



HENRIQUEZ PARTNERS ARCHITECTS

Public Hearing

# PROTOTYPE

**M5 - AFFORDABLE & MARKET RENTAL HOUSING**

A Mass Timber Net Zero Carbon Future for Vancouver

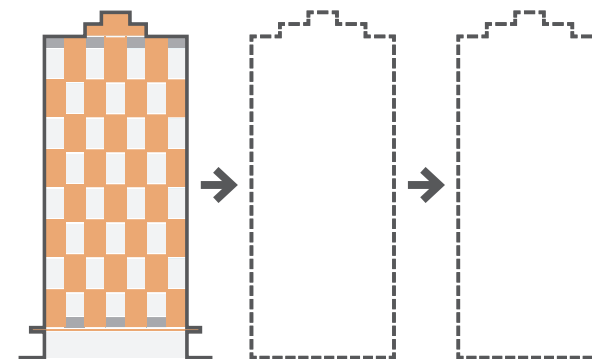
January 23, 2024



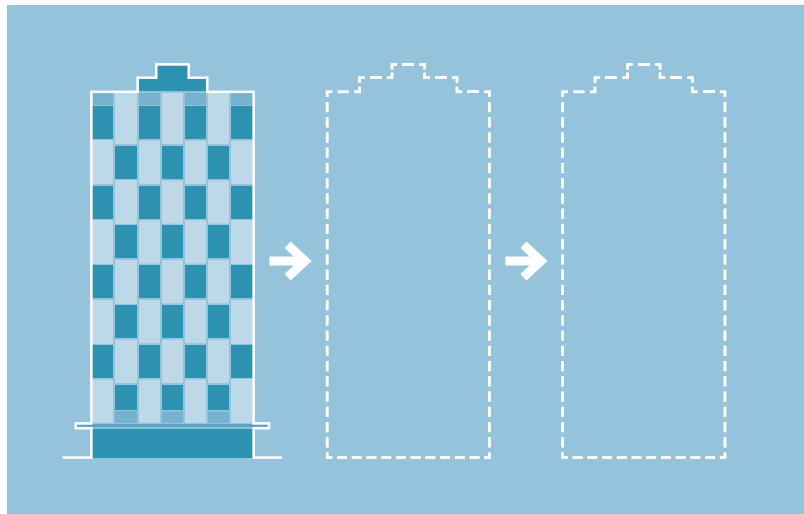
# PROTOTYPE

M5 - Affordable & Market Rental Housing  
2015 Main Street, Vancouver

PROTOTYPE is a Net Zero Lifecycle Carbon Affordable & Market Rental Housing tower. The project will be a zero-carbon case study and prototype towards future sustainable projects. The new tower is proposed to replace the at-grade parking lot south of the existing building at 2015 Main Street.



# Why is this Project Important?



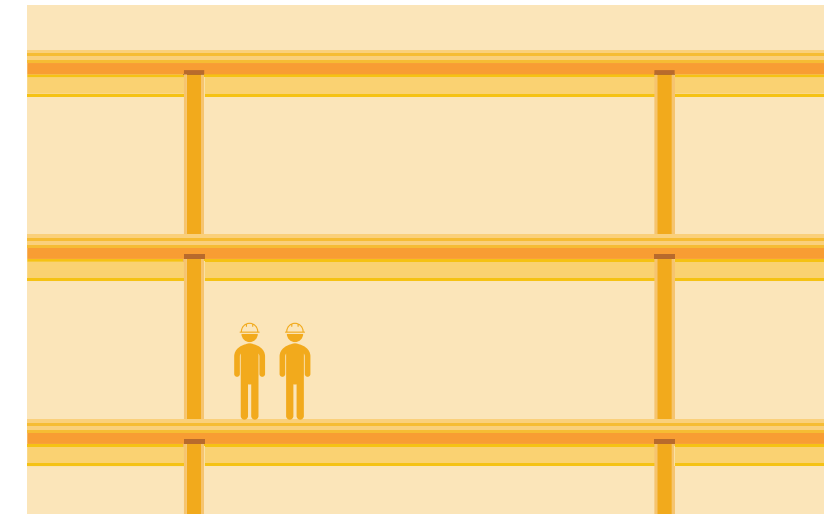
## Prototype

This project is a **replicable prototype** - an **open source, hybrid construction**, case study to help Vancouver and British Columbia achieve a **reduction in lifecycle carbon emissions**.



## Net Zero Carbon

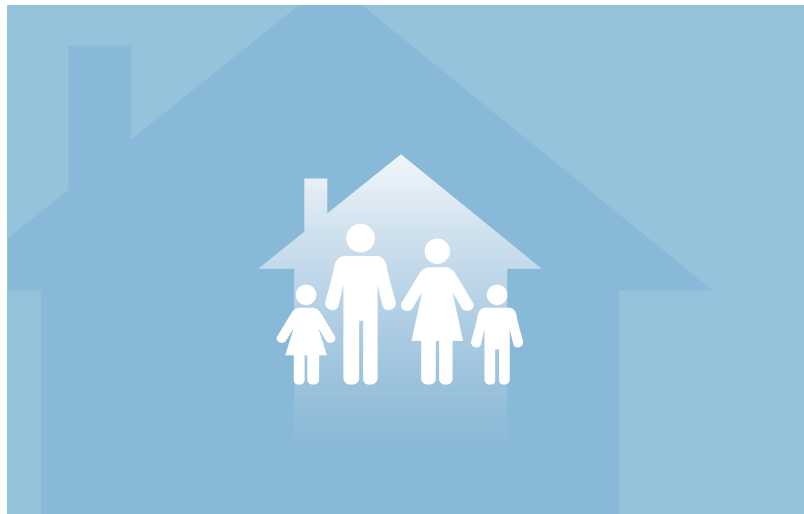
**Climate change is the challenge of our generation.** We must be strategic in maximizing environmental benefits for new buildings.



## Hybrid Mass Timber

**Mass timber delivers a significant reduction of embodied carbon** compared to conventional building materials. A mass timber and steel hybrid structure will allow for building efficiency.

