and size of students and children
Identity and context	Design facilities and the landscape of which students, children, educators, parents and community can be proud, and which also enhances neighbourhood amenity and urban structure.
Universal design	Design an inclusive built environment through universal design principles (design for all) to enable users of all abilities —staff, students, children and visitors to participate and fully engage in all experiences and activities.
Quality of the physical learning environment	The facilities must deliver and sustain physical environments and user comfort conditions that are conducive to learning, including the layout of spaces, materials selections, indoor air quality, daylight provision and control, thermal comfort, and acoustic engineering amongst others.
Inspiring spaces	Beyond function, architecture should excite and educate the imagination and create spaces that are engaging, diverse and inclusive, culturally rich and poetic, enjoyable and a great place to be.
Landscape and external environments	Make all external spaces assets for formal and informal learning, enhance social interaction and play, good supervision by a minimum number of staff, diverse in use and function, age-appropriate, and utilising sustainable principles to support flora and fauna, biodiversity and improve water quality. Trees (existing and new) are to be used to support each building's passive heating and cooling system as well as for sun protection when outdoors.
Supporting community use	Facilities that support and encourage community use through the identification of spaces suited to community and out-of-hours use, zoning of community use spaces in the design (including zoned and sub-metered engineering services, security controls and access to amenities), ease of direct safe access (out of hours), provision of storage, etc.
Interiors	Create excellent spaces for learning and teaching and using interior design to create a positive environment for students and children with diverse learning needs. The design is to demonstrate a co-ordinated selection of colours, finishes and materials. Joinery, fixtures and fittings must be flexible, adaptable and provide equitable access for students of all abilities. The design of interiors must ensure that students with disabilities can fully engage in learning alongside their similar-aged peers.
Feeling safe	Create a secure and welcoming place.
Long life, loose fit, low energy	Design for whole-of-life, creating facilities that can adapt and evolve in the future, which integrate community use and are adaptable in structure and plan.
Ecological sustainability	Design for environmental, social and economic sustainability, efficient lifecycle, reduced maintenance cost and reduced resource usage, and support of recycling.
Successful whole	Facilities that integrate buildings, landscape, infrastructure, sustainability and the site; cohesive in architectural form and expression and considers all interstitial spaces.

7.4 Building quality, materials and lifecycle

The architectural design must take account of the performance characteristics and durability of all the materials and components used in each building structure to ensure that the design life of the structure is achieved and that maintenance requirements are minimised. Materials should be considered which contribute to the diversity in experience of the users with due regard to scale, colour and texture.

Materials and finishes must be robust, durable, readily available, easily maintained and serviced and suited to the local climate conditions.

7.5 Design and construction to support future change

The use, size and requirements of some functional areas can be subject to change over the life of a school. The design, construction system and layout of fixed services must support opportunities for future change and re-configuration of general educational and administrative spaces.

Designs must be capable of being used for different organisational, operational and learning models without requiring significant modification or reconfiguration.

7.6 Ecologically sustainable design

Ecologically sustainable design (ESD) principles must be incorporated into the design, construction and operation of the facilities.

This means:

- ensure the long-term social, environmental and economic sustainability of the facilities.

ESD elements must be integrated into design solutions, providing multiple benefits and working in harmony with the overall design.

Three primary benefits must be realised from investment in ESD strategies in design and building performance:

- whole of life performance for the facilities
- quality of the learning environment
- enable aspects of the buildings, building design and outdoor spaces to be learning tools in themselves.

7.6.1 *Whole-of-life performance of the facilities*

The whole of life performance of the facilities must be considered in terms of economic, social and environmental impacts and opportunities.

Life cycle costing is to be used to guide design and procurement decisions to optimise the balance between capital and operating costs to ensure whole of life best value for money outcomes.

The environmental impact of the design, and up-stream and down-stream impacts of material selections, energy consumption etc. must be considered. ESD is to be integrated within all aspects of planning, including spatial organisation, materials selection, building services, landscape systems and planning, pedestrian and bicycle-friendly links to the surrounding streets.

Buildings and urban open spaces must be designed in such a way that a minimum of energy is needed to light and service them in terms of cooling, heating, ventilation and hot water.

The use of passive energy measures to achieve a comfortable internal environment must be employed where possible. The form of each building must be developed to take account of the need to minimise energy consumption with particular emphasis on maximising the use of insulating materials, natural ventilation and daylight, and passive solar design to maintain comfort conditions.

The sanitary fittings installed, and the landscape designed must minimise the water needed for human use and irrigation. Rainwater runoff from roofs is to be captured in tanks for use in toilets and irrigation.

The facilities must be designed with the future in mind, and a risk-based approach to foreseeable risks such as climate change must be implemented.

7.6.2 *Quality of the indoor learning environment*

The quality of the indoor learning environment needs to cater for the needs of occupants in terms of their health, comfort, and productivity. ESD initiatives should be implemented which contribute to the quality of the indoor environment by:

- Improving thermal comfort by maintaining temperature levels, relative humidity and air velocity at appropriate levels with minimal energy use
- minimising the ingress of outdoor pollutants

- providing sufficient outside air to ensure levels of indoor pollutants and CO_2 concentrations are maintained at suitable levels
- exhausting indoor pollutants directly to the outside of buildings while limiting their entry into other areas
- using materials, finishes and adhesives with low concentrations of volatile organic compounds and formaldehyde.

7.6.3 *Enable aspects of the buildings, building design and outdoor spaces to be learning tools in themselves*

ESD features must be incorporated in a manner that encourages practical student interaction and reinforces student's understanding and appreciation of environmental issues.

7.6.4 *Design strategies to support energy efficient building performance*

The following strategies to reduce electrical power consumption for cooling and heating must be implemented:

- Orient buildings with their longer axis set out in an east/west direction, maximising the north-facing facade and minimising east and west-facing facades.
- Minimise areas of east-facing and west-facing glass.
- Provide external fixed and operable shading of east, west and north-facing windows.
- Zone areas so that the cooled/heated areas are grouped and isolated from non-conditioned areas by means of doors.
- Main entries to buildings are located to avoid prevailing winds.

7.7 Internal learning spaces

7.7.1 *Spatial structure*

The interior layout must ensure the overall circulation strategy is clear, simple, safe and legible. It must provide shared circulation spaces, which encourage interaction and use visual transparency to enhance vertical and horizontal connectivity.

7.7.2 *Circulation*

All educational settings and learning environments must be designed to enable students and children of all backgrounds, identities and abilities to access and fully participate in learning.

Circulation and travel spaces must provide users with access to functional spaces, which can be considered as destinations or terminal spaces. However, circulation spaces could also be considered as part of the learning environment and be designed to support learning and contain functions and activities such as breakout areas for collaborative learning or lockers and wet areas. A clear hierarchy between circulation and terminal spaces is important for effective place making. Designs must provide clear unimpeded access in circulation spaces.

7.7.3 *Supervision*

Clear visual connections between and within spaces are critical to provide adequate supervision of students and children. School staff require opportunities to monitor students who may be working across different learning areas simultaneously. Amenities areas must be designed to provide supervision of handwash areas

and avoid any blind spots within the facility, so staff maintain full supervision of all students. The level of supervision required should be tailored to suit the age of the students.

The construction or use of internal or external spaces for the purpose of seclusion is explicitly prohibited.

In an early childhood centre, supervision must be prioritised to meet legislative requirements. Staff must be able to supervise children within all areas of the learning space simultaneously. Supervision is also critical between spaces that staff may use while responsible for the care of children e.g. resource store, nappy change, children's amenities etc. However, the dignity and privacy of children must be considered when planning supervision of areas such as amenities and nappy change spaces, particularly with regard to visitors who may enter the spaces. Supervision may be enhanced with the provision of low height walls, large viewing panels and fixed mirrors.

7.7.4 *Natural light, views and artificial light*

Internal environments must be designed to maximise daylight and views, with the appropriate levels of sun and glare control. Daylight must be able to be modified to suit different modes of use. Natural light and access to views that connect the interiors to the surrounding context should be exploited in the design of internal spaces.

Artificial lighting must enhance the overall ambience, avoid an institutional feel and provide a secure environment. An appropriate balance of direct and indirect lighting should be used to minimise glare and allow for the prominent display of artwork on walls.

7.7.5 *Natural ventilation*

The ventilation design must consider seasonal variations in climate conditions, orientation of the buildings, and wind direction to maximise natural air flow whilst limiting the entry of dust, pollen and other allergens.

7.7.6 *Surface, colour and texture*

The considered use of surface, colour and texture enhances and defines the spatial structure and supports the function of spaces.

A change in texture and surface can help define interior spaces and assist in wayfinding. This approach should be achieved using natural materials. The materials palette must be developed as part of the integrated architectural and interior design concept and resolution.

The appropriate choice of colour in learning areas must help students and teachers to stay focused, and extend students' attention spans, reduce eyestrain and foster work productivity and accuracy.

The design of colour schemes must:

- support the function of the building and the tasks that are carried out in it
- be restrained
- incorporate natural materials
- complement the display of student work
- create positive emotional and physiological effects
- create legibility and differentiate space.
- Minimise or disrupt space available as "canvas" for graffiti through use of dark colours, textured surfaces, murals etc.

The use of complex colour schemes and the use of contrasting colours of the same value (e.g., red/green) that could create a difficulty for a person with a visual impairment must be avoided.

7.8 Acoustics

Good acoustic design is essential and must be considered during the development of master plans and detailed designs.

Consideration must be given to:

- external noise sources including roads, industry, railways, aircraft flight paths, etc. and their impact on activities within the site
- the impact of normal activities, plant and equipment on adjacent properties and residents
- relationships between noise producing buildings within the site (e.g., gymnasiums, performing arts, technology workshops, etc.) and their impact on adjacent buildings and activities
- relationships between noise producing activities and spaces within individual buildings
- noise from mechanical ventilation and air-conditioning fans and compressors.

Master planning and detailed designs should seek to reduce noise impact by distancing noise sources from the areas affected by noise in preference to a reliance on the use of acoustic barriers and materials.

7.9 Safety and security in design

Schools and early childhood centres are exposed to real world risks and challenges, they can hold valuable assets and may stand empty for extended periods. When in use, students, children and adults will be accessing and using the facilities through the day, evenings and weekends. Designs must demonstrate that crime risks and user safety have been considered and addressed.

Crime Prevention Through Environmental Design (CPTED) principles must inform the design.

Facilities must provide safe and secure environments. To achieve this, the design of education facilities must:

- Provide clear and logical street access to administration or reception facilities that permits the supervision of all entries.
- Where practical, situate school administration facilities such that isolation fencing within the school perimeter is achievable.
- Discourage wilful damage.
- Avoid placing external doors in locations that are difficult to monitor.
- Where possible, compartmentalise facilities to support a range of out of hours uses.
- Limit opportunities for unauthorised roof access. Designs must avoid external structures and works of less than 1800 mm height (such as fences, balustrades, equipment cages, screen walls, shade structures, retaining walls, covered walkways and the like) that present climbing opportunities and access to roof areas.
- Consider on-site traffic management and separation of vehicular and pedestrian traffic.
- Include well placed external public address speakers.
- Provide easy and open access to first aid locations.
- Utilise durable and strong fencing systems that clearly delineate the site boundary and preferred entry points, enable staff to limit access during operating hours or lockdowns and present a substantial barrier to unauthorised entry or removal of assets from the site.
- Utilise security systems, lighting and construction to deter unauthorised access to car parking areas and buildings.
- Promote good supervision of all internal and external areas by minimum numbers of staff (long lines of sight).

- Promote neighbourhood passive surveillance out of hours across the site; provide clear and logical external signposting.
- Ensure safe and easy access to and from car parking areas at all hours.
- Ensure that the carpark area and footpaths used after hours are free from hiding spots (shrubs, substations, etc.).
- Provide safe access to toilets at all times.
- Provide security lighting to building perimeters, car park and external paths of access.

Further guidance on security fencing is provided in the *Specification for Security Fencing in State Schools*, Version 4 dated: January 2019[25].

7.10 Storage

Schools and early childhood centres make frequent use of teaching aids and resources, creative media, creative play materials, games, special furniture and equipment, etc. to support teaching and learning activities. Resources will be in various forms and quantities — some suited to storage on adjustable shelving, and some requiring floor space.

Designs must consider the distribution of accessible, well designed and efficient storage through all learning areas. Resources must be available where needed, when needed and can be securely stored away when not in use. Early childhood centres also require storage solutions for sleeping mats or mobile beds to service rooms catering for children aged 2-5 years.

Storage solutions may include dedicated storerooms, fixed joinery and mobile joinery that may be used to define learning spaces.

Storage must be provided both within and near to external learning environments, to facilitate the transfer of learning resources, and to provide space for the storage of loose furniture, fittings and equipment that will be used to activate outdoor areas.

Storage must be provided for use by community groups and associated with community use spaces, including outside school hours care, sports groups, etc. Locking mechanisms for this type of storage must consider the potential for multiple user groups and restricted access between groups

7.11 Signage and wayfinding design principles

Schools have an annual intake of new students who engage with complex and unfamiliar environments. The transition can be made easier by having the design of buildings and external environments support clear and easy wayfinding. Key issues to be considered and demonstrated in the design of buildings and external environments include:

- clearly defining points of entry into buildings and circulation paths through buildings
- defining different buildings using materials selections, colour coding, graphics, etc.
- defining functions and destinations (canteen, toilets, general office, etc.) using materials selections, colour coding, graphics, etc.
- creating clear and direct pathways that are informed by human factors analysis
- using sight lines to show destinations
- using signs (text/ graphics/ colour coding) at decision points.

25 https://qed.qld.gov.au/our-publications/standards/Documents/design/fencing-specification.pdf

Associated with the design of internal and external environments a complete signage design must be developed that provides clear directions, instructions or advice for all users, that clearly identifies destinations, functions and key spaces, and that is fully integrated into the design of the buildings and external environments. The design of the built and natural environments should support the signage through pedestrian layout, use of colour and material referencing.

The colour coding of buildings, spaces and facilities for wayfinding purposes must not discriminate or identify buildings, spaces or facilities on the basis of a user's abilities.

While early childhood centres do not generally have multiple buildings, their signage and wayfinding requirements should be considered in the context of any adjacent school facilities, to enable a logical flow and seamless transition between facilities.

8. Landscape design principles

Design of the internal and external environments must be developed simultaneously. Landscape is not an add on — it is an integral aspect of the learning environment. The whole site has potential as a landscape for learning.

From the outset, integrate the expertise of:

- a landscape architect in the master planning process so the key opportunities and assets of the site are captured
- regional support staff with specialist knowledge of the local requirements.

8.1 General principles and guidelines for landscape design

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.

The design of external environments must:

- Ensure that outdoor spaces are activated and designed to enable learning.
- Deliver spatial experiences within the external environments. Internal and external learning environments must support multiple teaching and learning modes. Similar thinking as is applied to the design of internal spaces and settings should be brought to the design and activation of external environments.
- Consider the visual outlook from internal learning environments. prioritise visual access to nature and exploit existing features such as mature trees.
- Ensure spaces are all access and address the ability needs of all students.
- Ensure external environments are designed with the cultural context of the First Nations community as a primary consideration.
- Consider how spaces are used and appropriated by different age groups and what elements are required to activate these spaces.
- Respond to the key opportunities and make best use of the existing assets of the site.
- Establish a hierarchy of open space to provide functional, adaptable, expandable and durable landscapes.
- Conserve and respect the natural vegetation, topography, ecology and heritage of the site.
- Support and express different cultural perspectives in the external environments.
- Consider the main entry points, nodes, linkages and gateways for students and the local community.
- Develop the spaces between buildings to foster various modes of recreation, gathering and socializing.

- Integrate seating areas and nooks within the building perimeter to form outdoor gathering areas.
- Consider how deck and ramp areas can also incorporate built-in furniture and other opportunities for play.
- Consider the interface between built form and landscape and how the building form can help to define outdoor gathering areas.
- Have a consistent design intent between the architecture and the landscape.
- Demonstrate sustainable land management practices and landscape design that reflects the history of an area.
- Provide robust, durable, high-quality external furniture in configurations that can support outdoor learning, student socialising and offer an integrated design solution.
- Integrate interpretive and educational opportunities within the landscape to facilitate active and passive outdoor learning.
- Consider the requirement for ongoing maintenance of outdoor areas and minimise seasonal impacts.
- Prevent soil erosion.
- Establish a clear planting structure. Ensure that the main structure planting is introduced as early as possible to provide identity, enclosure and shade to outdoor spaces.
- Consider the specific needs of the different school types and student cohorts.
- Provide shelter from the prevailing winds and weather during the different seasons to extend the range of days during which the external spaces are comfortable.

8.2 Biodiversity

The design of external environments must maintain biodiversity and improve the natural environment. Native and endemic plant species must be used where possible to support biodiversity and local fauna. The master plan and the landscape design must incorporate biodiversity considerations:

- Retain existing native and endemic tree and understorey plant species (where possible).
- Ensure new plantings are predominantly endemic and native to the local area. The plant palette is to be based on the nearest natural bushland areas to provide connectivity and increase the likelihood of migration of flora and fauna.
- Select new plantings to contain a variety of species and avoid monocultures.
- Where feasible, source new trees and plant specimens from areas within the same climatic zone.
- Include native and exotic food production gardens.
- Utilise composting of green waste and worm farming.
- Where appropriate, use drought tolerant planting species suited to the local climate to reduce irrigation requirements.
- Where feasible use biodegradable mulches to improve micro bacterial activity and reduce irrigation requirements.
- Introduce plantings and landscape features, such as retention basins, detention in dry basins, swales and bioswales, to slow surface water movement and increase stormwater infiltration, filter pollutants and provide habitat.
- Plant deciduous and evergreen trees to provide shade to building walls and external areas appropriate to the seasons and climate changes.

8.3 General design principles for external areas

8.3.1 *External public spaces*

For all external public spaces, consideration must be given to temperature control through wind protection, cross-ventilation, shading during warmer months, the capture of sunlight during cooler months, and the use of thermal mass in ground and wall surfaces.

8.3.2 *Civic presence*

The landscape design should complement the master plan to enhance the civic presence of the school whilst maintaining the characteristic of the surrounding areas. Structure planting should provide character and presence to the school both around the perimeter, within the major external spaces and along circulation routes.

