NSW Department of Education - School Infrastructure NSW

Design Framework: Sustainability

A guide to Implementing Our Commitment to Sustainability on school infrastructure projects.

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schoolinfrastructure.nsw.gov.au

NSW GOVERNMENT

Purpose of this document

This document has been created to help guide School Infrastructure NSW (SINSW) projects through planning, design and construction and ensure best practice sustainability outcomes are achieved.

It includes a range of sustainability initiatives to be implemented by projects to deliver best-in-category built-environment sustainability practice and provide school environments that promote student learning and wellbeing.

This document should be read by, external Project Managers, architects, engineers, external to the department, SINSW Project Directors and Project Officers, and anyone with an interest in sustainability.

The Department recognises that sustainability is a broader concept than resource conservation and environmental protection - sustainability also encompasses health and wellbeing, equity, and resilience. This position is closely aligned to NSW Government policy and the United Nations Sustainable Development Goals.

Disclaimer

This framework helps design teams easily access information and share successful project methodologies to ensure compliance with the school design principles. Following this framework does not irrevocably replace any project obligations to deliver against Educational Facilities Standards and Guideline requirements.

Related Documents

This framework has interdependencies to the following policies, guidance materials and frameworks:

Design Framework: Master Planning for Schools, SINSW

Better Placed: Design Guide for Schools, Government Architect NSW

Better Placed: Environmental Design in Schools, Government Architect NSW

NSW State Infrastructure Strategy 2018 – 2038

NSW Climate Change Policy Framework

NSW Net Zero Plan Stage 1: 2020-2030

NSW Government Resource Efficiency Policy

NSW Environmental Planning and Assessment Act 1979

NSW Environmental Planning and Assessment Regulation 2000

NSW State Environmental Planning Policy (Transport and Infrastructure) 2021

NSW State Environmental Planning Policy (Sustainable Design) 2022

National Trajectory for Low Energy Buildings 2019

For more information on Education Facilities Standards and Guidelines, Technical Standards and a glossary, please visit:

education.nsw.gov.au/about-us/efsg

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1. Introduction to Sustainability

Our commitment

The Department's vision is to be Australia's best education system and one of the finest in the world. It strives to deliver quality education outcomes while protecting the environment, contributing to economic prosperity, and helping communities to thrive.

Our Commitment to Sustainability recognises that the built environment, with more than 2,200 schools across NSW, is an area where it can have a significant impact and influence in demonstrating leadership with the sustainable design, construction, and operations of these schools.

This design framework covers the following design development phases:

- Phase 0 **Project initiation**
- Phase 1 **Master planning**
- Phase 2 **Concept design**
- Phase 3 **Schematic design**
- Phase 4 **Design development**
- Phase 5 **Tender evaluation**
- Phase 6 **Tender, evaluate and award**
- Phase 7 **Construction administration**
- Phase 8 **Commissioning and handover**
- Phase 9 **Post completion and warranty**

Our priorities

The NSW Department of Education has committed to five sustainability priorities:

1. Unlock human potential

Empower each person with the health, wellbeing, confidence, creativity, and resources to succeed.

2. Foster connections

Embed respect and caring for Country, nature, history, diversity, and community across everything we do.

3. Act on climate change

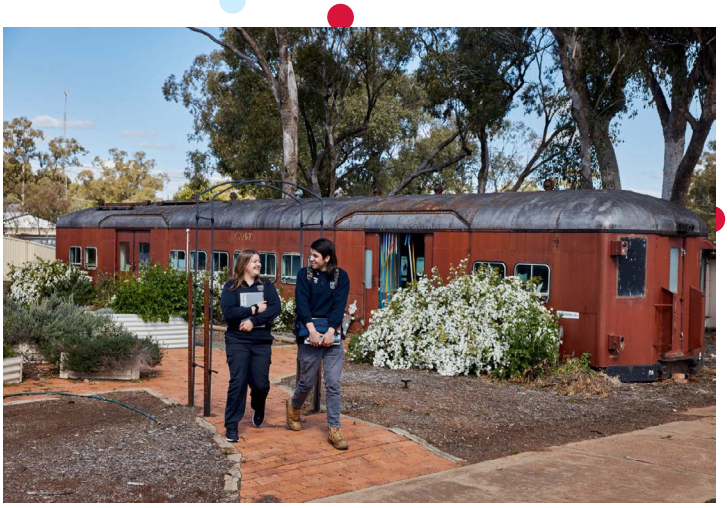
Achieve net zero emissions.

