Climate-adapted Building Envelopes

Description

Designing according to the local climate can help mitigate overheating. This can be through lightcoloured surfaces and manoeuvrable shading mechanisms. These passive methods can reduce energy consumption.

Key Pointers

- Investment cost vs. trade-off against energy bills should be considered.
- Allows for simple strategies to have a significant impact.
- Appointing a specialist consultant at the early stages of building design can help identify strategies for including climate-adapted building envelopes. Rating tools like Green Star and NABERs also recognise and encourage innovative methods.

Case Study

Larapi Child and Family Learning Centre, NSW



The school features a light-coloured façade and sinuous brick walls, which aid in reflecting solar gains and provide an environment that is not overstimulating to occupants.

Source: Larapi Child and Family Learning Centre / JAWS Architects | ArchDaily

Passive Solar Design

Description

Queensland is known to experience high solar gains. Relying on mechanical systems to reduce the gain can result in high energy consumption rates. Passive measures such as shading and orientation help reduce the gain.

Key Pointers

- Solar gains can be manipulated to create a comfortable environment for occupants.
- Design strategies should optimise daylight whilst reducing overheating.
- Designing passively reduces energy consumption and, in turn, energy bills

Case Study

German International School, NSW.



The school adopted three modular classrooms by Knut Menden, which featured triple-glazed windows. This passive measure increased the upfront cost of the building but reduced the classrooms' solar gain, which will reduce cooling consumption.

Source: PASSIVBLOG: Healthy Schools and Classrooms — Australian Passivhaus Association

Breathable Fabric

Description

Air tightness controls a building's breathability. A breathable fabric aids airflow and indoor air temperature and reduces reliance upon mechanical systems. This is a passive method of design that can have a high impact.

Key Pointers

- Innovative methods promoting breathable fabrics can bring recognition to future school designs.
- Appointing a specialist consultant at the early stages of building design can help identify strategies to include breathable fabrics.
- Rating tools like Green Star and NABERs also recognise and encourage such innovative methods.

Case Study

UQ Global Change Institute, QLD, has a breathable fabric, which means there is zero reliance on a mechanical ventilation system. This is implemented through louvres, which direct airflow throughout the offices and into the atrium. It also features a high-tech synthetic compound roof that is weather resistant and actively reacts to daylight.



Source: A living building - Global Change Institute - University of Queensland (uq.edu.au)

Passive Cooling

Description

Exploring passive cooling methods at the design stage is a lean way to reduce energy consumption. With the expected temperature increase due to climate change, adopting passive methods will have a long-lasting effect.

Key Pointers

- Reduces reliance on refrigerants, which greatly contribute to greenhouse gas emissions.
- Should be the first design route to reduce reliance on mechanical systems.
- Ensuring passive cooling techniques are effective requires thermal modelling. A sustainability consultant can provide this.

Case Study

UQ Advanced Engineering Building, QLD



The building exhibits a - 'passive cooling system' consisting of a labyrinth and phase change materials to cool the air entering the building, coupled with natural ventilation.

Source: Green star approval for new engineering facility - UQ News - The University of Queensland, Australia

Passive Ventilation

Description

Passive ventilation strategies enable optimum air movement and reduce mechanical systems and cooling requirements.

Key Pointers

- Investigating passive ventilation schemes at the early design stages reduces energy bills at the building's in-use stages.
- Reduce energy consumption.
- · Increase air flow.
- Ensuring passive ventilation techniques are effective requires thermal modelling. A sustainability consultant can provide this.

Case Study

Hingaia Penisula School, NZ



PassivHaus certification promotes passive ventilation methods. An example is Hingaia Penisula School, where a roof structure of vented battens was proposed. The structure ensured airflow was unimpeded through the roof cavity, promoting natural ventilation.

Source: VENT Passive Ventilation System on School Skillion Roof (ventsystems.com.au)

Building Fabric Optimisation

Description

Optimising the properties of the building fabric through material selection helps reduce the reliance on building services within the building, reducing the overall energy demand.

Key Pointers

- Innovative methods in building fabric design can result in awards and recognition for schools.
- Optimising building fabric is a passive method to reduce energy consumption.
- Optimising building fabric through thermal modelling at the early stages of design can help build a cool and healthy building. A sustainability consultant can assist with this.

Case Study

The Hills Grammar School, NSW



The installation of Veridian glass aids in the prevention of overheating. The properties of the glass help reduce the impact of solar gains.

