MMC CASE STUDY

Inala Infill Apartments
Queensland

All photographs: Christopher Frederick Jones unless stated otherwise.

Diversity and density done well:
The project demonstrates joyful contemporary architectural design for low-rise urban infill.

Emerging from the Queensland Government's "Density Done Well" initiative, this project delivers healthy homes that foster a sense of community, connection to nature, and reduce emissions.

QUICK FACTS

BUILDING TYPE:
Low-rise, multi-dwelling

LOCATION:
Inala, Brisbane, QLD

COUNTRY:
Yuggera Country

LOCAL GOVERNMENT AREA:
Brisbane City Council

CLIENT:
Queensland Government

PROCUREMENT PROCESS
Design Finalisation and Construct

PROJECT DATA:
Site area 1,876m²
Total built area 1,300m²
2 storeys
14 units (1x 3B, 13x 1B)
2 bicycle parking spaces
14 on-grade car parking spaces

PROJECT TEAM:

ARCHITECTURE
Baber Studio

BUILDER
Kane Constructions

ENGINEERING
ARUP, TONKIN

LANDSCAPE ARCHITECT
Free-Range Landscape Architects

CLT SUPPLIER
XLAM

PRINCIPAL QS
GRC

PROJECT TIMELINE:
Project initiation: Sept '19
Construction start: April '22
Project completion: May '25

ACCESSIBILITY:
3x Platinum
9x Gold
2x General

SUSTAINABILITY

RAIN WATER TANKS
1 No. 12,000L

SOLAR PANELS
None

HOT WATER SYSTEM
Instantaneous Elec,

BUILDING ENERGY
Electric

NATHERS RATING
6.9 stars (ave.)

NSW GOVERNMENT
Homes NSW
Queensland Government

Inala Infill Apartments is a low-rise, medium density social housing project in Inala, Queensland that showcases high-quality design, tailored to local climate and resident needs.

The design was one of the Queensland Government's social housing demonstration projects, a key outcome of the Density and Diversity Done Well competition run by the Office of the Queensland Government Architect and Department of Housing and Public Works. It utilises a hybrid Modern Methods of Construction (MMC) approach using cross-laminated timber (CLT) floor panels and roof panels to deliver 14 new dwellings.

Urban infill:
The site is an amalgamation of three suburban lots at the end of a street, creating an L-shaped block with two corners.

Context

The site is located on Yuggera Country, within the Greater Brisbane region, approximately 8 km south of Brisbane City. It benefited from a LMR2 low–medium density zoning, which permits the development of two to three-storey buildings. The surrounding residential neigbourhood comprises mostly of single storey, detached dwellings built from the 1950's to 1970s, featuring brick veneer and fibre cement clad buildings. Uniquely positioned on the end of an urban block, the site offers immediate walkable access to local village shops, a supermarket, and public bus services.

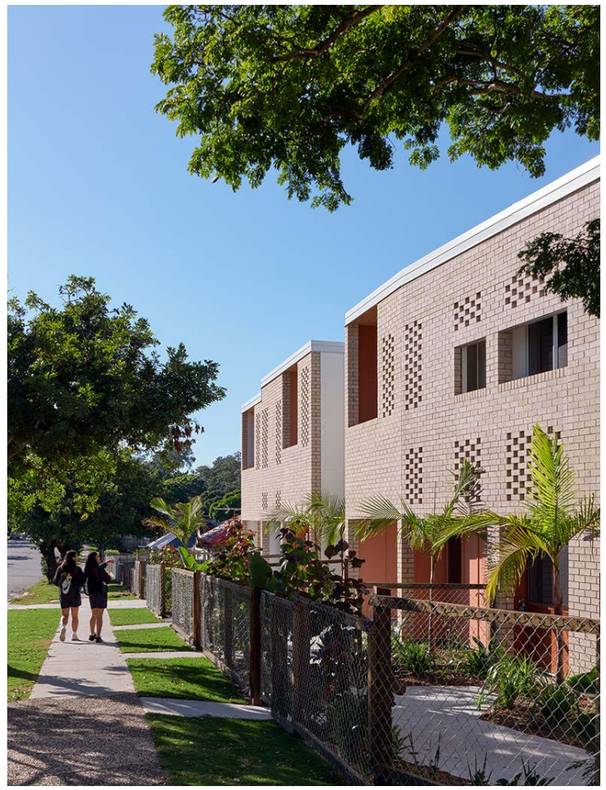
Make homes healthy

The project brief from the Department of Housing and Public Works was to demonstrate the application of the Social Housing Design Guidelines principles and deliver 14 new social housing dwellings on an amalgamated 1,876m^2 site. The context required a sympathetic approach to built form with a two-storey building that integrates well with the existing neighbourhood and contributes positively to its evolving character. The aspiration was to make homes healthy, encourage residents to be active, improve their well-being and offer sanctuary – for a place to relax and recharge.