4. Consume responsibly

Operate efficiently, design out waste, and uphold high labour and environmental standards in our supply chain.

5. Build resilience

Equip school communities to withstand and adapt to change.



The Department has nine goals to 2030 to deliver on these priorities:

1. Sustainability is embedded into school practices.
2. Every school is a verified healthy and inclusive learning environment.
3. Every school is an asset for its community, all year round.
4. We are net zero emissions in operation.
5. We eliminate resource waste.
6. We have a robust plan for adaptation.
7. We demonstrate leadership by investing in innovation.
8. Department staff confidently contribute towards achieving our sustainability goals.
9. We measure our social and environmental impact.

Our aims

School Infrastructure NSW projects can contribute to the Department reaching these goals with various actions through planning, design, and construction of new school buildings. The three relevant areas of focus are:

1. Net zero emissions or pathway plans for new school buildings
2. Independent measurement and verification of our social and environmental impacts
3. Climate change adaptation and resilience of new school buildings

Net zero emissions

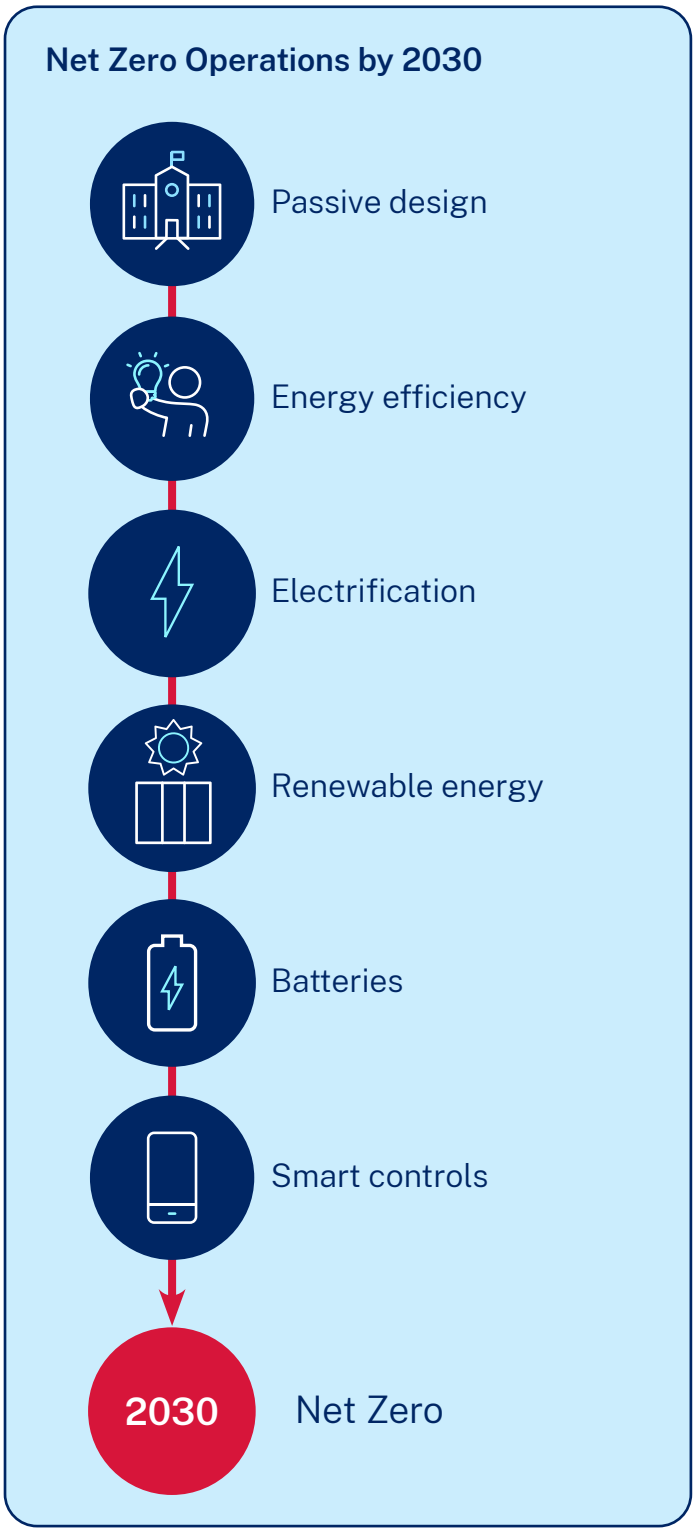
The NSW Government has set the goal of net zero emissions by 2050 and to support that goal, the Department has set the ambitious goal of net zero in operations by 2030. In the short term this will mean enhancing building design and performance standards, so all new schools have a Net Zero Ready Action Plan to be net zero emissions in operation by 2030.

