

## It's not complicated: Sustainability in conservation and adaptation

Words by Kai Chen, Anne-Marie Treweeke and Milica Tumbas

↳ The arcaded dining hall at University College, where Lovell Chen worked with a Passive House consultant and the building surveyor, refutes the notion that Passive House limits design outcomes. Photograph: Karey Shandler

→ Lovell Chen used EnerPHit at the University of Melbourne's Old Quad to balance the building's heritage value with thermal comfort and economic efficiency. Photographs: Eve Wilson (after works), Lovell Chen (during works)

The adaptation of existing structures plays a major role in reducing the impacts of climate change. Kai Chen, Anne-Marie Treweeke and Milica Tumbas explain how their multidisciplinary practice, Lovell Chen, unlocks sustainable design in significant heritage buildings.

*The conservation and restoration of monuments must have recourse to all the sciences and techniques which can contribute to the study and safeguarding of the architectural heritage.*

— Article 2, ICOMOS Venice Charter 1964

*In order to understand the relationship between cultural heritage, climate action and resilience, the idea of heritage must be understood and acted upon in its broadest sense. Physical conservation of selected buildings and artefacts will not realize heritage's potential to catalyse climate action or promote social cohesion, inclusion or equity, but neither can the promotion of resilience and sustainability be removed from the conservation of these properties.*

— The Future of Our Pasts: Engaging Cultural Heritage in Climate Action (ICOMOS, 2019)



The responsible practice of architecture in our time requires sustainability to be at the heart of everything we do. Lovell Chen works on projects that conserve or creatively adapt heritage buildings and sites, and we see a very natural connection between conservation and sustainability. Our work is all about sustaining the use of heritage buildings in the broadest possible sense – culturally, programmatically, economically, socially, environmentally. Climate change adds an imperative to what we do every day: creating sustainable futures for significant buildings.

To help us unlock and enable sustainable design, we looked for techniques founded in science – techniques that work with the physics of original building fabric. This led us to Passivhaus, or Passive House as it is known in Australia. From a design perspective, Passive House makes complete sense. It is based on a thorough knowledge of the performance of materials and building systems, on design analysis and on the certainty that actions taken are measurable in their impact and outcomes. It removes the idea that sustainability is optional – a below-the-line, value-add opportunity for a client; a menu from which one can pick and choose offsets. And it takes away reliance on the idiosyncrasies of human behaviour to achieve outcomes. For us, sustainability is embedded in every design. The result is “sustained” significant buildings that truly have lower embodied carbon (longer useful lives) and lower energy consumption. Their systems contribute to occupant wellbeing and their structures gain technical relativity for another 250 or more years, avoiding building-as-museum or relic status.

Our mantra is “It's not complicated” – it simply requires intent and persistence. Whether using Passive House (for new build) or EnerPHit (for the adaptation of existing structures), we begin by focusing on the whole fabric of a building in the service of energy-use reduction.



The critical ingredients for success are a committed client, knowledgeable consultants, and collaborative and detail-oriented suppliers and contractors.

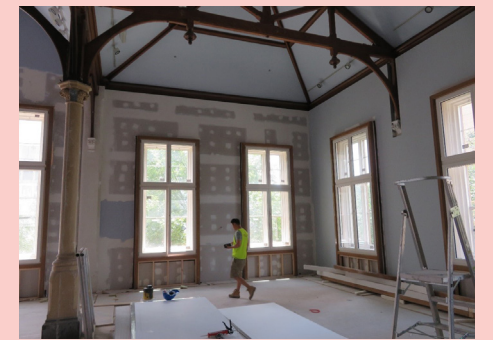
The Old Quad project (begun 2016) at the University of Melbourne is the first application in Australia of EnerPHit to a building of heritage significance. Notable as the first university building commenced in the country, its construction began in 1854 and the building evolved in increments until completion of the vaulted cloister (to the south) in 1981. In the first stage of the redevelopment, we worked on the adaptation and refurbishment of the North Wing, the north end of the East Wing and the North Annexe. The North Wing, while relatively intact externally, was compromised internally by major alterations. Given sustainability targets and the university's mandate for innovation, a decision was made to use EnerPHit as the best way to balance the building's valued qualities and characteristics with improved thermal comfort and economic efficiency.

