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| Guidelines for sustainability in capital works  Creating healthier resilient buildings for a changing climate |
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# Foreword

Climate change represents a fundamental threat to public health. Victoria is already experiencing significant impacts from events which are becoming more frequent and intense as a result of climate change, including excessive deaths from extreme heat, an increase in the prevalence of diseases such as the Ross River Virus and exposure to smoke from bushfires. As a result, it is critical that the health sector plays a central role in driving action on climate change, seeking solutions and supporting the community to adapt to its impacts.

The health sector contributes 4.4 per cent of carbon emissions globally and, if the sector were a country, it would be the fifth largest emitter on the planet. In Australia, it is estimated that the sector contributes 5.1 per cent of the nation’s emissions and 1.29 tonnes of carbon per capita. Australia’s per capita emissions from health are second only to the United States.

In 2018-19 Victoria’s public hospitals and health services emitted close to 0.9 mega-tonnes of carbon emissions from energy, nitrous oxide, emergency transport, metropolitan vehicle fleets and waste. Carbon emissions from energy use comprised 91 per cent of total emissions and energy costs were $157 million.

The health sector has a material role in contributing to reductions in Victoria’s government emissions. Equally, the sector has important assets that have growing vulnerability to the effects of climate and which must incorporate increased climate resilience.

Victoria is taking decisive action to address the significant risks posed by climate change through the *Climate Change Act 2017*. The health sector must play its role by taking action to mitigate emissions and adapt to climate change.

These guidelines for capital works provide advice and guidance to all stakeholders involved in the design, construction and refurbishment of healthcare facilities on how to build sustainable and resilient buildings. Sustainable and resilient healthcare buildings offer many benefits including lower environmental impacts, greater resilience at times when they are most needed, lower operating costs and a healthier healing and working environment for patients, visitors and staff.

A picture containing laptop, computer, dark, sitting

Description automatically generated  
**Robert Fiske**

Chief Executive Officer

Victorian Health and Human Services Building Authority

# Introduction

The Victorian Government acknowledges the effects of climate change and has legislated commitments, through the *Climate Change Act, 2017* to achieve net zero carbon by 2050 and adapt to the effects of climate change.

The Victorian Health and Human Services Building Authority’s (VHHSBA) *Environmental sustainability strategy 2018-19 to 2022-23[[1]](#footnote-2)* acknowledges the role that climate change plays in the health and wellbeing of the community and further recognises the contribution of hospital carbon emissions to the Victorian government’s carbon footprint.

In addition, the Department of Health and Human Services’ adaptation action plan 2019-21[[2]](#footnote-3) provides information and direction for Victoria’s response to climate adaptation. The plan assists the sector to embed climate change considerations into policies, planning, guidelines and operations, and respond to the risks posed to public health and wellbeing. Climate change adaptation will ensure that our health and human services continue to provide a high standard of service to Victorians and preserve the community’s health, wellbeing and safety.

These sustainability guidelines are applicable to all healthcare capital works delivered by the Victorian Health and Human Services Building Authority – new builds, retrofits and refurbishments.

Capital projects delivered by public hospitals and health services, regardless of the funding source, must meet the business as usual requirements. Public hospitals and health services that fund and deliver projects directly are encouraged to apply the 2.5 per cent sustainability allowance for above business as usual items.

The guidelines have been developed specifically for Victorian public healthcare capital works but may be applicable to other public and private healthcare capital works across Australia.

# Integrating universal design in capital works

The *Convention of the Rights of Persons with Disability 2008* (CRPD) legislates the rights of people to an inclusive environment. The *Disability Discrimination Act 1992* and the supplementary standards suggest that universal design principles be applied to health project settings and to allow full access and participation of all.

The Charter of Human Rights has encouraged public authorities to develop fairer policies that better respect human rights. A human rights-based approach helps identify potential human rights concerns – before the implementation of any proposed projects or policies. This approach requires public authorities to give equal consideration to what a particular policy intends to do and how it will do it.

Human ability is enabled, supported and encouraged by a universally designed environment that provides everyone with the opportunity to participate unassisted or with minimal support. Independence is best and can be extended with universal design. VHHSBA has adopted the universal design process to enable and empower Victoria’s diverse population through improving human performance, health and wellness, and social participation.

The universal design approach seeks to create environments, objects, and systems that can be used by as many people as possible. To this end, universal design is the process of embedding choice for all people in the things we design:

* **Choice** involves flexibility and multiple alternative means of use or interface.
* **People** include the full range of people regardless of age, ability, sex, or economic status.
* **Things** include spaces, products, information systems and any other things that humans manipulate or create.

Universal design is a user-centred process that evolves as designers and users broaden their own understanding, perspectives and experience by working with the range of users. It is an approach to the design of all products and environments to be as usable as possible by as many people as possible regardless of age, ability or situation.

The *Absolutely Everyone: State disability plan 2017–2020* embeds universal design principles across the state to make more infrastructure, services and places accessible to people of all abilities. This is enabling and empowering a diverse population by improving social participation, health and wellness.

All healthcare capital projects are to have universal design as an underlying design requirement that seeks to go over and above access to premises compliance levels. This ensures that projects plan to create smart, equitable, safe and comfortable environments for all occupants, regardless of their capability levels.

Designs are to demonstrate the following principles:

* **Equitable use (Fair)** – the design does not disadvantage or stigmatise any group of users
* **Flexibility in use (Included)** – the design accommodates a wide range of individual presences and abilities
* **Simple and intuitive use (Smart)** – use of the design is easy to understand, regardless of the user’s experience, knowledge, language skills, or current concentration level
* **Perceptible Information (Independent)** – the design communicates necessary information effectively to the user, regardless of ambient conditions or the user’s sensory abilities
* **Tolerance for error (Safe)** – the design minimises hazards and the adverse consequences to do accidental or unintended actions
* **Low physical effort (Active)** – The design can be used efficiently and comfortably, and with a minimum of fatigue
* **Size and space for approach and use (Comfortable)** – appropriate size and space is provided for approach, reach or manipulation, and use, regardless of the user’s body size, posture or mobility.

More information on universal design is available on [VHHSBA website’s Universal design page](https://www.vhhsba.vic.gov.au/universal-design) <https://www.vhhsba.vic.gov.au/universal-design>.

Universal design is to be delivered as part of the project’s base build and is not to use the 2.5 per cent sustainability allowance.

# Sustainability principles for capital works

Delivering sustainable and resilient buildings promotes better patient outcomes, higher employee satisfaction and productivity, lowers operating costs and emissions, and ensures the building is operational at all times to ensure fair and timely access to healthcare.

Healthcare capital works are to focus on the following sustainability principles.

## Hospitals are healing environments

Hospitals are built to make sick people well and are not to make well people sicker. Hospital design is to focus on indoor environment quality, a connection with nature and an active lifestyle. They are to:

* enhance working environments for staff, increase productivity, engagement and wellbeing
* enhance patients experience to support faster recovery through providing healthier healing environments
* encourage more active use of the building and surrounds, including active transport choices.