This includes:

- Passive building design to minimise energy use
- Electrification and minimal use of natural and liquid petroleum gas onsite (only where there is no alternative)
- Highly energy efficient electrical appliances
- Onsite renewable energy, such as photovoltaic systems
- Batteries, or the provision of space for future installation, and
- Smart, demand response control of equipment.

It is noted that public schools in NSW purchase electricity and gas under Whole of Government contracts managed by The NSW Government. As part of this arrangement off-site renewable and storage options are being investigated to assist government agencies to achieve 100% renewable energy use.

SINSW also encourages the use of low embodied carbon materials, with a future goal of net zero emissions in construction.



Independant measurement and verification

The **NSW Government Resource Efficiency Policy** encourages new government buildings to certify to Green Star. Our Commitment to Sustainability mandates that all new school buildings greater than 1000m2 and project costs over $10 million are in the top two bands of industry sustainability ratings, where practical.

Verification must be undertaken for all major capital work projects to demonstrate that:

- Best practice sustainability performance targets have been set and achieved,
- Sustainable development principles have been incorporated, and
- All mandatory requirements from the Educational Facilities Standards and Guidelines, the NSW Government Resource Efficiency Policy, and the National Construction Code Section J have been met or exceeded.

Green Star certification is to be achieved for major capital work projects, with estimated total project costs over $10 million and greater than 1000m2 of new building:

- 5 Star for Sydney, Wollongong, or Newcastle metropolitan areas, and
- 4 Star for the rest of NSW.

Green Star certification is a formal process administered by the Green Building Council of Australia, during which a building, fitout, or precinct is awarded a Star rating by an independent, third-party assessor following the submission of documented evidence of each initiative targeted.

For a small number of projects where Green Star certification is a condition of development approval, but is not achievable, SINSW have developed an Independent Sustainability Verification process which has been accepted as an alternative by the NSW Department of Planning and Environment. The process can only be elected with agreement from SINSW Sustainability and requires approval from SINSW Executive.

At a minimum, all other major capital work projects which do not met the criteria will need to show they have delivered the project in accordance with the Educational Facilities Standards and Guideline, which include sustainable development performance targets and requirements. This is submitted to SINSW sustainability team for verification as part of design review and project completion.