# Why is this Project Important?



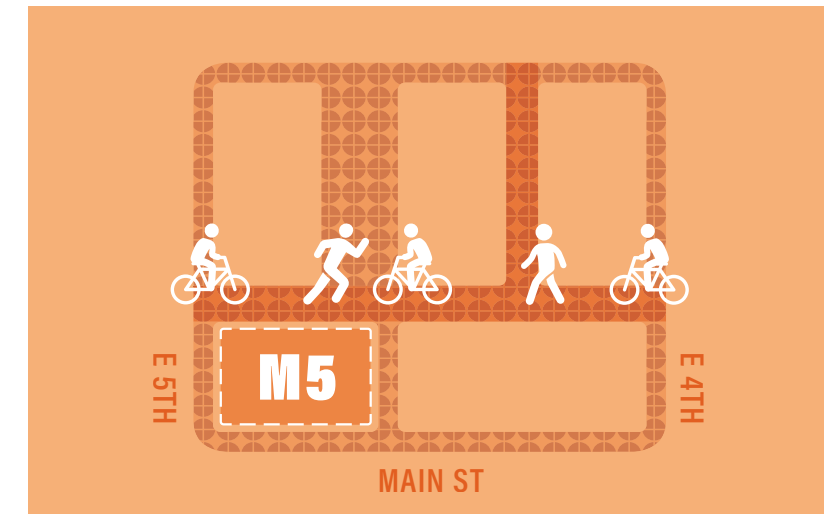
## Affordable Rental Housing

The provision of **100% secured rental housing, including 20% below-market rental housing**, will address housing challenges in the Mount Pleasant area under the Broadway Plan.



## Enhanced Public Realm

This project will **replace a surface parking lot** and enhance the Main Alley Campus plan, which aims to **create a vibrant neighborhood that is safe and active at all hours of the day**.



## Car Free Active Lifestyle

The M5 rental housing development, as part of the overall Main Alley campus and our net zero lifecycle carbon targets, could **reduce car dependence and encourage sustainable modes of travel**.

# Site Context

The site at 2015 Main Street is on the corner of Main Street and East 5th Avenue, within the Main Alley campus development.



Site Plan

 Main Alley Campus

# Main Alley Campus



- M1** Existing WeWork Building
- M2** Industrial, Digital Industry, & Offices
- M3** Industrial & Offices
- M4** Industrial, Digital Industry, & Offices
- M5** Residential Tower

# Project Description

The proposed development at the south portion of the 2015 Main Street site is part of a larger campus strategy. The rental housing and Net Zero sustainability goals align with City priorities and complement the overall development.

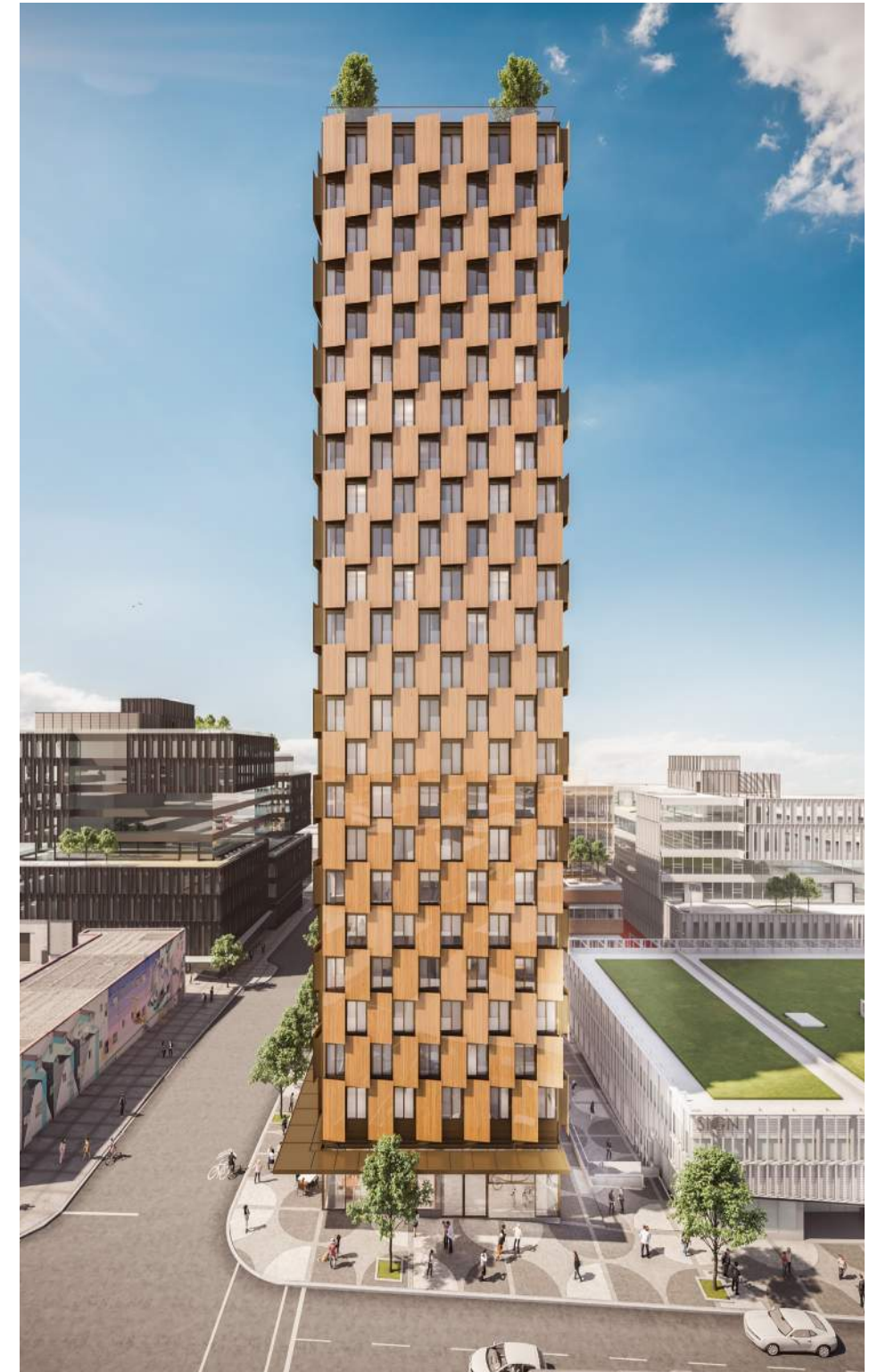
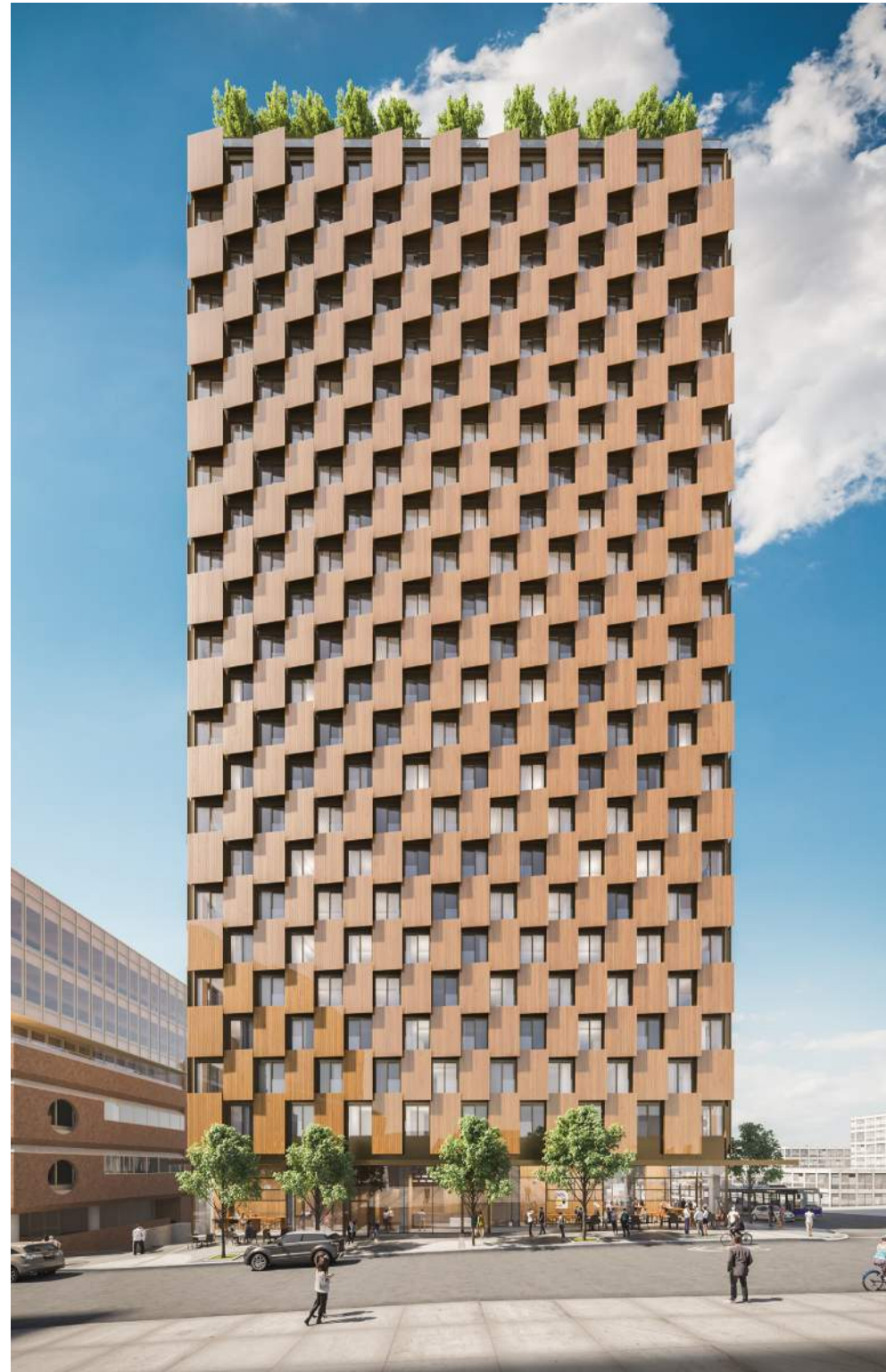
The proposed rental housing tower at the south portion of 2015 Main Street is 25 storeys, of which 23 floors are residential, and include 210 secured rental housing units, and 20% of the residential FSR as Below Market Rental housing.