## Passive design is paramount

Passive design can dramatically reduce the requirement for space heating and cooling, whilst also creating excellent indoor air quality and comfort levels. Space heating and cooling in a hospital can account for up to 47 per cent of energy use and 65 per cent of carbon emissions. The design and delivery of healthcare buildings are to focus on:

* insulated fabric and windows
* low air leakage
* use of solar and internal heat gains for heating
* quality assured process and components.

Air tightness is to be considered holistically for the whole building design fabric. Air tightness risk is to be clearly communicated to the operator to ensure it is protected from penetrations during post construction works, such as the installation of services.

## Resource use is minimised

Designing and building efficient and sustainable healthcare buildings will reduce the consumption of finite resources and the level of emissions to land, water and air associated with delivering healthcare. Reduced resource use will also minimise the growth in utility costs over time.

Reducing reliance on natural gas, reducing waste to landfill and promoting active transport will reduce any future carbon liabilities associated with meeting net zero carbon by 2050.

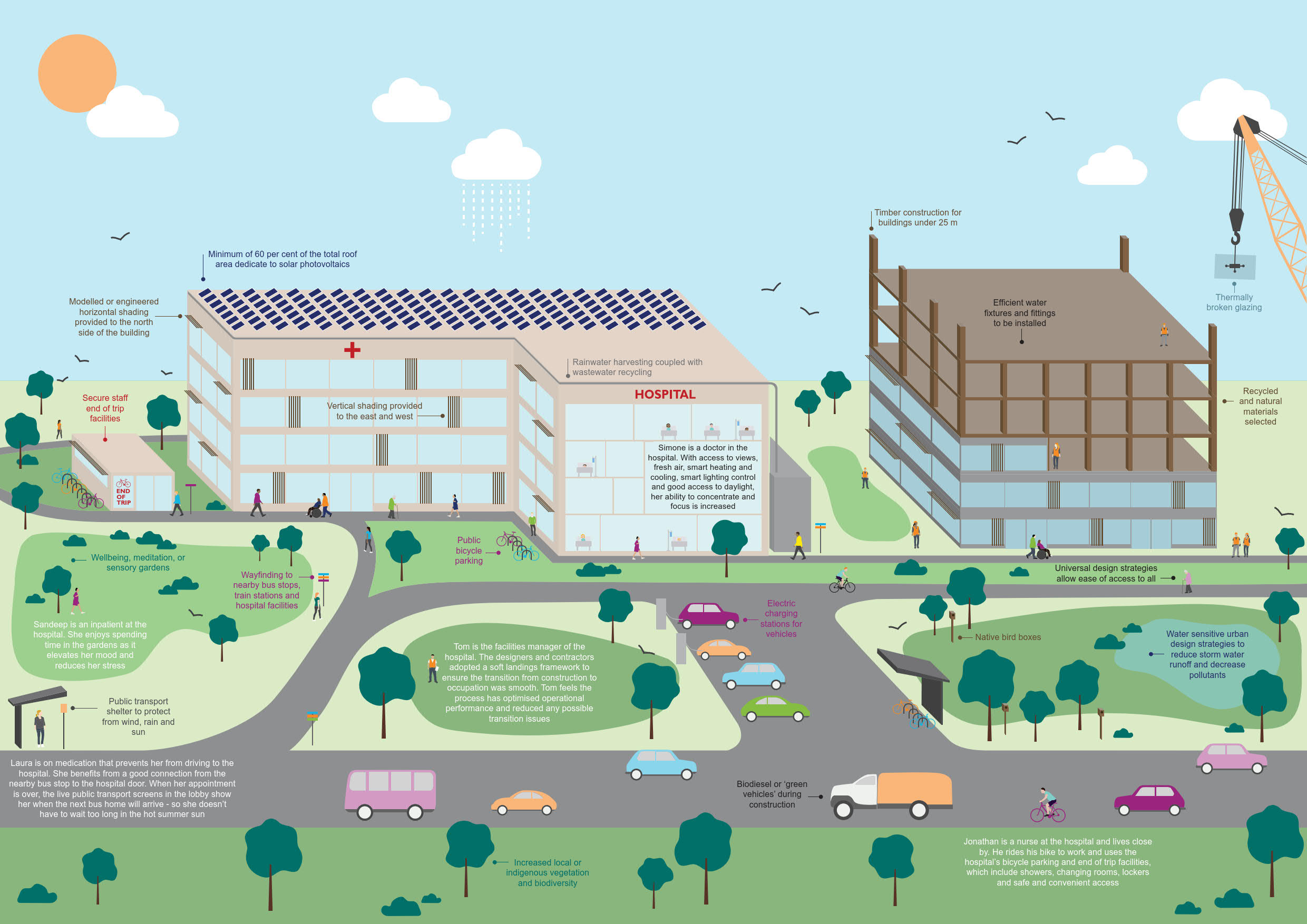
## Hospitals are resilient to climate change

Climate change is a significant and emerging threat to human health and wellbeing. Climate change has direct health and wellbeing impacts such as injury, trauma or death from extreme weather events such as bushfires, floods, heatwaves and dust storms. Indirect impacts include impacts on the social determinants of health and wellbeing, like degradation of the urban environment, access to water, economic costs, unemployment, and food security.

In addition to its patients, staff and tenants, climate change also presents significant risks to the function and operation of the health and human services system, including assets, services, workforce, programs, and policy outcomes.

Climate change risks to infrastructure include inundation due to sea level rise, riverine and inland flooding, soil contraction shifting foundations, extreme windstorms, bushfire and smoke damage, hot days and heatwaves, legionella growth and amplification of other pathogens and microbes. These can result in loss of assets to flooding, or reduced operability of air conditioning units, chillers and emergency generators in extreme heat. If these are not addressed when locating, designing, building and maintaining assets, climate change will reduce asset life and increase operational costs over their lifecycle.

More information on the implications of climate change for healthcare buildings and design responses are provided in [**Appendix 1**](#_Appendix_1:_Climate). During the design and delivery of healthcare buildings, these implications are to be assessed and appropriate responses integrated within the building.



# What does a sustainable healthcare facility look like?

# Delivering sustainable healthcare buildings

## Business as usual requirements

The most up to date version of the National Construction Code – Building Code of Australia is to be used. Projects moving through feasibility and schematic design are to actively plan for the introduction of revised codes and look to adopt them as soon as practically possible.

The list of business as usual requirements is provided in [**Appendix 2**](#_Appendix_2:_Business). These requirements are to be implemented on all public healthcare capital projects in Victoria as part of the base budget.

