

Apartments and Multi-unit Housing

Apartments are dwellings that are stacked vertically as well as horizontally. Multi-unit housing includes clustered and row, or terrace, housing. Both dwelling types offer additional challenges and opportunities for passive and sustainable design compared with individual dwellings.

Apartments are in a different category from domestic dwellings in the Building Code of Australia with stringent demands placed on fire and noise separation. Issues of privacy and overlooking and consideration of the role of private and common spaces, are inherent in multi-unit and apartment design and it is important to understand their relationship to both passive design and social aspects of sustainability.

SOME DESIGN ADVANTAGES

There are some inherent advantages to building with shared walls and floors as, overall, there will generally be proportionately less building envelope per dwelling and each dwelling may have a smaller external area of wall or roof exposed to heating and cooling loads from the environment. Passive design principles can be applied to these building types to great effect provided the constraints of fire and noise separation are addressed early in the design process.

The same passive principles apply of maximising cooling air movement and excluding sun in the hot months, trapping and storing heat and minimising heat loss to the external environment in cooler months.

A variety of dwelling types encourages diversity in the social mix and offers multiple design opportunities for different sustainable strategies.

SUSTAINABLE COMMUNITIES

Apartments and multi-unit housing are medium or high density buildings that generally fit best in urban environments. There are some examples, mostly overseas, of developing clustered dwellings on peri-urban or semi-rural sites where the strategy is to minimise the buildings' physical footprint and release more land area for vegetation and social amenity.

The density of apartment and multi-unit housing developments make them well suited to urban environments and they should be located close – ideally within walking distance – to shops, playgrounds, parks and other amenities. This improves social amenity for the residents and contributes to minimising motorised transport use, reducing greenhouse gas emissions (and road traffic accidents).

Apartment buildings can include services that support and encourage an active community such as gyms, swimming pools and also facilities such as laundries and community rooms.

SAFETY AND SECURITY

Alongside 'passive design', 'passive surveillance' should be a watchword in multi-unit dwelling design. A pedestrian dominated environment can be intrinsically safer than one dominated by motor vehicles, but care must be taken to ensure that there are no places that allow hidden loitering.



Unfriendly, fearful, socially alienating.

The individual design of all higher density dwelling units should adopt the principles and recommendations contained in the fact sheets on Safety and Security. [See: 3.4 Safety and Security]

STREETSCAPE

There is nothing more alienating than rows of houses hidden behind two metre high fences blocking passive surveillance of the street from the dwellings whilst giving passers-by no sense of whether the homes are occupied or not. Healthy communities are ones in which positive social interaction is encouraged and this can be facilitated by appropriate design, eg. fences low enough to talk over and placing mailboxes in shared community spaces that are conducive to casual conversation and have seating that feels safe and protected.

Spaces for informal social interaction may be set in common areas that are outside, as well as indoors. As well as being pleasant places to share drinks and chat, attractive garden environments can be places for active participation, managed directly by residents.

SUSTAINABLE LANDSCAPES

The extent of landscaping associated with these dwelling types varies considerably, ranging from environments dominated with hard surfaces with very limited plantings to leafy, substantial vegetation surrounding and dominating the immediate external





Sustainable landscaping can be at the heart of a sustainable community.

environment. There are many opportunities to integrate sustainable landscaping practices into medium and high density developments (particularly as appropriate management can be maintained through strata and community title corporations), including:

- > Low water use vegetation.
- > Water sensitive design.
- > Community produce gardens.
- > Green roofs, roof gardens and living walls.

TRANSPORT

It has been said that the quickest way to get from 'A' to 'B' is to build 'A' right next to 'B'; sustainable city advocate Richard Register calls this 'access by proximity'. Higher density dwellings can place more people close to shops, schools and other daily destinations with greater economy than conventional low density sub-divisions and make public transport more economically viable.

