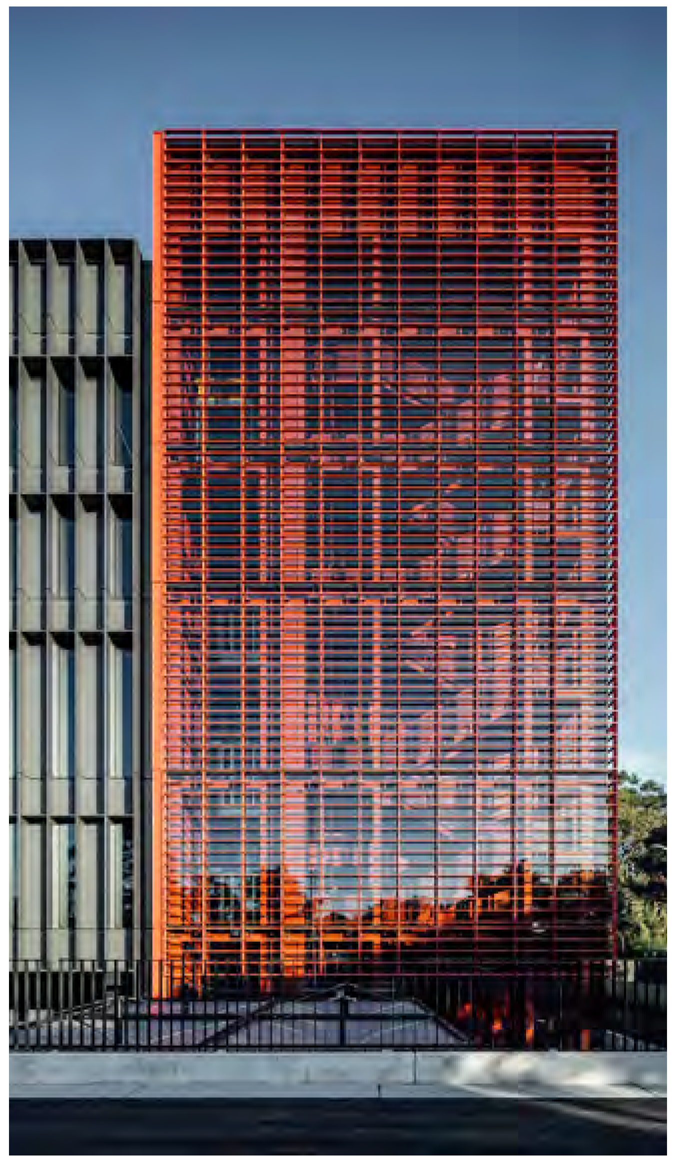
MONASH UNIVERSITY WOODSIDE BUILDING

GRIMSHAW



Stairs ↑
The stairs are fully glazed and screened with a panelised external louvre system designed to avoid overheating. The staircases sit inside the thermal envelope where spilled air from the internal conditioned space allows the temperature to remain within the comfort range, encouraging staff and students to use the stairs instead of the lifts.

Alignment with UN Sustainable Development Goals

SDG 3 GOOD HEALTH AND WELL-BEING
The high performance envelope is designed to guarantee comfortable internal temperature and air quality.

SDG 4 QUALITY EDUCATION
The building places learning on display and aims to become a living laboratory, showcasing the technologies used for its construction and operations.

SDG 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
The Woodside Building is the largest Passive House certified education building.

SDG 11 SUSTAINABLE CITIES AND COMMUNITIES
The building is designed to minimize the operational carbon footprint while diminishing it's EUI and maximising the renewable energy production.

SDG 17 PARTNERSHIP FOR THE GOALS
The demanding requirements of the PassivHaus certification were achieved through a close collaboration with Monash University, contractor and consultants.