## Carbon and water design targets

All acute, in-patient and aged care facilities are to be designed to meet the following targets, which are equivalent to delivering a 5-Star NABERS hospital:

* less than 95 kilograms of CO2-e per occupied bed-day
* less than 405 litres of water per occupied bed-day

It is recognised that not all healthcare buildings include in-patient and residential aged care beds, therefore these targets will not be applicable to all projects. Due to the way NABERS for hospitals is designed, it is not possible to convert the design targets to floor area.

To calculate the number of occupied bed-days, the number of in-patient and residential aged care beds is multiplied by 365 (number of days in the year) and by 0.95 (to assume the beds are occupied 95 per cent of the time). Points of care other than in-patient and residential aged care beds are not included in the calculation of occupied bed-days.

Energy and water use associated with the whole building is included in the analysis.

## Sustainability allowance

The cost plan is to allocate 2.5 per cent of the total construction cost for delivering sustainability initiatives above standard practice. This budget allowance is not to be rolled up into the overall project budget.

Where the sustainability allowance is used to exceed a standard practice requirement or replace a material with a more sustainable option, the allowance only covers the cost above that of implementing the standard option. For example, if the project was targeting wall insulation with an improvement of 10 per cent above the building code, the allowance could only be used to deliver the cost difference of delivering an additional R0.25 (that is, the difference between R2.5 and R2.75).

The sustainability allowance cannot be removed or reallocated without first implementing one of the following initiatives:

* installation of solar
* exceeding the NCC Section requirements by 10 to 20 per cent
* other suggestions listed in[**Appendix 3**](#_Appendix_3:_Guidance).

In renovation projects where the built form is not significantly affected, the sustainability allowance can be used for improving the sustainability of site-wide infrastructure, such as more efficient HVAC (heating, ventilation and air conditioning) systems, improved BMS (building management system) or the installation of solar. A greater focus on fittings, furniture and equipment and total volatile organic compounds can also be targeted to improve the indoor environment quality.

The sustainability allowance can be used to support the adoption of new and innovative technologies. Examples of innovation include the use of on-site generation technology beyond the conventional solar panel, such as thin film technologies on glazing that can also reduce solar gain and glare.

## Installing solar

Business as usual requires 60 per cent of the roof space to be designed for solar, such as orientation, areas of continuous space and lack of shading. The sustainability allowance can be used to install solar and arrays are to be sized to meet base load.

The VHHSBA’s *Environmental Sustainability Strategy 2018-19 to 2022-23* has a target of delivering 5 per cent of the public health system’s electricity use from behind the meter solar. It is recognised that metropolitan hospitals with a large base load and low availability of roof space may struggle to meet this, whereas rural and regional buildings with lower electrical demand and more roof space may be able to exceed 5 per cent.

Healthcare capital works should endeavour to source 5 per cent of electricity from on-site solar but it is not a design target – the VHHSBA measures performance against the target at the system level.

All solar arrays are to be configured for automatic export of generation data to the department’s environmental data management system (EDMS). More detail on the requirements is in [**Appendix 4**](#_Appendix_4:_Environmental).

## Installing batteries

It is not recommended that batteries are integrated with solar as it is unlikely that any solar array installed on a hospital would have sufficient export to charge a battery. As the price of batteries reduce, they could potentially provide value in the following scenarios:

* where there is significant differential between the peak and off-peak rates, batteries may lower peak demand and associated costs
* providing energy security of supply to discrete areas of a hospital or pieces of equipment.

As both of these scenarios do not directly or materially reduce carbon emissions, batteries installed for these purposes are not eligible for the sustainability allowance. Where modelling indicates that a solar array integrated with a battery could reduce carbon emissions, it should be discussed with the VHHSBA sustainability unit.

## Transitioning to electric buildings

Moving to all-electric buildings will support the 2050 net zero carbon target.

Sub-acute, primary and community health type buildings are to be all electric. Larger acute buildings are to investigate the opportunities to use more electric plant and equipment and minimise the use of natural gas. Steam for sterilisation and domestic hot water can generally be provided electrically, while heating hot water is still more viable to deliver through gas fired boilers.

In general terms thermal loads can be effectively and economically provided by electricity for buildings up to 10,000 sqm. When investigating the transition to all electric buildings for buildings greater than 10,000 sqm consideration must be given to the increased costs of peak demand charges and the sizing of emergency generators, where required.

The installation of LPG is to be adopted as a last resort and only be installed where electric heat pumps cannot provide the thermal energy and hot water needs, or the local electrical network cannot provide the required load. Where LPG is being proposed, this must be discussed with the VHHSBA sustainability unit prior to specification.

## Engaging sustainability consultants

Dedicated sustainability consultants are to be engaged for all projects with a total estimated investment (TEI) of greater than $10 million. Sustainability consultants can be engaged under the principal consultant. The role of the sustainability consultant is to:

* provide specialist technical sustainability advice on integrating sustainability across the project through the application of these guidelines
* provide advice on sustainability initiatives that will deliver best value from the sustainability allowance
* report to the VHHSBA project manager and Project Control Group on the compliance or otherwise of these guidelines.

For projects with a TEI of less than $10 million, the role of the sustainability consultant as described above can be delivered by the principal, architect or services engineer. In this instance, the successful provider must be able to demonstrate the requisite skills and experience within their team in all sustainability topics including waste, indoor environment quality, materials and sustainable transport.

Sustainability consultants can be from the same firm delivering other services to the project where there is a clear separation of personnel and lines of reporting, such as separate staff and project director.

## Sustainability workshops

Sustainability workshops are a useful way to bring the design team and key stakeholders together to agree on the sustainability priorities for a project. Workshops are to be facilitated by the sustainability consultant and include representatives from:

* health service facilities management or engineering department, capital department and sustainability officer or, if not appointed, the primary sustainability contact[[3]](#footnote-4)
* design team including architect, services engineer and project manager
* VHHSBA project manager
* VHHSBA sustainability unit, where appropriate.

Sustainability initiatives are to be prioritised based on delivering best value over the life of the project against the following criteria in order of importance:

* 1. reduced carbon emissions
  2. improved patient and staff wellbeing
  3. improved environmental outcomes
  4. reduced operating costs.

## Engaging the VHHSBA sustainability unit

The VHHSBA sustainability unit will review the list of funded projects at the start of each year to identify where it can provide best value. Where input is provided, it may include:

* input to design of, and attendance at, sustainability workshops
* review of sustainability and other reports as required
* meeting with the design team to challenge proposed sustainability concepts
* spot checks to ensure projects are complying with these guidelines.

Input on other projects will be provided as resources allow. Design teams are to liaise with the nominated VHHSBA project manager to organise input from the VHHSBA sustainability unit.

## Quality assurance

The VHHSBA sustainability unit will audit a representative sample of capital projects annually. These will be focussed on projects delivered by VHHSBA but could include projects delivered directly by health services. The audit will include projects at a variety of stages from masterplan to delivery.

