Sustainable multi-unit development

A handy checklist!

Image source: YourHome

Check out our handy checklist of steps you can take to deliver cheaper, cleaner and healthier homes for your clients.

NET ZERO PATHWAY	
☐	Optimise passive design into your build.
☐	Choose a target energy rating and include energy efficient upgrades accordingly.
☐	Go all electric with energy efficient appliances and install EV ready infrastructure.
☐	Maximise on site renewable energy generation to offset the power used to operate the development.
☐	Create a climate action plan that demonstrates a net zero commitment through buying residual electricity from a GreenPower provider.
☐	Select materials that have low embodied carbon emissions and have also offset the remaining emissions through a verified carbon offset scheme.
☐	Provide extra space within each dwelling and/or garage for bicycle parking.
☐	Use urban cooling principles in your design.
☐	Design your landscaping with indigenous plants.
☐	As part of the planning approval process, you will be required to submit a 'sustainability report' which assess the sustainability of the development. Achieving the commitments the above will likely satisfy most of the requirements within the report. Click for more information

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LOW CARBON LIVING

NET ZERO 2030 Every home, make it count

City of KINGSTON

OPTIMISE PASSIVE DESIGN

- [ ] Locate living areas to the north of your floorplan design, with windows facing north.
- [ ] Locate low occupancy spaces like bathrooms, bedrooms, garages and hallways to the south of your floorplan design.
- [ ] Limit the number and size of windows facing south and west.
- [ ] Design eave and pergola shading on the northern façade to passively block out the harsh summer sun but allow access to the winter sun.
- [ ] Select operable shading systems on the east and west facades, such as awnings, louvers, sliding shutters, venetian or roller blinds.
- [ ] Locate operable windows on opposite sides of rooms, to create natural ventilation pathways.

ENERGY EFFICIENCY

- [ ] Aim for NatHERS Rating of 7 stars or higher and consider if you want to market a higher standard like Passive House or Living Building Challenge.
- [ ] Select high performance double glazed or triple glazed windows to improve the thermal efficiency of the home. Select timber, uPVC frames or thermally broken aluminium frames, to minimise heat transfer through the frame.
- [ ] Install IC-4 rated (fire rated) LED lighting. Not only do they use 80% less electricity than the alternatives, but insulation can also be installed on top of the downlights which creates a better thermal seal.
- [ ] Commit to providing an airtight house through proper sealing of internal walls and ceilings as well as external gaps like pipework or ducts.
- [ ] Install insulation in the ground/floor, walls and ceiling/roof as required to achieve the desired energy rating. Make sure the installer can guarantee proper coverage and installs to best practice standards.
- [ ] Use low embodied carbon materials to construct the build.

ELECTRIFICATION

- [ ] Commit to using efficient electric heat pump hot water systems, which are 3-5 times more efficient than the alternative options.
- [ ] Commit to using reverse-cycle air conditioning systems for heating and cooling, select within 1 Star of the best available system on the market.
- [ ] Commit to using electric induction cooktops.
- [ ] To future proof the dwellings, install battery ready infrastructure and design the roof to allow a future occupier to add more solar panels should they wish to.
- [ ] Provide electric vehicle (EV) ready infrastructure to car parking spaces, to support future charging of EVs.
- [ ] Commit to providing renewable energy by installing solar PV panels on each dwelling. The amount of solar PV provided should be able to generate power equal or greater to the power required to operate the houses.
- [ ] Provide the planning team with a climate action plan that commits the development to the use of GreenPower (or similar) to supply any residual energy from 100% renewables for a period of 10 years post construction.

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URBAN COOLING AND WATER SENSITIVE URBAN DESIGN

- [ ] Select light coloured roofing materials to radiate away up to 75% of solar energy and reduce the urban heat island effect.
- [ ] Select light coloured external building materials.
- [ ] Design areas of grass and vegetation instead of hard surface materials like concrete, tiles and bricks. Specify permeable paving solutions where a structured surface is needed (such as for your driveway).
- [ ] Design trees and vegetation around your building, or green infrastructure (such as green walls, green roofs and raingardens) to provide natural cooling to your garden and home. Consider using indigenous plant species to support Kingston's wildlife.
- [ ] Design your roof to direct rainwater towards a centrally located rainwater tank. Connect the rainwater tank to all toilets in your home for re-use. Consider connecting it to laundries for clothes washing also.
- [ ] Design suitable remaining roof areas to direct towards a raingarden.