Source: Australia's Most Sustainable Schools | 5-Star Sustainable Programs 2023 | The Educator K/12 (theeducatoronline.com)

Air Quality

Description

High air quality is crucial for occupants' well-being. Ensuring sufficient fresh air supply and minimal pollutants aids both the occupant and the building.

Case Study

Covid sparked the need for better air quality in indoor spaces. The balance between sufficient fresh air and overheating due to external air temperatures sparked a new conversation. Ventilation audits are needed to ensure that air quality is consistent.

Key Pointers

- Good air quality is likely to increase occupants' performance.
- · Prevents damp, mould and high humidity.
- · Requires regular system maintenance.
- It is important to record and monitor air quality parameters regularly to maintain quality.

Queensland schools told to boost natural airflow to limit COVID, but experts say it is not enough

ABC Radio Brisbane / By Antonia O'Flaherty Posted Tue 18 Jan 2022 at 7:00am, updated Tue 18 Jan 2022 at 11:55am

Source: Queensland schools told to boost natural airflow to limit COVID, but experts say it is not enough - ABC News

Daylighting

Description

Daylight is essential to occupants' performance. High levels of daylight reduce the building's reliance on artificial lighting; however, it can have a negative impact on the cooling demand in regard to solar gain.

Key Pointers

- It is essential to consider the trade-off against cooling consumption.
- Lightwells and windows should be designed with internal/external shading devices to avoid glare.
- External shading objects may cause restrictions to daylight.
- Consultants can carry out daylight performance modelling to ensure sufficient daylight in internal spaces.

Case Study

GBCA Green Star - Education tool has a credit for daylighting, emphasising its importance in indoor air quality. Daylight modelling is required to achieve compliance.



Source: Green Schools_Lowres.pdf (gbca.org.au)

Space Layout and Orientation

Description

Consideration of the layout and orientation of spaces and buildings is important to reduce glare, high solar gains, and reduce the need for mechanical cooling.

Key Pointers

- Designing in line with the build's orientation optimises passive ventilation and cooling methods.
- Reduces energy consumption and, in turn, financial savings.
- Early design stage modelling can help achieve optimal energy reduction building orientation. A specialist consultant can aid with this.

Case Study

Australian governmental advice on home orientation is available online. The content highlights methods to maximise the amount of daylight during winter and receive shading by overhangs in summer. This strategy is effective for all building types.



Source: Orientation | YourHome

Natural Environment

Description

Combining design with the natural environment can optimise performance and reduce energy demand. Consideration of existing fauna, local climate and solar patterns is essential.

Key Pointers

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- Taking advantage of the existing environment can aid in zoning the building layout, i.e. areas with minimal glare due to external shading can be used for rooms with multiple screens.
- Appointing a landscaper/specialist to assist in maintaining the natural environment would be beneficial.
- Design strategies whereby the built environment compliments the natural environment to benefit the user and surroundings.

Case Study

Cobram Kindergarten, VIC



The kindergarten features an onsite lawn retreat garden, which offers a natural lawn that extends upon the existing shade canopies. The environment also consists of a rock river bed and bush-style spaces.

Source: Lawn retreat garden - Cobram Kindergarten - Learnscapes

Thermal Comfort

Description

A thermally comfortable environment is required for occupants. Passive methods to maintain comfortability should be targeted first, followed by artificial measures.

Key Pointers

- Requires an external consultant to produce thermal models to predict indoor temperatures.
- Design for thermal comfort considering future weather scenarios should be acknowledged.
- Exploring strategies to aid thermal comfort from a passive perspective can reduce energy consumption.

Case Study

Woodside building at Monash University, VIC



The building is an all-electric building with Mechanical Ventilation and Heat Recovery systems that ensure the building maintains sufficient temperatures for occupants. High heat recovery efficiency improves system performance.

Source: PASSIVBLOG: Healthy Schools and Classrooms — Australian Passivhaus Association

System Efficiency

Description

The system efficiency of building services aids in the reduction of energy demand. Implementing measures to reduce reliance on energy-consuming equipment can contribute to a healthy building.

Key Pointers

- Requires regular maintenance of building equipment for optimal efficiency.
- Minimum efficiencies should align with National Construction Code Section J compliance.
- It is important to consider the trade-off of operational and embodied carbon emissions of building equipment.

Case Study

International Grammar School, NSW

The school features efficient building services and internal equipment such as LED lighting, motion sensors and efficient appliances.



Source: Australia's Most Sustainable Schools | 5-Star Sustainable Programs 2023 | The Educator K/12 (theeducatoronline.com)