In response to the healthy homes brief, Baber Studio developed three guiding principles to direct the design – connection, amenity and sustainability. This case study has been framed around these principles.

Active connections
Common entryways open directly to the street, providing universal access, and good walkable connections to the public street.

Neighbourhood scale, climate responsiveness and diversity
Varied facade and built form expression break the overall massing into smaller buildings and provide a diversity of houses along the street. The western elevation provides shade from the harsh afternoon sun in summer.



Welcoming place
Warm brick detailing responds to the existing neighbourhood character, framing friendly and colourful ground level private openings.

Health and well-being
Front gardens incorporate climate responsive and resilient green foliage, providing high amenity while positively contributing to the streetscape.

KEY DESIGN PRINCIPLES

PRINCIPLE 1

Connection

Shaded green space for circulation, recreation and gathering spaces.

PRINCIPLE 2

Amenity

Building design increases amenity and effective natural cross ventilation.

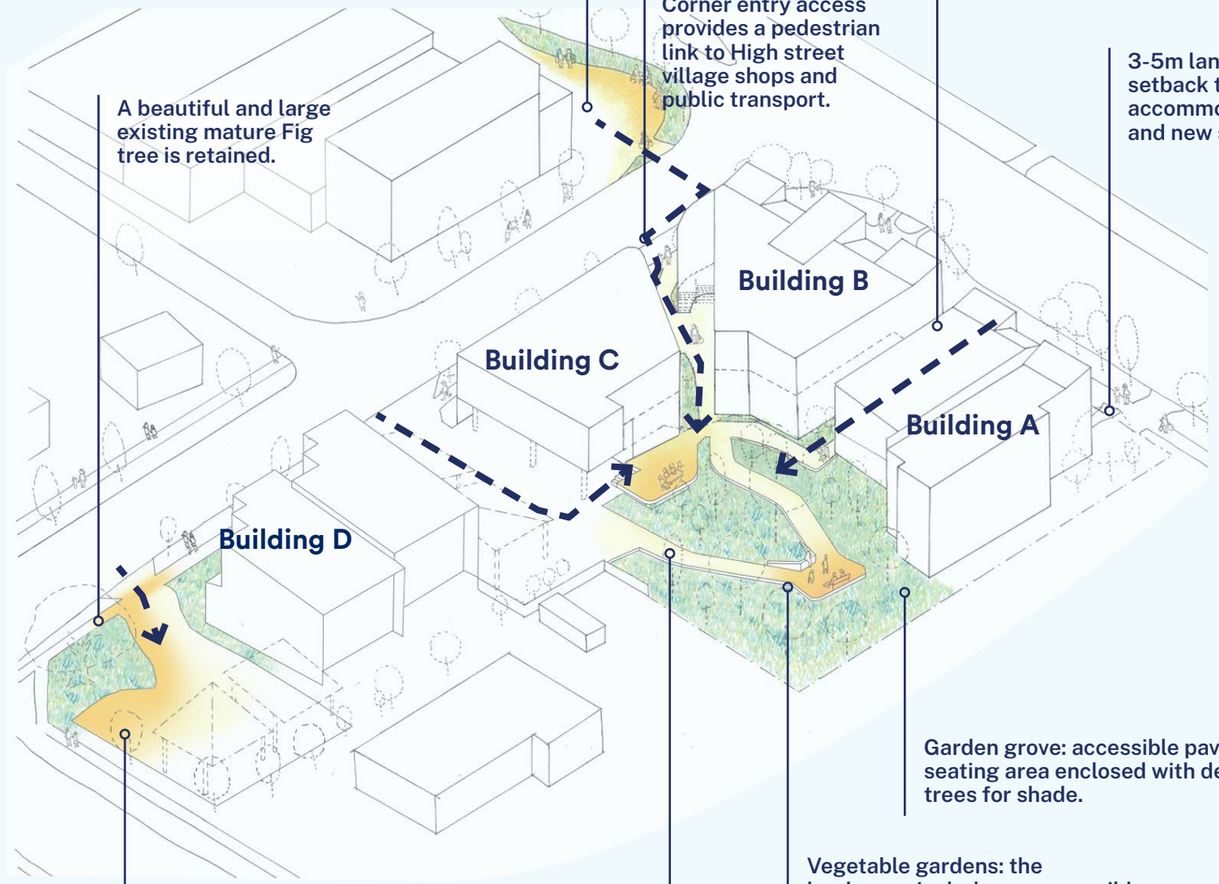
PRINCIPLE 3

Sustainability

Using low embodied carbon materials and technologies to reduce emissions.