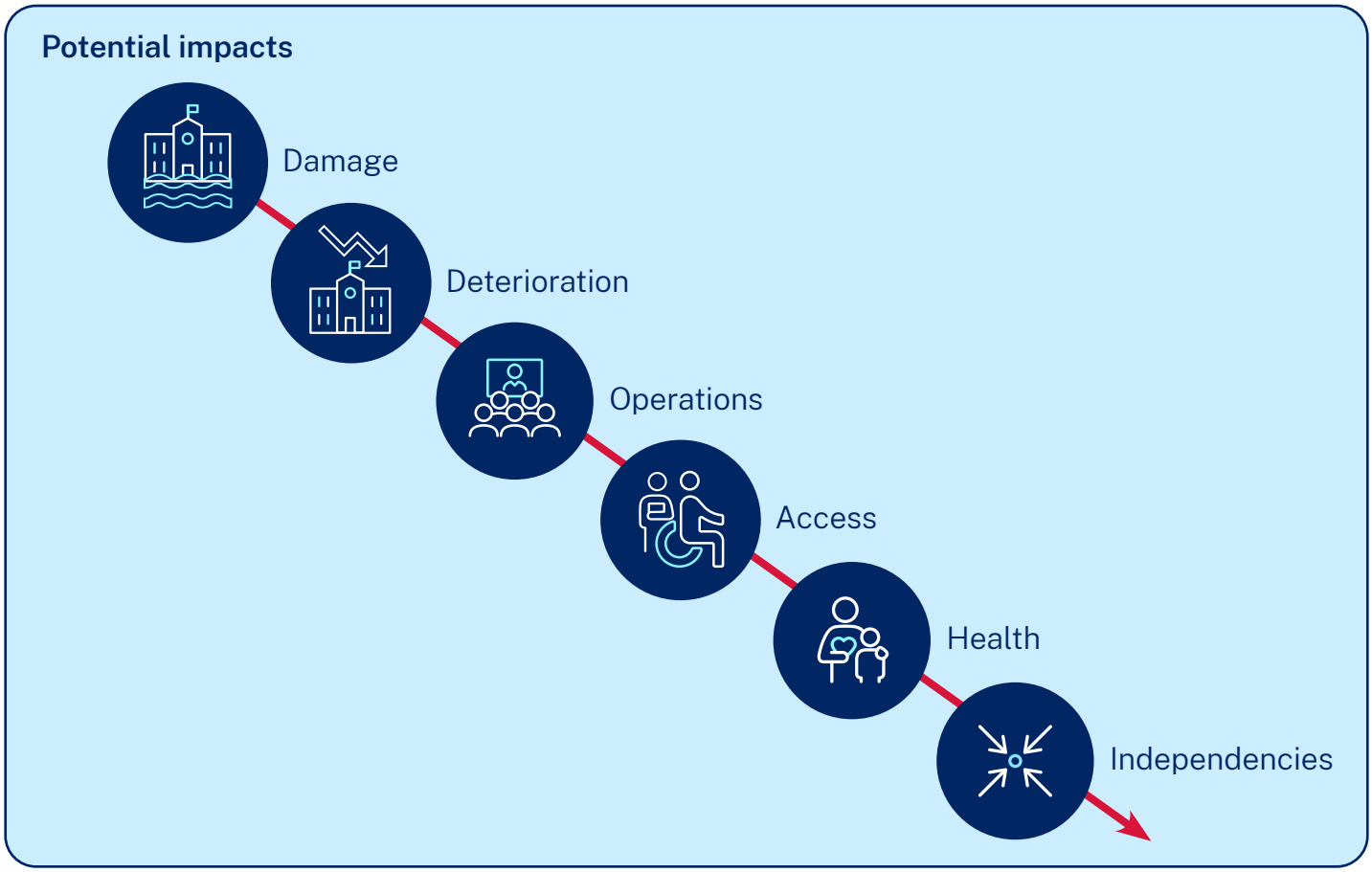
Climate change adaptation

NSW is already experiencing the impacts of climate change. Most recently these have included the unprecedented cycle of heatwaves, droughts, bushfires, storms, and floods. We need to adapt now to protect the things we value most.

School communities are particularly vulnerable to climate change and sites must be able to withstand natural and urban hazards and adaptively respond to the shocks and stresses of climate change over time to avoid social and economic costs of interrupted operation, and repairing or replacing damaged assets.

Steps which projects must undertake include:

- Identification of natural and urban hazards affecting the site, and further studies required to inform decisions and design, and ensure resilient development.
- Climate change risk assessments using medium term (2040-2050) and long term & (2070-2090) timeframe modelling.
- Workshop(s) with design team and operational staff to develop a climate change adaptation plan.
- New design responses for at least two risks, including all extreme or high risks identified.



2. Key Areas for Engagement

SINSW Technical Services

Technical Services is a group within School Infrastructure NSW that provides technical advice to construction and asset-management projects on NSW Public Schools. It includes teams with subject matter expertise in sustainability, design and infrastructure standards, statutory planning, compliance and environment, and heritage.

