SDAPP
Sustainable Design Assessment in the Planning Process
10 Key Sustainable Building Categories

Bayside City Council

1.0

Indoor Environment Quality

Building design for a sustainable future

What's included in this fact sheet:

Improving the indoor environment quality at home and in the workplace will generally enhance well-being and reduce the likelihood of ill-health. Through the implementation of passive design principles, good indoor environment quality also leads to energy savings due to reduced energy demands for heating, cooling and artificial lighting.

This fact sheet recommends ways to improve indoor environment qualities through informed building design and product and materials choices.

Why is good Indoor Environment Quality so important?

Australians spend on average 90 percent of their time indoors. And with indoor environments having a direct impact on our wellbeing and our health, it is important to ensure a good indoor environment quality in both our homes and offices. In fact, the CSIRO has estimated that the cost of poor internal air quality in Australia may be as high as $12 billion per year due to mental and physical ill-health and lost production.

Those most at risk are people with weak immune systems, including children and the elderly. While most will only ever experience medium health effects such as headaches or tiredness, others may suffer more serious health effects due to "sick" buildings. On the other hand, studies also show that an enhanced indoor environment quality in offices can be linked to staff's improved work performance and reduced sick leave.

Council's experience shows that good indoor environment quality has become an important criteria for not only those who are developing their own homes but also for savvy developers, who understand today's market demands.

What defines Indoor Environment Quality?

The quality of an indoor environment (e.g. a room) is commonly defined through the following main factors:

- Light – does the room receive enough daylight throughout the day and is comfortable artificial lighting provided for all other times?
- External views – does the room allow for distant views that provide a connection to the external environment?
- Air quality – does indoor air contain sufficient levels of oxygen and acceptable levels of pollutants from internal or external sources?
- Ventilation – can the room be sufficiently ventilated (preferably naturally but where this is impractical, mechanically) and provide occupants with quality fresh air?
- Thermal comfort – is the room sufficiently insulated, shaded and conditioned to ensure comfortable temperatures throughout the year?
- Noise – is the room sufficiently insulated from external noise sources and does it minimise internal reverberation and noise levels?
- Occupant control – are occupants able to control their environment, e.g. through the opening and closing of windows and blinds and operating heating and cooling services?
- Materials – do the chosen building materials and finishes have low levels of Volatile Organic Compounds (VOC) and other hazardous components?

If you were able to answer all questions with 'yes', the room that you were referring to provides high indoor environment qualities.