8.3.3 *Fencing*

The design and detailing of fencing must be considered as an important part of the overall presentation of the school. Fencing forms part of the street image of the school, and quality, colour and construction must be coordinated with adjacent buildings. Fencing will define contained school property and will identify the boundary that outsiders are not permitted to cross. Outdoor play facilities can attract out-of-hours use. Fencing must secure the site and outdoor spaces from unauthorised access.

Consideration should be given to including isolation fencing to administration facilities, as well as to any facilities required to be isolated for after-hours community use. Security fencing must comply with the *Specification for Security Fencing in State Schools.*

8.3.4 *Covered ways*

Where facilities comprise two or more buildings, and where the facilities include the provision of prefabricated buildings as part of the initial development, covered ways must be constructed to provide at least one sheltered pathway linking the main (administration) building with the outlier buildings and permitting travel between all outlier buildings under a continuous sheltered pathway.

8.3.5 *Active transport parking*

Parking facilities for bicycles, scooters and skateboards must be provided at schools to promote and encourage the use of active transport by students, staff and visitors.

Parking facilities must be located in an area where some level of passive surveillance is available and as close as practicable to the adjacent road frontage to allow direct access for users and avoid the need for shared pathways within the site. If multiple entry points to the school exist, parking may need to be provided in multiple locations.

Paths must be provided connecting the parking to cycle paths and roadways at the perimeter of the site. These access entries and paths must be separate from those used for vehicular access and designed to avoid conflict between bicycles, scooters, skateboards and vehicles. Paths must also be provided connecting the parking to the closest building or covered walkway.

Refer to Section Bicycle parking

for additional information on active transport parking requirements

8.3.6 *Sports fields and multi-purpose courts*

8.3.6.1 Sports fields

Sports fields must be located:

- With a direction of play orientation within ±10° of north/south.
- Allowing a minimum grade of 1:120 and a maximum grade of 1:80.
- With due consideration to passive supervision of the sports fields from school buildings. Where possible and practicable, sports fields should be located at a lower level than school buildings.
- With suitable access to facilities used to store sports equipment and toilets and amenities.
- To facilitate use by community groups outside of school hours.

For P–6 schools, the sports fields must be configured to accommodate:

- One cricket oval with a boundary 110 m long and 92 m wide and additional run-off areas of 3 m.
- One rectangular sports field 82 m long and 55 m wide placed within the boundary of the cricket oval.

For 7–12 schools, the sports fields must be configured to accommodate:

- Two rectangular sports fields each with a boundary 115 m long and 68.5 m and additional run-off areas of 5 m. The two fields shall be placed side-by-side spaced 14 m apart (boundary line to boundary line).
- A 400 m eight-lane oval running track 165 m long by 110 m wide overlaying the two rectangular sports fields. The running track shall be 8.5 m wide and have an internal radius of 46.5 m in the bends. A zone of 2 m outside the perimeter of the running track must be provided level with the surface of the running track and free of undulations and obstacles. The running track must be located so that the sports field goal posts (including goal post sleeves) do not encroach on the running track.

For P–12 schools, master plans must include separate P–6 and 7–12 sports fields configured to accommodate the abovementioned facilities.

Where joint use of sports fields with local government, local sporting groups or other agencies is being considered and their needs cannot be accommodated within the areas nominated the department's approval must be obtained prior to master planning the site to accommodate these needs.

Accessible paths 1200 mm wide and with a maximum slope of 1:20 must be provided between the sports fields and the school building zone.

Landscaping around the sports fields should provide turfed areas of battered banks, mounds or terraces for spectators.

8.3.6.2 Multi-purpose courts

Multi-purpose courts must be located:

- with a direction of play orientation within ±10° of north/south
- arranged side-by-side, rather than end-to-end
- with suitable access to facilities used to store sports equipment and toilets and amenities
- to facilitate use by community groups outside of school hours.

For P–6 schools, one double-court platform or equivalent area to accommodate two basketball or netball courts must be provided.

For 7–12 and P–12 schools, two double-court platforms or equivalent area each accommodating two basketball or netball courts must be provided.

For 7–12 and P–12 schools, two double-court platforms or equivalent area each accommodating two basketball or netball courts must be provided.

The platform dimensions must be based on the court dimensions including run-off areas specified by the relevant sport's governing body.

Master planning should consider distributing the court areas to address the needs of different student cohorts and age groups.

Where joint use of multi-purpose courts with local government, local sporting groups or other agencies is being considered and their needs cannot be accommodated within the areas nominated the department's approval must be obtained prior to master planning the site to accommodate these needs.

Accessible paths 1200 mm wide and with a maximum slope of 1:20 must be provided between the multi-courts and the school building zone.

8.4 Shade areas

Sun shading in the form of permanent roof structures, lightweight structures and shade trees must be provided.

The master plan and landscape designs must incorporate shading of:

- lunch areas and general seating areas between 10:00 am and 2:00 pm
- permanent playground structures including climbing frames and sandpits between 9:00 am and 3:00 pm.

The placement and extent of sun shading must:

- consider the sun angles at different times of the day throughout the school year
- reduce indirect UV radiation by managing reflected sun light
- not impact natural light levels, or block breezes to windows, in occupied spaces in adjacent buildings

Refer also to Section 21.2.2 for further requirements for Built shade and in particular requirements for early childhood centres.

9. Traffic and pedestrian movement

The Department of Transport and Main Roads' document *Planning for Safe Transport Infrastructure at Schools technical guidance*[26] assists in the design and provision of effective and safe transport infrastructure solutions at schools in Queensland. It includes guidance and recommendations which should be followed when planning for vehicular movement, pedestrian movement, car parking, bike parking, bus parking and end of trip facilities.

While the document does not include guidance for early childhood centres, the intent of the recommendations should be applied in the same way, in consultation with a traffic consultant.

9.1 General circulation and spatial organisation

The neighbourhood context must be thoroughly considered, with the locations of circulation routes in the public realm clearly informing the placement of access points into the school site.

Active transport facilities such as pedestrian links, bicycle paths into a site, bicycle parking/storage, and pathways/links to public transport must be given a higher priority over other modes of transport and integrated into the school design as a whole.

26 https://www.tmr.qld.gov.au/business-industry/technical-standards-publications/queensland-road-safety-technical-user-volumes/qrstuv-guide-to-schools

The main pedestrian access to a school must be prominent and easy to find, with buildings located near to it and be clearly visible from the road. Additional points of pedestrian access must be provided around a site, aligned with external infrastructure such as pedestrian crossings, public pathways, bicycle tracks, bus stops, street parking, street networks and local facilities such as shopping centres, neighbourhood parks, etc.

The main pedestrian entrance is the point of access for all visitors. It should be prominent, clearly visible, well orientated, well sized, and easy to find by the pedestrians entering the site, and it should be easily accessible from the car-parking area. The entrance should also provide a safe and secure environment for students. Signage should reflect the security restrictions and protections in place.

Consideration of the requirement to provide isolation fencing to the administration block and other community-shared facilities should inform spatial organisation of the site and proposed access points

Once in the school grounds users must be able to find the administration reception area without difficulty and without requiring or obtaining access to the rest of the site or other buildings.

Protection from wind and inclement weather prior to entering the main door must be provided.

Depending on the size of the site, access to adjacent roads and the layout of the school separate entrances for staff may be considered.

The majority of students will often enter an open campus at defined points of entry around the perimeter of the site and make their way around the grounds to play areas and to entrances to their respective learning areas.

Depending on proposed community use of a school, entry to community-shared facilities may be shared with the main entry or form a clearly defined separate entry.

Provision must be made within sites for vehicle access to permit parents to short-stay park and drop-off or pick-up students. Particular provision must be made for parking for children attending Early Childhood Education and Care (a parent or carer must accompany children to and from these facilities) and for children with special needs. Vehicles must be able to enter and exit a site in a forward direction without the need to undertake 3-point turns or reversing manoeuvres (excluding access to parking bays).

Internal circulation roads and vehicular access must be kept to a minimum while ensuring ease of parking and access to the main entrance. The location of vehicular access points and internal circulation must give consideration to the operation of the roads surrounding and connecting to the site.

Pedestrian routes on the school site must take priority over vehicular ones. Where routes intersect the priority for pedestrians must be emphasised. Footpaths must be designed with safe and direct access in mind. Where possible there must be clear separation between vehicular traffic and pedestrian movement. Where there is a conflict between pedestrians and vehicular movement, appropriate treatments must be provided to ensure the safety of pedestrians.

9.2 Provision for all occupants

All occupied areas of the school or early childhood centre and external civil works must be designed to provide safe, dignified and equitable access for all users of all abilities including students, staff, parents or other visitors.

The design must comply with the requirements set out in *AS1428*; the *Disability Discrimination Act* (DDA); Disability (Access to Premises — Building) Standards 2010; and Human Rights and Equal Opportunities Commission (HREOC) — Access to Buildings and Services: Guidelines and Information.

Other important issues that must be addressed in the planning of a site include:

- minimising pedestrian travel distances
- weather protection to pedestrian paths and at entrances

- functional and safe access around the site for pedestrian and vehicular traffic (this must include traffic planning in relation to drop-off and pick-up zones for students by cars and, where relevant, buses, with separation of pedestrian and vehicle traffic)
- provision of parking for teachers, parents and visitors
- access for delivery, waste removal and service vehicles
- emergency access.

9.3 Emergency exits

All emergency exits must be NCC compliant, clearly signposted and easily found. Emergency exit signage must comply with the requirements for fire safety certification.

If stairs are provided and in order to optimise the efficient use of floor area, stairs should have a dual function supporting day-to-day circulation as well as emergency circulation and egress.

9.4 Pedestrian access and egress

Pedestrian movement through the site must be well planned, safe and legible in both internal and external areas. The efficient and safe movement of people from car parks and boundary entrances to buildings is essential in delivering a user-friendly school or early childhood centre. Points of access and egress must be clearly defined and easily located.

A path network is required to provide all users with a safe, functional and direct means of access from boundary entrances to and around buildings on the site and to external learning and play areas. While all paths around buildings must receive spill lighting from external security lighting, access paths that will be used before sunrise and after sunset (including paths connecting car park areas and points of pedestrian access to doors used out of hours) must be provided with safe levels of illumination along the length of the paths.

Pedestrian access must engage with adjacent streets and local and neighbourhood pedestrian and bicycle paths to facilitate and encourage pedestrian access to the site. Pathways to engage with public transport stops must be provided where applicable. The design for a site must consider the best locations for flagged school crossings over adjacent streets and provide safe pathways to these locations.

Buildings and hard and soft landscapes must be designed to enhance and integrate with the external pedestrian experience, as well as enhance and focus the views for internal pedestrians.

The layout of pedestrian access networks across a site must consider the planned placement of prefabricated buildings to meet long-term and peak enrolment needs.

Pedestrians must be able to move from site entrances to buildings and from places such as parking areas using footpaths that avoid crossing vehicle circulation routes where possible. Pedestrian crossings must be provided where footpaths cross paths of vehicle movement. Pedestrian visibility must be a priority at these locations.

9.4.1 *Pedestrian paths*

Path widths must suit their anticipated usage, comply with the relevant DDA access requirements and, in general, be a minimum of 1800 mm wide. Where paths will be shared by pedestrians and cyclists these must be provided in accordance with the requirements of the Department of Transport and Main Roads' *Planning for Safe Transport Infrastructure at Schools technical guidance*. External paths widths must be consistent with the requirements of the relevant road authority.

Paths must be free of obstructions such as plant, equipment, furniture, fittings, projecting window sashes, or projections from external walls. The number of supporting columns to shelter structures over paths must be minimised.

Where changes of level must be managed, DDA compliant ramps are preferred to stairs. If stairs are provided, there must be an equitable ramp provided close to the stairs that leads to the same destination.

Where external access is provided to learning environments, footpaths must be wide enough at building entrances to provide sufficient paved area for the students waiting to enter.

Pedestrian paths must follow the key pedestrian desire lines through the site enabling students and other users to efficiently travel between buildings. Paths should be designed using Human Factors Analysis to reduce the cutting of corners over gardens and landscaped areas.

9.4.2 *Vehicular traffic design considerations*

There is significant vehicle traffic associated with the operation of a school and to a lesser extend an early childhood centre. The needs of various user groups must be considered:

- short stay for drop off or collection of students and children
- student arrivals and departures by bus
- visitors arriving for interviews or meetings
- goods deliveries
- staff

Some staff vehicles will stay for a full day. Visitors out of normal operating hours may stay for several hours to watch or participate in a performance, function, or sports event. Schools may have a bus that is parked permanently at the site. Emergency vehicles may rarely attend site but have high priority for direct unimpeded access to specific locations.

Commercial vehicle movements will include known and scheduled events (e.g., a waste truck arrives regularly, at a scheduled time, and follows a short, defined, and known path of travel) and frequent but irregular arrivals of large and small delivery vehicles. Site planning requires a considered response, wayfinding strategy and space provision for service vehicle parking.

Administration buildings are not intended to operate as a delivery bay and few deliveries will be suited to direct receipt at the general office. Deliveries to canteens and specialist learning areas (Science, Technology, Arts, etc.) have a specific end destination and will involve the transport of goods (sometimes large and heavy) across a school campus. The optimum solution that reduces manual handling may require vehicle access close to the end destinations, but this has consequences in terms of space devoted to vehicle access and risk in terms of the interface between vehicles and pedestrians.

In an early childhood centre, deliveries will need to be received at reception (not at the school).

In developing the master plan and in designing the site response to car parking provision and vehicle movements, the design must:

- consider the multiple vehicle movements that will occur across a week
- consider the purposes, destinations and vehicle types that will be involved
- consider and resolve the safety risks associated with the interface between vehicle movements and pedestrians
- demonstrate how the design responds to and supports these many competing demands for vehicle access to and circulation around the site.

9.4.3 *Vehicle access roads*

Vehicle access roads must provide functional and safe access into a site. For safety reasons, they must be separate from pedestrian and cyclist access paths. On-site parking must be designed with minimal site intrusion and the extent of access roads must be minimised.

A single point of vehicle entry to car parking areas should be provided to minimise the number of locations where pedestrians, cyclists and vehicles will interact. Multiple access and egress points may be provided where long and short-term car parks are separated within the site. Appropriate sightlines and intersection operations must be provided for any vehicle access points. Points of access and egress must be kept clear of external intersections, pedestrian crossings, curves, and other locations where turning traffic impacts on safe and efficient traffic movement.

Provision must be made for access and short-term parking for delivery vehicles. Where possible, delivery parking should be proximate to the delivery location, but delivery vehicle access must not take precedence over the safety and amenity of users. Delivery vehicles must enter and exit the site in a forward direction. Safe space for vehicle reversing movements must be provided where required. Carpark layouts must keep pedestrians separated from those areas where vehicles may be reversing.

Planning for vehicle access must also allow for easy access to play areas with sandpits, to facilitate re-filling of sand.

To maximise safety for students and children, the internal design should create a slow speed environment for vehicular traffic and maximise pedestrian visibility, which may require the use of:

- speed humps
- signage
- bollards.

9.5 Access for emergency vehicles

Master plans and civil works must facilitate access for emergency vehicles (such as ambulances and fire trucks) while minimising the length of on-site trafficable pavements. Provision must be made for an ambulance to park close to the first aid/sick bay and to sports fields where these are provided and to outdoor play areas in an early childhood centre.

The provision of access for emergency vehicles must be considered carefully in the context of site topography, on-site parking, hard play areas and zones where prefabricated buildings will be placed.

For ambulance access, all weather vehicle access must be provided from a surrounding street to sports fields, and outdoor play areas in an early childhood centre, by the shortest possible route.

Access for fire-fighting purposes must comply with the recommendations provided in the Queensland Fire and Emergency Services' *Fire Hydrant and Vehicle Access Guidelines for Residential, Commercial and Industrial Lots*[27].

9.6 Vehicle parking areas

Separate off-street parking areas must be provided for:

- short-term public parking and student/child drop-off and pick-up
- long-term staff, visitor and student parking (for high schools).

The location of car parks should:

- avoid car park access and exit roads crossing major pedestrian and cycle access points and pathways
- mitigate the impact of vehicle queuing on pedestrians, cyclists, buses and nearby roads and intersections
- consider access to facilities that may be used by the community outside of normal operating hours.

The Department of Transport and Main Roads' *Planning for Safe Transport Infrastructure at Schools technical guidance* provides requirements for the number of car parking spaces to be provided at schools in

27 https://www.qfes.qld.gov.au/buildingsafety/referral-agency-advice/documents/BFS-FireHydrant.pdf

Queensland. This document captures requirements for the number of Short-term public parking and student drop-off and. Long-term staff, visitor and student parking. Where a discrepancy exists between the number of parking spaces required and what can be accommodated on site, consultation with a traffic engineer will be required.

While the document does not include parking numbers for early childhood centres, the intent of the recommendations should be applied in the same way.

When delivering additional facilities at an existing site, the requirements set out in the *Planning for Safe Transport Infrastructure at Schools technical guidance* shall be applied to the increase in enrolment numbers only.

9.6.1 *Short-term public parking and student drop-off*

Public parking and student drop-off zones should be located adjacent to the property boundaries to support efficient access and to allow potential excision of these areas to the relevant local authority as a public road.

The design of public parking and student drop-off zones must:

- Allow all vehicles to enter and exit the parking area in a one-way forward direction. These car parks must not include dead-end aisles requiring vehicles to turn around.
- Include parallel parking for student drop-off and pick-up with the kerb and pedestrian footpaths being on the left of the parking bays.
- Include short-term parking based on a 60° nose-in arrangement.
- Include parking spaces with dimensions consistent with the classification nominated in The Department of Transport and Main Roads' *Planning for Safe Transport Infrastructure at Schools technical guidance* and as outlined in *AS/NZS 2890 Parking facilities.*
- Include designated and signposted accessible car parking spaces.
- Incorporate entrance and exit queue storage lengths consistent with Department of Transport and Main Roads and local authority requirements and operational assessments and queuing theory calculations based on car park capacity, expected service rates and arrival flows.
- Include at least 1% of all car parking spaces designed and designated as spaces for vehicle occupants with disabilities, with a minimum of one space being provided in each car park.