The audit will include reviewing the business as usual requirements and initiatives delivered through the sustainability allowance against the sustainability guidelines. Where appropriate, the VHHSBA sustainability team will undertake site visits to verify the delivery of initiatives.

Audit results will be used to:

* report on the implementation of the guidelines and delivery of sustainable healthcare buildings to the VHHSBA executive
* inform updates of the sustainability guidelines.

# Appendix 1: Climate resilience in capital works

| Event | Asset implications | Resilience responses |
| --- | --- | --- |
| **Rising temperatures and extreme heat** | Increased thermal discomfort and the risk of heat stress, resulting in decreased productivity of workers and impacting the health of vulnerable communities  Increased demand for air-conditioning, placing demand on energy networks and raising energy demand and associated utility costs  Increased peak loads and associated utility costs  Increased heat in urban environments, creating heat island effects and impacting the comfort of the users  Impacts on building structures and materials, increasing risks of movement, cracking and failure of building envelopes  Decreased levels of soil moisture, impacting building foundations (such as movement) and surrounding landscape  External building materials becoming too hot to touch (such as handrails, seats) | Orientate building for passive design  Provide for natural shade through landscape design  Use light colour materials and heat reflective coatings  Select roof, wall and floors materials for increased durability and water resistance  Improve building insulation and design out thermal bridging  Include high performance glazing  Increase passive or natural ventilation where possible  Include fixed external shading and internal blinds  External materials designed to be touched have low conductivity such as wood or recycled plastic (such that they are not extremely hot after prolonged sun exposure)  Increase efficiency or capacity of HVAC systems, demand control ventilation per AS1668.2  Include strategies to reduce operational energy |
| **Bushfires** | Increased severity and number of bushfires causing smoke, fire and water damage to property and assets  Increased risk to the health and safety of people and higher demand on emergency services and healthcare facilities | Avoid proximity to bushfire prone areas  Build to, or exceed, appropriate bushfire standards |
| **Extreme rainfall, storm, hail and high wind events** | Localised flooding leading to property damage and potential sewerage and stormwater system overflow, limiting access and egress  Falling trees and branches, impacting buildings, people, transport and access  Wind, hail and rain damage to building fixtures and structure | Secure signage and fixtures to resist extreme storm events  Ensure built land surfaces are permeable  Select appropriate landscaping to mitigate. Include for a tree maintenance plan.  Design for future flood levels, rainfall intensity |
| **Sea level rise and storm surge** | Intensified rates of coastal erosion, resulting in property loss and land damage and reduced access to open space  Increased risk of localised flooding limiting access and business continuity, increasing damage and insurance premiums  Increased salt spray and seawater intrusion resulting in increased corrosion and impacts on structural integrity of infrastructure and assets | Incorporate water sensitive urban design  Design for future flood levels, rainfall intensity  Avoid proximity to a floodplain, waterway or coast. If unavoidable, design for future flood levels, rainfall intensity (raise building FFL, essential services)  Select materials resilient to local environment |
| **Reduced rainfall rates** | Impacts on building structures and materials, increasing risks of movement, cracking and failure of building envelopes  Decreased levels of soil moisture, impacting building foundations (such as movement)  Reduction in harvestable rainwater  Increased irrigation requirements, reduced plant selections | Select drought and heat tolerant indigenous plants and grasses  Select plants to provide shade where appropriate  Increase water efficiency of fittings, fixtures and services  Ensure reliable potable water supply and collect recycled water for additional resilience |
| **Other** | Increased risk of loss of road access in extreme weather events impacting ability of staff, patients, visitors, emergency response and suppliers to access healthcare facilities  Increased risk of loss of grid connectivity in extreme weather events | Include climate risk in business continuity and emergency management plans, including procedures for staff, patients, visitors and logistics to access the site when access to roads are impacted  Link to or support of local health and wellbeing plans  Ensure continuity of essential engineering services |

# Appendix 2: Business as usual requirements

## Systems, processes and guidance

The managing contractor (builder) is to have an environmental management system developed in line with ISO 14001 and an environmental management plan in line with the NSW *Guideline for the preparation of environmental management plans*[[4]](#footnote-5) or similar.

The building is to be commissioned in compliance with the Chartered Institute of Building Services Engineers (CIBSE) commissioning code M.

A building user guide is to be provided to the operator detailing:

* energy and environmental strategy for the building
* modelled performance targets
* building monitoring system
* details of sustainable features and any operational requirements.

Provide VHHSBA, via email to **edms@dhhs.vic.gov.au,** the environmental data management system (EDMS) requirements template (see [**Appendix 5**](#_Appendix_5:_Data)).

Post-occupancy evaluations of energy and water targets and waste measures against actual building performance within **six** months of practical completion. Actions required to address any identified discrepancies and addressed through defects and liability.

## Indoor environment quality

Design and internal layout to provide daylight for occupied functional areas (all areas likely to be occupied for at least one continuous hour per day).

Internal layout to reduce excessive solar heat gain for patient areas.

Treat doorways and other external openings to manage prevailing winds and draughts.

Inclusion of internal stairs to promote internal staff and patient movement, noting requirements for universal design.

Use of electrolysed water systems or equivalent for surface cleaning in commercial kitchens.

Locate outside air intakes away from major roads, loading docks and waste collection to reduce contaminants from entering the building.

Design for a potential wider and more variable internal temperature band (such as 19 to 26° Celsius) adjusted for seasonal variation, unless contraindicated for clinical or operational reasons.

All paints, adhesives, sealants, wall and ceiling coverings to meet the following total volatile organic compounds (TVOC) in g/L of ready to use products:

* Interior wall and ceiling paint – 5g/L
* General purpose adhesives and sealants, trims, varnishes, wood stains, primers, sealers and prep coats – 75g/L
* One and two pack performance coating for floors, acoustic sealants, architectural sealant, waterproofing membrane and sealant, fire retardant sealants and adhesives, structural glazing adhesive, wood flooring and laminate adhesives and sealants – 250g/L
* Carpets: 0.5mg/m2/hour under ASTM D5116 test protocol for Total VOC; 0.05mg/m2/hour under ASTM D5116 test protocol for 4-PC
* All plywood, particleboard, MDF and LVL to meet formaldehyde limits of no more than 1mg/L
* All high pressure and compact laminates to meet formaldehyde limits of no more than 0.1 mg/m²hr

Acoustic treatment to meet best practice guidelines for noise levels, reverberation and acoustic separation as per current AS/NZS 2107:2016 standard.

A minimum of 30 per cent by cost of loose furniture to be third party-certified by a recognised environmental certification scheme, such as GECA, Green Rate, Eco specifier, SMaRT 4.0, Green Tick or equivalent.

Glare control for all occupied spaces unless it can be demonstrated that glare is eliminated by external shading features or glazing treatments. If blinds are installed, they are to be able to be controlled by affected occupants and have a visual light transmittance (VLT) of less than 5 per cent.