OPTIMISING PASSIVE DESIGN

Sustainable design decisions have the greatest impact, and least cost, when considered at the earliest stages of the design.

To build cleaner, healthier and more sustainable homes, it's important to incorporate passive design principles into your design early on. Passive design refers to designing in a way that responds to, and works with, the local climate and seasons to maintain a comfortable temperature in the home whilst reducing the need to use heating or cooling systems.

When designed correctly, factors such as orientation, thermal mass, insulation and glazing work together to achieve passive design outcomes.

The following focus areas will significantly reduce heating and cooling and help you achieve a more energy efficient development for less cost:

- Orientation: Locate high occupancy rooms such as living rooms on the northern side of the home (rather than bedrooms, laundries, garages). Northern aspect rooms benefit from the most access to sun and daylight, which can passively heat the space during winter and make the space more comfortable to be in.
- Orientation: Minimise window size on south and west sides of the home. Windows on the south will receive no direct sun exposure leading to heat loss, and windows on the west will receive very high sun exposure, leading to very hot rooms in summer.
- Shading: Provide horizontal shading, like eaves and pergolas, to windows on the northern side, which block the harsh summer sun, but allow the winter sun in.
- Shading: Provide operable vertical shading, like blinds and shutters, to east and west facing windows
- Thermal mass: In winter, thermal mass can absorb heat during the day from direct sunlight which is then re-radiated back into the houses throughout the night. In summer, provided the sun is blocked from reaching the mass, it keeps houses cool by drawing warmth from inside.
- Ventilation: Provide openable windows on opposite sides of a room to create natural ventilation pathways

If you are a designer, builder or if your designer and builder is not well versed in passive design consider involving an energy assessor early in the design process for expert guidance. To help you save money and headaches that would come with trying to achieve a high energy performance in a development that has not been designed with passive design principles.

For further detail regarding shading choice see Renew Magazine's buyers guide to shading here.

ENERGY EFFICIENCY

The energy efficiency suggestions essentially seek to improve the dwellings thermal performance by upgrading the dwellings thermal envelope to reduce its heating and cooling loads. Thankfully by prioritising passive design the loads will be reduced, which can then help you save money on the energy efficiency upgrades.

Energy Rating Tools

The Nationwide House Energy Rating System (NatHERS) is the most common and is specifically recognised by the National Construction Code 2022 (NCC22). It rates the thermal performance of a dwelling from 0 -10 stars, with the NatHERS website describing these ratings to mean:

- a 0-star rated home is quite uncomfortable – too hot in summer and too cold in winter. It will require a lot of energy to heat and cool.
- a home reaching a 7-star rating will need some mechanical heating and cooling to keep it comfortable to live in.
- a 10-star home is very energy efficient. It will remain comfortable year-round, with limited, or no mechanical cooling or heating.

NatHERS includes a voluntary Whole of Home Assessment which allows you to rate the choice of appliances within the home against a total annual energy use budget. The rating considers energy used for heating and cooling, and other appliances, minus the energy generated from solar PV panels. The assessment provides you with a score out of 100, where 100 represents a net zero emission home and a score greater than 100 demonstrates a climate positive home (a home that generates more renewable energy on site than it consumes).

While a NatHERS rating of 10 is the highest and best, we recommend 7 Stars or higher, with a whole of home assessment of at least 100.

There are other voluntary rating tools that you can use to target higher levels of sustainability, energy efficiency and thermal comfort, Including Passive House and Living Building Challenge.

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Windows

Up to 40% of a home's heating energy can be lost and up to 87% of its heat gained through windows.

We recommend selecting double or triple glazed windows, and opting for a timber, uPVC or thermally broken metal frame.

The 'best' windows for the development can depend on orientation, shading and the space they are serving. We recommend discussing window options with an energy assessor, as they can determine which combination of glazing and frame type will provide the best performance.

See window buyers guide for more information.

Lighting

An LED bulb produces approximately 80% less electricity to produce the same amount of light then a halogen bulb does.

Install IC-4 rated (fire rated) LED light fittings, which allow insulation to be installed directly on top of them. This will improve the efficiency of the insulation, which also means that you can achieve a higher energy rating with less insulation. See Sustainability Victoria's website for information on lighting.