Design criteria for improved Indoor Environment Quality

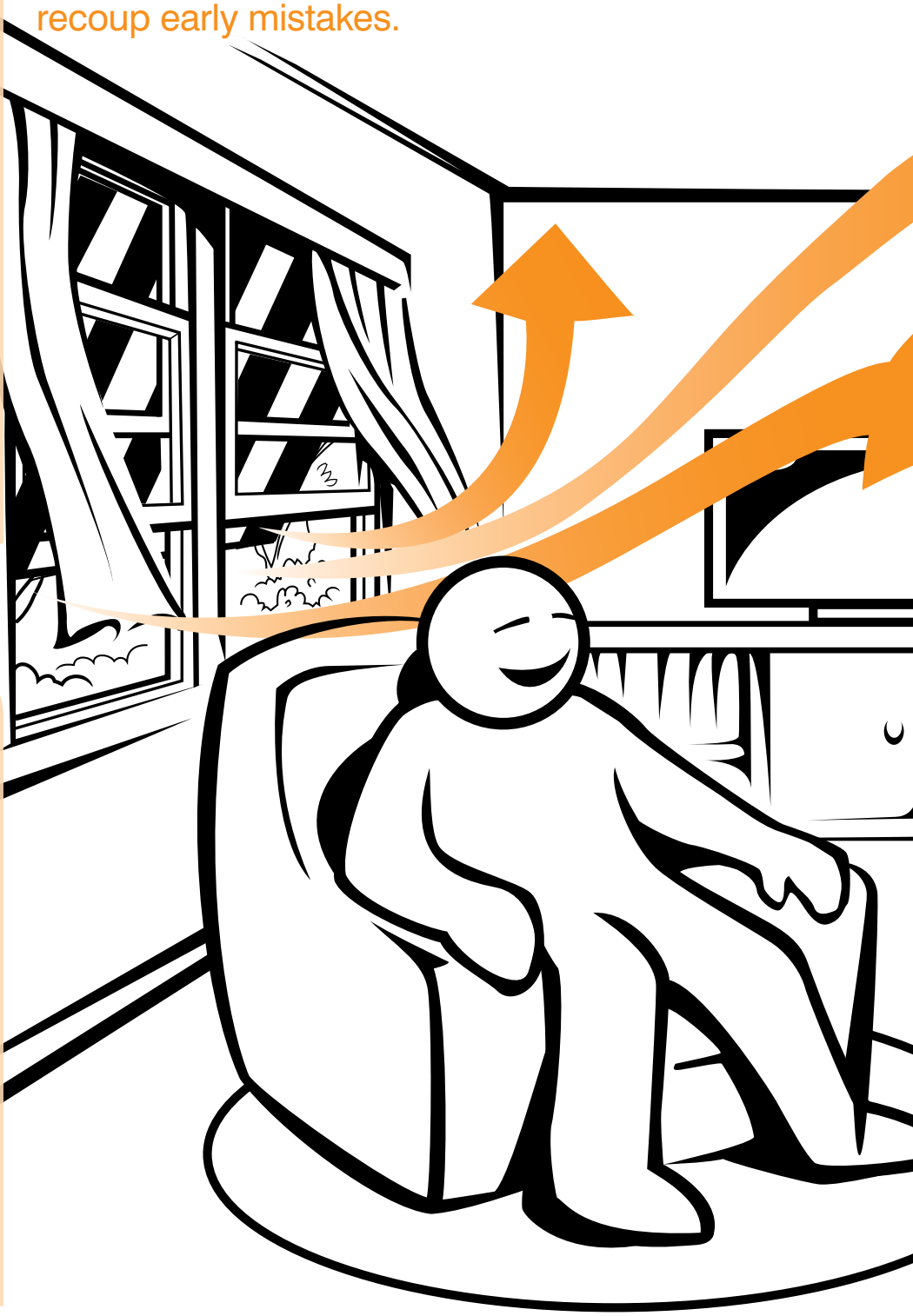
Ventilation

Whether via natural or mechanical means, Council recommends substantially exceeding minimum requirements for window opening sizes and air exchange rates under the Building Code of Australia.

In homes, the most effective ventilation is achieved through natural cross ventilation. The ideal layout features openable windows located in opposite walls, which creates a breeze path to let in fresh air and flush out stale air. Note that cross ventilation can be achieved through various façade openings, be it standard windows, operable skylights or even small solid doors.

In office buildings, air change effectiveness is important to ensure good quality air. Carbon dioxide levels should be regularly controlled to ensure a healthy and productive work environment. In smaller offices, natural ventilation is also a great way to save energy and cater for individual's differing comfort needs.

Council recommends carefully considering all aspects of good indoor environment quality during a project's early design stage. Experience shows that early design decisions make the greatest impact on future occupant's wellbeing and only expensive technologies and product choices can recoup early mistakes.