Key Sustainability Facts

PROJECT SITE
Greyfield (former carpark)

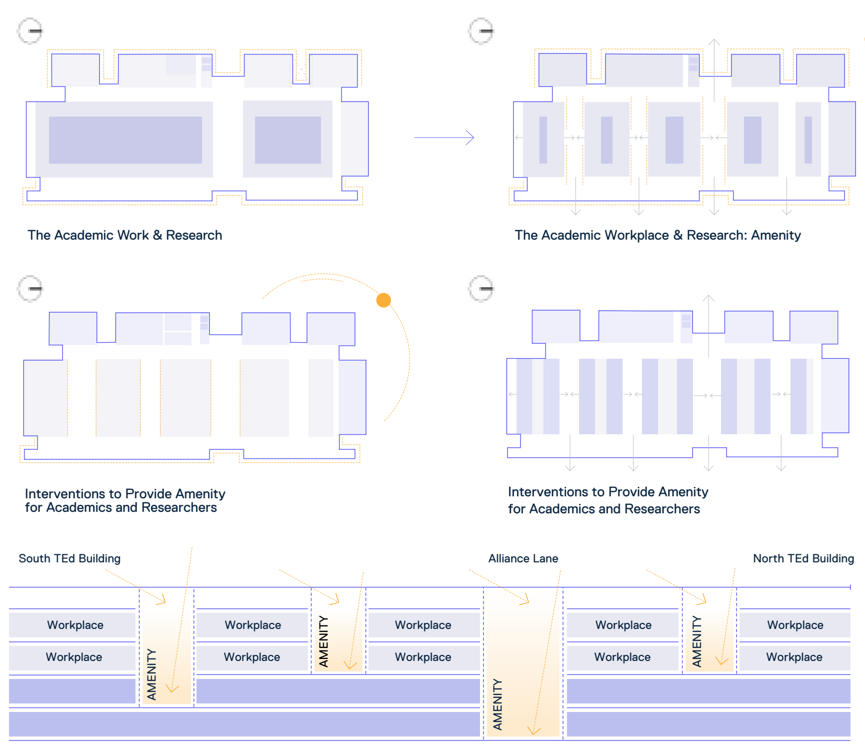
ENERGY USE INTENSITY (HEATING, HOT WATER AND ELECTRICITY)
19.4 kBTU/ft²/year | 61.1 kWh/m²/year

RENEWABLE ENERGY
273 MWh/year | 25% of total Energy use

REDUCTION OF ENERGY USE INTENSITY (EUI) FROM AN EQUIVALENT NEW BUILDING
65% from BCA-2016

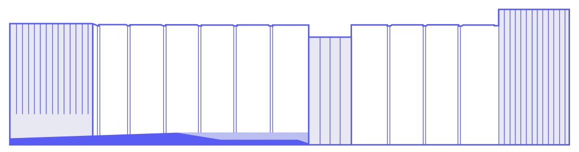
CARBON OFFSETS
All carbon used for construction operations has been offset by the contractor delivering the first Climate Active certified carbon neutral construction service. This was achieved by adopting low carbon building practices and offsetting all remaining FY19 construction emissions reported under the National Greenhouse and Energy Reporting Act (2007).

Location	Melbourne, Australia	**Project Partners/Lead**	Andrew Cortese, Michael Janeke/ Cristian Castillo
Completion	2020	**Project Team**	Grimshaw, Aurecon, Lendlease, Bollinger+Grohmann, Aspect Studios, Prism Façade
Client	Monash University		
Certification	Passive House		



← The interplay of learning, working, and common spaces
Visual and physical connections through the building vertically and horizontally, expose students, work practices and equipment, whilst the intimate relationship with working academics and informal learning zones are maintained.

OUTLOOK
NATURAL LIGHT



SUSTAINABILITY AND REGENERATIVE DESIGN CASE STUDY

The Woodside Building for Technology and Design is a transformational learning and teaching building for Monash University at their Clayton Campus in Melbourne.

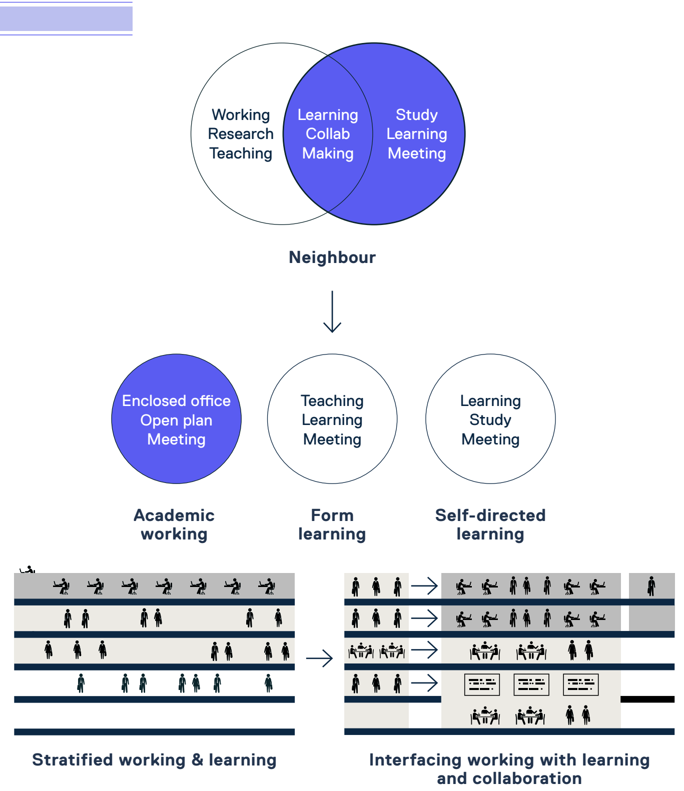
As a transdisciplinary facility for the Faculties of Engineering and Information Technology, it establishes new education standards and world leading environmental innovation as one of the most energy efficient and innovative teaching buildings of its type.