The facade of the residential tower is expressed as a latticework inspired by the woven pattern of traditional baskets. This expression is peeled away at the base to reveal the retail and residential entries. A rooftop amenity sits on top of the tower. The amenity is aligned with the north elevation, which allows significant sun for the landscaping proposed on the roof. The outdoor amenity area takes advantage of views to the mountains, ocean and downtown.

A unique feature of the project are the angled cladding panels that provide solar shading. The use of a laminated panel rain-screen system will showcase the appeal of real wood and animate the facade. Below-grade levels allow for bicycle parking, residential storage and building services with parking provided elsewhere on campus as part of the overall campus parking strategy.

## Public Benefits

- 210 units of Secured Rental Housing
- 20% FSR as Below-Market Rental
- 35% Family units, including 10% 3-bedrooms
- Net Zero Carbon Sustainable Design
- Enhancing Public Realm
- Supporting Bike Culture



# Exterior Expression - Design Narrative

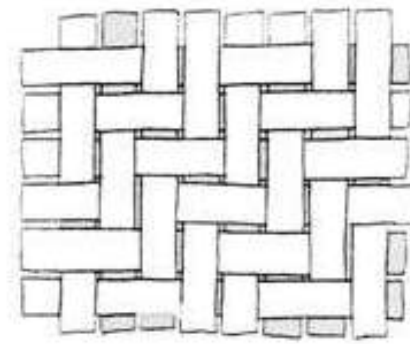
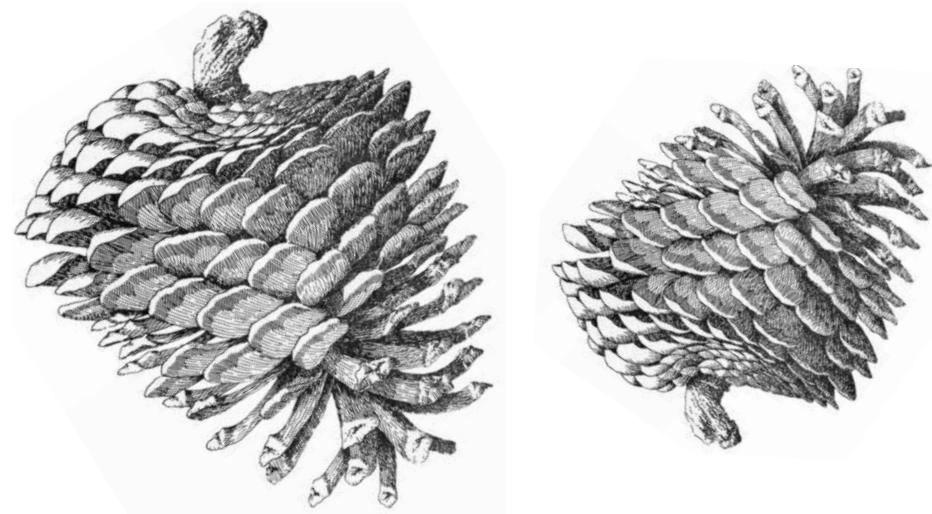
The building design and use of natural materials takes inspiration from British Columbian art and nature.

## Wood as more than Metaphor

The architecture and tectonics of M5 are inspired by nature, our local forests, and traditional weaving techniques. Cedar fiber Baskets were woven into an almost water-tight membrane that were used for storage or for gathering berries, roots, clams and other foods. These were tight enough to be used for boiling soups and stews.

Similar to pine cone scales, the panels of our exterior wall assembly are designed to protect the interior from rain and cold temperatures and provide shading from the sun.