The ultimate numbers of planned parking spaces must be calculated based on the long-term enrolment as advised by the department and the ratios nominated in The Department of Transport and Main Roads' *Planning for Safe Transport Infrastructure at Schools technical guidance.*

Consideration should be given to creating separate public car parks and locating these proximate to the various zones within a site (e.g., Early Childhood Education and Care, Prep–2, 3–6, 7–9, 10–12) to mitigate traffic congestion at peak times by not concentrating all parking in the one location.

Consultation with the relevant local authority must be undertaken during master planning and detailed design to ensure that the proposed designs are in line with the local authority requirements.

9.6.2 *Long-term staff, visitor and student parking*

The location of staff, visitor and student parking must include and allow for:

- convenient access for staff from the car park to buildings
- convenient access for visitors to the administration area and reception
- designated and signposted accessible car parking bays.

Delivery vehicle access may be incorporated into these car parks to provide close access to areas such as administration, canteen, science and technology.

The design of parking for staff, students and visitors must:

- Include parking based on a 90° arrangement with dimensions consistent with Class 1/1A as outlined in *AS2890.1 Parking facilities Part 1: Off-street car parking.*
- Incorporate entrance and exit queue storage lengths consistent with Department of Transport and Main Roads and local authority requirements and operational assessments and queuing theory calculations based on car park capacity, expected service rates and arrival flows.
- Not include dead-end aisles. Where dead-end aisles are unavoidable, adequate turning provision must be provided.
- Include at least 1% of all car parking spaces designed and designated as spaces for vehicle occupants with disabilities, with a minimum of one space being provided in each car park.

The ultimate number of parking spaces must be calculated based on the long-term enrolment and staff numbers as advised by the department and the ratios nominated in The Department of Transport and Main Roads' *Planning for Safe Transport Infrastructure at Schools technical guidance.*

9.7 Bicycle parking

The Department of Transport and Main Roads' technical note *TN207 Planning for Safe Transport Infrastructure at Schools - Bicycle Parking*[28] provides guidance on parking requirements for bicycles, scooters and skateboards to support and encourage the use of active transport.

The number of parking spaces recommended is based on a mode share assessment and a review of the existing cycle network servicing the site. The ultimate parking numbers must be calculated based on the long-term enrolment and staff numbers as advised by the department.

9.8 End of trip facilities

The Department of Transport and Main Roads' technical note *TN207 Planning for Safe Transport Infrastructure at Schools - Bicycle Parking* also provides guidance on the provision of end of trip facilities to support and encourage the use of active transport. These should be considered when planning new facilities at Queensland schools.

End of trip facilities are provided for staff only and not required for students.

When planning new facilities at an existing school, the recommendations for end of trip facilities may be met with existing facilities, such as an accessible bathroom containing a shower, rather than providing new dedicated end of trip facilities.

9.9 Bus parking

9.9.1 *Public bus services*

Master planning of sites must consider the location and extent of public bus service set-down areas and bus movements.

Consultation must be undertaken with the relevant local authority, bus service providers and the regional Department of Transport school transportation officer to determine service requirements.

Where current set-down areas do not exist or are considered inadequate, an assessment of the area required must be made using the recommendations provided in the Department of Transport and Main

[28] https://www.tmr.qld.gov.au/business-industry/technical-standards-publications/queensland-road-safety-technical-user-volumes/qrstuv-guide-to-schools

Roads' *Planning for Safe Transport Infrastructure at Schools technical guidance*[29]. Where set-down areas cannot be accommodated within the existing road reserve, an area at the site boundary shall be identified for possible excise to the relevant local authority.

A covered passenger waiting area must be provided with the site boundaries close to the public bus service set-down area and provide shade between 2:00 pm and 4:00 pm (and account for seasonal shade angles). The covered waiting area must not impede the safety and visibility of the set-down area.

The waiting area and any associated structures and infrastructure must not be in or encroach upon any area of the site to be excised.

9.9.2 *Private and charter bus services*

Where schools operate private bus services or will be chartering buses for school excursions, consultation must be undertaken with the relevant local authority and bus service providers to determine whether public bus service set-down areas may be used for this purpose.

Where agreement on the use of public bus service set-down areas cannot be reached, separate set-down areas for these buses must be provided.

9.9.3 *Students with disabilities*

Where dedicated bus services are provided for students with disabilities, a separate, secure and appropriately sized bus set-down area must be provided within the site boundaries.

Consideration must be given to the needs of these students with the set-down area being located near to the building/s used as a reception or waiting area for these students. A continuous covered walkway and awning must be provided which connects the bus set-down area to the reception/waiting area.

9.10 Visiting van services

The master plan and site planning for a school must include suitable trafficable all-weather site access, turning and parking for a dental caravan clinic towed by a truck (typical clinic dimensions: height 3.3m, width 2.4m, length 9.9m and weight between 5 to 5.5 tonne. Combined length of truck and van is approximately 18 metres), trade training truck, mobile library or similar visiting services.

Parking for visiting services must not be located within either the short or long-term car parks provided for the public, staff, visitors or students.

Parking for visiting vans must be located:

- Where practicable, near a covered shade area to cater for students waiting and in reasonable proximity to administration or other buildings to provide passive supervision. The preference is to locate the parking area away from the main site frontage.
- Away from windows where the noise from van air conditioners may impact occupants of nearby buildings.
- Close to site services infrastructure including electricity, potable water, sewer and telecommunications to mitigate the need to extend services for the sole purpose of servicing visiting vans.
- Dental vans require access to a 32 amp, 240-volt single-phase lockable power outlet. This is to be fitted to either a pole or wall mounted at 2 metres high enclosed in a lockable box. The box should measure 180 mm wide, 270mm high and 300mm deep. The power connection required is a Clipsal 56C332 three round pin socket outlet, or similar socket outlet to suit.

29 https://www.tmr.qld.gov.au/media/Safety/Schoolroadsafety/PlanningforsafetransportinfrastructureatschoolsTechnicalGuidev51.pdf

- Power supply cannot be further than 12 metres away from the site due to the regulation length of the van's power lead.
- Clear of pedestrian walkways and gates and a suitable distance away from all traffic and drop off zones.
- As part of a widened section of an internal paved access road with a minimum parking area of 10 m long by 4 m wide.
- Allowing for the construction of a concrete slab parking area which is level across its width and with a maximum gradient of 1:33 along its length.
- Allowing for the extension of any awnings, steps or other van fitments without these impacting on adjacent buildings, structures or landscaping.

Vehicular access from the site boundary to the visiting van parking area must be via continuous paved access roads. Access via sports fields, similar grassed areas, light-duty pavements, hard-courts or pavements with surface treatments susceptible to damage is not acceptable.

A pedestrian path must be provided linking the visiting van parking area to the site's internal path network. The pedestrian path must coordinate with the location of van entry doors and be of sufficient width to accommodate van steps extending approximately 800 mm and awnings of 1500 mm.

Additional information on dental van requirements can be obtained by contacting oral_health@health.qld.gov.au

9.11 Waste storage and disposal

A lockable, roofed and screened waste disposal enclosure must be provided for the storage of waste hoppers or bins and for the collection of waste.

The waste disposal enclosure must be located away from buildings, perimeter fences and neighbouring properties to mitigate the nuisance associated with odours, the noise associated with refuse collection and to minimise damage caused in the event of arson or vandalism.

Refuse collection vehicle access to the waste disposal area must consider other vehicular and pedestrian movements in the vicinity and must limit safety risks. The waste disposal facility must keep pedestrians separated from refuse collection vehicle movements

Part C

Technical standards

10. Introduction

Designs must have an emphasis on quality, functionality, durability and reliability by using materials, systems, plant, 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 school or early childhood centre.

10.1 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 4.

All material and equipment must be durable and have low maintenance life cycle characteristics in accordance with a recognised life cycle assessment (LCA) tool.

10.2 Design criteria

Buildings and facilities in schools and early childhood centres are subjected to heavy and demanding usage by children and students of a wide age range, displaying a range of behaviours and attitudes 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.

Educational buildings shall be designed to resist wind and earthquake loads to an importance level of 3 as per the NCC.

10.3 Ecologically sustainable design and energy efficiency

Educational 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 throughout the *Technical Specifications and Standards*
- implementing ESD initiatives that support and enhance sustainability outcomes, including initiatives that support learning outcomes by way of the built form.
- compliance with NCC, Section J Energy efficiency requirements

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 4. 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
External glazing security film	10
Civil engineering	
Asphalt pavements	20
Concrete pavements	40
Stormwater sub-surface drainage	50
Electrical services, plant and equipment	
Inverters	15/5
Lighting	15/5
Photovoltaic panels	25/20 (product)
Power outlets	15
Sub-mains	30
Switchboards	30/10
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	15
Playground soft fall: – Modular soft fall mats – Permanent soft-pour soft fall	 10 15

Item	Minimum design service life/warranty period (years)
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
Electronic security systems	
Electronic access control	5/1
Electronic intruder detection	5/1
Emergency tone warning systems	5/1
Closed circuit television systems	5/1

10.3.1 *Sustainability principles*

The design and installation of passive solutions and energy conservation measures are integral to the Queensland Governments long term renewable energy and emissions reductions 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
- maximise thermal insulation provision
- natural ventilation
- ceiling fans to assist with air circulation.

10.4 Health and Safety

10.4.1 *Machine Safety*

Equipment and fittings shall be located in a manner that ensures safe use and adequate circulation of persons around machinery in accordance with manufacturer specifications.

Safe work zones areas around each fixed machine in Industrial Technology Workshops shall be delineated on the floor by yellow safety line markings, 50mm wide.

Safety lines shall be located as recommended by the manufacturer or where not provided by the manufacturer shall be 700mm out from working face and 300mm from non- working face minimum.

Windows near machinery that may produce high speed projectiles shall have suitable safety glass to withstand impact.

10.4.2 *Projections, protrusions, pinch and entrapment hazards*

Exposed corners, edges, protrusions, fixtures, brackets etc. shall have rounded shape with no sharp edges and shall not intrude into pedestrian paths of travel or trafficable areas.

Sheet metal fixtures (such as flashings, benches, sinks, basins and troughs) shall be free of sharp edges and corners that could cause injury.

Holes, openings or slots (e.g. drainage gratings, grille screens, balustrades, fences, open steps) shall not constitute an entrapment hazard for feet, hands, fingers and head.

Drain covers, grates, manhole covers etc. shall be securely fixed to prevent opening by students.

Areas with low head height (such as under floor and roof spaces) shall be secured to prevent access by students yet allow authorised access for maintenance.

Overhead structures, fittings, windows (awning or casement windows), and sunhoods shall not intrude into pedestrian paths of travel or trafficable areas.

10.4.3 *Floor slip hazards*

All non-carpeted floors (such as vinyl, concrete, epoxy) shall have a slip resistant finish with the rating as briefed. Where a slip resistance is not briefed or required by the NCC, reference shall be made to Table 3B of SA Handbook 198.

All applied finish details are to be recorded in operating manuals including manufacturer's instructions, warranties, recoating procedures and timeframes.

Details of persons/companies applying such finishes are also to be recorded in manuals.

10.4.4 *Safety Glass*

Provide as mandatory safety glazing to high-risk areas to prevent accidental breakage and injury as per the relevant Australian Standards. Laminated safety glass is to be used in accordance with statutory requirements in all identified risk situations as detailed in the Standard, including the following situations:

- All glass in doors panels or beside door panels to workshops
- Glass to stairwells
- All glazing within 5 metres of ovals, sportsgrounds or practice nets
- For marked play courts, and glazing up to 2 metres from ground level
- Up to 1000mm above height of window located seating
- Other areas where high likelihood of human impact, including any existing glazing up to 1000mm from ground level
- Windows near machinery that may produce high speed projectiles
- All mirrors

11. 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.

11.1 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 operations.

Coatings and material shall be appropriate for corrosive atmospheric conditions and location (i.e. within 2km of coastline).

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 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 *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 penetrations through the roof (skylights, exhaust hoods, etc).
- Avoids 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, ladders and the like) shall be installed to provide safe access to and servicing of roof mounted equipment.

11.1.1 *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 be avoided 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.

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.

11.1.2 *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.

11.1.2.1 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.
- Must comply with all performance requirements of the NCC, including structural, fire, weatherproofing, condensation and energy efficiency.

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 subject to building certifier approval considering proximity to other structures. Aluminium composite panels with a polyethylene core must not be used.

11.1.2.2 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 or DWV SN8 Painted pipe).

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.

11.2 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 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 regular activities, children, students and vandalism.

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

- comply with all requirements of the NCC, including structural, fire, weatherproofing, condensation acoustics and energy efficiency.
- have appropriate long-term durability, aesthetic appeal and be pre-finished
- are low-maintenance, complete, windproof and watertight
- remain intact under local and regional ambient climatic conditions
- are resistant to salt water spray in coastal areas located within 1km of the shore line or large expanses of salt water
- are robust, durable, and suitable for long-term performance in high-exposure conditions and resilient to intentional damage
- support design wind pressures in accordance with *AS 1170.2* for ultimate strength design.
- Is capable of withstanding high wind speeds in regions, where wind pressures could exceed 2Kpa.
- accommodate all permanent and temporary loads
- accommodate all short and long-term movements and deflections
- provide adequate means of dealing with condensation, corrosion, and thermal movement
- discharge all water and moisture, including leakage and condensation, into a drainage system
- 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
- prevent access to and existence of breeding places for vermin (concealed or otherwise)
- do not enable the growth of algae, mould, or fungus
- are readily available commercial proprietary systems, easily cleaned, maintained, and replaced (if damaged).
- Support sustainability by having recycling potential at the end of usable life, and/or include recycled content.
- Provide appropriate corrosion resistance for:
  - Atmospheric exposure conditions
  - Service conditions due to the nature of nearby activities taking place in the installation
  - Contact with other materials or contact with water washing off other materials

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

11.2.1 *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.

It is advisable where two surfaces of dissimilar material come into contact, such surfaces shall be insulated with a layer of PVC or Polyethylene tape. This option should be discussed with a qualified professional.

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.

Externally, pre-finished surfaces must be used. External painting and the use of post-applied finishes must be minimised on any surface more than 2000mm AFFL.

Consideration should be given to minimising or disrupting space available as "canvas" for graffiti through the use of dark colours, textured surfaces, murals etc.

The following materials are not to be used:

- Aluminium composite panels with a polyethylene core of greater than 30% by mass and expanded polystyrene
- Autoclaved Aerated Concrete cladding (AAC)
- Timber (weatherboard) planks or cladding
- Plastic cladding
- unpainted/unsealed concrete block and other materials prone to dirt and scuffing, or which are otherwise difficult to clean or to remove graffiti from

11.2.2 *Compressed Fibre Cement Cladding*

- Factory finished panels are to be fixed using coloured screws or rivets as recommended by the manufacturer of the panel.
- The external cladding panel surface shall be factory prefinished by the supplier with a Fluoropolymer coating of either PVDF (polyvinylidene difluoride) or FEVE (fluoroethylene vinyl ether) for long term gloss and colour retention.
- The coated surface shall comply strictly with *AAMA 2605:2020, Performance Requirements for Superior Performing Organic Coatings.*
- Colour variation between any given colour of prefinished cladding should not exceed 0.5 DE (Delta error) when measured with Spectro photometer, to avoid visible colour differences between cladding panels to be installed.
- warranties of prefinished external cladding is to cover delamination, blister, flaking, peeling, specifically gloss and colour retention of applied coatings within the stipulated warranty period of 15 years.
- cutting of compressed fibre cement cladding on site is to be minimised. Panels are to be preferably cut-to-size and prefinished in the factory before delivery to site. Where minimal cutting is unavoidable exposure controls are needed as per Appendix 4 of the *Managing respirable crystalline silica in construction and manufacturing of construction elements* Code of Practice 2022 issued by Workplace Health and Safety Queensland.

11.3 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 shall be in accordance with *AS/NZS 4200.2 Pliable building membranes and underlays - Installation requirements* and are properly lapped and taped to inhibit all wind and vapour penetration
- that all bulk insulation complies with relevant WHS 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 *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.

11.3.1 *Exposed roof insulation*

Buildings, including sports halls must conceal the roof insulation with a layer of foil or similar material complying with the NCC.

11.4 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 standard window configuration in external walls of habitable rooms, shall extend from sill height 1000mm above floor level, up to 2400mm high.

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

- are able to be secured to prevent unauthorised access and are resistant to vandalism and attack
- 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. Minimise high level windows that require scaffolds, mobile plant or roof anchor points to clean.
- 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.

- High level louvres at 2400mm or more above internal floor level (such as clerestory windows) shall be mechanically operated in banks via low voltage electric motors concealed within the frame. Windows shall be controlled by a control unit with built in timer controls. All equipment (motors, controllers) shall be proprietary and supplied by the window manufacturer to ensure compatibility

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.

11.4.1 *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.

11.4.2 *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 stainless-steel security mesh screens with anti-tamper screws or welded steel security bars installed with a key operated (all keyed alike on the master keying system) push-button plunger lock.
- installed greater than 900mm from adjacent door handles
- positioned with the fixed section of sliding windows located adjacent to door hinge portion of door.

In areas intended for the storage of high value materials and equipment, additional consideration should be given to the height of windows and whether security mesh/bars and glazing are warranted.

Window handles must be fixed centrally.

11.4.3 *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.

In early childhood centres all blind cords must be designed to be inaccessible to children.

11.4.4 *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.

11.4.5 *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.

11.4.6 *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 NCC 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%.

11.4.7 *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 NCC to be achieved.

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

11.5 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.

Glass fitted in any door must be shatterproof laminated glass of a thickness and safety properties appropriate to the security 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.

11.5.1 *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 to suit the age and abilities of all users.

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, deter intrusion and vandalism and 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, to minimise disruption to operation.
- Solid core with non-removeable hinges and a steel strike plate covering the door tongue
- Where a viewing panel is required, this shall be laminated glass.

For areas requiring high security for the storage of valuable materials and equipment, doors should be no less than 1.2mm steel faced, 1.2mm steel frame, concrete filled and feature a lever escape lockset, keyed from outside only to the restricted keying system.