It has been designed with PassivHaus metrics to create an ultra-low energy building with all-electric services, integrating purpose built immersive and interactive learning and laboratory spaces.

The 19,000m2 five storey building is conceived as a modular steel framed armature ordered into tartan geometry of three linear elements spanning 12m for the 'design build studios' and co-lab spaces, 24m for flat floor and tiered learning spaces below and the academic and research above, and 6m for the informal collaboration. The lower three levels accommodate 30 different modular learning spaces of varying dimensions enabling an array of visually and spatially interconnected volumes that are orientated to sunlight and views, further activating the landscaped public realm of the campus.

In compliance with the Passive House requirements for energy consumption, the internal spaces were designed to have the rooms with high energy use in the centre of the building. Circulation and informal teaching spaces are positioned close to the façade with access to natural light and a more variable environmental condition. A series of skylights direct natural light into the central volumes.

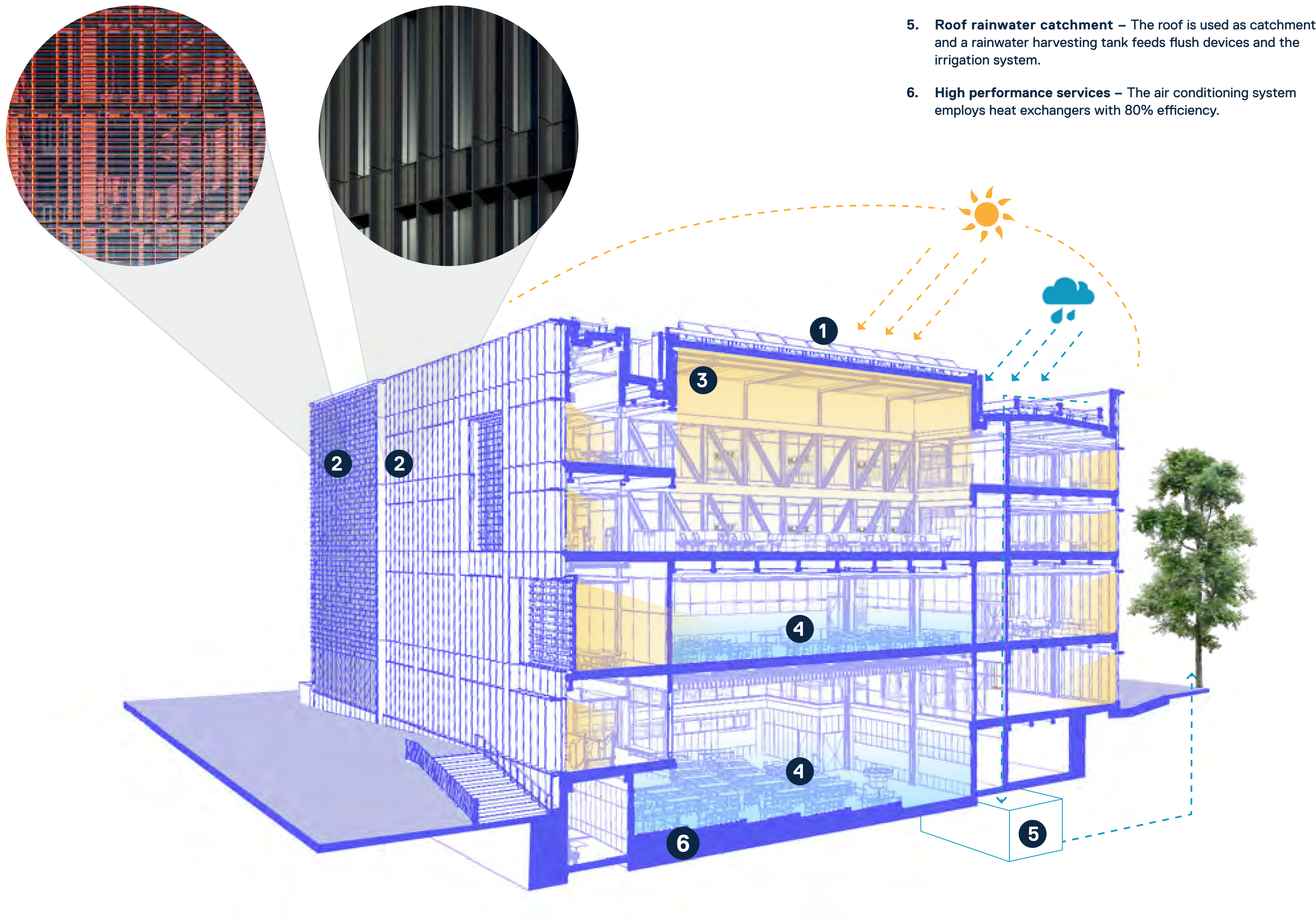
The use of a performance-based design approach allowed to achieve the best balance between access to view and daylight, and thermal performance in accordance with the stringent Passive House requirements. The 50% transparent façade with highly transparent glass panels, together with pairs of skylights located in the center of the building provide optimized daylight factors across the floor area.