Projects are developed in consultation with relevant stakeholders. This includes a Technical Stakeholder Group, which includes representatives from each of the teams within Technical Services. They review and endorse the approach, and the outcomes at each project phase. Consultation with and endorsement by SINSW Sustainability, and others within the Technical Stakeholder Group, is required to ensure that sustainable development considerations have been integrated.

SINSW Sustainability have developed an ESD Centre of Expertise SharePoint/Teams site to provide the latest and most up-to-date advice to project teams. Access to this site can be obtained by contacting SINSW Sustainability directly.

i Need more information?

Engage with...

SINSW Sustainability

SINSW Technical Services

NSW Public Schools and SINSW Asset Management

School principal and staff run day-to-day operations of the school. Consider consulting stakeholders early in the project design process to consider unique school sustainability requirements.

The local Director, Education Leadership (DEL) and school principal can be consulted through the usual project governance process. Through the consultation, there may be unique current and future considerations that would affect the sustainability attributes of the new school build.

These may include the following:

- Operational waste management
- Sustainable transport management
- Efficient operation of building systems

The regional Asset Management Unit is a school's main contact into School Infrastructure NSW and should also be consulted with on these issues to encourage a smooth handover and transition of management of the assets from the construction contractor to Asset Management.

Need more information?

Engage with...

- Local Director, Education Leadership (DEL)
- School Principal
- Regional Asset Management Unit

3. Supporting Sustainability

Master plan and concept design

Phase 0 **Project initiation**

Phase 1 **Master planning**

Phase 2 **Concept design**

Sustainability is considered by SINSW even before a project commences. The Department recognises that non-capital interventions to address a service needs are often the most sustainable. Once an infrastructure intervention is identified, early creation of a Sustainable Development Plan will assist in steering the project towards best practice sustainability outcomes.

Key considerations may include:

- Consideration of the proximity to railway stations and bus network, and the walkability and cyclability to site by students, with a rapid transport assessment
- Identification of natural/urban hazards affecting the site and further studies required to inform decisions and design, ensuring resilient development (e.g., flooding, pollution, extreme event, etc.). Any significant risks must be addressed through further investigations, design, and other response measures.
- Opportunities for joint and community use of school facilities and infrastructure.
- Orientation and massing of buildings for maximum renewable rooftop solar gain, as well thermal comfort, natural ventilation, sunlight access into learning spaces, views, and maximisation of open play space.
- Adequate spatial provision is made for sustainability initiatives, e.g., productive landscape, waste processing rooms, batteries, stormwater management elements, sustainable transport facilities, etc.
- Tapping into any precinct infrastructure or network, such as reticulated recycled water networks.
- Consultation with Aboriginal communities to consider the social impact of the school on their communities and incorporate celebration of local Aboriginal cultures into school design.

Environmental factors to consider include:

- Protecting and regenerating areas of high ecological and biodiversity significance on and surrounding the site.
- Avoiding bushfire and flood prone land.
- Considering topography to maximise solar access.
- Avoiding areas with potential ground contamination.

Heritage factors to consider include:

- Responding to and enhancing the positive qualities of the setting, landscape, and Aboriginal cultural heritage of the site.
- Avoiding areas of high Aboriginal cultural heritage

To support these initiatives throughout the project life, a Sustainability Consultant should be engaged before concept design to provide advice and develop the project specific strategy and initiatives, summarised within the Sustainable Development Plan. The Sustainability Consultant should also be a Green Star Accredited Professional if the project is to certify to Green Star and assist in registering the project with the GBCA.

The plan details how a project will deliver on the department's sustainability priorities and goals, set's performance targets for the buildings and projects, and requires consideration of a host of other requirements.

Sources of requirements of a Sustainable Development Plan

Key reference documents at this stage should include:

Design Framework: Master Planning for Schools

Design Framework: Site Selection and Development

Green Star submission guidelines

SINSW Practice Note – Sustainable Development

SINSW Practice Note – Green Star certification

Connecting with Country Draft Framework, Government Architect NSW

SINSW Practice Note – Sustainable Transport

Environmental Planning and Assessment Act 1979

Environmental Planning and Assessment Regulation 2000

Relevant Local Environmental Plans (LEPs) and State Environmental Planning Policies (SEPPs) and planning controls.