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. In early childhood centres, however, the hold open latch must be inaccessible to children.

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

11.5.2 *Automatically operated doors*

For all new school projects and major upgrades, external entry must be provided to the administration facility 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
- an internal lock down button to secure doors in the event of an emergency

- be integrated with any building access control systems

Automatic entry doors are not to be provided for regulated early childhood facilities but may be provided to the reception area of integrated services, where specified.

11.5.3 *Internal doors*

Internal doors:

- must be solid-core in a quality frame and have a durability consistent with adjacent activities and use
- where required operationally, feature a robust lock, keyed to the restricted keying system with an internal lever action handle, free egress from inside
- satisfy the minimum acoustic performance requirements specified in Section *Acoustic engineering*
-
- must be operable by all students, including young students and students with a disability.

Laminated glass viewing panels must be installed in internal doors which lead to public areas or where two-way traffic is expected and where staff may need to check the occupancy and activities in a room, but a degree of privacy is needed. The design and extent of viewing panels must account for the differing heights of all users.

For early childhood centres and 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:

- Swing outwards
- Include a door viewer in any doors from staff secure side to publicly accessible/reception areas where visibility is otherwise limited
- Be integrated with any building access control system
- have an internal afterhours release button (mushroom-cap push-button door release).

For administration secure stores, a steel security door should be installed with:

- concrete filled steel frame
- heavy duty anti-tamper hinges
- internal lever action handle
- four-point dead bolt lock openable from inside at all times
- fire resistant to one hour.

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.

11.5.3.1 Pool gates

In early childhood centres, pool gates may be used in place of internal doors to restrict unsupervised access between rooms while maximising supervision, they may also be used as part of the required safety zone at the entry to the licensed premises. All pool gates used must meet the following requirements:

- Be designed and constructed in accordance with Queensland Development Code *MP 3.4 swimming pool barriers*
- Minimum height 1200mm AFFL

- Latch to be located at 1500mm AFFL
- Sturdy construction to withstand the expected use in an early childhood environment
- Use tamper proof fixings

11.5.4 *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. Retractable bottom seals are to be provided to allow ease of operation.

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

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11.5.5 *Roller doors*

External roller doors shall be of industrial standard and 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. The bottom of roller doors should be strengthened with 100mm x 25mm boxed aluminium for high risk or high value storage areas. Roller door guides must be heavy duty to prevent the roller door being forced from the track.

A central locking mechanism should be provided at the centre of the roller door to prevent forced entry.

External roller doors are to be integrated with the intruder detection system via a dual reed switch to either side of the roller door.

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

Roller doors to counters where sales are transacted (e.g. canteen, uniform shop etc.) should likewise be fitted with central locking mechanisms regardless of whether they are internal or external facing. Consideration should be given as to the operational requirements of users and the locking solution designed accordingly. External roller doors to counters should be integrated with the intruder detection system via a dual reed switch to either side of the roller door. If direction is required, assistance should be sought from the department's Disaster, Emergency and School Security unit at: ISD.EmergencySecurity@qed.qld.gov.au.

11.5.6 *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).

11.5.7 *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 lifts 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.

Doors shall be inward opening 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.

In an early childhood centre, children’s toilet partitions are to be a maximum 1200mm high to provide privacy for children, while allowing appropriate staff supervision.

11.5.8 *Multipurpose Halls - Divider Curtain/Net*

Dividing Curtain/Nets are to be provided in multi-purpose halls to separate courts where more than one court is provided and to provide a separate space for Outside School Hours Care where one court halls are provided as follows:

- Operation is to be electric retractable via concealed motors with key switch operation.
- Mounted to a structural beam as designed by a certified RPEQ
- Made from heavy duty rip stop vinyl (bottom half) and vinyl coated mesh (top half). Fire rating to NCC requirements.
- Free of retractor cables or torque straps.

11.6 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 or early childhood 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.

In an early childhood centre, door handles should be located at 1500 mm AFFL wherever possible to limit unsupervised access. Consideration must be given to balancing accessibility requirements with the need to prioritise the safety of young children.

11.6.1 *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.

11.6.2 *Doorstops*

Provide effective and vandal resistant fixed door stops to any door where the door may strike a wall. Provide a fixed aluminium and rubber door stop, to floor or wall, in a position that will allow full access clear of door furniture, located so as not to create a hazard in trafficable areas or cause excess force on doors in windy conditions. Additional wall protection is to be provided behind wall stops to protect the wall from damage.

11.7 Security locking

Keyed security locking must be provided to all external doors (including learning areas) 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 offices, staffrooms, workrooms, interview and conference rooms.
- Doors that form boundaries to zones that need to be isolated for use outside normal operating 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.
- No spaces are permitted to be used to seclude children or students, preventing their free exit.
- 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).
- In an early childhood centre, all storage cupboards and draws to be keyed alike throughout the centre excluding the manager's office.

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

- Keyed and integrated with a site-wide restricted master-key and access hierarchy.
- Cylinders must be interchangeable between different lock manufacturers.
- Cylinders are appropriately mounted to allow for user requirements.
- Keys are fitted with generic identification tags. Tags should not identify the school or early childhood centre to reduce the risk of lost keys being associated with the facilities 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 controls access to individual locations and purposes and which separates paths according to access for school or early childhood use versus community use. The master key hierarchy must limit and contain the risk of re-keying if any single key (excluding a master key) is lost.

11.8 Ceilings

Minimum height of ceiling in habitable rooms shall be 2700 mm AFFL. Sloping/raked /high level ceilings (above 2700 mm) both internally and externally shall be provided only where approved by the Department of Education.

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

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

Steel protection mesh must be installed in roof cavities to prevent access via the roof cavity to administration secure stores. Steel protection mesh must have openings no larger than 150 mm × 150 mm and have wires with a diameter no less than 4 mm. The ceilings in these areas should be reinforced and fire rated to at least one hour.

11.8.1 *Suspended ceilings*

Suspended ceilings, where provided, must:

- be braced against lateral movement and uplift
- consist of 1200mm x 600mm x 19mm thick tiles
- have RH99 sag resistance
- 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.

11.8.2 *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.

11.9 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 NCC.
- Stair treads must have slip-resistant surfaces and a contrasting texture or colour.
- Stair nosing's shall comply with *AS1428.1*. Anti-slip tape or painted stair nosing's are not allowed.
- 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 NCC.
- All steps (internal and external) shall be uniform throughout the flights and where possible, throughout the site.
- 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 and early childhood centres 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.

At the head and foot of each flight of stairs or each section of ramp and change in level as required by the NCC and relevant Australian Standards, tactile ground surface indicators (TGSI) tiles must be installed.

TGSI's must be a colour that contrasts with the adjacent flooring colour to enhance visibility.

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

TGSI's must be mechanically fixed and epoxied in place. TGSI pads are to consist of a proven UV stabilised product and not create a trip hazard. Discrete TGSI's shall be 316 marine grade stainless steel. Peel and stick and press fit discrete TGSI's are not to be used.

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.

11.9.1 *Fall prevention barriers*

The following minimum requirements, which exceed NCC 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 barriers/balustrades do have a horizontal handrail or baseboard then the barrier/balustrade must be 1800 mm high above the finished floor level.

Existing historical barriers are to be modified to suit above requirements when applicable programs and funding are available.

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.

11.10 Sanitary ware

Suitable sanitary fittings and fixtures must be planned to support and complete the delivery of functional spaces and to meet the needs of users based on the student, child and staff populations resulting from the expected 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, children and visitors must be provided as below:

- The layout of toilet areas must allow for supervision of open areas from the entrance, with preference for a design where an entrance door is not required.
- 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.
- In an early childhood centre, toilet and washing facilities should be directly accessible from each indoor room and outdoor play area, with entrances adjacent to the rooms they serve.

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 the age and ability of 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 16.

11.10.1 *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.

Toilet pans must be sized to suit the age of the users. Pans in an early childhood centre must have a seat height of 300-350mm AFFL. In amenities dedicated for the Prep cohort there should be a mix of standard height pans and lower height pans.

Toilets provided for adults must have a double-flap toilet seat. Single-flap toilet seats must be provided for student toilets and children's toilets in an early childhood centre.

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

11.10.2 *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.

Wall-mounted urinals should be provided within a closed cubicle for privacy.

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

Urinals are not required in early childhood centres.

11.10.3 *Handwash basins*

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

Student and child hand wash basins must be vitreous china or stainless steel basins, wall-mounted, mounted at an appropriate height for the age of the intended users and with chrome plated brass grated waste outlets.

In an early childhood centre, basins must be mounted with a rim height of maximum 600mm AFFL in amenities for the 3-5 age group and maximum 550mm AFFL in amenities areas for the 0-2 age group.

Student and child hand wash basins must be mounted in a location that facilitates supervision and behaviour monitoring.

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

Basins provided for students and children require cold water only. Basins provided in staff-assisted student and child 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.

11.10.4 *Handwash troughs*

Hand wash troughs may be provided for student use in schools where it is more economical and secure to install hand wash troughs as an alternative to hand wash basins. Hand wash troughs are not to be used in early childhood centres. Hand wash 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 *Handwash* basins

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11.10.5 *Drinking troughs and fountains*

Drinking troughs and fountains must be provided and distributed across both internal and external areas to ensure students and children have access to drinking water at any time. Specific provision must be made for accessible drinking fountains for students with diverse abilities. One drinking tap must be planned for every:

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

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

In early childhood centres, drinking fountains should be provided as per the room data sheet requirements, drinking troughs are not to be provided.

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 and children 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.

11.10.6 *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.

11.10.7 *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.

11.10.8 *Art sinks with interceptor traps*

Art sinks must be provided with an interceptor trap 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.
- Installed at a height suitable for the age of the users, for example at a lower height in an early childhood centre or dedicated Prep area

Interceptor traps must be:

- sized to suit the intended activities and to mitigate the need for frequent emptying
- 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
- fitted in a way that allows them to be locked securely in place
- approved by the relevant trade waste authority.

11.10.9 *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.

11.10.10 *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.

11.10.11 *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.

Washing facilities (including showers) in early childhood centres must be designed to allow privacy for users and supervision for staff. Washing facilities should be located to ensure dignity of children – such that children do not have to walk through common areas/foyers, other activity rooms or long distances to access these facilities. Two indoor rooms may share the same facilities, provided they maintain convenient, appropriate and adequate access.

Tapware and mixers should be located out of reach of children, preferably at 1500mm AFFL.

11.10.12 *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.

11.10.13 *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.

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 and be fitted with anti-tamper taps to turn water off to taps accessible after hours.

Taps provided in early childhood centres must be suited to the age of the children, to promote independent use.

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.

As a minimum, provide two (2) anti-vandal hose cocks per building on the ground floor at opposite corners for cleaning purposes.

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.

11.11 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 38mm 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 or ABS 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 16 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.

11.11.1 *Accessibility and inclusion*

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

Where fixed joinery workstations are provided in teaching and learning spaces, at least one work station must be provided that is accessible by those who may use a wheelchair, in accordance with *AS 1428*.

11.11.2 *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. In early childhood centres these should be keyed alike throughout the centre excluding the manager’s office.

- Nappy change stairs – In early childhood centres where a nappy change table is provided, pull-out joinery stairs are required under to avoid strain on staff having to lift children onto the bench.

11.11.3 *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.

11.12 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.

11.13 Termite protection

Termite protection must be provided to all 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).

11.14 Way finding and signage

11.14.1 *Entry structures*

- The main school street frontage shall be enhanced by landscaping and an entry statement to provide a focal entry point for the facility with a path leading primarily to the Administration block.
- Entry structure shall include signage to identify the facility within the community.
- The entry structure and signage at schools 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.
- The main street frontage and pedestrian entry for an early childhood centre should clearly identify the facility and entry point. Signage is also required to the car park entry.

11.14.2 *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 or early childhood provider 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.

11.14.3 *Room signage*

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

Ensure room signage has appropriate placement and fixings to inhibit vandalism

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

11.14.4 *Building directory/level boards*

Provide inside each major building entrance, a simple 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.

11.14.5 *Braille and raised tactile signage*

Incorporate Braille and tactile signage complying with specification 15 of the 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

12. Building finishes

Building finishes must:

- be durable and resistant to exposure, weathering and general wear and tear suited to their environment
- be fire-resistant, where required
- enable the minimum acoustic and thermal performance requirements specified in Section *Acoustic engineering*
- and Section J of the NCC 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.

Wherever possible, as a measure to disrupt canvas available for graffiti, the use of darker colours, textured surfaces, murals etc should be considered.

In extreme locations, such as the Torres Strait, consider the use of alternate materials to steel to prevent corrosion (i.e. Treated timber with stainless steel bolts for shade structures, polycarbonates for play structures).

12.1 Concrete

All concrete design, supply and construction:

- is to be executed in accordance with *AS 3600:2018 – Concrete Structures*, and *AS 1379:2007 – Specification and supply of concrete*.
- for areas subject to pedestrian traffic, pavement surfaces shall achieve the minimum compressive strength of 25 MPa.
- for areas subject to pneumatic tyred vehicles (3t vehicle mass and below), pavement surfaces shall achieve the minimum compressive strength of 32 MPa.
- concrete shall be of normal class unless noted as decorative, or by approval of the RPEQ certifying design engineer, and is to achieve the nominated characteristic compressive strength after 28 days as per *AS 3600*.
- all aggregates are to be appropriately graded, with no gap-grading, to ensure that segregation does not occur.
- concrete slumps shall be in the range of 80mm – 110mm for pavements, where delivered by chute.
- tolerance for concrete slumps shall be in ±15mm for concrete specified at 80mm slump, ±20 mm for concrete up to 110 mm slump. Concrete delivered outside this range should be rejected.
- Project/batch specific sampling and testing of all concrete is to be completed in accordance with the current edition of *AS3600*, adopting project assessment method for compressive strength and slump compliance. The results of all tests shall be promptly submitted to the engineer for review.
- The required concrete cover to the outside face of any reinforcement is to be followed as per the project engineer's specifications.
- A pencil vibrator shall be used to assist in the compaction of concrete where reinforcement is congested, or mix is dry or where vertical depth of member is greater than 150mm.
- The maximum size of aggregate shall be 20mm unless noted otherwise and water/cement ratio not greater than 0.65.
- All concrete of depth greater than 100mm is to be mechanically vibrated. Vibrators shall not be used to spread concrete, and care should be taken to avoid over-compaction.
- All concrete is to be cured in accordance with *AS 3600*, by using an approved method for 7 days immediately after concrete is hard. During curing all surfaces are to be protected from evaporation by use of engineer approved spray membranes or moist curing, as approved by the engineer.
- No additives shall be added or applied to the concrete mix without the approval of the engineer.
- The contractor is responsible for checking and confirming weather conditions (wind, temperature, humidity, precipitation) are well considered and appropriate for concrete placement. The CCAA Smart Concreting App, provides guidance on this and is recommended to be used.
- Construction joints to be installed as per project engineer's approval. Pavements are to be appropriately reinforced and jointed to avoid unsightly uncontrolled plastic shrinkage cracking.

- The maximum permissible transport time for concrete between batching and placement on site shall be in accordance with the following Table 5.

Table 5. Ambient air temperature and maximum batching to placement time

Ambient air temperature	Maximum batching to placement time
10° - 27°C	90 Minutes
28° - 30°C	60 Minutes
31° - 33°C	45 Minutes
35°C+	No placement of concrete unless chilled water or ice in mix

- A vapour barrier shall be placed beneath the slab on ground so that the ground surface under the slab and thickenings is entirely covered. Joints in barrier are to be taped using an approved tape.
- The vapour barrier shall be minimum 0.2mm thick polythene. The sheeting and installation shall be in accordance with *AS 2870-2011*.
- Where service pipes penetrate the floor provisions must be made for the movement of the floor.
- Diagonal reinforcement shall be placed at all re-entrant corners as per the project engineer's specifications.
- All steel reinforcement is to be positioned and installed in accordance with *AS 3600* and the project engineer's specifications. All steel reinforcement in concrete elements shall be inspected by the engineer and passed prior to pouring of any concrete.
- Water is not to be added on site. By exception the supplier/manufacturer may permit small additions of water at their own liability, with clear recording of the amount added and W/C ratio.
- All concrete delivery dockets shall be forwarded to the project engineer for information. Any modifications to the mix on site are to be documented. No modifications to the mix will be permitted after site sampling has taken place.

Concrete Dusting (Laitance)

Concrete dusting presents an unacceptable WHS risk. Particular attention to concrete design, supply and construction as per the Cement Concrete & Aggregates (CCAA) datasheet "*Dusting Concrete Surfaces*" is required.

Excessive laitance is considered to be laitance which upon removal leaves a surface which does not meet the specified requirements. In practice this presents as a weak dusty porous surface where sweeping to remove laitance and normal trafficking of the surface dislodges further fine particles, resulting in a never-ending or extended period where additional fine particles are dislodged from a weak surface.

A surface is considered to have ***excessive*** laitance when:

- The surface remains dusty after 28 days of curing (i.e., running a hand/finger across the surface leaves it coated with powder, and/or;
- has locally lost its textured finish (i.e., the striations of a broomed finish have been worn away locally) within 3 months of normal use;

In such cases, an in-situ non-destructive assessment of surface strength is to be undertaken (by an RPEQ structural engineer) using a calibrated Schmidt Impact Hammer and a report produced to confirm the likely surface strength and appropriate rectification methods.

12.2 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.

12.3 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 and external steel work 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*.

Consider the use of additional protection for galvanising in extreme locations such as the Torres Strait by way of grit blasting prior to galvanising.

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.

12.4 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 used for all exposed (non-structural) steel in facilities located within an atmospheric corrosive category of C4 or above (refer *AS 4312 Atmospheric corrosivity zones in Australia*).

12.5 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 user’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.

12.6 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 and child accessible spaces shall be equal in impact/scuff resistance to 9 mm fibre cement.

Wall sheeting in non-student accessible spaces in schools and early childhood shall be equal in impact/scuff resistance to 6 mm fibre cement.

Note: Standard plasterboard is not acceptable in teaching and learning spaces due to the ease of damage to the surface.

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

- have provision for controlled expansion and contraction
- comply with all requirements of the NCC, including structural, fire, weatherproofing, condensation acoustics and energy efficiency.
- 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.