Blended Learning ↑
Central to the design of these facilities was the maximisation of the interface between learning, practical work and academic workplace creating the potential for the development of vibrant learning and research communities.

Exploded axonometric diagram ↓

1. **PV panels –** The large building footprint maximises the quantity of photovoltaic panels on the roof and the production of renewable energy. The photovoltaic panels are designed to produce one third of the total energy consumed by the building.
2. **High performance envelope –** The envelope consists of a 50% solid 50% transparent, highly insulated curtain wall with high performance glass panels (double glazed with Argon filling).
3. **Skylights –** Pairs of skylights allow natural light in the center of the volume and in the lower floors.
4. **Layered internal space –** The teaching spaces with the highest energy usage are located in the centre of the building, using the informal teaching spaces and corridors as buffer zones.
5. **Roof rainwater catchment –** The roof is used as catchment and a rainwater harvesting tank feeds flush devices and the irrigation system.
6. **High performance services –** The air conditioning system employs heat exchangers with 80% efficiency.



PROJECT DESIGN CHALLENGES

The Woodside Building was designed and built within an extremely tight program: the project was tendered in August 2018 and final completion was April 2020. This impacted on the modularity and the systems used to design the façade and structure.

Achieving the stringent requirement given by the PassivHaus (PH) certification, without overlooking the quality of the design, and of the space, revealed to be a considerable challenge from the beginning of the project.

The main PH targets that impacted the design were:

> The space heating/cooling energy demand is not to exceed 15 kWh per square meter of net living space.

> 0.6 air changes per hour at 50 Pascals pressure, as verified with an onsite pressure test.

> Thermal comfort requirements for all living areas during winter as well as in summer, with not more than 10% of the hours in a given year over 25 °C.

> Generation of renewable higher than 20 kWh/(m2a)

PassivHaus Principles ↓
The 5 core elements typical of a PassivHaus design are integrated with the building through the detail design of the façade and mechanical systems.