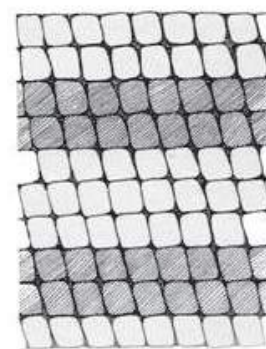
The inspiration drawn from these two sources acknowledges our local forests and is expressed in the tectonics of our building envelope as a way to celebrate mass timber and our local forest industry.



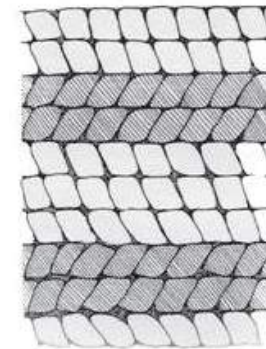
PLAITING TWILL PATTERN



DIAGONAL PLAITING



Close-up of overlay (stitch slants in same direction as rest of weaving)

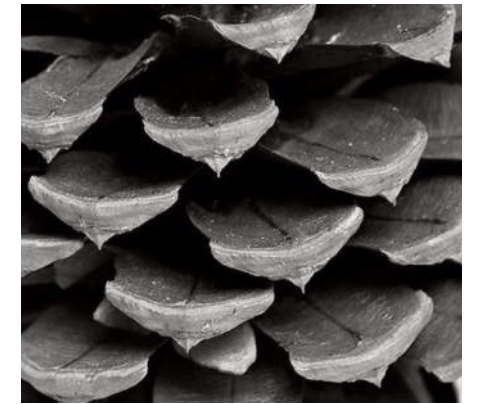


Close-up of false embroidery (stitch slants in opposite direction as rest of weaving)

## Weaving Techniques

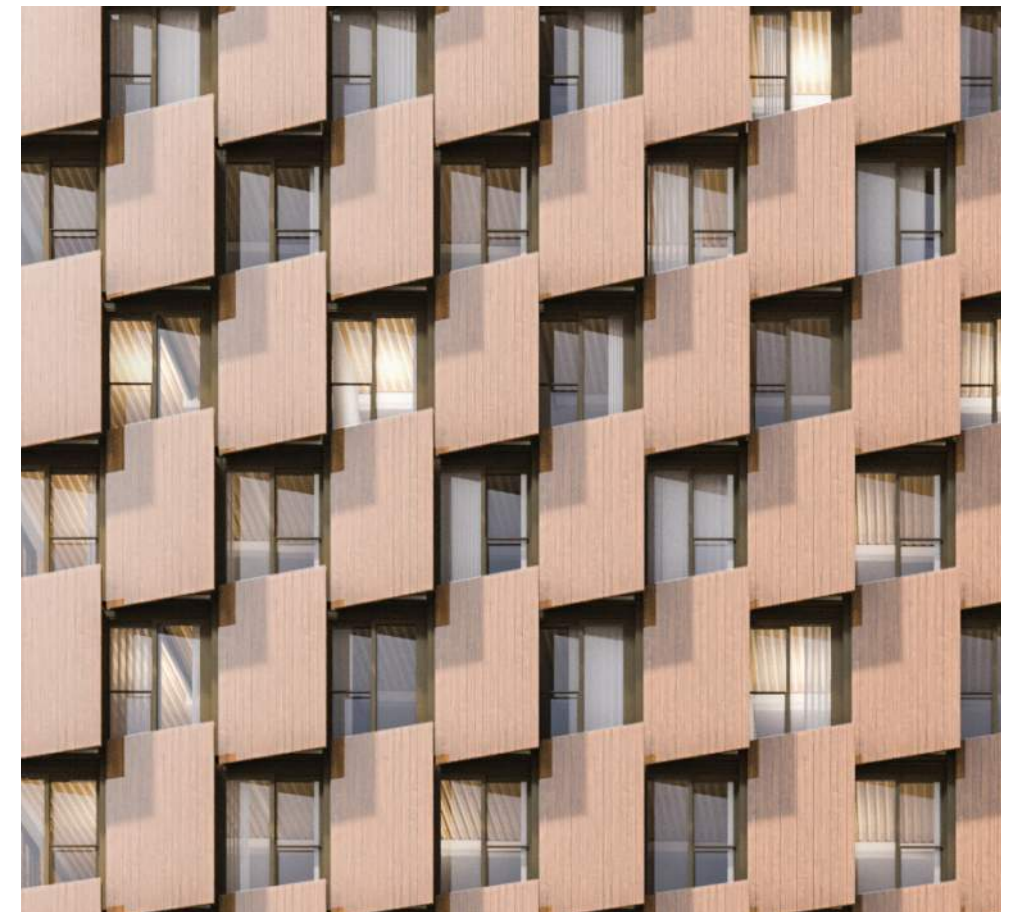


STITCH PATTERN



PINECONE TEXTURE

## Inspiration



## Facade Tectonics



# Affordable, Secured, Purpose-Built Rental Housing

Prototype is 100% secured purpose-built rental housing, including 20% of the residential floor area as Below-Market Rental housing. This project proposal meets affordability measures set by the Broadway Plan and the Rental Incentive Programs Bulletin for eligibility for the Development Cost Levy waiver.

Westbank is proposing a rental structure for the Below-Market Rental (BMR) units where starting rents by unit type will not exceed a rate that is 20% less than the city-wide average rents for the City of Vancouver as published by CMHC, as required by section 12.2.16 of the Broadway Plan.

After initial occupancy, rent escalation during a tenancy will be limited to the increases authorized by the Residential Tenancy Act. Between tenancies, the rent will be re-indexed to the current CMHC average rent by unit type, less 20%.

The below-market rental units and rates would be secured as part of the secured rental agreement and would be owned and operated by Westbank. The single ownership will allow a single door with shared lobby, elevators, and amenities often complicated on other projects with shared ownership.

## Housing Strategy

- 100% Secured Rental Housing
- 20% FSR as Below-Market Rental
- 210 units of Secured Rental Housing
- 168 units of Secured Market Rental Housing
- 42 units of Below-Market Rental (BMR) Housing
- BMR units at 20% less than city-wide average, CMHC
- 35% Family units, including 25% 2-bed, & 10% 3-bed units

### + 100% Secured Rental Housing

100% of all residential units will be secured rental housing. Contributing much needed rental housing in support of the City's 10-year housing goal to provide 12,000 units of social, supportive and Co-op housing, and 20,000 units of purpose-built market rental.

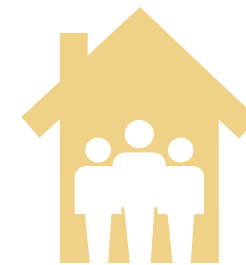


### + 20% at Below-Market Rates

A minimum of 20% of the secured rental housing FSR area will be provided as secured Below-Market Rental housing. The BMR units will be owned and operated by Westbank.