Areas requiring very high security and fire resistance for the storage of confidential records, irreplaceable documents and highly valuable materials and equipment that require protection against theft, vandalism and fire, should be reinforced concrete masonry walls of 200mm nominal thickness, fire rated to one hour.

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

- Impervious wall surface 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 multi-purpose halls, gym and fitness areas will be subject to impact from sports equipment and from users and require robust finishes. Generally, fibre cement products are not suitable in these locations.

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

12.6.1 *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.

12.7 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.

12.7.1 *Carpets*

Carpets, mats, carpet tiles and associated components and work must be consistent with the room use and high levels of wear and 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.

Table 6. Carpet – tiles

Criteria	Minimum requirements
Description	□ Tufted loop pile, direct stick carpet tile
Australian Carpet Classification Scheme (ACCS) Grading	□ Contract Extra Heavy Duty and Stairs (CEHD)
Face yarn	□ 100% nylon (polyamide) □ No polypropylene or polyester
Colour and pattern	□ Colours to be of the darker range with disruptive patterning
Tile size	□ Nominal 500 mm^2
Total pile mass	□ Minimum 610g/m^2 (18oz/yd^2)
Machine gauge	□ 1/10th (39.4 needles/100 mm) and finer
Pile height	□ Minimum 3 mm– 6.5 mm
Cushion backing thickness	□ Minimum 4 mm
Backing thickness	□ Nominal 4 mm
Dimensional stability	□ Less than 0.2% variation to heat and water
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/m^2 □ Smoke development rate less than 750%-minute
Environmental rating	□ ACCS Environmental Certification Scheme (ECS) Level 4
Warranty	□ Minimum 15 Years Commercial wear
Installation	□ Follow manufacturer's guidelines and relevant Australian Standards □ Ensure concrete floors are tested for moisture and pH levels □ Adhesive to be low-VOC, 'cross linked' water-based acrylic □ Supply 5% area additional over for maintenance purposes

Table 7. 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) □ 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/m^2 (22 oz/yd^2)
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/m^2 synthetic backing

Criteria	Minimum requirements
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 □ 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* □ Ensure concrete floors are tested for moisture and pH levels □ Adhesive to be low-VOC, 'cross linked' water-based acrylic □ Supply 5% area additional over for replacement purposes

12.7.2 *Sheet vinyl flooring*

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).

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

Table 8. Sheet vinyl flooring

Criteria	Minimum 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* □ Slip resistance classification of new pedestrian surface materials be one of the following types: **Type A – General use vinyl** (e.g., resource prep rooms, store rooms) – *AS/NZS4586: 2013* – Appendix A Wet Pendulum – Y – Appendix D Oil-wet ramp R9 **Type B – Slip resistance vinyl** (e.g., canteen prep and serving areas, HE food & catering kitchens, science labs, art studios, practical learning areas etc.)

Criteria	Minimum requirements
	– *AS/NZS4586: 2013* – Appendix A Wet Pendulum – X – Appendix C Wet/ barefoot ramp – A – Appendix D Oil-wet ramp R10 **Type C – Barefoot/wet-area vinyl** (e.g., staff amenities, shower rooms, PWD shower/toilets) – *AS/NZS4586:2013* – Appendix A Wet Pendulum – X – Appendix C Wet/ barefoot ramp – B – Appendix D Oil-wet ramp R10

12.7.3 *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
- sealed with a protective topcoat to be 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-S0209* 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.

12.7.4 *Sports, dance and drama flooring*

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

Cushioned polyurethane flooring is the preferred flooring in lieu of a sprung timber floor to reduce whole of life costs. Cushioned polyurethane floors must be selected with properties appropriate to the types and levels of use proposed.

Where sprung timber flooring is selected to suit a functional requirement, the 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 a continual cushion underlay system. Battens systems are not to be used
- laid with expansion joints in the floor in accordance with local humidity conditions and the anticipated behaviour of the flooring, in accordance with manufacturers recommendations.
- 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.

12.7.5 *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 mechanically or adhesive fixed to the wall lining.
- Vinyl skirting profile mechanically or 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.

12.8 Painting and applied coatings

All external and internal surfaces (other than 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.

Consideration should be given to application of an anti-graffiti paint finish, especially in external, accessible areas featuring large uninterrupted surfaces which can be attractive to vandals.

12.9 Engineered Stone

The supply, processing and installation of Engineered stone products (more than 1% crystalline silica) is banned in schools and early childhood centres as per WHS legislation.

Previously installed engineered stone does not need to be removed. Repairs and minor modification of previously installed engineered stone products shall be conducted in alignment with minimum standards outlined in the *Managing respirable crystalline silica dust exposure in construction and manufacturing of construction elements* Code of Practice 2022.

13. Utilities and associated infrastructure

13.1 Demand requirements

All services must be sized to meet the demand requirements based on the anticipated 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 prefabricated 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 Standards*.

13.2 Water

Applications for new, relocated, demolished, or upgraded water and fire service connections must be made to the relevant local water authority in accordance with their requirements.

Liaison must be undertaken with the relevant local water authority to determine the location and adequacy of existing authority water mains within the streets surrounding the site.

Separate/dedicated potable water and fire service connections must be installed. Water supply and metering shall be to Local Water Authority requirements. New fire service supply connection, assembly and pipework shall be 150mm diameter pipework. Where the street utility main is only 100mm diameter, the pipework should be expanded to 150mm - if allowed by the local water authority - to accommodate future site requirements and street utility upgrades.

Fire service connections shall include testable back flow prevention and metering devices e.g. a testable single detector check valve (SDCV) with ultrasonic/mag-flow meter. These shall comply with Local Water Authority water supply requirements.

A lockable galvanised cage shall be installed around each complete (above-ground) water connection assembly. The cage shall have lockable access panels to allow adequate (360 degree) access for maintenance, or complete renewal. The cage shall feature 003 locks to protect the valves from tampering and vandalism.

For recycled water, sites should be connected to an authority’s recycled water main where these exist.

Where town water supply is not potable:

- Provide suitable rainwater collection, tank storage, filtration, sterilisation (UV) and reticulation for potable water supply which will be used for drinking and hygiene purposes in accordance with Local and State Authority requirements

Where town water supply is unavailable:

- Provide rainwater collection, storage and reticulation system for sanitary fixtures, internal and external hose cocks

13.3 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.

13.4 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.

13.5 Natural gas

New gas installations should be avoided wherever possible and should only be used where the curriculum delivery requirements cannot be met without a gas supply.

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.

13.6 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*.

13.7 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 site 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.

13.8 Separate services connection

For services operated exclusively by a third party, such as some early childhood centres and other community facilities, a separate site connection to services infrastructure is to be provided, allowing independent connections and separate metering to the school (including water, drainage, power, telecommunications and electronic security). Ensure separate metering by an approved service provider meter is used to enable separate accounts to be established. Meters must be in a location accessible to the provider and any control panels located in the administrative area of the facility, secured from public access.

Establishing separate connections can take considerable time and these should be instigated early in the project to ensure they are available at building handover.

14. 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 regular 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.

14.1 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 day-to-day activities is not included.

14.1.1 *Building services*

Building services must comply with the noise limits detailed in Table 9.

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 day.
- The night-time noise limits must be met for plant operating out of normal hours.
- The noise criteria for equipment only operating during emergencies may be relaxed by 10 dB from that nominated in Table 9.

Vibrations from building services plant must not result in the noise limits detailed in Table 9 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.

14.1.2 *External noise intrusion*

Noise intrusion from sources outside of buildings must be limited to achieve the acoustic performance standards detailed in Table 9.

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.

14.1.3 *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 9 during a moderately heavy rain event (at a rate of up to 15 mm/h).

Table 9. 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: • Drama studios, assembly halls, multi-purpose halls — drama, physical education, dance, audio/visual presentations, assembly, occasional music • Music and dance activity spaces • Small and large practice rooms • Performance and recital rooms • 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: • Materials and technology workshops — electronics, systems, textiles, food • Art and graphic design studios • Project spaces • Science laboratories – Fume cupboards @ 1 m from sash	40 55	45	40
Circulation spaces: 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

Space type	Building services (dBL_{Aeq})	Rain noise @ 15 mm/h	Noise intrusion ($dbL_{A10, 30\ mins}$)
Kitchens and laundries	60	65	50
Offices, medical rooms and staff rooms	40	45	40
Change rooms	50	55	50
Toilets	50	55	50

14.2 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 in Table 10.

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 11. The sound insulation requirements are provided in terms of the weighted standardised level difference D_{nTw} values between two spaces.

Table 10. 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: • Drama studios, assembly halls, multi-purpose halls — drama, physical education, dance, audio/visual presentations, assembly, occasional music • Music and dance activity spaces • Small and large practice rooms • Performance and recital rooms • 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: • Science laboratories • Electronics, systems, textiles, food, graphics and art and design studios	Average	Medium
Materials and machine workshops	High	High
Circulation spaces: 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 11. 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.

14.2.1 *Sound insulation between floors*

Where 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.

14.2.2 *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}.

14.2.3 *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 11. 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.

14.3 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 (see Table 12).

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 12. Mid-frequency reverberation time values

Space type	Mid-frequency reverberation time
Year P–6 levels: general learning areas, small group spaces, sensory calming rooms	≤ 0.6
Year 7–12 levels: general learning areas, seminar rooms, tutorial rooms, language laboratories, study room (individual study, withdrawal, remedial work, teacher preparation), science laboratories, materials	≤ 0.8

Space type	Mid-frequency reverberation time
technology, CAD and design areas, electronics and systems, textiles, food, graphics, design and resource areas, ICT rooms, art	
Open plan teaching and learning activity areas: • General teaching and learning • Resource and breakout areas	 ≤ 0.5 ≤1.2
Music: • Music activity space • Practice/group room — volume ≤ 30 m^3 • Practice/group room — volume > 30 m^3 • Ensemble room • Performance, recital and dance	 ≤ 1.0 ≤ 0.6 ≤ 0.8 0.6–1.2 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

14.4 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 hours 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 outdoor areas:

- 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.

15. Civil engineering

15.1 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 or early childhood centre.

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 NCC.

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.

15.1.1 *Designing for storm events*

Drainage systems must be designed and constructed to cater for the higher of the design storm events listed in Table 13 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.

Where a swale drainage system is used, channels with a depth x velocity ratio greater than 0.4m /s are to be fenced off to prevent student access.

15.1.2 *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[30].

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.

30 https://dsdmipprd.blob.core.windows.net/general/spp-july-2017.pdf

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

Table 13. 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 buildings.

15.1.3 *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.

15.1.4 *Floor levels*

Consultation must be undertaken with the relevant local government authority and the water authority that has 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.

Consideration should be given to the relevant authority's minimum floor level requirements. Projected future 1% AEP flood levels should be incorporated such as the 0.2% AEP or 0.5% AEP levels. 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. Potential risks to occupants and damage to infrastructure must be mitigated as part of the design solution in line with floor 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.

15.1.5 *Pipework*

15.1.5.1 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.

15.1.5.2 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.

15.1.6 *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.

In early childhood centres, drainage slots must be a maximum of 5mm wide to prevent finger entrapment. The area surrounding the gully pit must be designed to prevent debris blocking the grate.

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 prefabricated buildings. Where pits are in the expected path of vehicle movements they must be designed and constructed to accommodate the anticipated weight of these vehicles.

15.2 Vehicle and pedestrian pavements

15.2.1 *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 prefabricated buildings, firefighting, goods deliveries, waste removal, buses and any other activities that could reasonably be associated with the operation of the school or early childhood centre.

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

15.2.2 *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 or concrete
- 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. In early childhood centres, bollards are required where a car park adjoins an outdoor play area and should be considered where car parks adjoin other pedestrian traffic zones.

15.2.3 *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.

15.2.4 *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.

16. 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 or early childhood centre will be used outside of normal hours by third parties and designs should include separate sub-metering of these facilities.

16.1 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 and early childhood centres, 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 prefabricated buildings and facilities associated with the forecast peak 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[31].

16.2 Design and infrastructure capacities

Electrical services and infrastructure must comply with the requirements detailed in Table 14.

Table 14. 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, spare conduits	As a minimum, provide spare conduits in all underground runs allowing for the future installation of same sized cables. Electrical conduits are to be sized so that the cross-sectional area of the cables 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.

16.3 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.

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

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 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.

16.4 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 distribution switchboards

Error! Reference source not found. 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 2. Label to display on all new Department of Education's distribution switchboards (not to scale)

16.4.1 *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.

16.5 Energy metering

Energy metering shall be provided as a minimum, to comply with the requirements of the NCC, Part J9. The subsequent paragraphs under this clause are applicable to all 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, large early childhood centres 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.

16.6 Underground pits and conduits

Underground pits and conduits are to be used to provide cable connections between buildings (including prefabricated 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:Access covers and grates) and be able to sustain the weight of a heavy vehicle or machinery 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.

16.7 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 prefabricated 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.

- Cabling through covered walkways apart from lighting is to be avoided where ever possible by the use of other cable pathways.

16.8 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 access 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.
- Outlets in early childhood centres must be located 1500mm AFFL in children’s accessible areas, unless briefed otherwise.
- 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 normal 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.

In tuckshops/canteen food preparation areas, each general purpose outlet (single or double) shall be on a separate circuit.

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.

16.9 Electrical safety

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

16.9.1 *Power emergency stop (E-Stop)*

Refer *QBuild, Electrical Minor Projects — Standard Document* for detailed E-Stop specification and wiring diagrams. A copy of this document may be obtained by emailing POE.DesignStandards@qed.qld.gov.au.

Emergency stop push buttons (E-Stop) must be provided to specialist rooms such as workshops, science laboratories and food technology areas as nominated in room data sheets. Provide "Emergency Stop Button" aluminium signage compliant to *AS 1319 - Safety signs for the occupational environment* above each emergency stop.

The emergency stop button system must disconnect electrical supply to all nominated circuits within the respective room while ensuring continued operation of lighting and other essential services.

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. Locate adjacent to the key reset switch and E-Stop button.

16.9.2 *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.
- Capable of being locked in the off position.
- Connected to equipment so as not to create a trip hazard.

16.9.3 *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 is 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.

16.9.4 *Switches and socket outlets*

Switch and socket outlets with removable trims or pull off covers are not to be used.

All light switches must have the switch mechanism secured to the flush plate by two (2) screws to prevent the mechanism being forced out of the flush plate.

16.10 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. In early childhood centres, outdoor play areas may require external lighting to accommodate extended operating hours.

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

LED luminaires must have:

- a colour rendering index (CRI) - 80+
- standard deviation colour matching (SDCM) ≤ 3 Macadam steps
- luminous efficacy for general and task lighting - ≥ 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 learning spaces and offices is to 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.

Lighting systems must comply with the following requirements:

- Lighting systems and their controls must comply with Section J of the 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 learning spaces, administration and office areas must be fitted with low-glare prismatic 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.

Where higher illuminance is required for specific tasks (i.e. welding bays), consideration must be given to additional luminaires over the task . Where suspended luminaires are not considered appropriate, suitable local task lighting should be provided.

16.10.1 *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.

Lighting in workshops with machinery shall be in accordance with *AS1680* series for “Medium Bench Work” and shall be 400 lux minimum.

16.10.2 *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*.

16.10.3 *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.

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 security system with manual overrides for external lighting.

Lighting in spaces not typically occupied (i.e., Store rooms, cleaners’ rooms, amenities, change rooms, plant rooms and data rooms) shall be motion sensor controlled.

In an early childhood centre, lighting controls should be mounted at 1500mm AFFL.

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.

16.10.4 *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 or early childhood 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.

16.10.5 *Access and security lighting*

Access and security lighting must be provided to assist authorised persons to enter, exit and move around the school or early childhood centre and to enable the detection of persons approaching the 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 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 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.

Where motion detectors are used to activate security and access lighting, they should be calibrated to avoid unwanted activation by environmental factors.

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

16.11 Ceiling fans

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 plastic blades.

Note: Plastic ceiling fan blades are preferred to reduce potential for rusting of 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.

16.12 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.
- Where inverters are mounted on external walls and susceptible to vandalism the inverter/s shall be caged using aluminium small diamond mesh. The cage shall be openable and have a locking facility keyed to the site requirements. The cage shall be sized to allow for maintenance access as per the manufacturer recommendations.
- 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 22%.
- 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 performance guarantee of:

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

17. Fire systems

All fire safety systems shall be installed as specified in the statutory requirements of the NCC and shall comply with the referenced Australian Standards therein. Fire safety system installations include all active and passive fire protection systems. Active fire systems include fire/smoke detection systems, fire suppression systems e.g., fire sprinklers, fire hose reels, fire hydrants, fire water supply tanks, pumps boosters etc. Passive fire systems include smoke doors etc.

The completed installations must be certified and approved by the local Authorities Having Jurisdiction (AHJ) i.e. The Building Certifiers and the Queensland Fire & Emergency Services (QFES).

Performance based solutions shall 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).

Some sites may include a fire detection system and audible alarm system if deemed a requirement by the NCC and/or DoE.

Fire systems must be appropriately designed to minimise intentional misuse of the installed items of equipment.

Performance based solutions may be required in line with the *Technical note: Special school evacuation guideline,* to support the evacuation of building occupants with a mobility impairment.

17.1 Water supply

Water provision for the fire systems must comply with the following requirements:

- The supply connection must comply with the requirements stipulated in Section *Water*
- and Hydraulic services
- Up-to-date water modelling shall be obtained from the local water authority at the nearest nodes to inform the design of the fire hydrant system. If utility data is unavailable, undertake local flow and pressure testing. Data provided should be relevant to the 95 percentiles as per *AS2419.1:2021 Fire Hydrant Installations*.
- For large and complex fire hydrant systems, a ring-main arrangement is preferred for the reticulated fire pipework to reduce frictional pressure losses and enhance the reliability of the system.
- Fire water reticulation systems shall be engineered with the highest priority for minimising pressure loss throughout the fire service network. DoE preference is to avoid the installation of diesel fire pumps and firewater storage tanks, where the design permits.
- Where unavoidable, above-ground pipework routes are acceptable if proposed, to avoid and minimise impacts on existing trees. Above ground pipework must be securely installed to comply with the applicable Standards.
- Above-ground pipework in other circumstances may be provided if justified and accepted by DoE.
- If used, above-ground pipework must be free from sharp edges and must not present trip, fall or climb hazards.