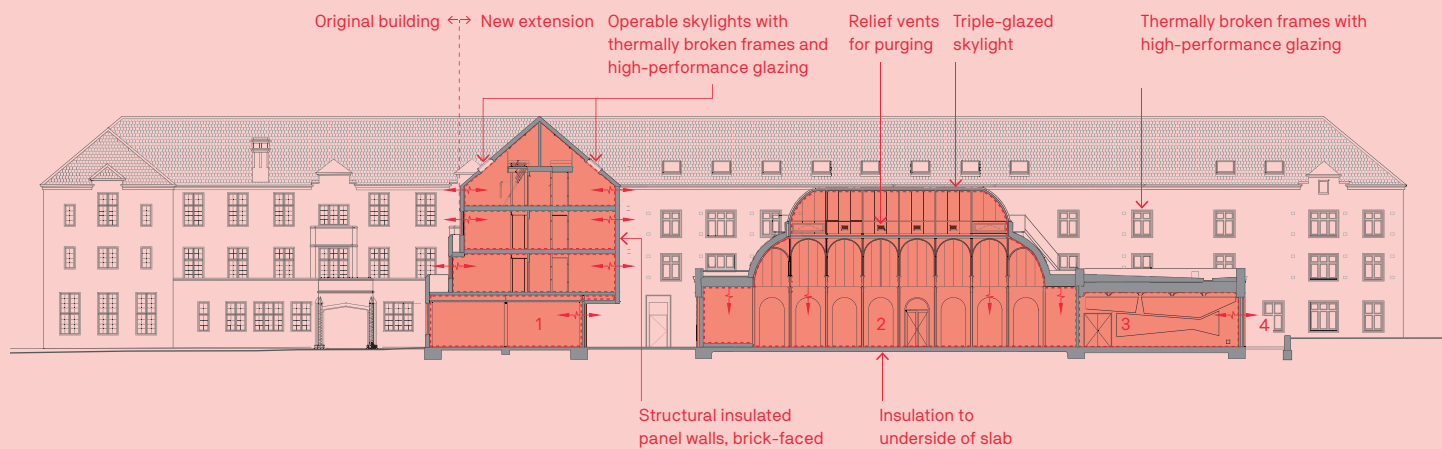
We developed an internal “compartmental” approach, treating the two parts of the building involved as separate thermal airtight envelopes. Insulation and airtightness barriers were introduced to the inner faces of existing walls, separated by air gaps. A multi-unit

variable airflow airconditioning system, using indirect evaporative cooling units with high-efficiency heat exchange cores, was installed. Existing windows were refurbished and a secondary layer of high-performance windows inserted into the inner-skin walls. To establish that the original fabric would not be impacted, thermal and moisture transfer studies were undertaken.

The 2014 project for University College, also at the University of Melbourne, involved a much larger program of renewal and expansion, and we revived Kingsley Henderson's original 1930s masterplan. The project included a new 400-seat dining hall, a new kitchen, 190 student rooms, a conference centre, offices and student common rooms. Although not certified, the scheme is based on a detailed Passive House Planning Package model.

The building is constructed in timber and steel, with a brick outer skin and conventional tiled roof. The challenges in the detailing related to the requirement to integrate rigorous fire separation and address inherent conflicts between NCC/BCA (National Construction Code/Building Code of Australia) and DDA (Disability Discrimination Act) standards while achieving a thermally broken and airtight envelope. By working closely with the Passive House consultant and building





University College Passive House section detail  
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surveyor, we were able to overcome these hurdles, and the need for a new substation was eliminated despite the significant increase in built area. The arcaded dining hall, surmounted by an arched, triple-glazed clerestory over the central aisle, evokes the lightness of a glasshouse and confronts head-on the idea that Passive House limits design outcomes.

Galleries present particular challenges in balancing environmental guidelines and sustainability. The Bendigo Soldiers Memorial Institute, in regional Victoria, wanted to achieve “AA class” precision control for its new temporary exhibition space but needed to consider the costs that result from the perpetual operation of mechanical systems needed for the AA standard. This project anticipated the 2018 AICCM (Australian Institute for the Conservation of Cultural Material) Environmental Guidelines for prioritizing passive control solutions and low-energy technologies wherever possible.

The new gallery is designed around a simple stacked cellular program of gallery and collections storage, surrounded by an unconditioned ambulatory and connected to the restored original building by a glazed link. The design includes an energy-recovery ventilation system, and minimal use of structural steel to minimize thermal bridging. It was detailed as Passive House, but not advertised as such at tender, removing any perceived “challenges.”

Successful project delivery was underpinned by an engaged regional builder who took the time to train and support their trades and subcontractors so that each understood the importance of their contribution.

Passive House demands careful coordination and sequencing of trades, and site supervisors who champion the need for airtightness and rigorous attention to detail. Creating an airtight envelope is not yet the norm in conventional building in Australia. However, it is eminently achievable through proactive quality management by builders.

Irrespective of whether our clients want to pursue full Passive House certification or not, we have found no pushback on the idea of improving thermal performance to drive down energy consumption in the long term. The Passive House approach also brings the use of natural and more-sustainable materials, a clean environment for building occupants, improved ventilation and more fresh air – the benefits are self-evident. Clients welcome the embedding of sustainability objectives into the design approach for their projects. It is often industry inertia, preconceived ideas about cost, or simply a lack of knowledge that needs to be overcome.

Heritage projects always involve a careful balancing of actions to conserve, restore and sympathetically adapt. It is now imperative that adaptation needs to include clear thinking on genuine sustainability.

— Kai Chen (director), Anne-Marie Treweeke (director) and Milica Tumbas (principal) work together at multidisciplinary practice Lovell Chen.

University College section detail key

- 1 Student rooms, administration and conference
- 2 Dining Hall
- 3 Mural room
- 4 Terrace
- Airtightness envelope
- Supply and return air
- Supply air