Principle 1 – Connection: The buildings are arranged to foster social interaction, providing spaces for gathering, recreation, and community engagement.

The site has four entry points from the street, with most ground floor dwellings enjoying direct access through a small front garden. Existing mature trees have been retained, while the buildings frame a central courtyard creating an informal meeting space and a green sanctuary in the heart of the site.



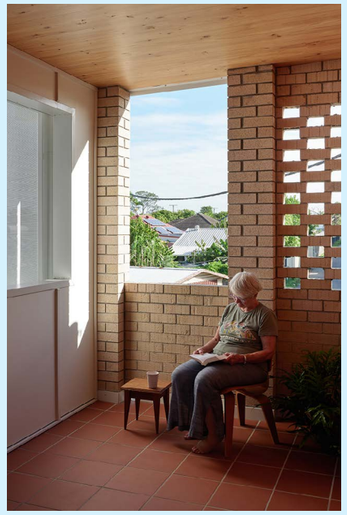
Biophilic design

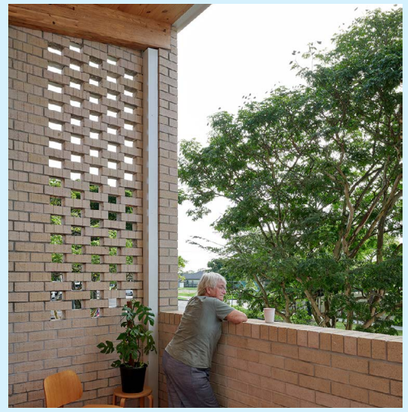
The dwellings are connected by shared walkways with internal planters. These overlook the central courtyard and promote connection to nature.

Tree retention

The layout retained existing trees, the most notable being a fig tree on the southern corner of the site. Shade loving plants were planted in the courtyard and along the internal walkways to create a secluded forest.

Drying room
The rear balcony or drying room is generously sized to serve a variety of purposes.





Privacy with outlook
Solid balustrades and careful planning for visual privacy.

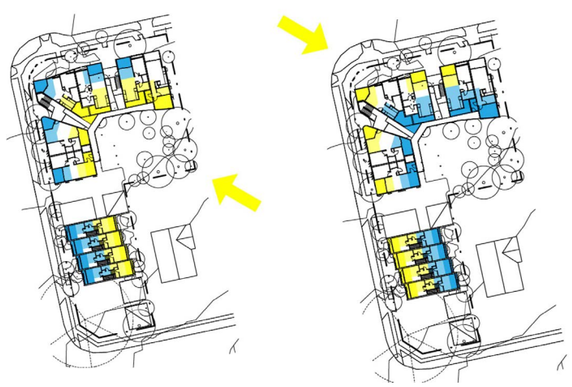
Principle 2 – Amenity: the design promotes healthy living by maximising natural cross ventilation

Home for the long term

The Department of Housing and Public Works's development brief ensured that the mix and size of apartments was appropriate for older tenant cohort and facilitated aging in place. The one and three bedroom apartments are designed to be broadly consistent with Platinum and Gold level Livable Housing Design Guidelines, with the apartments on the first floor accessed via a lift. Open staircases enhance visibility and perceptions of safety while encouraging active mobility, supporting a healthier lifestyle. The internal layouts are simple and efficient with a typical dwelling layout incorporating a galley kitchen, open plan living-dining room and a balcony addressing the street. Secondary rear balconies function as drying rooms, but are generous enough to be furnished. Street-facing bedrooms enjoy abundant natural light and a pleasant outlook.