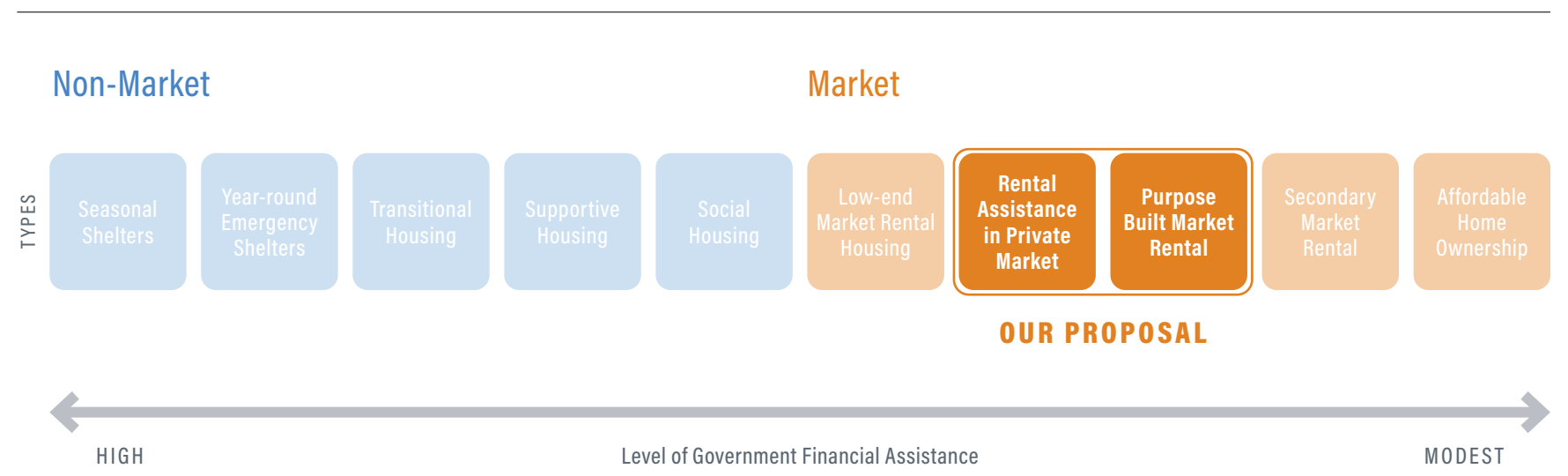
### + True Affordability

Below-Market Rental units will be offered at 20% less than the city-wide average rents as published by CMHC, and subject to income testing and monitoring under the Secured Rental Policy as described in the Rental Incentive Programs Bulletin.



### + 35% Family Units

A minimum of 35% of all secured rental housing units, including those at Below-Market Rental rates, will be two bedrooms or larger and suitable for families with children, including 25% 2-Bed, and 10% 3-Bed units.



## Housing Continuum

# Net Zero Lifecycle Carbon

The building will leverage the low-cost, low-carbon, reliable energy supply options that are readily available.

The building will be designed to minimize both operational and embodied carbon and to offset any residual emissions.

*Over 25 years:*

## Operational Carbon = 10% of emissions

Optimize the design of the building envelope and select low-carbon energy systems to minimize operational emissions.

## Embodied Carbon = 90% of emissions

Design and construct the building in a way that minimizes embodied emissions.

## Offsets

Purchase verifiable carbon offsets that will reduce carbon emissions within the City of Vancouver.

## Trends in operating vs. embodied carbon

Past → Future

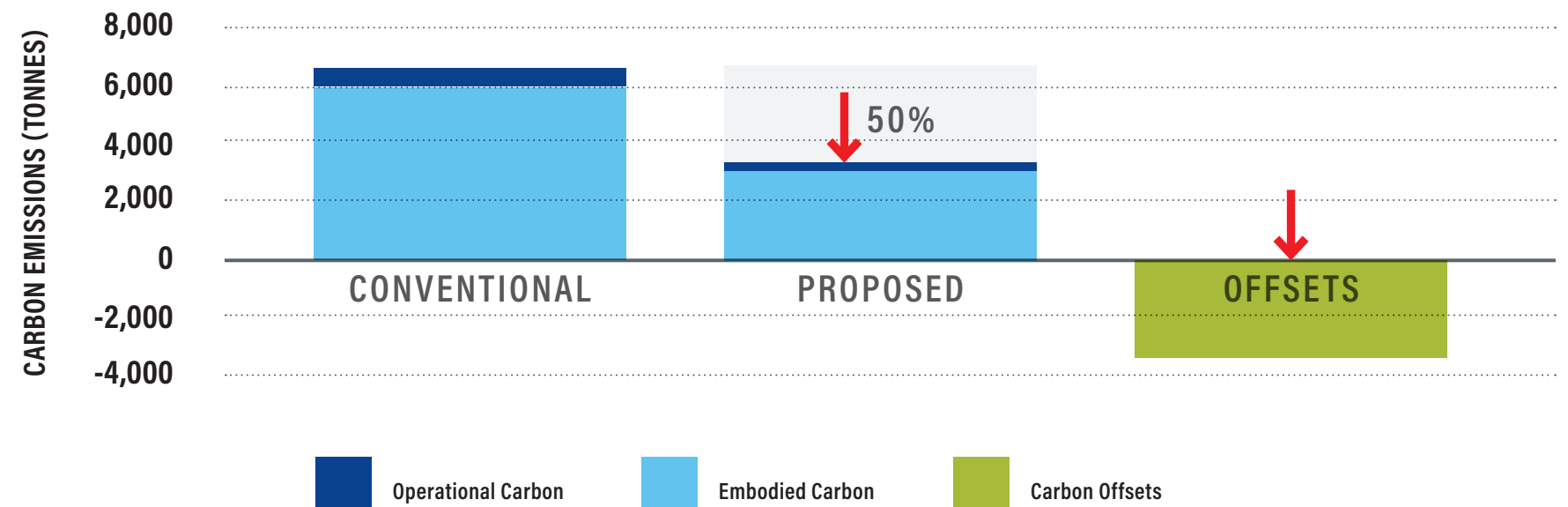


## NET ZERO LIFECYCLE CARBON

$$\text{Reduced Operational Carbon} + \text{Reduced Embodied Carbon} - \text{Carbon Offsets} = \text{Zero Carbon}$$

## Carbon Emissions over a 25-year lifecycle

Our goal is to reduce Operational and Embodied Carbon by half and purchase offsets for the remaining carbon emissions over the course of a 25-year lifecycle.



# Reducing Embodied & Operational Carbon

Focusing on energy reductions alone can be costly and may not always deliver on reducing emissions. We are proposing a balanced approach with a clear focus on both embodied and operational carbon reductions.