## Energy efficiency

Orient and design the building, within site constraints, so that as close as possible to 100 per cent of the north façade is shaded at the noon solstice and there is minimal glazing (with shading) on the west façade.

Maximise shading of northern and western façades from existing trees and neighbouring buildings.

Maximise use of directly accessible stairs through location and design.

All window systems to be double glazed and thermally broken with light-coloured window frames.

Design of skylights to harvest daylight in single storey buildings and top floors of multi-storey buildings within transit routes and stairs must include appropriate insulation properties to minimise thermal heat gain and or heat loss.

Provide operable windows for natural ventilation in sub-acute patient and administration areas, where feasible.

Design out inefficient thermal bridging across floor plates, walls and roofing. Examples of thermal bridging include cantilevered structures with no thermal break (such as balconies and wing walls), steel framed walls and roofs with no thermal break.

For non-24-hour theatres, implement a set-back mode for when the operating theatres are not in use. In set-back mode the operating suite will:

* set to minimum outside air
* widen temperature dead band to 14 to 30° Celsius
* always maintain full humidity control within the limits set in *Engineering guidelines for healthcare facilities: Volume 4 – mechanical engineering*.

Design outside air cooling options to server, communication rooms and data centres with supplementary computer room air conditioning unit (CRAC) air treatment for support and higher temperature operating days.

All below-ground car parks to have carbon monoxide monitoring and variable speed drive (VSD) fan controls.

Install minimum 0.95 power factor correction systems for building services.

Use of heat pump or high efficiency equivalent technology to provide domestic hot water for sites below 10,000 sqm.

Investigate viability of commercial scale heat pumps for domestic hot water for sites greater than 10,000 sqm.

All boiling water units to have operational timer controls installed and set to Monday to Friday 7 am to 7 pm, unless otherwise required, and not require supplier or specialist service engineer expertise to change time settings.

Air conditioners (single phase, non-ducted), clothes washers, clothes dryers, dishwashers, televisions, refrigerators, freezers, computer monitors and pool pumps to have a minimum 5-star energy rating.

Over door air heaters or curtains to be designed out.

### Lighting

Design and take advantage of natural light in new buildings to minimise the use artificial lighting during daytime working hours.

Internal artificial light sources to have a minimum colour rendering index (CRI) of 80.

External and internal artificial lighting to employ occupancy sensors, lux level sensors, lux/occupancy combined sensor or BMS transition dimming and shutdown as appropriate to building type and work area use. Include local control for light zones of up to 75 sqm.

Artificial lighting efficiency benchmark must not exceed the NCC-BCA minimum requirements per square meter averaged across the building net floor area (at maximum wattage).

Glare from lamps to be managed, for example, by:

* fitting bare lamps with baffles, translucent diffusers
* complying with clause 8.3.4 of AS/NZS 1680.1-2006, or
* not exceeding the maximum Unified Glare Rating (UGR) values listed in Table 8.2 of AS/NZS 1680.1-2006, calculated in line with Clause 8.3.3.

LED technology to be used for all lighting, unless clinical practices dictate specialist lighting solutions.

External lighting, including architectural, public areas and carparking to use LED lighting with lower activity dimming and day light sensors (dusk to dawn). Architectural lighting not required for wayfinding or public safety is not to operate between the hours of 12.00 am and 6.00 am.

### Metering

A metering and monitoring strategy to be provided, describing the water and energy sub-metering strategy for the project, including instruction for data collection and analysis and an integration control strategy between building services disciplines. Metering to form part of handover materials to the operator.

Metering to be designed in line with ‘Good practice’ in Appendix A of DHHS’ *Guidance note on implementing effective energy and water metering systems*[[5]](#footnote-6).

All metering connections (sub-metering) to be installed and commissioned to report to the building management system, or dedicated monitoring platform in the engineering or facilities management office (or both). Metering to be able to provide real-time notifications to engineering or facilities management staff (or both) of use outside abnormal parameters.

### Heating and cooling

Reverse cycle split system air-conditioning units to be within one star of highest available for output (kW).

Building ventilation and heat rejection vents to be located near or next to hot water and heating heat pump systems to improve air-on conditions to heat rejection plant.

### On-site renewable generation

At least 60 per cent of the roof space is to be designed for the installation of solar, including:

* continuous roof areas of greater than 20 square meters
* roof top systems to be designed to minimise shading from trees, HVAC units, vents, pipes, ventilation systems, skylights, mobile phone masts, parapets or other architectural design features
* north, east and west facing including any azimuth angles in between (with plus or minus 10-degree tolerance)
* roof pitch angles of 25 degree or less are preferred for rooftop systems installations
* preference for tin roof finishes rather than roof tiles
* installation of solar preference for lower storey buildings (easier access for install and maintenance) where they will not be overshadowed by future development.

Allowance within the design of the electrical infrastructure, including circuit breakers or space in the main switch board (or both) to enable retrofit of solar photovoltaics without requiring upgrade to electrical infrastructure.

Adequate weather protected wall space suitable for the location and installation of inverters.

Where safe access and/or harness points for working at heights are being installed for other plant, the design is to allow expansion for future use for the solar panels.

Solar photovoltaic arrays are to be sized to match the hospitals base load and avoid export to the grid due to diminishing returns from over-sized arrays.

All solar arrays are to be configured for automatic export of generation data to the department’s environmental data management system (EDMS) as detailed in [**Appendix 3**](#_Appendix_3:_Guidance).

## Water management

Install tapware with maximum flow rate equivalent to 6-Star WELS rating or above in all bathrooms, en-suites and general amenity areas.

Install dual flush toilets with flush rates equivalent to 4-Star WELS rating or above.

Install showers with maximum flow rate equivalent to 3-Star WELS rating or above.

Urinals for staff and visitors to be fitted with demand driven or smart demand operation and have flush rates equivalent to 5-Star WELS rating or above. No cyclic flushing urinals to be installed.

Patient amenities taps to include flow rates equivalent to 6-Star WELS rating or above.

Drinking water fountains to be installed in internal and external public areas to minimise use of bottled water.

Water using appliances, such as dish washers and washing machines to be equivalent to 4.5-Star WELS rating or above.

Preference cooling of equipment such as CSSD or compressors with chilled water and heat exchangers or non-potable water where services are in close proximity. Use of non-potable water to be in line with *Guidelines for water reuse and recycling in Victorian healthcare facilities: Non-drinking applications*.[[6]](#footnote-7)

Include water-sensitive urban design, such as swales and biofiltration to manage stormwater run-off.

Design landscaping to be water efficient, including use of mulching, plant selection and water-efficient irrigation system, comprising subsoil drip systems and automatic timers with rainwater or soil moisture sensor over-ride.