Morning time
Balconies facing the street are coolest

Afternoon time
Balconies near the garden are coolest



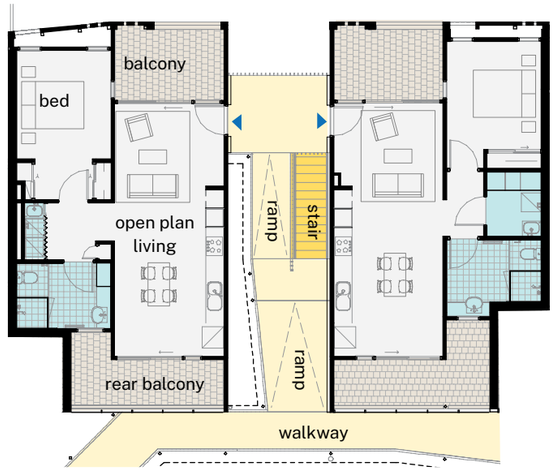
Responsive to Queensland's sub-tropical climate

The breezeway design is responsive to the local microclimate, with openings positioned to capture the prevailing south-easterly breezes. The open plan living arrangement connects the two balconies at either end of the dwelling, facilitating passive cross ventilation and encouraging 'Diurnal migration' – where residents can move between the coolest parts of the apartment at different times of the day or in response to the seasons.

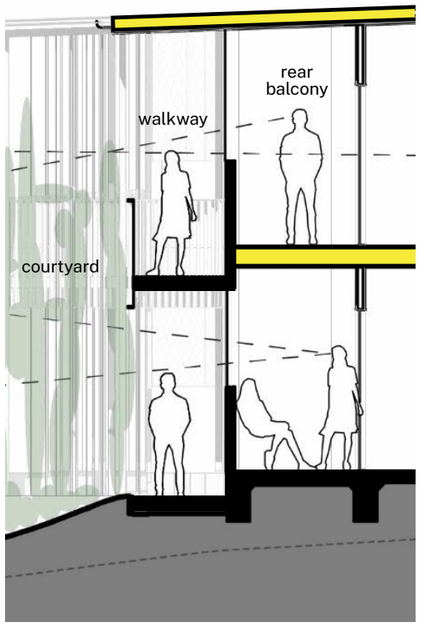
While some might consider two balconies a luxury for social housing, the second balcony was provided in lieu of the 2m^2 internal multi purpose space and the over all floor area of the dwellings was comparable to typical social housing. The multi-functional, semi-enclosed drying room affords the tenant greater flexibility in how they can use the space and enhances overall amenity as it enables more effective cross ventilation and passive cooling.

Privacy and safety

Special attention was given to the design of the common circulation and rear balconies to ensure adequate levels of safety and privacy. The floor plan arrangement ensures that no bedrooms are located adjacent to the walkways, and the level of the external walkway was deliberately set down 400mm from the internal floor level. The balustrade of the balcony was raised to 1.2m and a secure, perforated screen was provided, enabling the space to be multi-functional while meeting fire egress requirements for gallery access. Dwellings are accessed mid-plan with a gentle ramp bringing residents up to an entry level, where residents are greeted with views of the street before entering their homes.



Ramped circulation
The units are entered centrally with a gentle ramp connecting from the entry level to the courtyard gallery.