ACCESSIBILITY

As with all modern homes, higher density dwellings need to be healthy and adaptable. In the case of apartments and most multi-unit dwellings the need for 'vertical circulation' can be a dominant consideration. Although apartment buildings can be designed as 'walk-ups' this results in access problems for all but the most able people – any of whom may themselves be disabled at any time by a vehicle accident or illness. The provision of lifts addresses the issue of access but they add costs and require additional operational energy. They also have on-going running costs that can be quite high. Lifts should be selected for their energy efficiency.

In multi-storey housing the stairs should be 'future-proofed' by being designed to readily accept 'stair climbers' or similar devices.

Every effort should be made to design lift and stair areas as attractive places and not just as utilitarian spaces. When making landings for walk-up apartments ensure that they are wide enough for people to stop and chat whilst allowing others to pass.

- > Regard all common areas as potential social space, including stairs and stairwells.
- > Make private balconies and outdoor areas as generous as possible.
- > Consider using the roof area for a green roof (for environmental reasons) or accessible roof garden (for both environmental and social benefits).

ORIENTATION

Although it is not always possible to obtain optimum orientation in more urban, higher density environments, the correct positioning of apartments and multi-level dwellings can greatly assist passive design and cooling.



Consider making balconies as generous as possible.

PASSIVE DESIGN

Just as with individual homes, incorporating the principles of passive design in apartment and multi-unit housing:

- > Significantly improves comfort.
- > Reduces or eliminates heating and cooling bills.
- > Reduces greenhouse gas emissions from heating, cooling, mechanical ventilation and lighting.

Whereas the passive design of a single dwelling on its own block usually (but not always) benefits from an uncrowded aspect in all directions, the massing or clustering of multiple dwellings can contribute to improved environmental performance and the comfort of their occupants in a number of ways, including:

- > Creation of courtyards that can provide shelter from inclement weather or create suntraps in cooler weather.
- > Enabling more dwellings in multilevel buildings to have solar aspect.
- > Providing shade to adjacent dwellings that assist in reducing overall energy use.

Passive design is design that does not require mechanical heating or cooling but in apartment buildings this is not always easy to achieve. Homes that are passively designed take advantage of natural energy flows to maintain thermal comfort and multi-unit housing can also do this with good design.

With apartments, various building code requirements can impact on strategies for passive design, for instance, thermal flues for passive cooling can induce fire pathways and be contra-indicated, thus needing particular attention to be paid at the design stage.

When it is necessary to use mechanical ventilation this should be designed to be as energy efficient as possible.

It is always possible and is advisable to provide passive ventilation to habitable rooms – openable windows can be very effective.

SHADING

Shading should be dealt with according to the same principles that apply to detached homes. With multi-level buildings it may be desirable to use shade to protect the whole façade but the practicality of this depends on other aspects of the design. Balconies and shade structures may be used rather than reliance on eaves.



An apartment building where the eaves shade the whole north façade during the middle part of the day.



An apartment building that uses shade structures over otherwise exposed balconies.

PASSIVE SOLAR HEATING

Where it is possible to maintain good solar exposure, passive solar heating of apartments and units should be easily achieved. Where there are difficulties with aspect, as is often the case in tight urban environments, design to first principles, bearing in mind that both east and west sun can be used for solar gain and that in many Australian climates it may be beneficial to have southern aspect during the hottest months.

RENEWABLE ENERGY

Photovoltaic panels are less cost effective on apartment buildings as there are more dwellings per site area compared with the roof area available to carry the panels. Nevertheless, the provision of PVs can be very worthwhile as the energy captured can be used to offset the energy use and other running costs of community or strata corporations for common areas and services.

Incorporating PVs into the fabric of the building as functional cladding helps to amortise the investment in them by giving them multiple functions.



Skylit central stair and liftwell uses integrated semi-transparent PVs as roofing material.

Solar hot water systems can be used for multi-unit and multi-level buildings but consider the use of heat pump systems. A good service engineer can be very helpful when it comes to establishing which kind of hot water system is really the most cost and energy efficient for a given project.