## Embodied Carbon

In the context of relatively affordable and clean energy available to the M5 project in particular, reductions of embodied carbon become all the more critical to reducing overall carbon emissions. Our strategy will focus on the sub-structure and super structure, which accounts for 60% to 70% of the building's embodied carbon. We are proposing a balanced, rational and cost effective approach, using the right material for the right purpose. Our approach is to use mass timber for the floor slabs where it is the most effective, combined with steel posts for vertical loads and a low-carbon form of concrete for the building core. This approach will achieve a 50% reduction of embodied carbon compared to a conventional design.

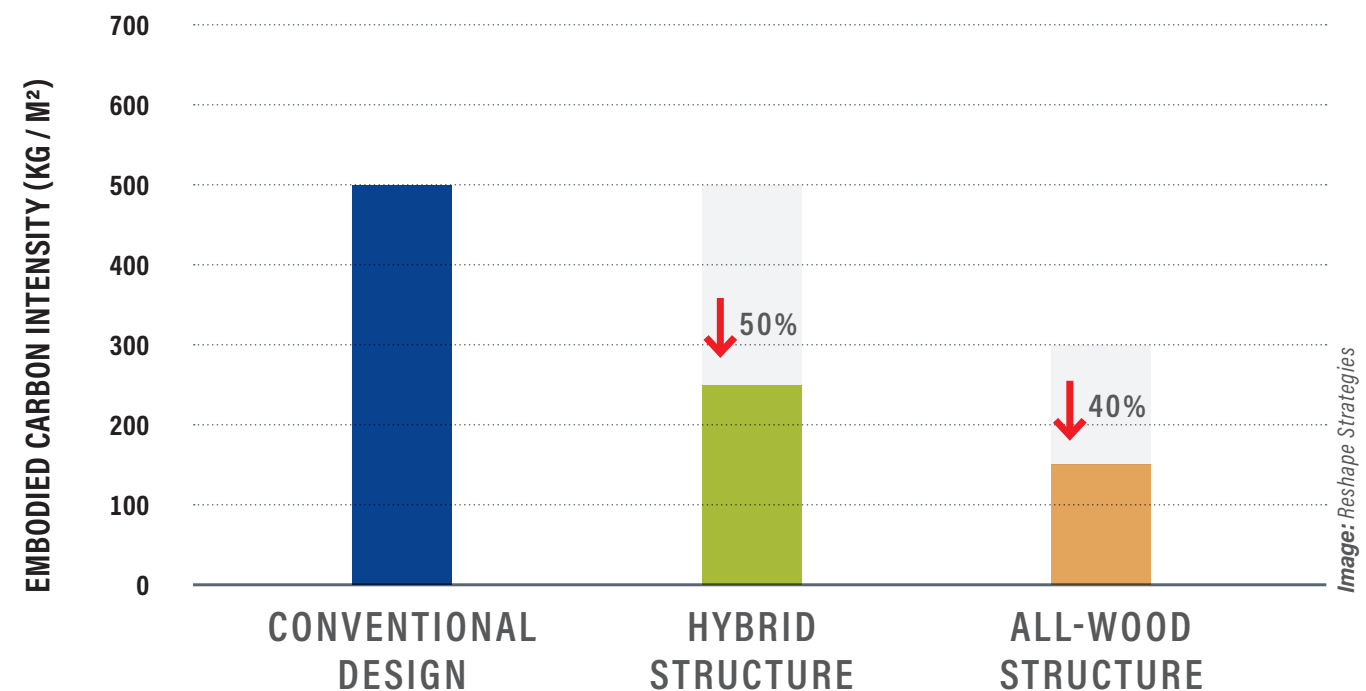
- Hybrid Mass Timber Structure
- 50% reduction of embodied carbon

## Operational Carbon

Our strategy includes a combination of a High Performance Envelope and a Low Carbon Energy System. The building will be designed to achieve a minimum TEDI of 30 kWh / m<sup>2</sup> / yr or better, and will leverage the availability of district heating and cooling systems.

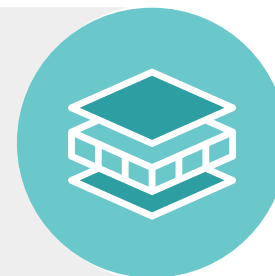
- Connect to District Energy
- Reduce % of Glazing to 35%
- High Performance Walls and Glazing
- Overall Minimum TEDI Target of 30kWh/M<sup>2</sup>/year

## Embodied Emissions Intensity by Building Type



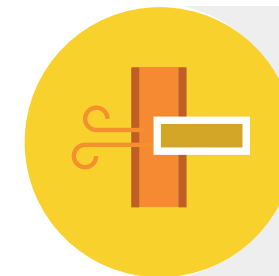
### BOOST INSULATION

To reduce heat loss, increase insulation in walls, floors, roof, and foundation.



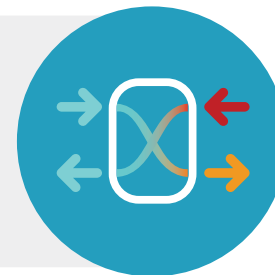
### MINIMIZE THERMAL BRIDGES

A break in your insulation acts like a bridge that carries heat straight out of the house. Take care with corners, junctions, gaps and studs!



### VENTILATE SMARTLY

Bring plenty of fresh air into the home and recover heat from the exhaust air leaving the building.



### SEAL IT UP

Air leaks are heat leaks. Wrap the home tightly, taking care to seal around ducts, pipes, fixtures, and wires that pass through walls, ceilings, and roof.



# Low-Carbon Energy

The building will leverage the low-cost, low-carbon, reliable energy supply options that are readily available.

The energy required to operate the new affordable rental housing building at Main and East 5th will take advantage of clean energy readily available to the project, including the following:

## Power

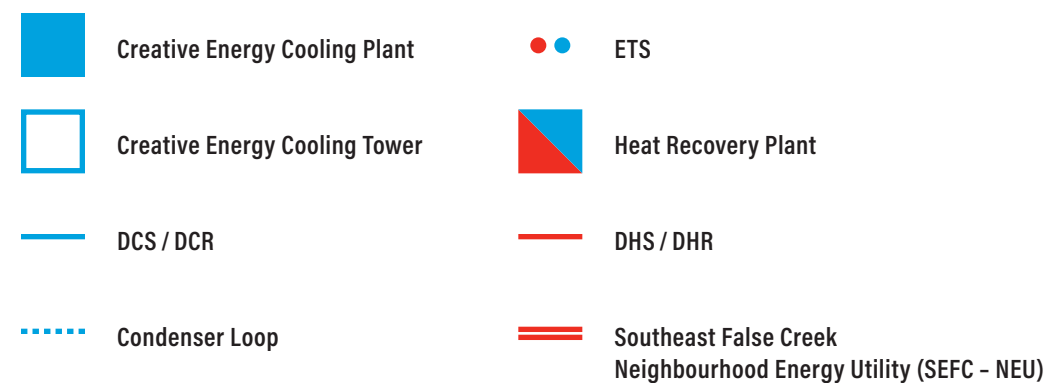
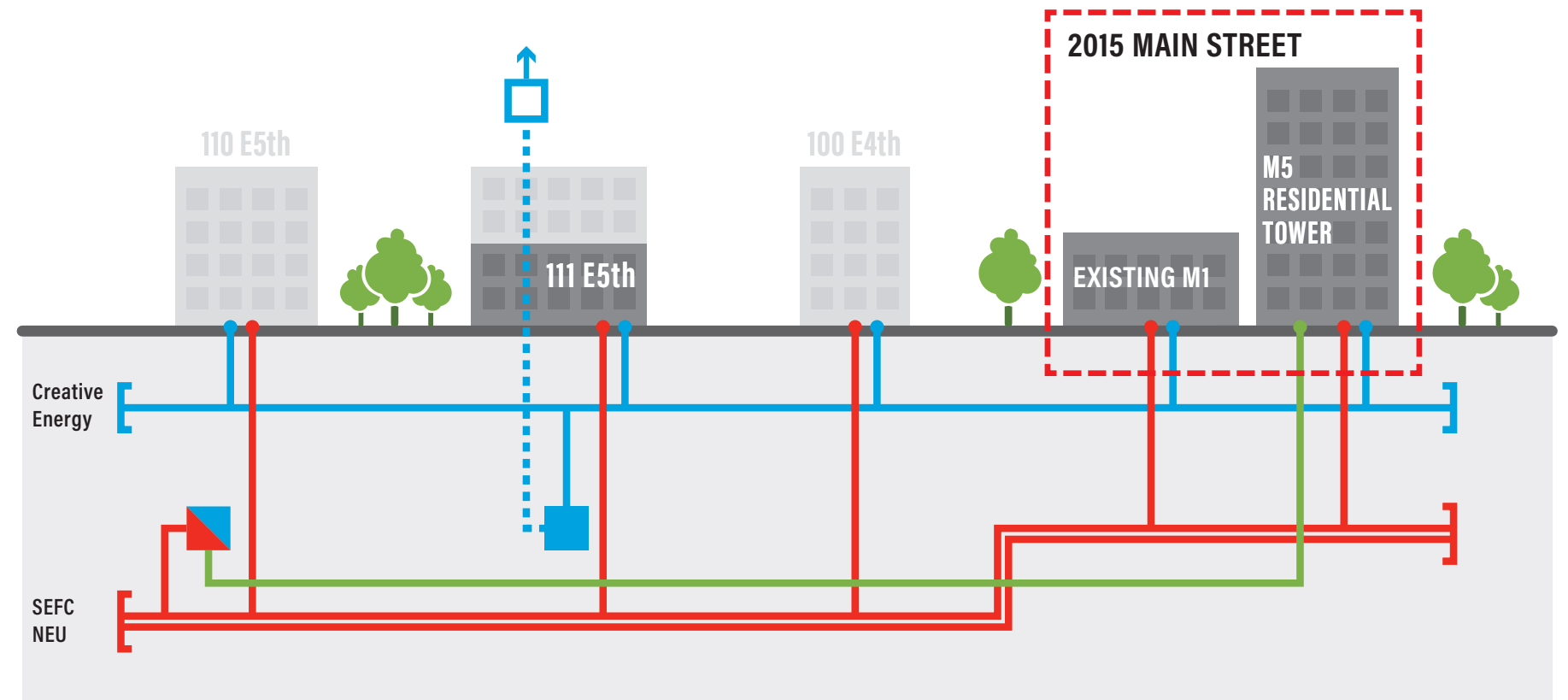
The new building will connect to BC Hydro that is already 95%+ low carbon with a carbon intensity of approximately 10–30 kg / MWh, which varies year to year based on conditions.

## Space Cooling - Creative Energy

The project will connect to Creative Energy's District Cooling System that has a carbon intensity of approximately <10 kg / MWh, which fluctuates with BC Hydro's carbon intensity.

## Space Heating and Domestic Hot Water - SEFC NEU

Multiple options exist for this site to achieve a Zero Carbon solution including an option to connect to SEFC NEU, or alternatively the project could create an ambient loop network between Creative Energy's cooling plant and the M5 residential building. These options are being explored further by Reshape Strategies and Creative Energy.



# Hybrid Mass Timber Structure

We are proposing a hybrid mass timber structure to reduce embodied carbon with a focus on using the right materials for the right use.

## Mass Timber Floors

Floors are proposed to be constructed from Mass Timber for a significant reduction of embodied carbon. CLT panels will be exposed for a significant portion of the floor area. These are designed to provide an additional 2-ply to provide the required char layer thickness and meet fire resistance rating (FRR) requirements.

## Columns & Beams

Steel columns and beams are proposed for the main vertical support structure for the CLT panels. This balanced approach reduces floor to floor heights, simplifies connections and fire protection, controls costs, and maximizes overall embodied carbon reductions.

## Connections

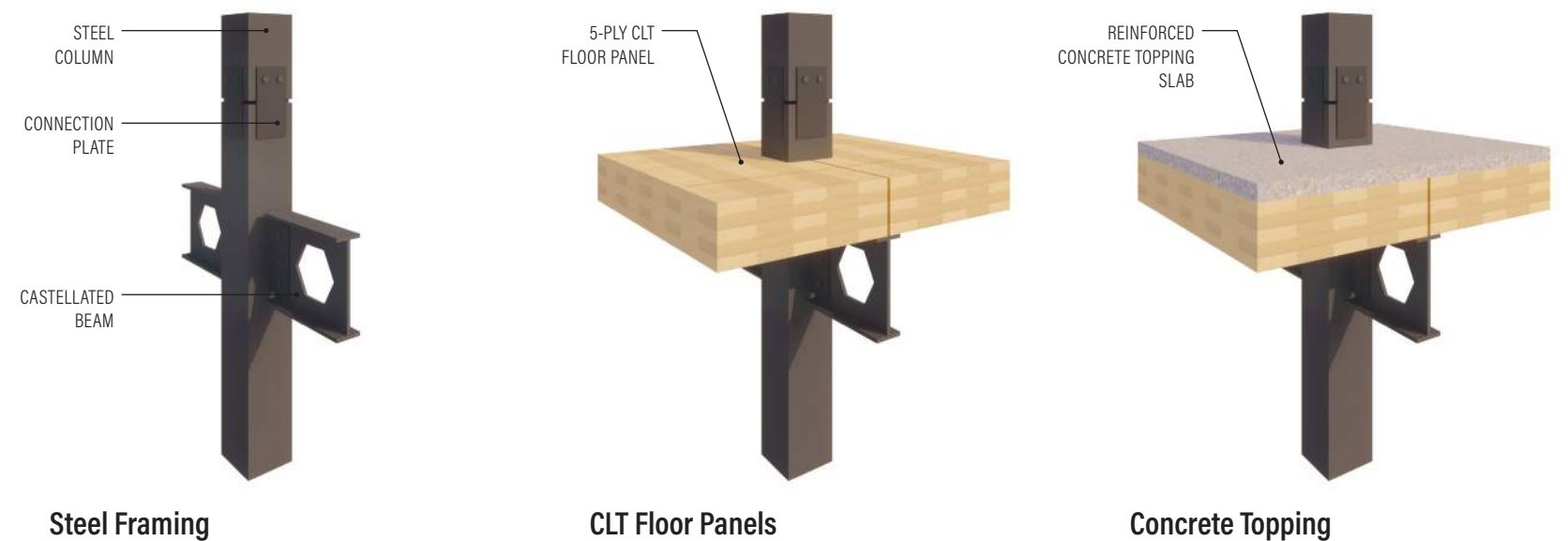
Wood-to-wood connections are a significant driver of cost and one of the main reasons we are proposing steel posts and beams.

