



Natural Light / Daylighting

Overview

Daylighting refers to the application of natural light in an internal environment. Ensuring adequate levels of daylight reaches in the dwelling can reduce the need for artificial light and lead to energy savings. Beyond this, the liveability benefits of improved natural light in the home may include:

- Physical and psychological health benefits
- Economic savings due to reduced reliance on artificial lighting and reduced dwelling energy costs

Previous research has shown the beneficial social and psychological effects of building designs which feature natural light and views of natural surrounds, including reduction in stress, better emotional health, improved communication and a sense of belonging to a community or place [1] [2] [3] [4].

To reduce any potential negative impacts of daylighting, such as glare and heat retention, care must be taken to balance daylight penetration against solar heat gain wanted or otherwise. Knowledge of the sun's path (sunrise to sunset) is essential for planning and assessing the effectiveness of daylighting strategies. Design should be flexible and adaptable to accommodate for different lighting desires. For example, optimising morning (eastern) sunlight is generally preferable to afternoon (western) sunlight, especially in kitchens and dining areas. Indirect light on the southern side of the dwelling, or filtered light on the northern side, is often preferred and may be important to those who work from home or who spend the majority of their time in the dwelling during the day.

"As humans we need fresh air and daylight when we are indoors. It has a positive effect on our health and well-being as well as our ability to learn." [5]

Reduced reliance on artificial lighting can lead to energy savings. An MIT study revealed artificial lighting accounts for approximately 25-40% of energy consumption in a typical building. [6]

What our Findings Revealed...

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Satisfaction with natural light

Residents in the QUT High-Density Liveability Study were generally satisfied with natural light in their dwelling. Only 13% of residents made modifications or adjustments to the outside of their dwelling (sunshades/external shading) and only 3% had enclosed balconies. Interviews with residents in inner-city high density dwellings provided further insights into the importance of natural light, or daylighting, for reasons of aesthetics as well as thermal and lighting comfort.

Balancing wanted verses unwanted daylight

Residents recognised advantages of daylighting in their dwelling yet were also mindful of the negative impacts of heat from the sun, particularly at certain times of the day (e.g. afternoon) and times of year (e.g. summer).

Yes [natural light here is] good, the only real problem is that two months in summer time, for about a couple of hours in the afternoon, you get the western sun going over the TV towers there. It gets a bit hot but other than that, it's perfect.

To achieve optimal daylight, many residents either wished they could change the dwelling to allow more light inside or worked within the constraints of their dwelling by using shades and blinds to manipulate and direct natural light. Residents were also very aware of the importance dwelling orientation played in daylight penetration.

It's designed well for breezes but the lounge room, living area is on the west facing wall so one of the first things I did was put up block out blinds along that wall because we'd get really hot from the full sun.

It's excellent. Because we get mainly southern light...[U]nfortunately we don't get direct sunlight until the afternoon because the sun comes over this way.... So it would have been nice to get more sun maybe in the morning, but there's not much we can do about that.

I'd like to poke a hole in the ceiling and let some light in but you don't want to break the membrane up above otherwise if water gets in causes you grief and all sorts of structural things.

Natural light and feelings of comfort

Natural light was not only associated with sunlight and heating but also with a 'feeling' of more open space, therefore creating a more comfortable, liveable and aesthetically pleasing dwelling interior. One resident indicated this can also be achieved by changing the internal colour and decor of the dwelling.

[I] changed the colour scheme) because before it was all chocolate and brown and it was just too dark. I needed the lights on during the day. We just changed it all to white and brightened it up. It's made such a difference. Before it was depressing walking in and we had the lights on all day. I hated it. Whereas now we don't need [lights on during the day].

Balconies – allowing connection to daylight

Maintaining a connection to the outdoor environment is an important need for high density residents. This could be achieved through open windows and balcony areas. Many interviewees identified the balcony and associated open space and views as their favourite design feature of the dwelling.

I think (my favourite design feature of this apartment is) the balcony and the glass windows because it's private... (and) just the open space of it.

I think our apartment definitely gets enough sunlight as we are on the second floor with a balcony that opens up.

Recommended Guidelines

The following table presents practical suggestions for Residents, Building Managers, Designers and Developers in relation to daylighting and maximising natural light in the dwelling.

	Residents	Building Manager	Designer	Developer
Face living areas towards the north or east where possible and open to a terrace, verandah or garden area.			✓	✓
Use materials that admit sunlight but exclude the sun's heat without making adjacent interiors too dark during the day. For example, polycarbonate in double or triple layers is useful for skylights, awnings, balustrades and privacy screens.			✓	✓
Investigate architectural and horticultural strategies for reducing summer glare and direct light penetration into the dwelling; Trees shading the north of buildings can reduce energy needs in summer by providing cooling. Depending on their height and distance from the building, such trees may need to be deciduous so that electricity use in winter is not increased by demand for warming, and for day-lighting. Trees on the south may increase electricity use, particularly in winter months, if their shade causes people to use artificial lighting during the day.	✓	✓	✓	✓
Incorporate adjustable external screens to allow residents to modulate the sun's heat and light according to the time of day or the season of the year.	✓		✓	✓
Ensure natural light is available to utility areas such as bathrooms and laundries.			✓	✓

Maximise opportunities for natural light in stairwells and shared corridors. However, ensure that light is even and avoid situations where people in corridors are 'back lit' as it is difficult to recognise faces in such conditions, and compromises feelings of personal safety.		✓	✓	✓
Educate occupants about climate control	✓	✓		

Further Information

Sustainable Homes Brisbane

<http://www.sustainablehomebrisbane.com.au/DESIGN.htm>

Skylight Industry Association

<http://www.siai.com.au/>

Your Home Technical Manual and Website

<http://www.yourhome.gov.au/>

Level – The Authority on Sustainable Buildings

<http://www.level.org.nz/passive-design/daylighting/>

Cleaner Greener Buildings – Qld Government Legislation

http://www.climatechange.qld.gov.au/_data/assets/pdf_file/0003/25626/3_P-and-B_-_E1_web.pdf

References

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3. Heerwagen, J. and L. Zagreus, *The Human Factors of Sustainable Building Design: Post Occupancy Evaluation of the Philip Merrill Environmental Center*. 2005, US Department of Energy Building Technology Program. p. 1-26.
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