FIRE ISSUES

Fire regulations may determine outcomes that seem to be less than ideal from a sustainability perspective. It may not be possible, for instance, to ensure that all bathrooms and wet areas can have both natural light and ventilation. Given the short occupancy periods of wet areas generally, and the tight constraints on space planning typical of the kind of denser dwelling type represented by apartments, the trade off from resorting to mechanical ventilation may be justifiable.

Lightwells and atriums need careful design consideration if there is to be any attempt to use them as part of a passive design strategy. It is advisable to explore this sort of issue early in the design process and discuss options with both service engineers and building certifiers.

THERMAL INSULATION

The Australian Building Code has only recently begun to demand thermal insulation in apartment buildings. Consider building with insulation in excess of the current code requirements to improve building performance and ensure that the building remains competitive in its thermal performance during its anticipated lifetime.

THERMAL MASS

Multi-storey buildings often require dense concrete cores, particularly for elements like stair and lift wells. Multi-unit dwellings demand good fire separation that is often most economically and effectively provided by using concrete construction whether pre-cast, in-situ or as blockwork. In each case the high density concrete elements can provide excellent thermal mass. Its situation in the core of an apartment or as party walls in well insulated houses is good placement for thermal mass and should be incorporated as such into the overall design strategy.



Dense precast concrete panels provide structural support and appropriately located thermal mass for this five storey apartment building, seen here under construction.

WINDOWS AND GLAZING

Double glazing is advisable for all climate zones. As well as providing thermal insulation it provides additional acoustic insulation that can be a real asset in denser, urban environments.

Openable windows require careful consideration in multi-level buildings and there are often regulatory controls over the extent to which windows may be opened. Consider using vertical sliding sashes for maximum control over ventilation options (the extent of low or high opened area can be adjusted to suit weather conditions and individual comfort requirements).

CONSTRUCTION SYSTEMS

There are many construction systems available for apartments and multi-unit buildings ranging from frames to load-bearing walls. Having decided on a general approach, whichever construction system it is should be reviewed against the Your Home checklist to ascertain what might be achieved in regard to passive design.

MATERIALS

Materials selection should take into account embodied energy, waste minimisation, indoor air quality and impacts off-site.

APPLIANCES AND LIGHTING

Most apartment and multi-unit housing projects have a main developer who has purchasing powers unavailable to individual home owners. This power can be used to preferentially purchase energy and water efficient appliances and fittings.

STORMWATER

Stormwater can be captured and stored in underground tanks but it will necessarily only be an adjunct to the overall water supply whereas the roof of an individual dwelling in many parts of Australia can shed enough water to provide a significant part of that home's required supply. The amount of water shed by the roof of a single dwelling with a floor area of 260m² can be the same as that shed by the roof of a compact apartment building with a dozen or more dwellings within its envelope on the same footprint.

GREYWATER AND BLACKWATER

Capture and treatment of greywater and blackwater may be more economically viable for larger developments on the basis of a collective system. However, there is a threshold at which such systems become economically efficient and this should be clearly established before proceeding with design.

LANDSCAPING

As with individual dwellings, the landscape should be considered as much as possible to be integral with the building. Multi-unit developments often have high car parking demands that may conflict with the provision of a sustainable landscape. A preferred design strategy must be to de-emphasise the car and emphasise the pedestrian domain. If roads and driveways are inescapable, then they should be designed to be multi-user friendly, perhaps with surface treatments and designs that favour pedestrians over wheeled vehicles.

RATING TOOLS

As of early 2008 there are no rating tools for Australia that deal specifically with apartment buildings, although there are some tools under development. In the meantime it is possible to obtain formal ratings for apartments by using tools like AccuRate, as has been done for case studies in this Technical Manual, but they do not take into account the context of each apartment as part of a larger building and therefore may not fully reflect some of the energy benefits of this building type.

ADDITIONAL READING

Contact your State / Territory government or local council for further information on passive design considerations for your climate.
www.gov.au

Australian Bureau of Meteorology
www.bom.gov.au/climate/environ/design/design.shtml

Commonwealth of Australia, *Australian Model Code for Residential Development* (AMCORD) (1995), AGPS Canberra.

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