Provide rainwater tanks to collect water from roof tops, reverse osmosis (dialysis) and other areas where flows justify. Collected water to be treated and used for landscape irrigation and toilet flushing in staff and public areas. Use of non-potable water to be in line with the *Guidelines for water reuse and recycling in Victorian healthcare facilities: Non-drinking applications*.[[7]](#footnote-8)

Wash-down hoses to be controlled by commercial high-pressure water efficient trigger nozzles and connected to rain, or reclaimed water tanks.

## Materials specification and selection

Re-usable fittings compliant to current performance requirements, furniture and workstations from vacated and/or demolished premises to be re-used or donated to third party uses.

Design for re-use of existing structures or facilities on-site, where feasible.

Adopt and promote the use of standard material sizes and components in design and fit-out.

Minimise use of paint or finishes on exterior surfaces.

Use of post-consumer waste or post-industrial waste, such as recycled aggregate, fly ash and silica fume for concrete and post-consumer recycled content or re-used steel. A proportion of recycled content to be used in the following:

* tarmacked areas, including on-site access roads, at-grade carparks and footpaths
* non-structural concrete, including kerbing and footpaths, with concrete aggregates to contain a minimum 15 per cent recycled or substitute materials fly ash, crushed recycled aggregate
* car park wheel-stops, landscaping elements, decking, bollards and fixed outdoor furniture.

Maximise use of locally produced building materials, construction workers and facilities.

Cross laminated timber (CLT) structure options to be considered during design.

All timber (structural and architectural) to be Forest Stewardship Council (FSC) certified or recognised equivalent.

Preference carpet squares with a recycled content for ease of replacement.

Preference stainless steel, concrete or bamboo bench tops in food preparation areas. Stone or composite stone products are to be avoided.

Preference for recycled content for plumbing and drainage reticulation pipework.

## Waste and resource recovery

95 per cent by weight target for demolition and construction materials (excluding hazardous waste) to be re-used or recycled (or both).

Provide a baler in the loading dock and space provision of 6 square meters.

Provide an additional 10 square meters in the loading dock for storage and management of recycling bins.

Provide an additional 10 square meters in the loading dock for a compactor in buildings greater than 10,000 square meters.

Space provision of an additional 20 square meters per 1,000 square meters of building space for installation of recycling bins at the point of generation for recovery of the following resources.

| Clinical areas | Staff and admin | Public areas | Kitchen areas |
| --- | --- | --- | --- |
| Commingled  Paper and cardboard  Confidential paper  PVC  Kimguard  E-waste (see note) | Commingled  Paper and cardboard  Confidential paper  E-waste (see note) | Commingled  Organics  E-waste (see note) | Commingled  Organics |

**Note**: In Victoria it is illegal to send e-waste to landfill. E-waste to be collected in these areas generally relates to batteries, pagers and mobile phones. Space for larger e-waste items, such as medical equipment and computers, is to be allowed for in the loading dock or facilities department.

Space allowance is to be distributed across the points of generation including dirty utility rooms, supply, facilities management/engineering and kitchens. Even if collection services are not available for these resources, space is to be provided so they can be collected when services become available.

## Ecology and landscaping

Avoid building on land that is:

* prime agricultural value
* below the 100-year flood operations location
* subject to erosion, bushfire or landslides
* land of recognised heritage or conservation value.

Maximise retention of existing ecological resources, contiguous ecosystems networks and native vegetation during construction for project delivery.

Maintain balance of topsoil and fill on site, such that minimal topsoil is removed from site. Topsoil is not to be sent to landfill.

Deliver a net biodiversity increase to the site from landscaping, using locally indigenous flora and planting for habitat and enhancing local wildlife, including invertebrates.

Provide habitat corridor links where the site is close to conservation areas and natural habitats.

Maximise use of sensory and well-being gardens for interaction with staff, visitors and patients/residents.

Maximise use of outdoor spaces and activities for patient rehabilitation.

## Transport

Incorporate connectivity to transport nodes within the site, adjacent to it and surrounding (bike paths, bike storage, car parks, public transport nodes, pedestrian networks) following universal design principles.

Health service to develop an integrated transport plan (ITP) for greenfield projects over 10,000 square meters consolidating all behavioural and infrastructural transport measures implemented on site and recommendations for future improvements.

Provide tele- and video-conferencing facilities for corporate office use. Encourage adoption of tele-medicine where budget allows.

Provide wayfinding to direct staff, patients and visitors to bike and pedestrian networks and public transport, following universal design principles. Work with local council to provide wayfinding from public transport nodes to the healthcare facility.

Provide secure and conveniently located on-site bicycle parking for staff and visitors and ‘after-trip’ facilities for staff in line with provisions in clause 52.34 of the Victorian Planning Provisions (VPP), including where exemptions exist. Buildings are to meet the requirements for ‘Hospitals’ or ‘Medical Centres’, whichever is the most appropriate. Healthcare facilities located in Melbourne and regional centres are to exceed VPP clause 52.34 requirements by at least 20 per cent.

Provide internal charging points with appropriate berth for motorised mobility devices and investigate viability of charging points for e-bikes and scooters.

Provide 25 per cent of total parking spaces designed and labelled for small cars or motorcycles and mopeds (or both), hybrids, electric cars and alternative-fuel vehicles and carpool vehicles in preferential locations with adequate signage or markings.

Future-proof carpark infrastructure to enable charging stations to be installed in line with DHHS’ fleet management guide, *Planning for electric vehicles in the health sector*.[[8]](#footnote-9)

## Emissions to land, water and air

Install noise attenuation on engineering plant and other noise sources to meet required noise emission standards. Location of engineering plant to be considerate of local noise sensitive receptors, including residential housing and other community facilities.

Avoid ozone-depleting chemicals by sourcing recognised alternatives with low ozone-depleting potential (ODP), for example, hydrocarbon gases in air conditioning and thermal insulants.

No lighting to be directed beyond site boundaries or upwards without falling directly onto a surface for illumination, being mindful of safety and ‘ambience’ requirements.

Non-blown insulation (thermal, pipe, fire, acoustic) to have a global warming potential (GWP) of less than or equal to 5. Blown insulation to preference low GWP products.

Where refrigerant systems have a charge of over 3 kilograms or refrigerant with a GWP over 5 (or both), leak protection and leak detection systems are to be installed.

# Appendix 3: Guidance for using the sustainability allowance

Install embedded generation solar panel that is sized to the base load of the building.