Airtightness

Uncontrolled air leakage allows hot air in during summer and cold air in during winter and can account for 15 – 25% of heat loss in Australian homes. Common air leaks in new builds are found at:

- the junction of walls, floors and ceilings,
- bulkheads, including on top of cabinetry
- ducted heating and cooling return air cavities.
- around window and doors frames
- plumbing penetrations.
- down lights, exhaust fans and manholes.

See Sustainability Victoria's video covering best practice for air tightness and insulation installation here.

Insulation

Insulation helps keep houses cool in summer and warm in winter by providing a protective barrier between the outside climate and the indoor climate. The effectiveness of insulation can be greatly impacted if not installed properly. It must be consistent, not compressed and installed up against any air barrier. See video via link above.

Your desired energy rating combined with good quality efficiency upgrades will determine the level of insulation required in the roof/ceiling, walls and floor.

If constructing with a slab-on-ground foundation, it is important to provide slab-edge insulation as well as under slab insulation. It is estimated approximately 80% of the heat loss in the slab occurs through the edges.

For further information, check out Renew's Insulation Buyers Guide and see video to how it should be properly installed.

Low embodied carbon materials

Embodied carbon refers to the carbon emissions used to produce a material or product, including mining, manufacture and transport.

The embodied carbon in a building typically accounts for 15%-25% of a buildings total carbon emissions after 30 years of operation.

See YourHome and Renew for more information on sustainable selection of materials.

ELECTRIFICATION

Installing all electric appliances has many benefits, including cost savings, improved health and wellbeing and the potential to power houses entirely by renewable energy sources.

By selecting efficient electrical appliances, the amount of solar required to offset the energy use of a dwelling will be reduced.

From 1 January 2024, all new homes requiring a planning permit are required to be all-electric, and will be unable to connect to the gas network.

Appliances

Selecting efficient and all-electric appliances will improve the energy efficiency of the development and lead to energy and cost savings for future occupiers. From 1 January 2024, all new homes requiring a planning permit are required to be all-electric, and will be unable to connect to the gas network.

See energy rating website for more information and appliance buyers guide for more information.

Hot Water

Hot water systems are the second highest user of energy in Australian homes. Heat pump hot water is 3-5 times more efficient than the alternatives and can be powered by renewable energy.

Look for systems with control options that allow the occupier to select the time of day that the system heats the water. This will allow them utilise solar PV system to heat the water during the day or to run the system during off-peak times to save money (if they have off-peak electricity tariff).

See hot water buyers guide for more information.

Heating and Cooling

Reverse cycle air conditioning is the most efficient heating and cooling system available.

Reverse cycle systems come in several types, including single split, multi-heat split and ducted. The most common of these is single split systems, which allow you to cool one room or area with a higher efficiency than the alternate options.

For single split system units, select a system within 1 Star of the best available on the market.

Within the design of the builds consider how, zones can be created within houses so that the occupier can avoid heating or cooling areas that are not in use.

See electric heating buyers guide for more information.

Induction Cooktop

Induction cooking heats food quickly and evenly, while the surfaces around the pan stay cool and safe. They are safer for families and better for health and wellbeing.

Environmentally conscious consumers will look out for this as a key factor when buying a house. See induction cooktop buyers guide for more information.

Electric Vehicle (EV) charging

It's recommended that EV ready infrastructure is installed to car spaces in each unit. This will allow future owners to easily install chargers without needing to require the whole house and/or development to be upgraded.

See maximum demand guideline for more information.

Solar PV

Ideally the renewable energy generation produced on site will be greater than the energy required to operate the development. If there is not enough roof space for adequate solar to offset the operation of the development, then further thermal improvements should be implemented until the balance is right.

Also consider the design of the roof to allow for north facing solar panels or panels facing east and west orientations. Where possible allow for additional roof space so that future occupiers have the option of installing additional solar.

Residual Energy

Sometimes there simply will not be enough sunlight to generate enough electricity for the day even if home batteries are installed. Provide a climate action plan that commits the development to the purchase of GreenPower or similar for 10 years so that all electricity is produced by renewables.

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Bicycle Parking

Provide bicycle parking within your development to encourage future occupants to ride instead of drive.

Locate a power point next to the bicycle space to enable e-bike charging.

URBAN COOLING

Urban heat is the cumulative effect of urban materials capturing and radiating heat back into an urban area. On a hot day this results in elevated temperatures above the regional average temperature which can result in sickness and death.