Schematic and detailed design

Phase 3 **Schematic Design**

Phase 4 **Design Development**

During schematic and detailed design phases, projects should take an integrated design approach to achieve a safe and accessible school that is at the heart of its community, incorporating sustainability initiatives to achieve the targets from the project's Sustainable Development Plan. Building modelling should be used to inform the design and the selection of building materials and systems, such as predictive energy modelling, predictive indoor environmental quality modelling (thermal, acoustic and daylighting) and life cycle assessment modelling.

Design teams must demonstrate how school buildings are designed to minimise the consumption of energy, water, and natural resources, reduce waste, encourage recycling, and be durable, resilient, and adaptable.

Key considerations may include:

- Incorporate best practice passive design principles such as orientation, shading etc.
- Improved thermal performance of glazing
- Improved thermal insulation in non-glazed sections of building envelope
- Thermal bridge abatement of all building fabric (windows and opaque sections)
- Heat recovery in mechanical ventilation systems
- Best Practice air tightness of building envelope
- Indoor environmental quality, such as daylight, views, ventilation, thermal comfort, lighting, etc, to support the health and wellbeing of staff and students.
- Design responses to address high and extreme risks identified from the climate change risk assessment and workshops.
- Green spaces, with the retention and regeneration of significant vegetation and water sensitive landscape design, to reduce the heat island effect, and provide high-quality play spaces for students.
- Designs should embody humans' connections to nature and the natural cycles of sun, wind, rain and the four seasons. Schools must connect with nature and incorporate biophilic design principles
- Open space must allow for exploration, biodiversity, and earth education to enhance the site's outdoor learning potential.
- Welcoming and inclusive spaces for students of all abilities.
- Energy measures to reduce energy demand and energy consumption in schools, including:

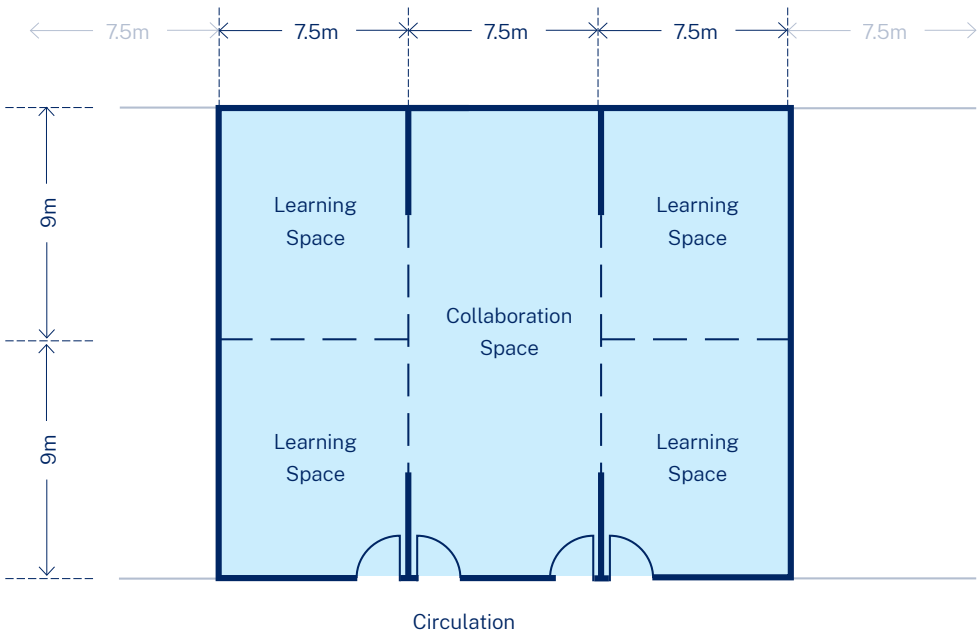
- LED lighting, other energy efficient appliances and other electrical equipment,
- A Photovoltaic system to produce onsite renewable energy, and
- Energy management readers and controls of mechanical and electrical equipment, including visualisations for staff and students of energy use.