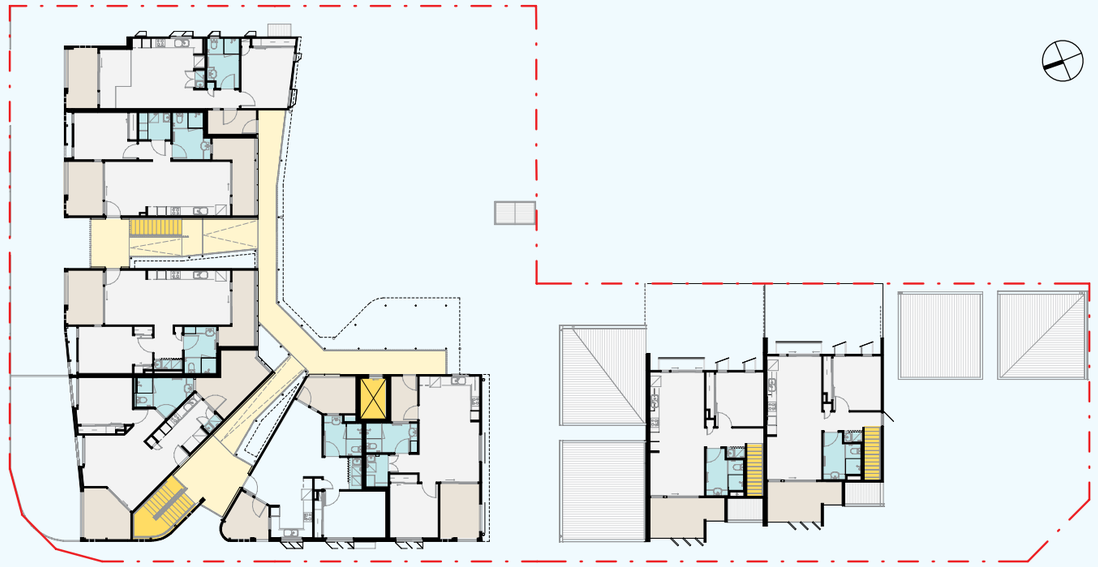


Working with levels to ensure privacy
The level of the walkway has been dropped by 400mm to limit views into the drying room whilst maintaining sightlines into the courtyard.

"The objective was to create enjoyment, and support people through life's challenges"
– Peter Nelson

Ground floor plan

The built form is arranged as two buildings - an L shaped building that turns the corner and frames the courtyard, and a separate, smaller 4 unit building to the south. The buildings have narrow, 1.5m setbacks off the secondary street with ground floor units each having a gates onto the street. A parking court is provided between the two buildings.



First floor plan

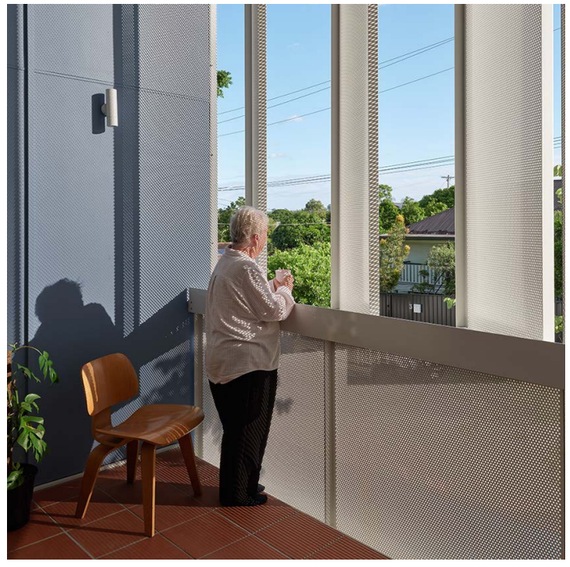
The first floor gallery frames the courtyard and connects to the lift. The open communal stairs are pushed towards the street with balcony views into the public domain.

Diversity in typology

Another innovation was the use of different housing typologies that respond to accommodate different lifestyles. The four units to the south of the site are arranged as a manor house with two apartments vertically stacked one above the other. Each apartment has its own front door onto the street, giving residents a strong sense of identity while simplifying construction under Type C classification, which carries distinct fire safety requirements under the NCC. The structure is lightweight timber frame and clad externally, with bathrooms and laundries stacked vertically to improve efficiency and integration. External screens are provided to the balcony and bedroom to provide privacy, sun control and prevent overlooking to the neighbours.

Detail view of the manor house

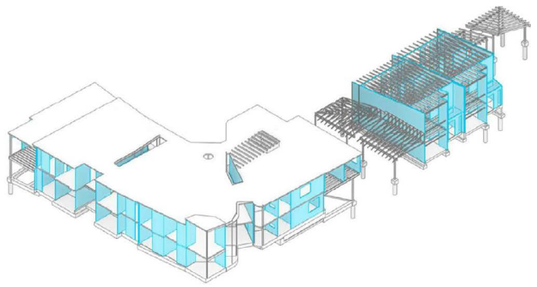
Individualised stairs and the vertical stacking of balconies and wet areas ensures an efficient design.



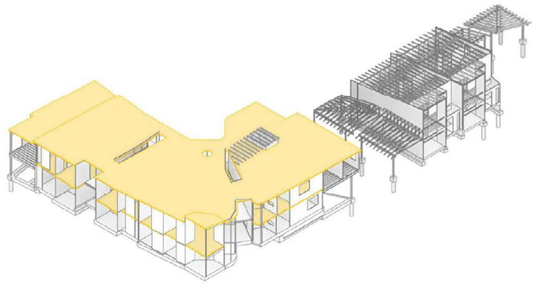
Privacy and amenity

Semi-enclosed balconies overlook the active street, with operable screening integrated into facade detailing.