WHAT WE DID DIFFERENTLY - BUILDING FABRIC

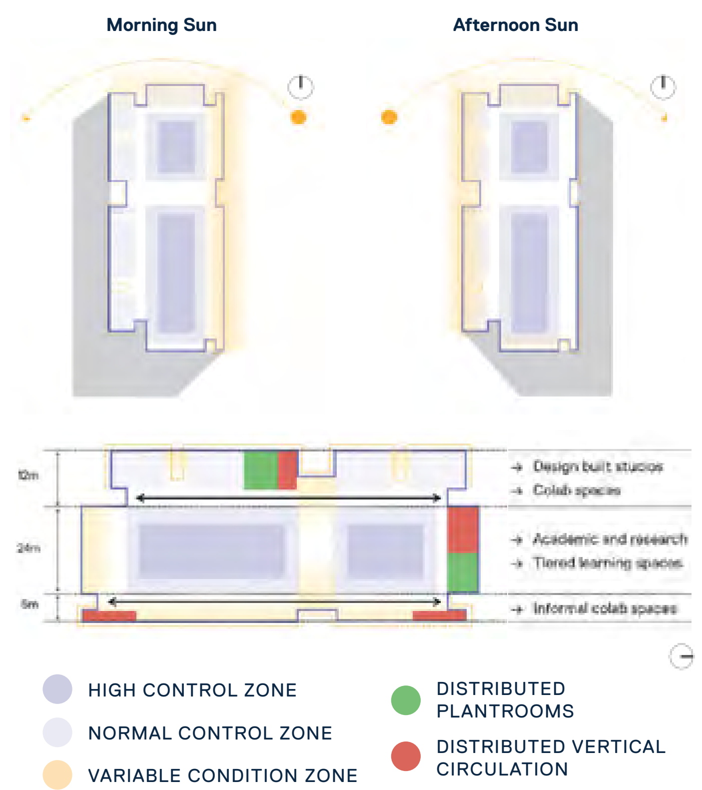
A number of design solutions were adopted in order to embed the efficiency in the building fabric and reduce the energy consumption.

The main building components of the Woodside Building were designed as prefabricated elements to respect the construction timeframe. The modularity and optimization of materials reduced the wastage and the embodied energy of the building.

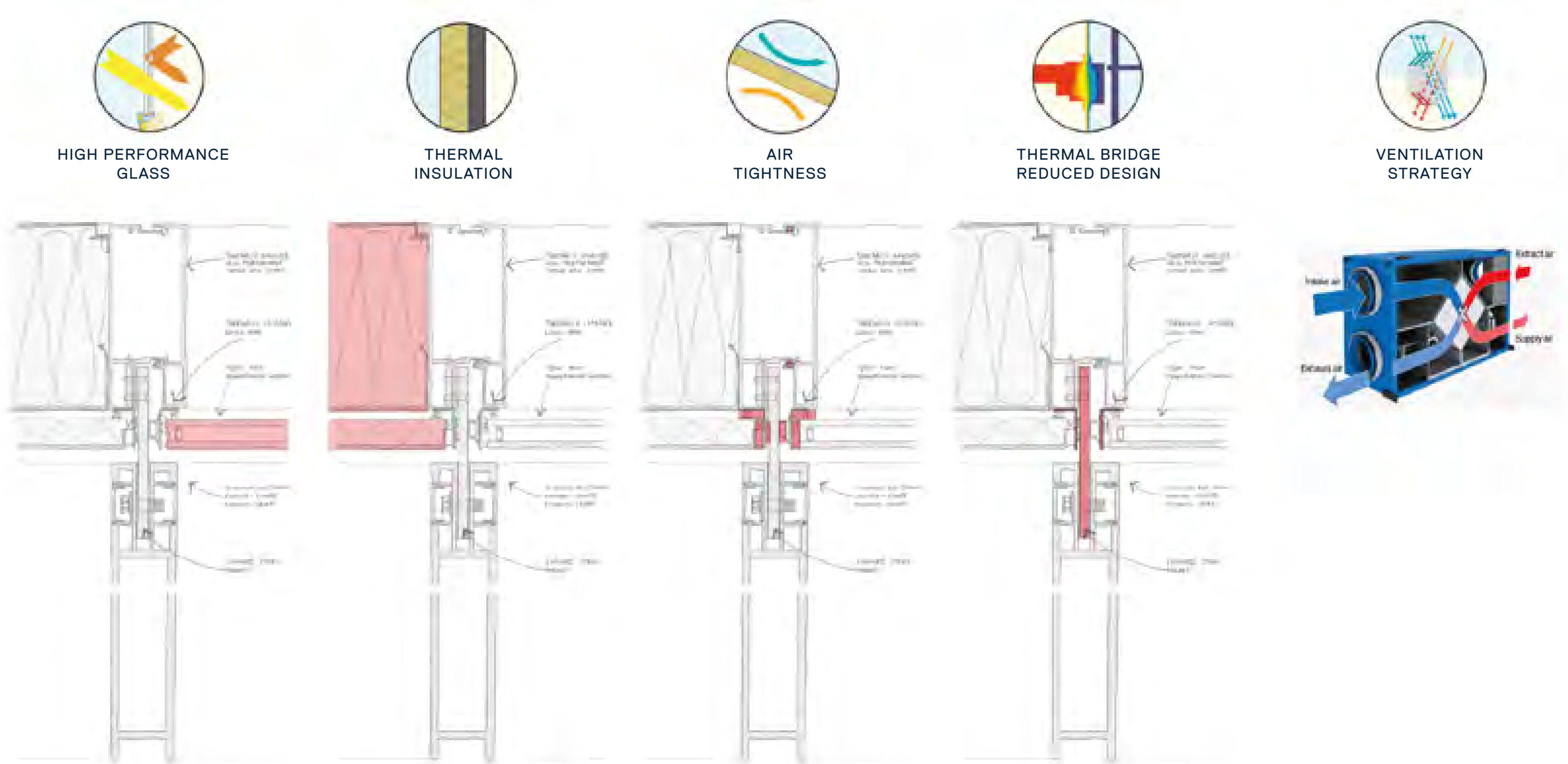
Due to the large building footprint (4600 m2), instead of a centralised plantroom, the mechanical services were divided and located in two separate rooms. These were positioned to serve different sections of the building, minimizing energy loss due to the service reticulation.