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.

Where firewater storage tanks are installed, the test water shall be piped back to these tanks.

17.2 Booster cabinet, suction and booster connections

Where required, a fire hydrant booster assembly must be provided in a compliant location agreeable to the local fire authority, DoE and any other council-imposed restrictions.

The booster cabinet shall comply with *AS2419.1* and in addition, should be manufactured from colourbond steel to minimise corrosion, with reinforced door panels and full-length hinges on the doors. The top of the cabinet shall receive pan-brake folds for strength, and to ensure a raised profile for water runoff. The cabinet should be mounted on a concrete slab sitting 50mm above ground level.

A hard stand area for firefighting appliances must be provided adjacent to the booster assembly in accordance with the NCC-referenced Australian Standard or as approved by the relevant local fire authority.

Use of an adjacent public road as a hard stand area must have the prior approval of the relevant local fire authority.

17.3 Pipework, valves and fittings

Wet fire suppression reticulation system shall include:

Watermark isolation valves - must enable individual buildings and sections of the reticulated pipe network to be isolated for maintenance, fault-finding, and for future addition and alteration.

Watermark isolation valves must be installed on each side of check valves.

Pipework shall be isolated from vibration by flexible connections at the pump suction and pump discharge and suitably supported.

Fire services pipework must comply with the requirements of *AS2419.1:2021* section 8 & 9 as a minimum. Additional requirements for DoE sites include:

- High Density Polyethylene (HDPE) for fire hydrant supply in-ground, rather than PVC due to PE having better environmental credentials – recyclability, etc.
- Polyethylene (PE) pipe conforming to *AS/NZS 4130* shall be DN125PE (i.e. to ensure 100mm minimum internal diameter).
- Steel pipework shall be galvanised - mild steel pipe shall not be used.
- Galvanised steel pipework shall not be used in-ground.

17.4 Fire hydrants

Fire hydrants shall only be installed as required by the NCC, the Queensland Building Fire Safety Regulation 2008 Australian Standard and approved by the AHJ.

Fire hydrant systems must comply with the following requirements:

- All hydrants shall be external. Internal hydrants shall only be used where external hydrants are not able to provide coverage and/or are not practical to achieve compliance.
- External hydrants must be appropriately secured to prevent unauthorised use. Metal hydrant outlet caps shall be used; they shall be attached to the hydrant using steel wire with swaged connectors.
- Robust metal covers shall be installed over the valve turning wheels with 003 locks on all hydrant landing valves; the covers shall feature hinge pins and locking tab flanges of diameter/thickness no less than 4 mm.
- Consideration may be given to the use of street hydrants where appropriate and prior approval has been provided by the relevant local fire authority.
- External hydrants should not be located within active play areas where they create an injury hazard. Where these locations are unavoidable, the hydrants must be protected by bollards.
- Hydrants shall be protected from vehicular impact. All hydrants within 1.5m of a vehicle accessible path (min. 2 bollards); All hydrants in open grassed areas, and where vehicles can approach from all sides (min. 4 bollards). Bollards shall be 150mm diameter, 1200mm high and installed to applicable Codes & Standards, or QBuild specifications, whichever is greater.

- Hydrants and their immediate supply pipework must not create a climb, trip or fall hazard for students (if installed other than vertically).
- 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.
- Internal fire hydrants shall be installed in cupboards located within stairwells or adjacent to stairwells.

The fire hydrant system shall include provisions to send an electronic signal to the security system (where available), when any fire hydrant valve on the sitewide system is opened/flown.

For sites with a pump-assisted system, this is achieved by connecting the pump “run” signals to the security Panel.

For all other sites, one flow switch shall be installed at/after the site's dedicated firewater supply connection/assembly or at the booster cabinet (if installed). This flow switch shall be connected to the site's security panel (hard-wired or wireless).

17.5 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 NCC *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 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 operating hours.

The fire hose reel water supply shall be preferably provided by potable water supply, rather than fire service supply. The hose reel must be fitted with a flow switch connected to the security system to alert usage.

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.

17.6 Automatic fire sprinklers

Automatic fire sprinkler systems shall only be provided as required by the NCC and Australian Standards or if required by a “Performance Solution” and agreed upon by DoE. The fire sprinkler system must be fitted with flow switches connected to the 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.

17.7 Fire extinguishers

Where required, fully charged hand-held Standards Australia approved fire extinguishers must be in accordance with the requirements stipulated in the NCC 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, as per the requirements of NCC.

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

Extinguishers located in unsupervised areas (corridors, carparks etc) shall be installed in a metal non-lockable cabinet complete with flush latch.

17.8 Fire blankets

Where required/mandated by the NCC, fire blankets must comply with and be installed in accordance with the relevant Australian Standards.

In addition, 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.

17.9 Fire detection systems

Fire detection and alarm systems (FDAS) shall be installed where specified by the NCC and shall meet all NCC referenced Australian Standards.

Unless required by NCC, FDAS are generally not voluntarily required by DoE in the following circumstances:

- In standardised type general learning buildings which do not feature additional specialist, technical, or highly valuable equipment or assets
- In multi-purpose halls which are predominantly one large single fire zone
- In pre-fabricated buildings and amenities blocks.

FDAS shall only be voluntarily installed where required by the Department of Education *Security Design Requirements - Appendix 4.*

17.10 Emergency warning and intercommunication systems

An emergency warning and intercommunication system (EWIS) provided for audible sound alert must be provided if required by the NCC and NCC-referenced Australian Standards and the Queensland Building Fire Safety Regulations 2008.

The EWIS must be installed separate from any Occupant Warning System/PA System, school bell or general alert systems used for daily operational and security purposes.

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 across the whole site. Alert and evacuation tone sequences must comply with Queensland Fire and Emergency Services' requirements and site evacuation plans.

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 (in lieu of speakers) 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 a hearing impairment including lift lobbies, public waiting areas, corridors, interview rooms, etc.
- In special schools as requested by the school to suit the student cohort.

The control panel must be appropriately located in the administration area 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.

17.11 Smoke and fire doors

Smoke and fire doors must be installed in accordance with the requirements of the NCC 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.

Doors shall be single-leaf or double leaf type doors, as applicable with electrically operated “mag-locks”.

Doors shall be held open with a charge through the magnet and then in fire alarm mode, when the power is cut, the doors shall swing shut (or vice-versa, as per the requirements).

Doors shall be designed to avoid tampering due to vandalism (mechanical damage).

17.12 Fire detection control and indicating equipment

Where a fire detection and alarm system is required by the applicable codes (NCC) and/or is called up as required in Section *Fire detection* systems

, an FDCIE and compatible detection must be installed.

FDCIE shall be analogue addressable type as a preference, however if all other FDCIE equipment at the site is of conventional type, a compatible FDCIE can be installed to match.

Where a new building is provided that requires FDCIE, the make and model of any existing equipment on site must be considered to minimise maintenance and servicing costs. The new FDCIE must be linked into the existing system of FDCIE’s on site.

FDCIE shall not be oversized with multiple un-used circuits – the simplest solution to detect and alert a fire is preferred.

A single common alarm and fault output from each FDCIE must provide an individual and separate input into the security system (refer Section *Intruder detection and alarm* systems

) to allow remote monitoring of the fire detection system.

A Main FDCIE is not required in the Administration building of a school, however permanent signage should be mounted in a prominent position in the Administration building entrance, to identify the location (i.e. which buildings) where FDCIE are installed, as well as any network cabling between FDCIE, if it exists.

Where FDCIE are already installed in existing buildings, which do not align with the voluntary installation requirements outlined in Section *Fire detection* systems

, the FDCIE shall be operated and maintained to end-of-life and retired from use without renewal.

When removing end-of-life FDCIE (or multiple FDCIE, including those that are obsolete with respect to spare parts availability), appropriate approvals shall be obtained from a building certifier. If the FDCIE is monitored directly by Queensland Fire and Emergency Services (QFES), their approval shall also be obtained. Relevant approvals are required to ensure that the FDCIE is not a mandatory requirement of the NCC or NCC-referenced *AS 1670.1.*

When removing FDCIE, all network, power cabling and conduit shall be removed, tidied and made good. Any ancillary functions of the FDCIE must be provided via an alternate arrangement. That is, background music (BGM), school bell alerts, public announcements (PA system), and other intercommunication systems which might have been a function of the FDAS system, must be provided via alternatively installed systems when an FDCIE is removed.

17.13 Fire hydrant system hardstands

Hardstands (access roads) for fire brigade appliances (vehicles) shall allow adequate width, clear height, radius and turning circle diameters to meet QFES Guidelines for QFES Vehicles of 15 or more tonnes GVM.

The hardstand design and construction shall consider the impact on the urban heat island effect, soil absorption, moisture holding capacity, stormwater runoff, changes to overland flow and potential for exacerbating erosion.

DoE seeks to minimise the amount of hard (impermeable), high-density surfaces in education settings. Options other than concrete or asphalt, which are permeable/porous, yet load-carrying surfaces, are acceptable where justified and approved by DoE. Where such types of hardstands are specified/scoped for a site; they shall be subject to an RPEQ signed-off design, certification and local QFES approval.

Hardstands specifically designed and constructed for fire brigade appliances shall be clearly and permanently marked out and labelled in white or yellow surface paint. If surface labelling is unsuitable, alternate signage shall be located along the course of the hardstand.

17.14 Fire hydrant system fencing

Where fire water supply storage or break tank installations are installed, steel fencing shall be installed around the perimeter. Adequate clearances (minimum 600 mm) for maintenance shall be provided around pipework valves, sensors and connections. Lockable gates shall provide clear access to the maintenance perimeter work space. The fencing shall meet the DoE Security Fence Type 1 requirements, at 2100 mm in height.

17.15 Fire pump house

The construction of the pump house shall meet *AS2941* and QFES requirements.

Minimum clearance requirements within a purpose-built pump house (e.g., a colourbond shed, or blockwork enclosure) includes 2.1 metres head clearance and 1-metre-wide clear pathways to the control station and control valves.

Proprietary package pump enclosures shall only be used for single or dual pump installations where approved by DoE, and must accommodate full length openable doors or panels for full access for maintenance. Proprietary package pump enclosures shall be installed on concrete plinths which extends 1.0 metres on all sides.

Where the pump alarm signals are connected via the Security Panel to a 24/7 “Manned” Security “Control Centre”, the requirement of providing an audible alarm per Clause 9.4.9 *of AS2941:2013* is fulfilled

“remotely” at a “manned” security “control centre”; and hence the integral audible alarm/sounder is to be removed from the pump controller.

The “visual” warning alarm (strobe lights) shall NOT be removed in any case.

Suitable signage/notification near the pump controller should be provided to this effect (to notify others).

NB: For the sites where there’s no Security Panel or where the Security Panel is not connected to a 24/7 “manned” security “control centre”, the pump audible alarm shall NOT be removed.

18. Gas supply

18.1 General

New gas installations should be avoided wherever possible and should only be used where the curriculum delivery requirements cannot be met without a gas supply.

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 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. Access panels must be provided to concealed gas pipework connections.
- Quarter turn isolation valves must be provided to each floor level take-off in visible and accessible locations.
- 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 15.

Table 15. 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

18.2 Natural gas

Natural gas infrastructure must comply with the following requirements:

- 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.

18.3 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.

19. Hydraulic services

All plumbing fixtures, materials and fittings installed in Queensland schools and early childhood centres 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 16.

Table 16. 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

19.1 Domestic water services

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

Provide water control valves in the main supply to each building adjacent to that building in suitable path boxes.

19.1.1 *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 *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 prefabricated buildings.
- Valved potable water point must be provided to allow for temporary supply to dental vans, trade training trucks and similar visiting services.

19.1.2 *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/sterilisation (where required) 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*[32].

19.1.3 *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, must:

- 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.

19.1.4 *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.
- 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.

19.1.5 *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 17.

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

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

19.1.6 *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 17. Plumbing fixtures

Code	Description
S1	Science gas turret • 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) • Single bowl, inset type, 300 × 300 × 200 nom deep, stainless steel 316 grade (or approved resin type), acid resistant grated outlet and waste. • 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) • Sink as for S2. • 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 • Stainless steel bowl with lever operated twin aerated eye/face wash nozzles and hand-held aerated hose, cold water only.
S4	Fume cupboard sink • Sink and tap as for S2.
S5h	Preparation glassware wash-up sink • 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. • 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 • 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. • 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 • 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.

Code	Description
	• Wall mounted hose cock chrome plated, 5-star WELS rated, cold water only.
S8	Sink — student practical learning areas • 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. • 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 • 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.
S9h	Commercial pot sink — canteens and student catering kitchens • 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 • 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, • Lever handle taps, swivel gooseneck aerated spouts (one per bowl), 3-star WELS rated, cold water only. • CP copper or concealed waste pipes to nom 40-litre paint/clay trap under sink.
S11	Sculpture/printmaking sink • 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. • 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. • CP copper or concealed waste pipes to nom 40-litre paint/clay trap under sink.
S12	Soap dispenser • Wall or splashback mounted stainless steel, vandal resistant, lockable.
S13	Paper towel dispenser • Wall or splashback mounted stainless steel, vandal resistant, lockable.
S14	Vanity basin • Vitreous china basin, white semi-recessed type chrome plated brass grated waste outlet (not plastic). • Flick mixer tap 5-star WELS rated, cold water.
S15	Toilet and in-duct/in-wall cistern • Vitreous china pan white with wall faced concealed trap, white closed front seat with flap. • 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 • 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 • 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 • Vitreous china wall mounted white basin, chrome plated brass grated waste outlet (not plastic) or provide shrouding of pipework. • Flick mixer tap, 5-star WELS rated, cold water only. • Alternative for PWD/access basin (Enware SLM606D or equal).
S19h	Hand basin — hot & cold water • Basin as for S19. • Flick mixer tap, 5-star WELS rated, hot & cold water. Alternative tap for food areas — knee operated.
S20	Drinking fountain

Code	Description
	• 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. • Chrome finish shielded bubbler with self-closing push button valve, cold water only.
S21	Wash basin/s — student amenities • 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. • Single tap per bowl, timed flow pillar cock, 5-star WELS rated, cold water only.
S28	Toilet suite — persons with disabilities • Vitreous china pan, white, with wall faced concealed trap (for easy cleaning). • In-wall/in-duct 6-litre dual smart flush cistern, push buttons at max 1000 mm above floor, with CP stopcock, cold water supply. Shower • Shower installation to comply with AS1428.1, provide 1500 mm hose, mechanical hose retraction device is NOT to be used.
S30	Wash/quench trough • 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 • 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). • Lever handle tap, swivel gooseneck aerated spout, 3-star WELS rated, cold water only. • Waste to nom 40-litre pain/clay trap under sink (where applicable).
S39	Laundry tub — inset type • Single SS 70-litre chrome plated brass grated waste outlet (not plastic). • Lever handle tap, swivel gooseneck aerated spout, 3-star WELS rated, cold water only.
S40	Pot filler laundry arm • Splashback mounted telescopic laundry arm (for filling large pots in situ on stove), cold water only.
S57A	Urinal — wall mounted • Wall hung vitreous china urinal stall, white, concealed trap, cold water only.
S57B	Urinal waterless — wall mounted • Wall hung vitreous china urinal stall, white, concealed trap.
S58	Safety drench shower with eyewash • Combination overhead drench shower and eye/face wash, hand and foot operated, cold water only.

19.1.7 *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 prefabricated buildings associated with the peak forecast enrolment and any third-party or community facilities.

Pump equipment and assemblies must be mounted on hot-dipped galvanised skids, housed in a vandal proof housing or metal cage.

19.2 Hot water

Hot 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 are to be provided as per room data sheets. 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 hot water systems and boiling water units during holidays, weekends and other non-operational days should be installed. Provide a flushing procedure in operation manuals for schools and early childhood centres to implement after holiday periods.

19.2.1 *Hot water systems*

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

Systems must be selected from:

- 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 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.

19.2.2 *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.

19.3 Sanitary plumbing and drainage

Sanitary plumbing and drainage systems must accommodate the permanent and prefabricated buildings and estimated sewage volumes associated with the peak forecast 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 prefabricated 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 regular 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 prefabricated 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.

19.3.1 *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 peak forecast enrolment (expected 5-year growth) and any third-party or community facilities or uses plus spare capacity.
- Where new buildings are provided that rely on an existing wastewater treatment system, the capacity and functionality of the system must be assessed. Potential to eliminate the system should be reviewed.
- 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.

19.3.2 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.

19.3.3 *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.

19.4 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 prefabricated buildings associated with the peak forecast 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 prefabricated 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.

19.4.1 *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.

19.4.2 *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 *Sanitary plumbing and* drainage
- .

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

19.5 Material selection

Hydraulic services pipework must comply with the requirements detailed in Table 18.

Table 18. 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

Service	Location	Material	Jointing	Nominal pipe size (mm)
Potable cold water	In-ground	HDPE Type PE100 SDR 11	Compression, butt welded, electrofusion	15–150
	Above-ground	Copper Type B Copper Type B Crosslinked polyethylene (PEX)	Silver soldered Silver soldered, press fit Compression sleeve	15-150 15–20 15–20
Hot water	In-ground	Copper Type B	Silver soldered	15–150
	Above-ground	Copper Type B Crosslinked polyethylene (PEX)	Silver soldered, press fit Compression sleeve	25–150 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

20. 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.

20.1 Audio visual systems

Audio visual systems and devices must be provided to support a school or early childhood centre'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 or early childhood centre.

20.2 Occupant Warning systems

A digital zoned occupant warning system suitable for announcements and information must be provided which covers all permanent and prefabricated buildings, sports fields, and outdoor areas.

The occupant warning system should include a lockdown warning function which extends to all facilities onsite, including early childhood centres. Controls must enable the selection and de-selection of zones in a simple and efficient manner. The lockdown warning must override all other public address functions when in use. Occupant warning systems can include bell and public address as additional functions in one system. The system must be capable of directing messages to selected zones, while minimising the audibility of these messages in adjacent zones.