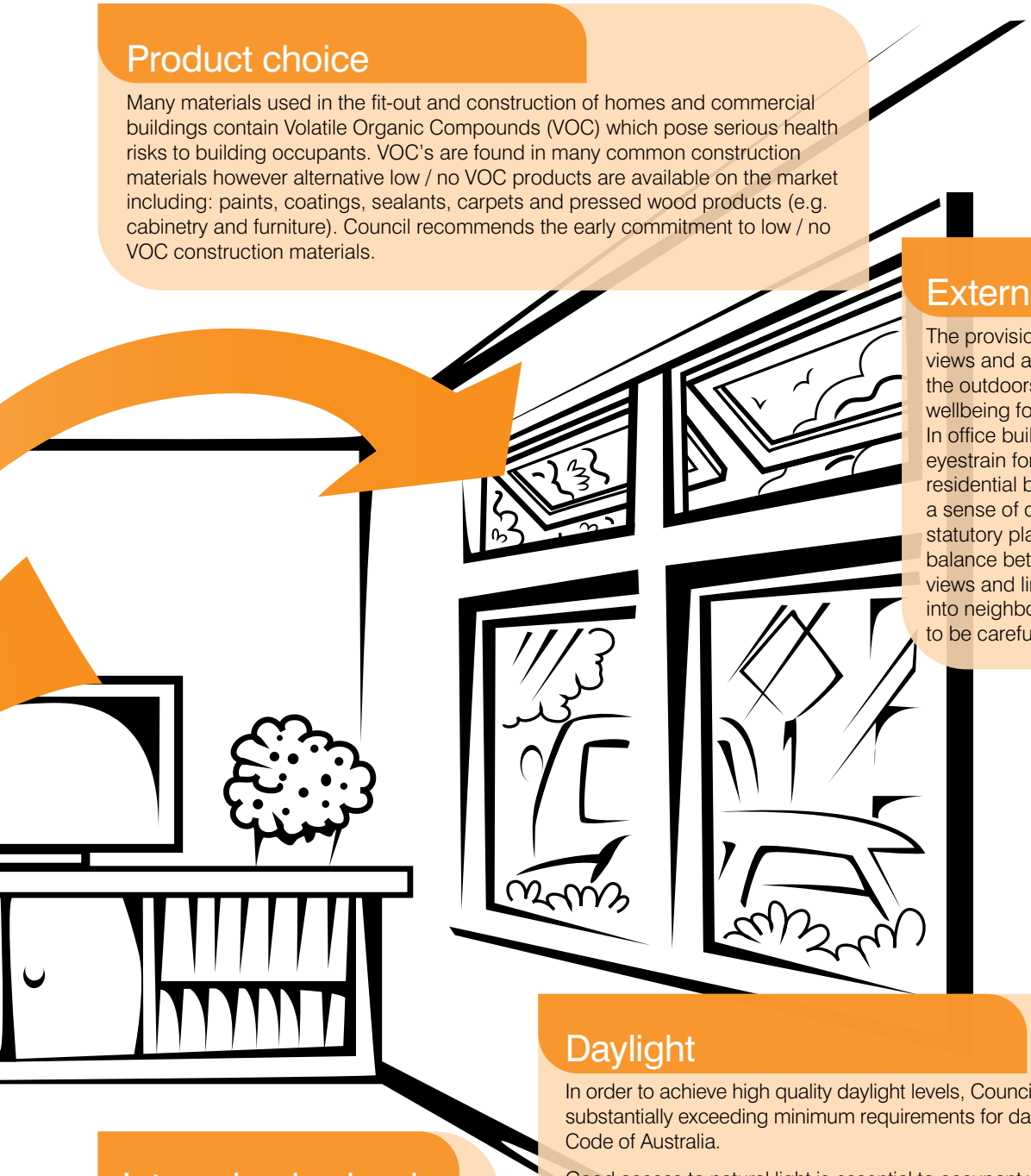
Thermal comfort

Thermal comfort describes the temperature and humidity range in which humans feel comfortable. This range can fluctuate by many degrees and percentages, depending on activity levels, clothing, annual seasons and personal preferences.

Environmentally sustainable buildings provide thermal comfort levels with little reliance on mechanical heating and cooling systems. This is commonly achieved through sensible orientation, good insulation, effective ventilation and flexible external shading. In order to respond to changing weather conditions throughout the year and different user patterns, occupants should be provided with sensible controls of both active and passive systems to ensure good thermal comfort.

Product choice

Many materials used in the fit-out and construction of homes and commercial buildings contain Volatile Organic Compounds (VOC) which pose serious health risks to building occupants. VOC's are found in many common construction materials however alternative low / no VOC products are available on the market including: paints, coatings, sealants, carpets and pressed wood products (e.g. cabinetry and furniture). Council recommends the early commitment to low / no VOC construction materials.



External views

The provision of long distance views and a visual connection to the outdoors commonly increases wellbeing for building occupants. In office buildings, views can reduce eyestrain for computer workers; in residential buildings views provide a sense of connectivity. Due to statutory planning provisions, the balance between sufficient external views and limiting the overlooking into neighbouring properties needs to be carefully considered.

Daylight

In order to achieve high quality daylight levels, Council recommends substantially exceeding minimum requirements for daylight under the Building Code of Australia.

Good access to natural light is essential to occupant wellbeing and employee performance. Daylight is vital for body functions, gives us a sense of time and place and connects us to our environment. Therefore, habitable rooms with 'borrowed light' should be avoided.

Daylight is the combination of direct and indirect (reflected) sunlight. Therefore, on an overcast day, south facing windows will receive just as much daylight as north facing windows. High level windows will throw daylight deep into rooms, that's why they are particularly useful for deep floor plans.