The vertical circulation has been distributed along the floor plan, encouraging the use of the stairs and reducing the number of lifts and the need for escalators. Consequently reducing the electric demand of the building.

The internal space is structured so as the rooms with high energy use are located in the centre of the building. The circulation and informal teaching spaces are positioned closer to the façade with access to natural light and a more variable environmental condition.



Orientation ↑
The Predominant East/West orientation is fundamental con connect the building to the campus fabric and to activate the activate the life inside and outside of the building, offering a great variety of environmental conditions.



← East/West façades
The unitized curtain wall is designed with a window to wall ratio of 50%, and external 560mm deep vertical and horizontal fins that screen most of the direct sun light and heat. This solution contributes in controlling the natural light and the external gains from sun radiation, helping to reduce the cooling peak load.

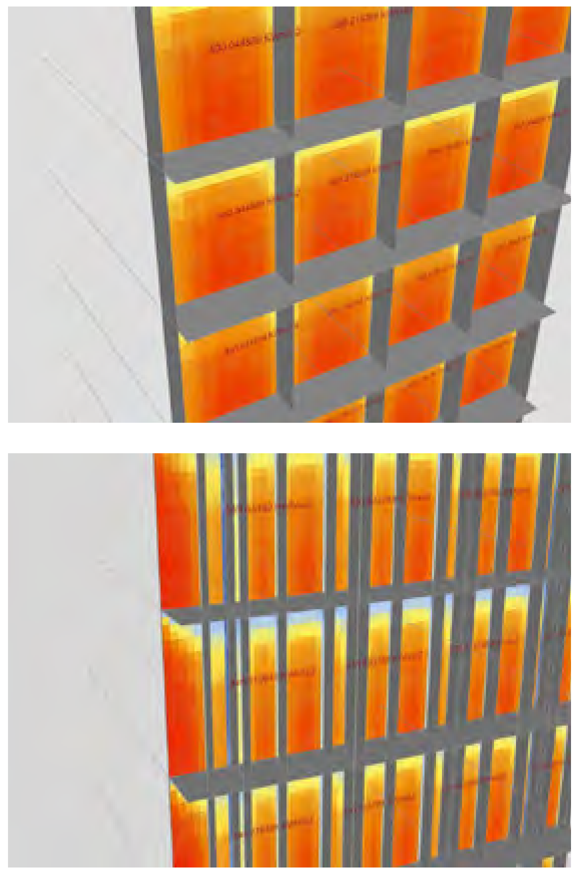
WHAT WE DID DIFFERENTLY - FAÇADE DESIGN

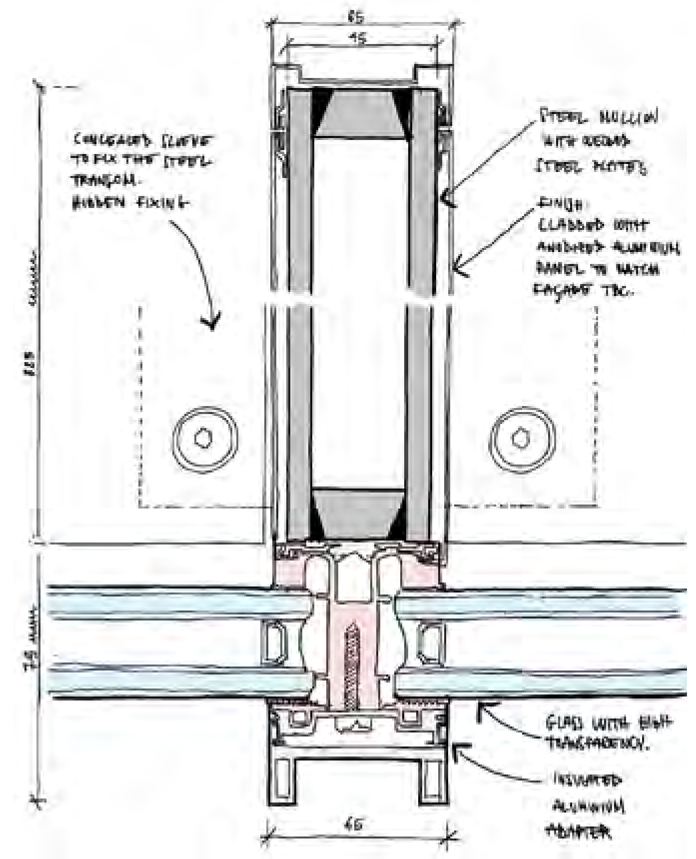