Exceed the minimum NCC BCA 2019 Section J requirements by 10 or 20 per cent, as provided in the following table:

| Part | Minimum standard | 10 per cent improvement | 20 per cent improvement |
| --- | --- | --- | --- |
| **Insulation (total system values)** | Roof: R3.2 Walls: R2.5 Floor: R2.0 | Roof: R3.5 Walls: R2.75 Floor: R2.2 | Roof: R3.85 Walls: R3.0 Floor: R2.4 |
| **Glazing (total system values)** | U-Value 4.5 SHGC 0.45 | U-Value 3.0 SHGC 0.40 | U-Value 2.6 SHGC 0.40 |
| **Building sealing** | Airtightness testing required to 5 m3/hr.m2 at 50 Pa, tested in line with Method 1 of AS/NZS ISO 9972 | Airtightness testing required to 4.5 m3/hr.m2 at 50 Pa | Airtightness testing required to 4.0 m3/hr.m2 at 50 Pa |
| **HVAC** | VAV Air Cooled System  Energy efficiency ratio (EER) 3 for refrigerant chillers at full operation | Power factor 0.95 EER for full load operation 4.71 | Power factor 0.98 EER ratio for full load operation 5.13 |
| **Lighting** | 3.5 W/m2 | 3.0 W/m2 | 2.7 W/m2 |
| **DHW** | J7 – Thermal efficiency 86% Central gas system | Thermal efficiency of 90% central gas system  **Or**  Electric heat pump | Thermal efficiency of 95% central gas system  **Or**  Electric heat pump |
| **Monitoring** | Standard BMS to meet NCC Section J8 requirements | BMS and 10 additional sub-meters and connections | BMS and 20 additional sub-meters and connections |

Provide real-time public transport travel time display in the public foyer.

Install reed switches on openable windows in rooms with individual thermal controls to manage heating and cooling.

Incorporate pre-conditioning technology for air source heat pumps and energy recovery systems on flues and exhausts.

Introduce ground source heat pumps for pre-air/water conditioning

Incorporate extended external building design to extend and improve building summer shading.

Provide a ‘soft landings’ approach for a period of 12 months.

Install super-efficient equipment with an energy rating of 7 to 10 stars.

Exceed any of the business as usual requirements.

# Appendix 4: Environmental data management system requirements

The following key information is to be provided to set-up a new facility, add an asset to an existing facility, or update existing facility details in the department’s environmental data management system.

Facility details

| Facility or asset details | Guidance | New facility or asset details |
| --- | --- | --- |
| Building name | Free text |  |
| Is this a new facility? | Yes or No |  |
| Is this a new asset adding to an existing facility | Yes or No |  |
| If Yes, what facility | Free text |  |

Contact details

| Facility or asset details | Guidance | New facility or asset details |
| --- | --- | --- |
| Health service contact | Type name here | Type email address here |
| Sustainability consultant | Type name here | Type email address here |
| VHHSBA project manager | Type name here | Type email address here |

Building details

[Lists of preselected answers](#_Lists_of_pre-selected) are shown on the following page.

| Facility or asset details | Guidance | New facility or asset details |
| --- | --- | --- |
| What peer group does the building belong | Select from [‘Peer group’ list](#_Peer_group) |  |
| Building area in sqm – New / refurbished | Amount of sqm |  |
| Land area (New site only) | Amount of sqm |  |
| Facility type | Select from [‘Facility type’ list](#_Facility_type) |  |
| Health service (Operator) | Health service name |  |
| Output Code | Select from [‘Output code and label’ list](#_Output_code_and) |  |
| Output label | Select from [‘Output code and label’ list](#_Output_code_and) |  |
| Building type | Select from [‘Building type’ list](#_Building_type) |  |
| Address details | Full postal address |  |
| Town or Suburb | Full postal address |  |
| Postcode | Full postal address |  |
| Asset configuration | Please select 1, 2–3, 4–9 storeys |  |
| Total levels | How many levels, including basements |  |

Measurement devices

| Type of measurement device | Guidance | Measurement device details |
| --- | --- | --- |
| NMI | Not account number |  |
| Electricity supplier | Name if known |  |
| MIRN | Not account number |  |
| Gas supplier | Name if known |  |
| Water account | Account number |  |
| Water supplier | Name |  |

Installation of solar arrays and water tanks

| Initiative | Metric | Size | Name of building installed at |
| --- | --- | --- | --- |
| Solar array | kWp |  |  |
| Water tank | Litres |  |  |

Lists of pre-selected answers

### Peer group

Select the dominate activity type for building:

* Accommodation
* Acute
* Aged care
* Ambulatory
* Community Health
* Metro Local
* Metro Regional
* Office
* Regional
* Rural
* Specialist
* Sub-Acute
* Tertiary

### 

### Facility type

* Specialist Hospital
* Public Hospital-Acute
* Public Hospital-Subacute
* Residential Aged Care
* Ambulance Station

### 

### Output code and label

* 11000 Acute health
* 12000 Ambulance
* 13000 Aged & home care
* 15000 Mental health
* 16000 Public health
* 27000 Dental health
* 28000 Community health
* 34000 Drug services

### 

### Building type

* Hospital
* Aged care
* Administration or Office
* Community, Allied or Primary health
* Mental health
* Dialysis
* Accommodation
* Car park
* Kitchen
* Laundry
* Plant room
* Ambulance

# Appendix 5: Data acquisition from embedded solar PV

This document specifies the required data feed to be provisioned for all embedded solar PV installations in the Victorian public health portfolio.

**Aim**

The aim is to provide a periodic structured solar data production record, readable by automated computer systems (interface), that can be automatically uploaded into the health environmental data management system (EDMS) to track hospital solar PV electricity production data.

**Transmission methodology**

The system is to provide information to the interface via email containing an attached file in Excel CSV format (\r\n for new line) containing records in the following structure:

**‘supplier name’,’measurement device’,’start datetime’,’stop datetime’,’measured quantity’,’measurement unit’,’activity name’\r\n**

| Term | Definition |
| --- | --- |
| Suppler name | The producer of the measurement.  For a health service owned solar installation, this is the health service name (such as Eastern Health). |
| Measurement device | A unique identifier for the solar PV system (or part of a system) from which the data is being supplied.  For a measurement device that reports solar production from the entire solar PV system (such as taken from the Class one LGC meter, a single inverter or for reporting an aggregate of multiple inverters), the naming convention follows the format: **FACILITY NAME\_SOLAR\_kWp** (system capacity).  For example, for a 7 kWp array at Healesville Hospital, the measurement device would be named: **HEALESVILLE\_SOLAR\_7**.  Where Solar PV data is being measured from multiple measurement points within the overall solar PV installation (such as emails generated from individual inverter outputs where there is more than one inverter), the naming convention follows the format: **FACILITY NAME\_SOLAR\_kWp\_Inverter (or other device) number**.  For example, for a 200 kWp array at Bendigo Hospital with separate measurement devices, the measurement devices would be named: **BENDIGO\_SOLAR\_200\_01**, **BENDIGO\_SOLAR\_200\_02** and so on. |
| Start datetime | The time of the measurement period start in SQL format datetime **YYYY-MM-DD HH:MM**.  For example, 9 **September 2017 at 11.30 pm is recorded as** **2017-09-10 23:30.** |
| Stop datetime | The time of the measurement period end in SQL format datetime **YYYY-MM-DD HH:MM**.  For example, 11.44 pm on 10 September 2017 is recorded as **2017-09-10 23:44** |
| Measured quantity | The amount of the measurand. For example, the measured amount on 200kWh is 200. |
| Measurement unit | The unit of the measurand. For solar this is kWh. |
| Activity name | The EDMS-approved name for the activity type. For solar it is Solar Power (with capitalisation as shown). |