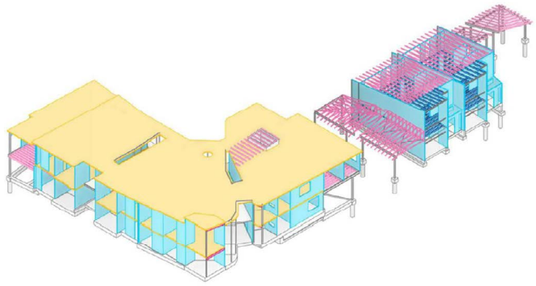
Structural system



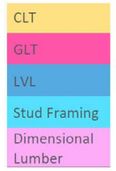
Walls
Traditional timber stud wall-framing



Roof & floor slab (raft)
Cross-laminated timber



Roof & floor: beams & joists
Laminated veneer lumbar, glue laminated timber. Units 11-14



Principle 3 – Sustainability: Using low embodied carbon materials and technologies to reduce emissions

Timber construction

One of the drivers of the project was a commitment to sustainable outcomes and exploring the potential of Modern Methods of Construction. One of the big moves in reducing carbon emissions and embodied carbon in particular was material substitution – swapping out concrete and steel for timber. The entire level 1 floor plate and roof (80m^3) were constructed of prefabricated cross laminated timber (CLT) panels.

A variety of other timbers solutions were adopted including:

— Cross Laminated Timber (70%)
— Glue Laminated Timber (1%)
— Laminated Veneer Lumber (2%)
— Timber Stud Framing (23%)
— Dimensional Lumber (5%)

Overall, Baber Studio calculated that the use of timber reduced the total carbon emissions for the project as a whole by 173.4T CO2 – the equivalent of taking 37 cars off the road for a year. The whole building required only 2Ha of forest, which could be regrown in plantation forests across Australia in 18 minutes.

A hybrid kit-of-parts approach

While volumetric construction was investigated as an option, the decision to use brick-veneer externally for its resilience led to a shift toward a hybrid, kit-of-parts approach, which was refined collaboratively with the contractor post-tender.

Collaboration was key, and architects worked closely with the structural engineers, the Wood Solutions Midrise team and CLT suppliers XLAM to arrive at the most buildable and cost-efficient solution. The digitisation of the design in 3D with BIM software allowed for detailed coordination of the core structural system. The CLT floor and roof elements are supported primarily with lightweight timber stud framing and complemented with a composite steel post and glulam structure. The reinforced blockwork lift shafts provide rigidity.

This hybrid approach demonstrated the optimal properties of each material, with the intent being to achieve overall efficiencies in terms of reduced on-site install time, long term durability, cost and embodied carbon emissions.

The power of renewable materials
All the timber used on the building could be harvested from 2Ha of plantation, which could be regrown in 18minutes.

Accelerated construction
Delivery of CLT floor slabs to site

Lessons for MMC

1. Remain agile when working on demonstration projects with an emerging industry

While contractors are developing better MMC capabilities, not all local project teams and subcontractors will have the expertise with MMC. Clients, contractors and designers need to work to local conditions and detail accordingly.

2. Not everything needs to be MMC

Offsite manufacture requires a high degree of design resolution prior to construction which demands time and resources. Early on the team explored opportunities to use prefabricated timber wall cassettes, however on smaller, more bespoke projects like this with access to skilled trades (in this instance the carpenter / framing subcontractor), investing time and resources into developing details and cutting schedules can be wasted, and it is often quicker and more efficient to use traditional methods.

3. Assemble the right team

Ensure that service providers are familiar with the delivery approach and that the Quantity Surveyors and engineers engaged have experience in the construction methodology with MMC and the materials being used. Involving these specialists early helps ensure accurate costings and allows the time and cost benefits of MMC to be fully realised.

4. Leverage the benefits of CLT

Apart from the obvious embedded carbon benefits, CLT can be cut to any shape and has two-way structural spanning capability. The installation of the CLT floor panels was much quicker than anticipated, taking only two days when six days had been allowed in the program. The efficient deployment meant the expensive crane hire could be retired early, resulting in cost and time savings.

5. Compliance testing

Class 2 buildings require compliance with stringent fire and acoustic regulations. While industry and certifiers are becoming more familiar with standard performance solutions, ensure that adequate time is allowed for in the program for fire engineering.

6. Combinations of material require careful consideration

The construction of the external brick veneer took a long time compared to the relative speed of the lightweight cladding and structure, but offers a long term low maintenance solution. A very conservative approach to the structural design of the brick skin, particularly in areas with both sides are exposed, also resulted in an excessive use of steel which could have been avoided.