- Water conservation methods including:
  - Rainwater capture and reuse,
  - Stormwater harvesting and re-use for irrigation and toilet flushing,
  - Sanitary and tapware fittings with high water-efficiency ratings,
  - Water sensitive urban design elements, landscaping, and plant selection,
  - Hydraulic control measures, such as timing and half-flush cisterns to reduce water consumption, and
  - Connection to the recycled water network (where available in the area).

Incorporate opportunities for building materials that can be disassembled for re-use, in conjunction with considerations for the addition and removal of accommodation over time.

Spaces to be easily reconfigured, allowing different activities and buildings to easily be adapted over time, ensuring facilities are sustainable over their operational life.

Application of principles within the Design Framework: A Standardised Approach, such as the standardisation of rooms on a grid system enables the future flexibility of converting spaces for different uses.



Example of design within the 9m x 7.5m grid
Source : SINSW (diagram is indicative only, not to scale)

Key reference documents at this stage should include:

AS5334:2013 Climate change adaptation for settlements and infrastructure; and AS/NZ ISO31000:2009 Risk Management.

Better Placed: Environmental Design in Schools, Government Architect NSW

Green Places: an urban green infrastructure design framework, Government Architect NSW

Connecting with Country Draft Framework, Government Architect NSW

Infrastructure NSW Guidelines for Resilience in Infrastructure Planning: Natural Hazards

National Construction Code (NCC)

NSW Government Resource Efficiency Policy

Delivery, commissioning and handover

- Phase 5 **Tender evaluation**
- Phase 6 **Tender, evaluate & award**
- Phase 7 **Construction administration**
- Phase 8 **Commissioning and handover**

The Sustainability Performance Specification is used to communicate requirements to the Construction Contractor and specified at tender. It will include all items from the Sustainable Development Plan that are relevant to construction works, which includes the evidence that needs to be developed and issued by the Contractor for As-Built verification.

Designers and Contractors are required to develop documentary evidence to show Sustainability compliance. The project's Sustainability consultant is required to collate the evidence and provide consolidated Design and As-Built submissions for review and verification.

Key considerations may include:

- Monitoring and review of sustainability initiatives and environmental performance of construction activities, including the recycling of construction waste

- Restricting the flow of pollutants and emissions into the environment
- Minimising the negative impacts of construction works on communities.
- Assisting in the commissioning and tuning of equipment.
- Training of school users of sustainability initiatives

Major projects are required to prepare a commissioning and handover plan, that includes all activities and deliverables to ensure all building systems work efficiently and as intended.

Adequate commissioning refers to the preparation of school facilities and their staff for commencement of operation, such as equipping and familiarising staff with facility operation, safety, security, communications, and other systems. In addition, it refers to activities undertaken by the principal leading up to and after handover to ensure staff are familiar with operating the facility.

SINSW's commissioning and handover process provides assurance that:

- New facilities and equipment are ready for occupancy and use, i.e., fit for purpose
- The new facilities and equipment meet all government legislative requirements including those from the EFSG
- Training is provided to staff in the operation of new equipment and safety procedures
- any minor defects which require rectification by the contractor are identified and addressed

Key reference documents at this stage should include:

Project specific construction and operational waste management plans

Project specific environmental management plan

Project specific commissioning plan

School specific transport management plan

School specific building user guide

4. Benefits of Sustainability

Whole of life planning

A key element of sustainable design is the principle of whole-of-life decision-making. This is also enshrined in accordance with NSW Government's commitment to total asset management planning. Whole-of-life decision-making means balancing:

- The whole-of-life cost of the new facility,
- Reducing operating and maintenance impact on existing resources,
- Value for money achieved by government from the design, construction, and operation of the facility, and
- The facility's ability to incorporate sustainability principles and achieve sustainability objectives.

Whole-of-life costs are also taken into consideration as part of the business case and factored into Net Present Value calculations. Costs included in the calculation of whole-life value of an asset or service include planning, design, construction, acquisition, operation, maintenance, renewal, rehabilitation, replacement, disposal, depreciation, and cost of finance. Environmental and social costs should also be quantified and included in estimations.

Energy and water efficiency initiatives offer significant return on investment for buildings over time through reduced utility costs in operations and are the cheapest way to achieve emissions reductions over the lifetime of the asset.