Systems must comply with the requirements of the "*Electronic security guidelines*[33]".

20.3 Hearing augmentation

A hearing augmentation system which satisfies all NCC 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 prefabricated 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.

20.4 Physical security of Information and communications technology

The Centre of Network is to be protected within a defined security perimeter which prevents unauthorised access, damage or interference with the department's information and associated assets.

The Centre of Network and other rooms intended for housing information communication technology equipment is to be protected with a solid core, lockable door with lever escape lockset. Access should be on a restricted basis to approved users only. Where access control systems are available, a key override on the restricted master keying system must be installed. The Centre of Network must be covered by the building intruder detection system. CCTV where available should cover the entry/exit. The entry door to the Centre of Network must feature a reed switch connected to the building security system.

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

Doors should be no less than 1.2 mm steel faced and 1.2 mm steel frame concrete filled and feature a lever escape lockset, keyed from outside only to the restricted keying system.

Where possible locate data points to encourage computers to be located against internal walls and away from windows. Where this is not possible, consideration should be given to restricting visibility from outside through the use of window films or tints. Lockable storage should be provided for portable IT equipment.

21. 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.

External environments should be designed with the cultural context of the First Nations community as a primary consideration. This should be sourced from local community leaders and reflected in the purpose, look and feel of spaces, including the selection of indigenous vegetation and incorporation of cultural artefacts that replicate cultural practice (e.g. yarning circles and totems).

21.1 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 for learning or play 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 safety, 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
- Loose gravel or loose rocks shall not be used as a surface treatment. Any pebble or stones shall be securely adhered to the surface.

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.

21.1.1 *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 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.
- Imported topsoil depth 100mm after settlement.

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 300 mm wide are to be installed between turfed and vertical surfaces (i.e., immediately adjacent to the perimeter of buildings).

Concrete edging is to be installed between mass planted areas and grassed areas to facilitate maintenance and contain mulch.

21.1.2 *Sports playing fields*

Sports playing fields must comply with the functional requirements and dimensions detailed in Section *Sports fields and multi-purpose courts*

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.
- Upgraded site stripped topsoil or imported topsoil of depth min 200mm (preferably 300mm) to sports fields.
- 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.

21.1.2.1 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 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.

21.1.3 *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*.
- Products must be selected to reduce heat absorbance and transfer
- Must be made from Australian manufactured yarn with a manufacturer's warranty of at least 10 years
- 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.

21.1.4 *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.

The extent of mass garden beds should be designed to maximise turfed areas for play and running spaces, particularly on tight sites.

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.

21.1.4.1 Raised planter beds

Raised planter beds can assist in taking up level change, provide enclosure and provide better access to planting to students of all abilities.

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.

21.1.4.2 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.

21.1.5 *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.

21.1.6 *Irrigation systems*

21.1.6.1 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.

21.1.6.2 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 authorised users to override the remote control system.
- Feedback must be provided to the controller and include the state of manual override switches.

21.1.7 *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.
- 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.

Restricted invasive plants shall not be planted. Refer to the Business Queensland web page for information regarding restricted invasive plants[34].

Dangerous and poisonous plants must also be avoided, refer to the Queensland Health web page for information regarding dangerous and poisonous plants[35].

In an early childhood centre, ensure that all plant species used in the play area are thoroughly investigated by a specialist horticulturalist, cognizant with dangerous plants and the needs of the age group of children.

21.1.7.1 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.

21.1.8 *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

34 https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/biosecurity/plants/invasive/restricted
35 https://www.poisonsinfo.health.qld.gov.au/plants-and-mushrooms

- the soil profile of the wetland must match the soil profiles of up and down stream wetlands.

21.2 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[36].

21.2.1 *Natural shade and trees*

Natural shade should be a major element of shade provision within a school or early childhood centre. 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 *Plant selection*

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.

36 https://www.sunsmart.com.au/downloads/resources/booklets/shade-guidelines.pdf

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.

21.2.2 *Built shade*

Built shade should be provided to compensate for a lack of natural shade and delays in the provision of natural shade as trees mature. Consideration must be given to initial and long-term natural shade cover in the design of built shade.

Hard roofed structures are preferred for durability and reduced on-going costs. However, shade fabrics may be used in limited circumstances where a hard roofed structure is unsuitable such as:

- Small and oddly shaped play spaces
- Enclosed spaces
- Difficult site topography
- A need for filtered light
- Where the shaded area is needed to meet the requirement for unencumbered outdoor play space in an early childhood centre

Shade fabrics must not be larger than 50 sqm, unless briefed otherwise.

Note when selecting a shade fabric structure that the replacement may not be covered in the case of an insurance claim for a weather event.

Engineering certification for all built shade shall be provided by an RPEQ to verify the tie-down and attachment of the sail, including footing and wind loading.

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 NCC.
- For shade structures using a knitted or woven shade fabric, fabrics must have a shade factor of 95% measured and tested in accordance with *AS 4174 Knitted and woven shade fabrics.*
- Have a minimum clearance height of 3m in height.
- Include supports that are clearly visible, with rounded edges and/or padding and placed to minimise risk of collision.
- Not include any supports attached to an existing building structure.
- 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.
- 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.*

21.3 Hard landscaping

21.3.1 *Multi-purpose courts/hard courts*

The construction of multipurpose courts/hard courts 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 *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. Provide protective pads for all posts. All post holes must be installed with a flush lid to cover the hole when posts are removed.

21.3.2 *Fencing*

Security fencing must comply with the *Specification for Security Fencing in State Schools*.

Fencing must be used to define the site and identify the boundaries and areas where visitors are not permitted.

Fencing and associated gates must be fit-for-purpose, robust, durable, and 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 19 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*[37].

A concrete mowing strip must be provided below or on each side of all fencing panels.

In an early childhood centre, any outdoor space used by children must be enclosed by a fence that is of a height and design that children cannot go through, over or under it.

Table 19. Fence types

37 https://qed.qld.gov.au/our-publications/standards/Documents/design/fencing-specification.pdf

Area	Requirement
Perimeter fencing: Main street frontage	• Type 1 security fence • Type 2 security fence (large sites in rural areas) • Lockable gates at each point of pedestrian, cyclist and vehicle entry
Perimeter fencing: Rear and side street frontages	• Type 2 security fence • Lockable gates at each point of pedestrian, cyclist and vehicle entry
Perimeter fencing: isolation security fencing to administration building or other facilities	• Type 1 security fence • Lockable gates at each point of pedestrian, cyclist and vehicle entry • Isolation fencing design and layout is to be approved by the DoE Security advisor.
Perimeter fencing: Not visible to the public Fencing of high-risk areas: Creeks, dams, flood risk gullies, retention basins, etc. Agricultural areas	• Type 3 security fence • Lockable gates at each point of pedestrian, cyclist and vehicle entry
Play areas for students of all abilities	• Palisade fencing • Minimum height 1800 mm • Set back from street alignments • Screened by planting
Early childhood centres – outdoor play areas (excluding where the play area adjoins the school perimeter fencing)	• Hoop topped pool fencing • Minimum height 1800 mm • Tamper proof fixings • Set back from street alignments • Protected from vehicular impact
Sports playing fields: Ball drop-zones within 10 m of a site boundary	• Chain mesh fencing • Minimum height 6000 mm • Located outside of the run-off area
Hard courts	• Chain mesh fencing • Minimum height 3600 mm • 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 • Palisade or chain mesh fencing with a flat top • Minimum height 1200 mm
Bus parking for students with high needs	• Palisade or chain mesh fencing with a flat top • Minimum height 1800 mm
Pool fencing	• Conform to *AS 1926.1 Swimming pool safety Part 1: Safety barriers for swimming pools* • Latches and controls must be operable by students and staff with a disability
Water tanks, Fire tanks and pumps	• Type 1 security fence
Immediate change in levels greater than 900 mm	• Palisade fencing with a flat top • Minimum height 1200 mm

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.

21.3.3 *Pathways*

Pathways and the interconnectivity between buildings, outdoor learning areas, car parks, sports playing fields, multipurpose courts, play areas, etc. must comply with the higher requirements of:

- the functional requirements and dimensions detailed in the *Design Standards for Department of Education Facilities*.
- *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 *Pedestrian footpaths*

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21.4 External equipment

21.4.1 *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 in schools 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.

Similar informal seating opportunities should be provided in early childhood centres to encourage adults to sit and engage with children at their level, this might include: sandpit edging, sandstone blocks, yarning circle etc.

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.

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.

All external seating, path and ramp railings and outside stage areas are to be fitted with anti-skating devices.

21.4.2 *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 age-appropriate 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
- certain swing types, including plank swings, cradle swings, boat swings, chair swings, maypole swings

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.

21.4.2.1 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 to 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.

In early childhood centres the preference is for natural soft fall, with the exception of play areas that cater for children under 2 years, where synthetic grass with impact pads is more age appropriate.

21.4.2.2 Sandpits

Sandpits should be provided as part of the play opportunities for primary aged students and are essential to meet licensing requirements in a regulated early childhood centre.

Sandpits must comply with the following requirements:

- Accessible to users restricted to wheelchairs and allow for equipment and fixtures to enable inclusive engagement.
- Level hardstand access from at least one side.
- Protected from wind gusts.
- Minimum sand depth of 500 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 operating hours. Covers must be able to be fixed or tied down from all sides to prevent children and animals 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.

21.4.2.3 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.

Adequate drainage for sandpits must include the installation of a drainage membrane /geotextile fabric separating the sand from the gravel sub base. If the site is not free draining, install Ag pipe located within the gravel and connect to the storm water system to aid drainage.

Drainage pits and any other service pits must not be installed within the fall-zone of any play equipment or any sand pit.

21.4.2.4 Dry creek beds

Dry creek beds may be provided as part of the play opportunities in primary schools and early childhood centres. Dry creek beds must comply with the following requirements:

- Water pathway to be constructed of non-permeable material (for example, concrete with smooth exposed aggregate) and to be non-linear
- Good quality, hard wearing hand pump to be provided
- Allow adequate fall for the water to travel down the pathway
- Creek bed to terminate at an adequate drainage point to funnel water away efficiently
- Consider site drainage and overland flow paths when designing dry creek beds to ensure they do not become flooded and water is not retained within the bed.
- Consider maintenance and cleaning requirements in the design of dry creek beds
- Not to be located close to the sand pit or any area of loose material (eg chip bark) that can be floated down the water to clog the drain.

21.4.3 *Flagpoles*

At each school, provide four (4) aluminium spar flagpoles, 6 metres in height.

Locate adjacent to the Administration facility and visible from the main pedestrian entry point providing a focal point.

Flagpoles to be fold down type and have lockable hoists.

Create open space around the flagpoles, preferably hard surface for ceremonial activities and to allow for fold down space.

21.5 Early childhood centres – outdoor environments

Outdoor areas provide critical learning environments in an early childhood centre, in addition to the standards already noted in Section *Landscape architecture*

, the below apply to all early childhood centres.

Outdoor environments require a natural look and feel, prioritising the use of timber, stone and other natural materials and avoiding the use of plastics or other artificial materials wherever possible.

The outdoor environment must provide outdoor play spaces suitable for groups of various sizes and a range of learning experiences that can challenge children appropriately to support:

- Gross motor skills (running, climbing, sliding)
- Manipulative skills (throwing, catching)
- Stability skills (bending, swinging balancing)

And to provide opportunities for:

- Exploratory nature play
- Risky play
- Imaginative physical play
- Sensory play (water play, gardening and play pit experiences)

The size of the dedicated outdoor play area should be maximised as much as possible and should exceed the minimum unencumbered outdoor space requirements outlined in the *Education and Care Services National Regulations* 2011.

Outdoor play areas may be separately fenced for each age group or combined to create larger spaces which are shared. Generally, play areas for the 0-2 age group will be fenced separately and other age groups combined.

Supervision is a critical consideration in designing outdoor environments in early childhood centres, the whole of the play area dedicated to each age group must be easily supervised, with good sight lines from the associated indoor play area and children's amenities. Supervision of irregular shaped play areas can be improved with the use of fixed mirrors. The accessible outdoor space should provide some clear area not less than 20m wide to allow opportunities for running space. However, play areas as a whole do not need to be regular in shape, as long as supervision of the whole outdoor area can be achieved.

Generally, a 1:50 to 1:100 fall is preferred across the play area with natural mounds preferred over artificially created ones.

When designing outdoor play areas in an early childhood centre, consideration must be given to the potential extended operating hours of the centre which may require after hours lighting.

21.5.1 *Play structures*

Play elements made from natural materials are preferred. Where fixed equipment structures are installed, these should be made from natural materials with consideration given to the durability and maintenance requirements of the finishes selected.

All play elements should be designed to suit the intended age group of the users, to provide challenging experiences in an age-appropriate environment.

Consider the selection of colours for heat reflection. Light colours reflect the heat while dark colours absorb it, making surfaces dangerous hot for children to touch.

In addition to the required sandpit, outdoor environments should include a selection of play elements chosen and designed to suit the site requirements, including but not limited to:

- digging pits
- dry creek beds
- platforms and other elevations
- decks and gazebos
- bike tracks and mounds
- natural pathways
- sandstone blocks/boulders
- vegetable gardens
- swings and play forts

21.5.1.1 Sandpits

In addition to the requirements outlined in Section *Sandpits*

, sandpits in early childhood centres must comply with the following requirements:

- Be a minimum size of 15sqm and up to 40sqm in a larger centre.
- Have a timber or rock edge to the sandpit perimeter.
  - Preferably maximum 150mm high timber edge in 0-2 play space
  - Preferably maximum 300 high timber and/or rock edge to 3-5 play space
- All timber edges are to be combined horizontal and vertical logs at varying heights.
- All rock edges are to be varying heights with securely fixed rocks
- Provide dedicated entry points with a 1500mm wide threshold to capture loose sand off children's feet
- Consider including sunken elements e.g., boulders, to focus play within the feature.
- Allow for a hose cock or water course with direct access to the sandpit.

21.5.2 *Shade*

Shade is to be provided with a mix of large trees, shade fabrics and hard roofed structures. Play areas require sufficient shading for different times of the day. Plan to provide at least 2 sqm of shaded area per child between 12 pm and 3 pm.

22. Mechanical services

Mechanical services, including heating, ventilation, cooling, extraction systems, etc., must be provided to areas identified in this section or as otherwise required under statutory requirements such as the NCC.

22.1 General requirements

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 located and protected and only permit access by authorised personnel.
- Appropriate controls must be provided that are easy to use, 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 *Internal acoustic* performance
- are not exceeded.
- The provision of active air-conditioning, evaporative cooling and mechanical ventilation used for the purposes of thermal relief from high ambient temperature and humidity 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, evaporative cooling and mechanical ventilation 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 and security enclosures must be provided for ground mounted external equipment.
- In an early childhood centre, the security enclosures for external equipment must ensure that equipment is inaccessible to small children

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.

22.2 Sustainability

22.2.1 *Demand-based control*

Demand based control of air conditioning and ventilation thermal comfort systems shall be provided as required by the NCC.

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 thermal comfort systems provided to transient and low usage areas must be capable of being switched off automatically via timer controls.

22.2.2 *Energy reclaim*

Air-conditioned spaces that require high volumes of exhaust or spill air may require the use of energy reclaim systems to supplement the air conditioning systems. If used, energy reclaim systems must precondition the outdoor air to minimise load on the associated air conditioning system to conserve energy, while maintaining humidity levels to achieve acceptable comfort within the occupant areas.

Energy reclaim may be required to the following areas:

- performing arts centres
- indoor hydrotherapy pools
- assembly halls.

When considering the need for energy reclaim systems, the design of air conditioning systems must, in the first instance, consider the use of variable outside air and air conditioning unit capacity control as outlined in Clause 13.2.1.

22.2.2.1 Latent and Humidity Control

Note: In Queensland, the driving factors for comfort air conditioning are cooling and humidity.

In designing energy reclaim systems, the designer shall pay special attention to humidity control, latent capacity and load profile of the air conditioning system to ensure that comfort conditions are always maintained. The designer shall liaise with the project DoE representative regarding the utilisation of the facility.

The operation of the energy reclaim system shall only be supplementary to the air conditioning systems which shall be designed to accommodate the majority of the outside air load and associated latent load. Generally, the energy reclaim system should only be utilised during peak demand.

Air Conditioning systems based on 100% outside air shall be avoided wherever possible unless required by relevant code requirements or design parameters.

22.3 Active Thermal Control Systems

Where eligible, active thermal control systems such as air conditioning, evaporative cooling or mechanical ventilation shall be used to achieve acceptable internal comfort conditions.

For locations and rooms eligible for active thermal control, refer to project specific documentation including room data sheets.

22.3.1 *Types of Active Cooling and Heating*

Unless specified otherwise in project specific briefing notes, active cooling and/or heating shall generally be achieved by way of DX refrigeration split systems.

For some specific room uses and National Construction Code climate zones, evaporative cooling or mechanical exhaust ventilation systems shall be used to provide thermal relief.

Generally, DX split systems shall consist of a single internal evaporator head unit connected to a single external condensing unit. Based on the capacity required, multiple systems shall be utilized in spaces where one system has insufficient capacity or where one system cannot achieve efficient cooling or air distribution within the space.

Where possible, Evaporative Cooling shall utilise ground mounted evaporative coolers with air supplied to occupied spaces via a system of ductwork and distribution grilles. Roof mounted evaporative cooling units may be allowed only where there is no practical solution to the use of ground mounted units.

Mechanical Ventilation shall be via ducted systems with exhaust fans located at roof level.

Thermal control systems must be selected considering environmental conditions, the nature and use of the space to be cooled and energy efficiency.

22.3.2 *Alternative Air Conditioning System Types*

In some instances, DoE may approve the use of Variable Refrigeration Flow (VRF) multi-head or ducted air conditioning equipment to be considered. Preferably this shall only be where the location is on the eastern seaboard and within two hours' drive from a major metropolitan or regional city centre. Instances where consideration may be given to these alternative systems are as follows:

- Heritage listed buildings.

- To minimize aesthetic impact on the building or where it may be assessed there is inadequate space for multiple condensing units.
- Large floor area spaces with high occupancy levels - such as Performing Arts Buildings. In such cases, ducted air conditioning may be required to deal with the high occupancy and outside air demands.