### Example seven-day extract

Eastern Health,HEALESVILLE\_SOLAR\_7,2017-09-10 00:00,2017-09-10 23:59,0.060,kWh,Solar Power

Eastern Health,HEALESVILLE\_SOLAR\_7,2017-09-11 00:00,2017-09-11 23:59,0.170,kWh,Solar Power

Eastern Health,HEALESVILLE\_SOLAR\_7,2017-09-12 00:00,2017-09-12 23:59,0.200,kWh,Solar Power

Eastern Health,HEALESVILLE\_SOLAR\_7,2017-09-13 00:00,2017-09-13 23:59,0.370,kWh,Solar Power

Eastern Health,HEALESVILLE\_SOLAR\_7,2017-09-14 00:00,2017-09-14 23:59,0.550,kWh,Solar Power

Eastern Health,HEALESVILLE\_SOLAR\_7,2017-09-15 00:00,2017-09-15 23:59,0.680,kWh,Solar Power

Eastern Health,HEALESVILLE\_SOLAR\_7,2017-09-16 00:00,2017-09-16 23:59,0.800,kWh,Solar Power

**Note:** CSV files must:

* **not** contain header rows
* **not** contain blank rows

**E-mailing**

E-mails are to be sent to **direct-data@edensuite.com.au**.

E-mails must contain only a single attachment file – if multiple files are generated at the same time by a batch process, they must be emailed separately.

Frequency of e-mailing from each measurement device can be set appropriate to the solution provided but should not be less frequently than monthly.

Solutions that require manual action by health services or third parties to process e-mails will not be accepted.

**Notification of measurement device names**

When setting up a new data supply, notify the department via email to **edms@dhhs.vic.gov.au** of the measurement device unique identifier, the solar PV system it is associated with and the frequency of e-mailing.

Any queries on the collection of solar data, or naming measurement devices can be sent to [**edms@dhhs.vic.gov.au**](mailto:edms@dhhs.vic.gov.au).

# Appendix 6: Image descriptions

Illustration on page 11

The illustration shows a hospital building and its surrounds, including bicycle parking, electric charging stations and a new building being constructed.

### The hospital building

* Minimum of 60 per cent of the total roof area dedicated to solar photovoltaics.
* Rainwater harvesting coupled with wastewater recycling.
* Modelled or engineered horizontal shading provided to the north side of the building.
* Vertical shading for the east and west.
* Simone is a doctor in the hospital. With access to views, fresh air, smart heating and cooling, smart lighting control and good access to daylight, her ability to concentrate and focus is increased.

### Construction

* Timber construction for buildings under 25 metres.
* Efficient water fixtures and fittings to be installed.
* Thermally broken glazing.
* Recycled and natural materials selected.
* Biodiesel or ‘green vehicles’ during construction.
* Tom is the facilities manager of the hospital. The designers and contractors adopted a soft landings framework to ensure the transition from construction to occupation was smooth. Tom feels the process has optimised operational performance and reduced any possible transition issues.

### Outside the buildings

* Wellbeing, meditation or sensory gardens.
* Native bird boxes.
* Waster sensitive urban design strategies to reduce storm water runoff and decrease pollutants
* Increased local or indigenous vegetation and biodiversity.
* Sandeep is an inpatient at the hospital. She enjoys spending time in the gardens as it elevates her mood and reduces her stress.

### Access and transport

* Universal design strategies allow ease of access to all.
* Electric charging stations for vehicles.
* Public transport shelter to protect from wind, rain and sun.
* Laura is on medication that prevents her from driving to the hospital. She benefits from a good connection from the nearby bus stop to the hospital door. When her appointment is over, the live public transport screens in the lobby show her when the next bus home will arrive – so she doesn’t have to wait too long in the hot summer sun.
* Public bicycle parking.
* Secure staff end of trip facilities.
* Jonathan is a nurse at the hospital and lives close by. He rides his bike to work and uses the hospital’s bicycle parking and end of trip facilities, which include showers, changing rooms, lockers and safe and convenient access.

1. Available on [Health.vic’s Sustainability in healthcare page](https://www2.health.vic.gov.au/hospitals-and-health-services/planning-infrastructure/sustainability) <https://www2.health.vic.gov.au/hospitals-and-health-services/planning-infrastructure/sustainability> [↑](#footnote-ref-2)
2. Available on the [DHHS website’s Environmental sustainability strategy page](https://www.dhhs.vic.gov.au/publications/environmental-sustainability-strategy-department-health-and-human-services) (under ‘Climate change strategy’) <https://www.dhhs.vic.gov.au/publications/environmental-sustainability-strategy-department-health-and-human-services> [↑](#footnote-ref-3)
3. The VHHSBA sustainability unit administers a list of primary sustainability contacts for all health services. Contact details can be requested via email at **sustainability@dhhs.vic.gov.au**. [↑](#footnote-ref-4)
4. See [Planning NSW’s Guideline for the preparation of environmental management plans (.PDF)](https://www.planning.nsw.gov.au/~/media/Files/DPE/Guidelines/guideline-for-the-preparation-of-environmental-management-plans-2004.ashx?la=en) <https://www.planning.nsw.gov.au/~/media/Files/DPE/Guidelines/guideline-for-the-preparation-of-environmental-management-plans-2004.ashx?la=en> [↑](#footnote-ref-5)
5. Available on [Health.vic’s Guidelines and guidance notes on sustainability page](https://www2.health.vic.gov.au/hospitals-and-health-services/planning-infrastructure/sustainability/resources/guidelines-on-sustainability) <https://www2.health.vic.gov.au/hospitals-and-health-services/planning-infrastructure/sustainability/resources/guidelines-on-sustainability> [↑](#footnote-ref-6)
6. Available on [Health.vic’s Managing health and environmental risks of water supply page](https://www2.health.vic.gov.au/hospitals-and-health-services/planning-infrastructure/sustainability/water/managing-water-supply) <https://www2.health.vic.gov.au/hospitals-and-health-services/planning-infrastructure/sustainability/water/managing-water-supply> [↑](#footnote-ref-7)
7. See footnote 6 [↑](#footnote-ref-8)
8. Available on [Health.vic’s Transport page](https://www2.health.vic.gov.au/hospitals-and-health-services/planning-infrastructure/sustainability/transport) <https://www2.health.vic.gov.au/hospitals-and-health-services/planning-infrastructure/sustainability/transport> [↑](#footnote-ref-9)