An early stage performance-based design approach was used from the outset of the project to determine the best combination of parameters that allowed the design to meet the Energy consumption targets set by PassivHaus, without diminishing the access to natural light.

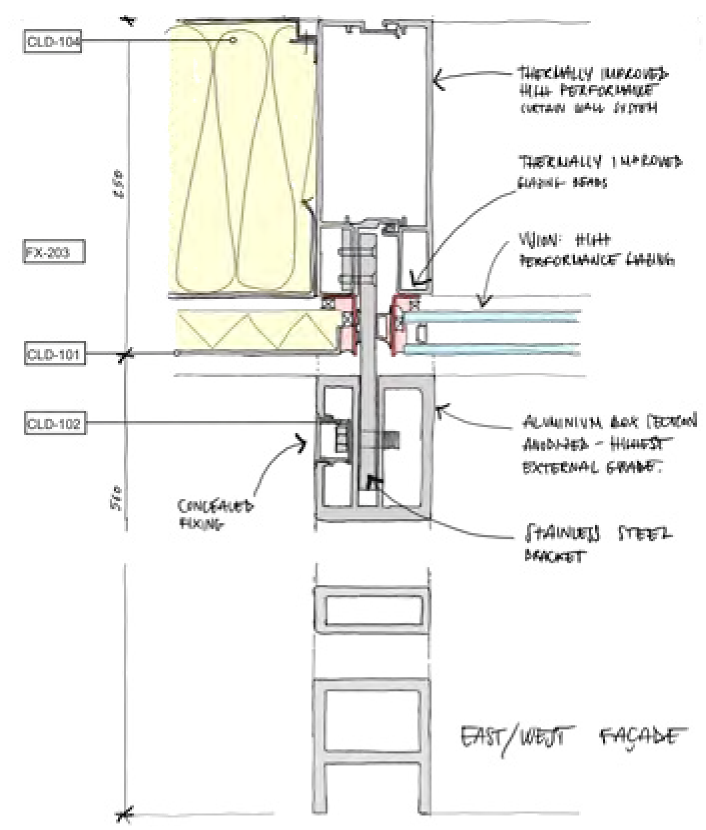
The data-based analysis considered the following variables:

> Ratio between solid and transparent façade panels
> Shading devices location and dimension
> Thermal performance of the glass
> Solar heat gain coefficient of the glass
> Thermal performance of the solid panel

An iterative study of the external shading system led the design towards an optimised solution that achieved the best compromise between solar radiation on vertical surface, internal daylight levels and architectural quality.







Façade Analysis ↑

PROJECT DESIGN SOLUTIONS IN REGIONAL & GLOBAL CONTEXT

The Woodside Building sets an example of efficient construction and design methodology, and it demonstrates how the use of Passive House as a design implement enabled Grimshaw to design a building that is estimated to use 65% less energy compared to an equivalent standard code compliant building.

[Ref. Building code of Australia (BCA-2016) - Section J - Study undertaken with Aurecon ESD]