The built environment can be designed to combat this by including:

- Light weight and light-coloured materials;
- Shading;
- Vegetation and green infrastructure;
- Improving the thermal efficiency and ventilation of existing dwellings;

Look out for Council's Urban Cooling Page currently under construction for more detail.

WATER SENSITIVE URBAN DESIGN (WSUD)

Water sensitive urban design (WSUD) is an approach to design that minimises the impact of buildings on the surrounding landscape and waterways. It makes use of rainwater on the site and reduces the amount of water that flows out to stormwater drains. This has many benefits, including increased vegetation in your garden, a cooler local environment, reduced water use (and bill savings), cleaner water flowing out to stormwater and a reduced risk of localised flooding.

WSUD solutions will be required as part of your planning permit application for two or more dwellings.

If you are doing two (2) dwellings the minimum requirement is a 2,000L rainwater tank connected to toilets for flushing.

In addition to the minimum requirements there are ways you can incorporate improved WSUD outcomes in your development including increasing the areas of permeable surfaces (surfaces that absorb water) in your garden, collecting and re-using rainwater on-site, and treating rainwater on-site with bio-retention systems.

Permeable surfaces

Permeable surface are surfaces that absorb water, such a soil, vegetation or permeable paving solutions. These surfaces assist in keeping rainwater on-site in the natural landscape, rather than shedding to stormwater drains.

Permeable pavements allow water to pass through the pavement and filter into the ground below. They are a good option for areas of ground cover that require some level of structural stability, such as walkways and driveways.

Speak to your civil engineer as some soil compositions such as clay are not suited to permeable paving.

Rainwater capture and re-use

Rainwater collected from roof areas can be diverted to a rainwater tank and stored for use within the home. Typically, rainwater tanks are connected to all toilets within a dwelling and can also be used for irrigating the garden and for laundry washing.

Collecting and re-using rainwater on-site will help reduce the amount of potable (mains) water that your home uses and reduce the risk of localised flooding.

See rainwater tank calculator for optimal water tank size calculations.

Raingardens

A raingarden is a specially designed garden bed that removes pollutants from stormwater runoff. Rainwater flows into the garden bed and filters through layers of engineered soil. The clean water is collected by slotted pipes and directed back into the traditional drainage system.

The surface traps litter, leaves and sediment while the soil helps to filter and breakdown microscopic pollutants such as nutrients, heavy metals and hydrocarbons.

Types of raingardens include:

- Planter box raingardens are elevated garden beds that collect rainwater from a diverted roof downpipe.
- In-ground raingardens are located in the ground to collect rainwater from adjacent hard surfaces or a diverted roof downpipe.

Rain gardens filter pollutants from frequent low intensity showers (95% of all stormwater runoff). Traditional drainage systems (pits and pipes) are still required to cater for large storms to prevent flooding.

For technical guidance on raingarden specifications check out Kingston's Civil Design Requirements for Developers.

WSUD during construction

Ensure your builder considers WSUD during the demolition and construction stages of your project. Measures should be taken to reduce contaminants from building materials and soils on site flowing into stormwater drains when it rains. These include:

- Keeping mud off the road and on site
- Stop mud entering the stormwater system by installing sediment traps around the drains
- Placing rubbish bins on-site to contain litter
- Locating stockpiles away from low points on the site
- Covering stockpiles with tarp or mesh to control dust and reduce runoff
- Retaining existing vegetation on site.

See the EPA website for further information regarding WSUD in construction here.

QUESTIONS TO ASK YOUR BUILDER

If you are committed to implementing a high quality design and employing a builder to carry out the build to the standard that you are committed to we recommend asking the following questions when selecting your builder:

- Air Sealing: Can you guarantee appropriate sealing levels? Are you willing to do a blower door test? Can trades work together to seal the vapour barrier?
- Insulation: Can your installer guarantee good coverage? Can your installer take appropriate safety precautions?
- Passive solar design: is the architect, designer or builder integrating passive solar design principles into the development? Do you have a regular energy assessor and are they happy to get involved early in the design?
- Sourcing materials: are your materials bought locally? Is the timber from sustainable plantations? Do you ever re use or recycle non-toxic materials? Do you have any good low embodied carbon material recommendations?
- Waste: What is your waste minimisation strategy?
- Windows: how are the windows going to be shaded in summer? What material is the window frame? Can we have thermal breaks in the window if aluminium?

For further info on questions to ask you builder see Sustainability Victoria.