It is also worth noting that the provision of daylight in living and working spaces reduces energy consumption. This is due to a reduction in the use of air-conditioning, associated with the heat generated by artificial lighting. However, in office environments, daylight has to be carefully balanced with possible glare as this strains our eyes.

Internal noise levels

Excessive noise generated by neighbours, traffic and hard surfaces that reflect internal sounds (echo) can impact occupant's amenity and employee's productivity. In order to ensure comfortable noise levels, Council recommends considering the inclusion of acoustic insulation to internal and external walls, double-glazing to windows, landscaping that buffers traffic noise and a good balance of internal hard and soft finishes.

Guidelines for improved Indoor Environment Quality

Balancing Indoor Environment Qualities

Designing for a high indoor environment quality can be challenging as all criteria need to be addressed while some may even contradict each other. Windows in particular need to be carefully designed - they influence access to daylight and ventilation, create heat gains in summer and losses in winter and provide a visual and acoustic connection to our immediate environment.

Another example is the choice of internal finishes. They not only impact on internal sound quality but also influence a room's thermal comfort, light reflectivity and air quality.

It is therefore important to understand and carefully balance individual design and product choices upon the benefits and disadvantage for different indoor environment quality criteria. If in doubt, we recommend talking to a sustainability expert and focusing on a project's key indoor environment quality goals.

Mandatory Requirements and Council's Best Practice Standards

Mandatory Requirements
You must meet the National Construction Code (NCC) requirements for ventilation, daylight, energy efficiency, and;

The objectives and standards of the local planning scheme.

Council's Best Practice Standards

- Habitable rooms of single-aspect apartments should be limited in depth to 8 metres from a window.
- Achieve a minimum daylight factor of 1% for 90% of the floor area in each living area including kitchens, and a minimum daylight factor of 0.5% for 90% of the floor area for each bedroom. A daylight modelling report for large scale developments may be required.
- For non-residential developments, achieve a daylight factor of at least 2.0% for at least 30% of the floor area of regularly occupied primary spaces.
- Design living areas and private open spaces so that at least 70% of apartments in a development receive a minimum of three hours direct sunlight between 9am and 3pm in mid winter.
- Limit the number of apartments with internal bedrooms to a maximum of 10% of the total apartments proposed.
- Design for all dwellings to be effectively naturally ventilated, either via cross ventilation, single-sided ventilation or a combination.
- Design for at least 60% of a development's dwellings to be cross ventilated.
- For adequate single-sided ventilation, room depth to be no more than 5m.
- For adequate cross-ventilation: The length of the breeze path should be a maximum of 15 metres. Ventilation openings should be at least 1m2. Ventilation openings on adjacent walls should be at least 3m apart. There should not be more than 1 doorway or opening between ventilation openings. Any doors in the breeze path should be provided with door catches. Where the doorway is a front door, a security screen door must be provided.
- Locate external noise sources to prevent acoustic impacts to openable windows.
- Design external shading devices to provide protection from summer sun angles and respond to different façade orientations.
- Provide openable external windows to circulation corridors and lift lobbies to facilitate natural ventilation and daylight.
- Avoid the use of light courts for daylight provision to habitable rooms.

Developments, which seek to vary from these best practice standards, must demonstrate how indoor environment qualities can be satisfactorily achieved.

Where can I find out more?

Technical Manual Passive Design
Your Home
www.yourhome.gov.au

Better Apartment Design Standards
www.planning.vic.gov.au/policy-and-strategy/better-apartments/better-apartments-design-standards

Toolbox and other info
Sustainability Victoria
www.sustainability.vic.gov.au

WELL Building Rating tool
www.wellcertified.com

GECA (Good Environmental Choice Australia)
www.geca.org.au

Best Practice IEQ Guidelines
Green Building Council of Australia
(Download the applicable rating tool).
www.gbca.org.au

Other Fact Sheets in this series are also available to provide guidance on the 10 Key Sustainable Building Categories. For further information on Indoor Environment Quality, consider the Fact Sheets entitled:

- Energy Efficiency
- Building Materials
- Urban Ecology
- Sun Shading

ACKNOWLEDGEMENT: The MAV acknowledges the five IMAP (Inner Melbourne Action Plan) councils – the Cities of Yarra, Port Phillip, Melbourne, Stonnington and Maribyrnong – for their leadership in producing this suite of Fact Sheets to enable a more liveable and sustainable built environment.