Integrated Design

It is recognised that the most meaningful sustainability outcomes are achieved through an integrated and coordinated cross-disciplinary approach to creating and implementing the sustainability strategy. Sustainability is not the responsibility of any one discipline or team member, and while most projects will engage a Sustainability consultant, they are there to advise other members of the project team on how they can all work together to achieve the sustainability targets and outcomes planned for the project.

Through an integrated design approach, with systems thinking and whole-of-life considerations, the various stakeholders in a project can consider potential synergies (and consequential savings) between the systems in the building, site, and community, and explore the many ways to better integrate and optimise services over the life of the asset.

Parametric modelling and discussion of building design, material choices, energy and water use, indoor environmental quality, environmental emissions and impacts, and other factors, at key stages of design development can assist project teams in making value-for-money decisions.

Student wellbeing and educational outcomes

With an emphasis on improving indoor and outdoor environmental quality, the sustainable design of schools will create healthy and productive learning environments. For example:

- Improved indoor air quality can reduce absenteeism due to sickness, increase staff productivity, and improve student learning.
- Providing high-quality outdoor play spaces can improve student wellbeing and provide educational opportunities to learn about biodiversity.

The building itself can become an educational tool for students learning about building systems and sustainability.

5. Future Directions for Sustainability

The NSW Government regularly reviews policies and considers increases to sustainability targets for construction projects to meet the long-term objectives of the NSW Net Zero Plan, the NSW Climate Change Adaptation Strategy, the NSW Waste and Sustainable Materials Strategy, and NSW Infrastructure Strategy. This may include setting or increasing targets on:

- Resource efficiency,
- Greenhouse gas emissions,
- Renewable energy generation,
- Circular economy,
- Sustainable procurement,
- Sustainable financing and
- Third party, independent sustainability ratings for projects and assets

School Infrastructure NSW is also investing in Modern Methods of Construction (MMC), as the preferred construction method for schools in NSW due to the numerous benefits provided. This method has many potential sustainability outcomes, including reducing waste (materials, water, energy) and emissions during the construction phase, and designing and constructing for disassembly, reuse, and recycling at end of life.

Appendix A: Case Study

Mainsbridge School - Green Star certification

In September 2019 Mainsbridge School became the first NSW Public School to achieve a 4 Star Green Star - Design & As Built v1.2 rating.

Mainsbridge School is a new school through relocation. The project included:

- Flexible learning spaces, including quiet zones designed with consideration for children with specific needs.
- An administration and staff building.
- A multipurpose hall and performance stage shared with Warwick Farm Public School.
- External play spaces.
- A two-storey library with multimedia areas.
- An indoor hydrotherapy pool.

It opened for staff and students Day 1, Term 2, 2021.


Artist impression of the Mainsbridge School upgrade

Sustainability initiatives recognised in certification included:

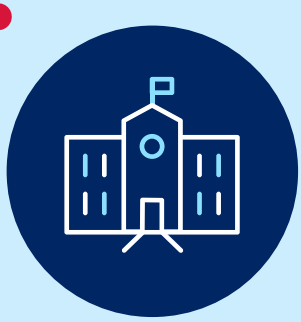
Environmental quality and user comfort

- A high level of thermal comfort achieved for the staff and students.
- Safeguarded occupant health through consideration of internal air pollution levels, with the use of low volatile organic compound (VOC) paints, adhesives, sealants, and carpets, and low formaldehyde engineered wood products.
- Minimisation of harmful microbes in the building's mechanical systems.
- Provision of sustainable transport infrastructure, including access to the site by public transport and bicycle parking and associated facilities.

Building construction and performance:

- Over 20% reduction in energy consumption and greenhouse gas emissions, compared to minimum compliance.
- A whole-of-building, whole-of-life, life cycle assessment was conducted for the project to demonstrate the project had a cumulative environmental impact reduction of over 80%, compared to minimum compliance. Impact categories assessed included climate change, ozone depletion, acidification of land and water, human toxicity, and resource depletion.
- Construction materials, including steel and timber, were responsibly sourced, had a sustainable supply chain, and had transparent product specifications.
- Consideration of neighbouring properties with very high stormwater pollution reduction from the site, and minimal light pollution.

NSW Department of Education - School Infrastructure NSW



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