Note: Under no circumstances shall chilled water systems be used.

22.4 Design day temperatures

22.4.1 *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 20 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 20. 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

22.4.2 *Design day internal temperatures and humidity*

22.4.2.1 Air-conditioned Spaces

For spaces utilising air conditioning systems to heat or cool to control internal room temperatures, the design of such shall achieve the Design day internal temperatures and humidity listed in Table 21.

Wherever possible and suitable equipment is available, reverse cycle air conditioning shall be used for heating. If a suitable reverse cycle solution cannot be achieved (such as may occur with ducted air conditioning) duct mounted heaters may be used.

Table 21. Design day internal temperatures

Space type	Winter (°C)	Summer (°C)	Relative Humidity (% Nominal)
Communications and network centre	24+/- 1	24+/- 1	55
General learning areas	21+/- 1	25+/- 1	55
Early childhood learning areas	21+/- 1	25+/- 1	55
Staff and administrative areas	21+/- 1	25+/- 1	55
Libraries and learning resource centres	21+/- 1	25+/- 1	55
Food technology, canteen and hospitality areas	21+/- 1	25+/- 1	55
Performing arts auditorium	21+/- 1	25+/- 1	55
Change rooms	21+/- 1	25+/- 1	55
Special schools and facilities specifically denoted for use by students with disabilities or high needs	23+/- 1	24+/- 1	55

Space type	Winter (°C)	Summer (°C)	Relative Humidity (% Nominal)
Some special needs students require room temperatures lower than the specified 24°C. 21°C shall be the lower-level acceptance* **Temperatures set lower than 24°C shall be determined by school management. Air conditioning equipment shall be selected to allow for the possibility of a room set point of 21°C	* 21 Min	* 21 Min	
All other occupied areas	21+/- 1	25+/- 1	55

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 21 may exceed the required design day internal temperature in Table 21 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 schools or facilities specifically denoted for use by students with disabilities or high needs, which must always achieve the temperatures set out in Table 21.

22.5 Air Conditioning – Cooling and Heating

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 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 with a well-established local service and parts network.
- For systems utilising condensate drain pumps, the pump must be a proprietary and integral part of the air conditioning unit manufacture. Retrofitted condensate pumps shall not be used.
- 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 21.

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, locate the units in shaded locations to ensure the most efficient operation.

All ground mounted condensing units shall be located on concrete pads and housed in enclosures constructed of a galvanised steel or aluminium framework with mesh infills to allow unimpeded airflow through the condensing unit. All enclosures shall be fitted with lockable access gates keyed to the school master key system.

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.

Where VRF equipment is used, system designs shall be based on 2 pipe configurations.

22.5.1 *System selection*

Cooling systems must be selected considering environmental conditions, the nature and use of the space to be cooled and energy efficiency.

22.5.1.1 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 20 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 21 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 isolation mounts or pads must be provided under all outdoor units.
- Exposed external wiring and refrigerant pipework must be protected from weather by Colourbond steel metal covers.
- 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 *Internal acoustic* performance
- to be exceeded.

22.5.2 *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.

22.5.3 *Cooling systems controls*

Air Conditioning systems shall be fitted with the following control functionality:

- All student related areas are to be fitted with 0 to 8 hour (adjustable) timer control. Local control adjustment of thermostat and operational modes must be able to be restricted.
- All staff only areas shall be controlled via the air conditioning unit proprietary controller.
- 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 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.

22.6 Ventilation

Natural ventilation must be provided throughout all buildings where the external air quality is of an acceptable standard. Where applied, the natural ventilation shall be an integral part of a building architectural design.

There may be exceptions to this where the provision of natural ventilation devices (e.g. external openable windows) presents safety risks to occupants, as may be the case in high-rise buildings or in some special education facilities. Such exceptions need to be determined by the building designer in consultation with a Building Surveyor.

Where necessary, natural ventilation systems should be supported by mechanical ventilation and extraction systems to achieve required air quality. Mechanical ventilation must be provided to areas:

- that do not meet the current NCC requirements for 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.

22.6.1 *Natural ventilation*

Natural ventilation provision must, as a minimum, be in accordance with the NCC. Notwithstanding the requirement for full compliance with the NCC, provision for DoE facilities must ensure compliance with the following:

- 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 1500mm AFL 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

22.6.2 *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 *Queensland Workplace Health and Safety Act.*

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 to be located with regard to adequate security, maintenance access and acoustic performance.
- Extraction fans shall be operated using variable speed controllers only as required to meet the performance requirements of Section J of the NCC or as may be required to commission a system to achieve specific design airflow requirements.
- 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.
- Control systems must be tamper proof. Exception to this is in the case of ventilation for comfort that requires variable speed control.

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 grilles. 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 *Internal acoustic* performance

to be exceeded.

22.6.3 *Mechanical outside air*

For air-conditioned spaces where the natural ventilation openings meet the mandatory requirements of the NCC, the following outside air must be supplied at the rate nominated in Table 22 to improve indoor air quality.

Table 22. Mechanical outside air flow rates

Area	Outside air flow rate (L/s per person)
Student areas	5
Early childhood centres	12
Staff areas (0–4 occupants)	Nil

Staff areas (5–7 occupants)	10
Staff areas (8+ occupants)	5

Where the natural ventilation openings do not meet the mandatory requirements of the NCC, the outside air flow rate supplied to the space must comply with *AS 1668.2 The use of ventilation and air conditioning 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.

22.6.4 *Toilet and change room exhaust systems*

All toilets and change rooms must have permanent natural ventilation and controllable mechanical ventilation. Mechanical ventilation shall be controlled in conjunction with the operation of lighting.

Where practicable, make up air to the toilets and change rooms must be drawn from adjacent conditioned spaces.

22.6.5 *Food preparation exhaust systems*

Exhaust hoods and systems must be provided in all areas where food is cooked. This includes staff rooms, canteens, early childhood kitchen and food technology classrooms.

The systems installed shall be either of the domestic or commercial type.

22.6.5.1 Domestic

Domestic kitchen exhaust hoods are to be provided where a commercial hood is not required under *AS1668.2.* In such cases permanent make-up air provisions are not required provided that the natural ventilation openings are sufficient for make-up air provision and compliant with the current NCC.

22.6.5.2 Commercial

A commercial kitchen exhaust hood is required where the following conditions are met as per *AS1668.2.*

“Heated air with or without water or grease vapour produced by cooking or dishwasher equipment employed for the preparation of food for commercial or institutional purposes and having a total maximum input exceeding 8 kW for an electrical appliance, or total gas input 29 MJ/h for a gas appliance, or any deep fryer appliance, or more than one item of apparatus within a room and having a total maximum power input exceeding 0.5 kW/m2 (1.8 MJ/m2 for gas appliances) of floor area of the enclosure.”

Commercial 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 200L/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 VET 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 shut down on activation of commercial kitchen exhaust hoods. However, an override switch shall be provided to allow for operation of air conditioning.

The shutdown of air conditioning shall not apply where the exhaust hoods are connected to supply air make-up air systems.

22.6.6 *Fume cupboards*

Fume cupboards must be installed where specifically called up in project specific scoping document or where there is a risk associated with the use of appliances, flammable and noxious gases, chemicals, and dangerous processes.

If not called up in the project specific scoping document and there is a possibility the above risks may arise, a hazardous areas consultant shall be engaged to clarify those risks and make recommendation or otherwise for the provision of a fume cupboard. If recommended, a fume cupboard shall be installed.

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.

22.6.7 *Chemical stores*

Ventilation must be provided to all hazardous chemical and flammable stores in accordance with the:

- *Queensland Workplace Health and Safety 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.

22.6.8 *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.

If not specifically called up in the project specific scoping document and there is a possibility the above risks may arise, a hazardous areas consultant shall be engaged to clarify those risks and make recommendation or otherwise for the provision of a spray booths and alcoves. If recommended, spray booths and alcoves shall be installed as advised by the hazardous areas consultant.

Spray painting booths and alcoves must comply with the following requirements:

- *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 via permanent natural ventilation openings must be provided to compensate for the volume exhausted.
- Maintain sufficient separation to electrical ignition sources as per manufacturers' recommendations.

22.6.9 *Localised fume extraction*

Local fume extraction systems must be provided where there are work, health and safety risk associated with the use of appliances (such as 3D printers) 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.

22.6.10 *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.

22.7 Dust extraction systems

Dust extraction systems must be provided to remove dust particles 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:

- *AS4745: Code of Practice for handling combustible dusts*.
- 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.

A hazardous areas consultant shall be engaged to complete a risk assessment and advise on additional requirements.

Acoustic attenuation of fan assemblies and discharge ductwork must be provided to satisfy the requirements detailed in Section *Acoustic engineering*

and the requirements stipulated by any relevant authority. Engage an acoustic consultant to advise on specific requirements.

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.

22.8 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.

22.9 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.

22.10 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 Colourbond metal covers must be provided to conceal pipework.
- Floor mounted pipework must be avoided.

Pre-insulated refrigeration pipework that does not conform to the NCC must not be installed.

22.11 Compressed Air

Compressed air supply systems shall comply with relevant Australian Standards.

The compressor shall be located in a room or enclosure with appropriate acoustic control measures to maintain acceptable noise levels for adjacent habitable rooms.

Compressor to be a cast iron reciprocating type, with a maximum operating pressure of 10 bar. Maximum compressor duty 50%.

Air quality will require a refrigerated air dryer and filtration with automatic drains to achieve ISO8573-1 Class 1.5.2. Design temperature 35 C°.

Condensate will be treated by an oil water separator before disposal to sewer.

Compressed air receivers shall have Australian design registration, be sized to maintain required design supply pressure for the number of outlets through start/stop cycles.

Compressor shall have a dial pressure gauge, valved drain point, automatic condensate drain and pressure relief valve.

Separated liquids shall be automatically drained away from filter material.

Exposed pipe work shall be concealed or covered to protect from mechanical damage.

Size all pipe work to ensure that pressure loss does not exceed 10% of the design supply pressure.

Low pressure compressed air installation shall operate between 21-28kPa via an adjustable pressure reduction valve located to be accessible by staff only. Provide a main regulator at the main compressed air plant and additional adjustable and lockable pressure regulators provided at each room for local control.

23. 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.

24. Security technology

Schools and early childhood centres must provide a safe and secure environment for students, children, staff, and visitors, including parents and service personnel.

Security technology provides mechanisms to restrict access, ensure that intruders can be detected, and appropriately protect assets.

Administration staff should be able to easily lock all access to the reception area and/or non-public areas of the building in an emergency. They should have access to duress equipment to call for immediate assistance if threatened.

Where a facility is to be managed by a third-party provider under a lease arrangement, the security systems, including intruder detection and closed-circuit television systems, are to be established independent from the school security system but must comply with the departmental *Electronic security guidelines*.

Any installation of electronic security systems must be by providers who have a current:

- Electrical contractors licence and;
- Security provider licence Class 2 (Security Equipment Installer).

24.1 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 and early childhood centres.

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[38] or found on One Portal (Department of Education employees only).

For existing facilities:

- 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:

38 https://www.protectiveservicesgroup.qld.gov.au/about_us/contact_us

- Installation of a new or upgraded electronic intruder detection system 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 the existing 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 dual press duress buttons
  - fire hydrant and hose reel water flow switches and fire pump alarms
  - fire indicator panel connection where applicable
  - 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. The locations of all equipment shall be specified in the Engineering schedule, which shall also define the required partitioning of the electronic security system into the separately controllable intruder detection areas. Each building shall be a separate intruder detection area.
- Where smoke or fire detection devices are installed, these are to be monitored by a dedicated Fire Indicator Panel (FIP). If the FIP will not be monitored by QFES, two outputs from the FIP (alarm and fault status) are to be monitored by the intruder detection system.
- An alarm control module must be provided and be installed in the same space as the centre of network for the campus.
- The alarm control module 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 module must have sufficient capacity to accommodate all permanent and prefabricated buildings associated with the peak forecast enrolment, third-party and community facilities, and no less than two additional expanders for future use.
- 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 prefabricated buildings associated with the peak forecast enrolment and must include conduits and pre-wiring leads to pits located near the planned locations for the future installation of prefabricated buildings.

24.1.1 *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 hours. The total number of keypads over an entire 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 operations, assistance should be sought from the department's Disaster, Emergency and School Security unit (ISD.EmergencySecurity@qed.qld.gov.au).
- All keypads across a campus should be of a matching style and be consistent in visual appearance and functional use.

External keypads must be installed:

- Under cover, protected from wet weather and in well-lit locations.
- In IP66 rated enclosures fitted with a cylinder lock or padlock which is keyed to the master key system. A tamper switch must be installed to detect attempts to remove the enclosure from its mounting surface.

24.1.2 *Sirens*

Sirens interfaced with the intruder detection and alarm system must be installed as following:

- Sound Level capacity of 105 dB/m.
- Piezo top hat sirens are to be installed internally, ceiling mounted and centrally located within the room.
- Sufficient sirens should be installed to reach a level of 80db in internal areas of each block.
- 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.

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.

24.1.3 *Intruder detection and duress devices*

Table 23 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 the administration area and any location where money is stored or handled. This may include canteens, multipurpose hall kiosks or uniform shop points of sale.

In each building containing a duress button, a single dedicated, silent internal strobe must be installed and positioned to attract the attention of building occupants and alert them to an alarm activation. The strobe shall operate for a set period of 5 minutes on activation of any duress button within that building.

Table 23. 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 • Motion detection
	Reception, cash counters	• Motion detection • 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
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 • 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, staff rooms	• Motion detection
Ancillary staff	All offices, store rooms, workshops	• Motion detection
	Chemical/fuel storage	• Reed switch
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

Block	Room/area type	Device/s
	Shed entry/roller door	• Reed switch
Sheds (general use)	Physical education storage, grounds equipment storage, preparation storage	• Reed switch
Early Childhood Centre	Indoor activity areas, office, kitchen, amenities, laundry/cleaners, nappy change, store room, consulting rooms, meeting rooms	• Motion detection
	Data room, external doors, external store	• Reed switch • Motion detection
	Reception/sign in	• Motion detection • Duress button

It is optional, where specifically determined by the Department's Disaster, Emergency and School Security unit (ISD.EmergencySecurity@qed.qld.gov.au) for electronic security systems to include the following equipment:

- Wireless duress pendants
- Photoelectric beams
- Glass break detectors

24.2 Electronic access control 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 failure (including backup battery), 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.
- Must be configured to provide required access to all approved users and visitors via a single standardised card or fob.

Any access control doors must be installed with a physical key override, keyed to the restricted key system.

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.

24.3 Closed circuit television systems

Closed circuit television (CCTV) systems can be used as a deterrent to prevent unauthorised access, theft or violence and as an auditable access record.

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.

CCTV systems must comply with the following requirements:

- Standard signage advertising the use of CCTV must be displayed prominently, and as a minimum, should be placed at every entry point to the school grounds as well as the entrance to every CCTV camera's area of operation.
- Coverage must be restricted to the buildings, grounds and spaces approved by the Disaster, Emergency and School Security unit.
- Colour 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.
- External 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.
- Cameras installed should record high quality images in all lighting conditions present in the location of installation.
- A network digital video recording (NVR) system comprising two recorders must be installed in secure locations.
- One NVR shall be installed in the Centre of Network with a viewing monitor and mouse to enable user access. The second redundancy recorder shall be installed in a secure room in a 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 have sufficient storage to record at least 31 days of footage at the recommended frame rates for the installed cameras.

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, learning areas, study rooms, or to monitor student and staff performance.

24.4 Security containers (safes)

A heavy-duty (e.g., 16 gauge) lockable steel key cabinet should be provided with sufficient hooks to store numbered or labelled keyrings with capacity (e.g., 30/60/120 hooks) determined by requirements of the school site. The key cabinet is to be secured to an internal wall following the manufacturer's instructions. The cabinet should be located in the Centre of Network or other secure space covered by the intrusion detection system and CCTV (where available). Consideration should be given to appropriate storage of cleaner keys to minimise access to the main cabinet. If operationally suitable, cleaner keys can be kept in a separate key cabinet located beside the main key cabinet.

Where additional security is required, e.g., for the storage of fleet cars, or in high-risk locations, the site should be supplied with a commercial grade double lined, steel key safe with reinforced door. The safe should have digital locking supporting multiple users, and either single or dual access control as determined by the requirements of the site. The cabinet should be located in an area out of sight of public access areas, ideally in a secure room, and should be fitted with a reed switch connected to the security alarm system and covered by the intrusion detection system and CCTV (where available).

25. Structural engineering

25.1 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.

25.2 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.

25.3 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.

25.4 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.

25.5 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.

25.6 Structural provision for access aids

First aid rooms and a proportion of amenities at schools supporting students with disabilities or high needs plus 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 of these rooms 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 the immediate needs.

25.7 Gymnasiums

All surfaces must be capable of withstanding a horizontal impact of 0.75 kN.

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.

25.8 Covered walkways

Covered walkways must be used to provide protection to the front entry point and for users moving throughout a school or early childhood centre.

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 in a school (nominal width of link to be 3600 mm, minimum width of link to be 2400 mm clear of any obstructions including handrails).

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.

- Minimum height to underside of link framing or to 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 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.

26. 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:

- Lift to be a machine room-less gearless traction type with capacity minimum 1000kg. Drive type - variable voltage variable frequency AC drive with selective collective control system.
- Lift speed to be minimum 1.0 metre per second.
- Access to lifts must be restricted by key or access control for use by authorised students, visitors and staff only. Provide external on/off key isolators to secure the lift (recessed and vandal resistant).

- 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 4G 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.
- Lift car doors to be fitted with door protective device (infrared or similar light beams).
- Lift car dimensions and emergency operation in a special school should be selected with reference to the *Technical note: Special school evacuation guideline*

  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 driven rain, inclement weather and overland flow paths. Provide a drained sump at the bottom of the lift pit.
- 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.

The selection of lifts must consider the make and model of any existing lifts on site and their current operating efficiency, as a means of minimising on-going maintenance costs and the duplication of parts, servicing contracts, etc. The lift system shall not require any proprietary equipment, tooling, passwords or codes to maintain, repair or make adjustments to the lift.