## Low-Carbon Concrete Core

We propose a central core, including the structure from foundation up to a transfer slab at underside of Level 3, to be constructed from low-carbon concrete. Cement replacement such as Carbon Cure or SCMs will be explored to reduce the embodied carbon of the concrete component

## Exterior Panels

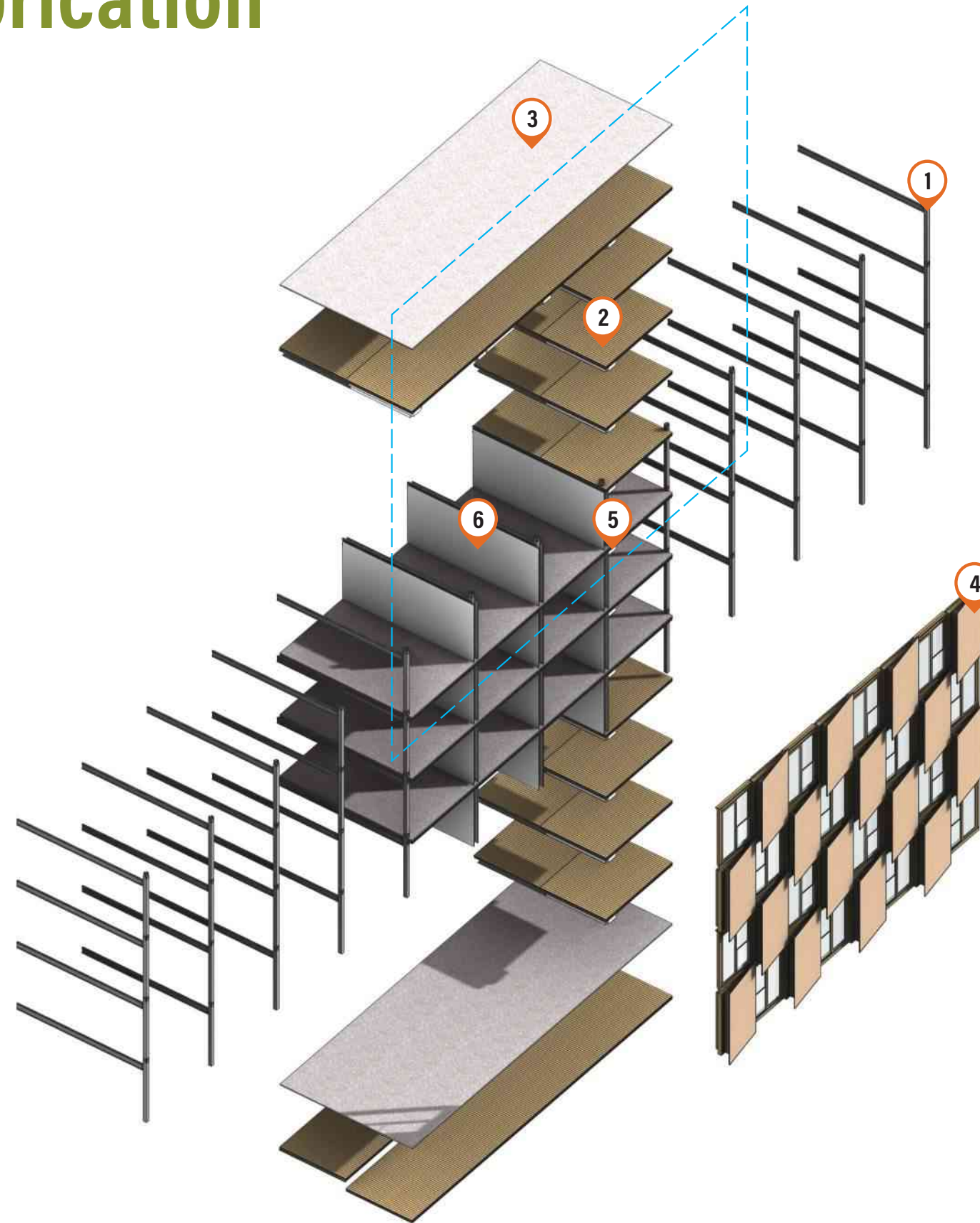
The exterior panels are designed for prefabrication and ease of installation. The internal CLT panels will provide the necessary rigidity and structural integrity to support the exterior insulation and cladding. The CLT panels will be exposed within the suites to take advantage of the visual warmth of the timber panels. The panels will be highly insulated and air tight.



Curtain Place, Hybrid Mass Timber Building, London

# Mass Timber & Prefabrication

- 1 Steel Structure
- 2 CLT Floor Panels
- 3 Concrete Topping
- 4 CLT Wall Panel & Window Wall Envelope System
- 5 Services routed to facade
- 6 Interior Partitions



# Mass Timber Balconies – Construction Challenges

Barriers to entry for mass timber are very high. Height and density Incentives are not possible due to the view cone. In lieu of additional density, our proposal has been designed without projecting balconies in response to the following challenges.

## Challenges

- Significant risk of moisture damage with CLT floors
- Challenging structural and building envelope detailing with wood CLT floors
- Increased thermal bridging / increased carbon emissions
- Combustibility of mass timber overhangs – balconies to be of non-combustible construction or to be sprinklered
- Constructibility challenges – prefabricated balconies difficult to install
- Expensive – will add \$3 to \$4 million to the project
- Projecting steel Balconies will increase overall embodied carbon
- Changes the design – concrete construction if balconies required
- Delays approvals and delivery of affordable rental housing – necessitates complete redesign

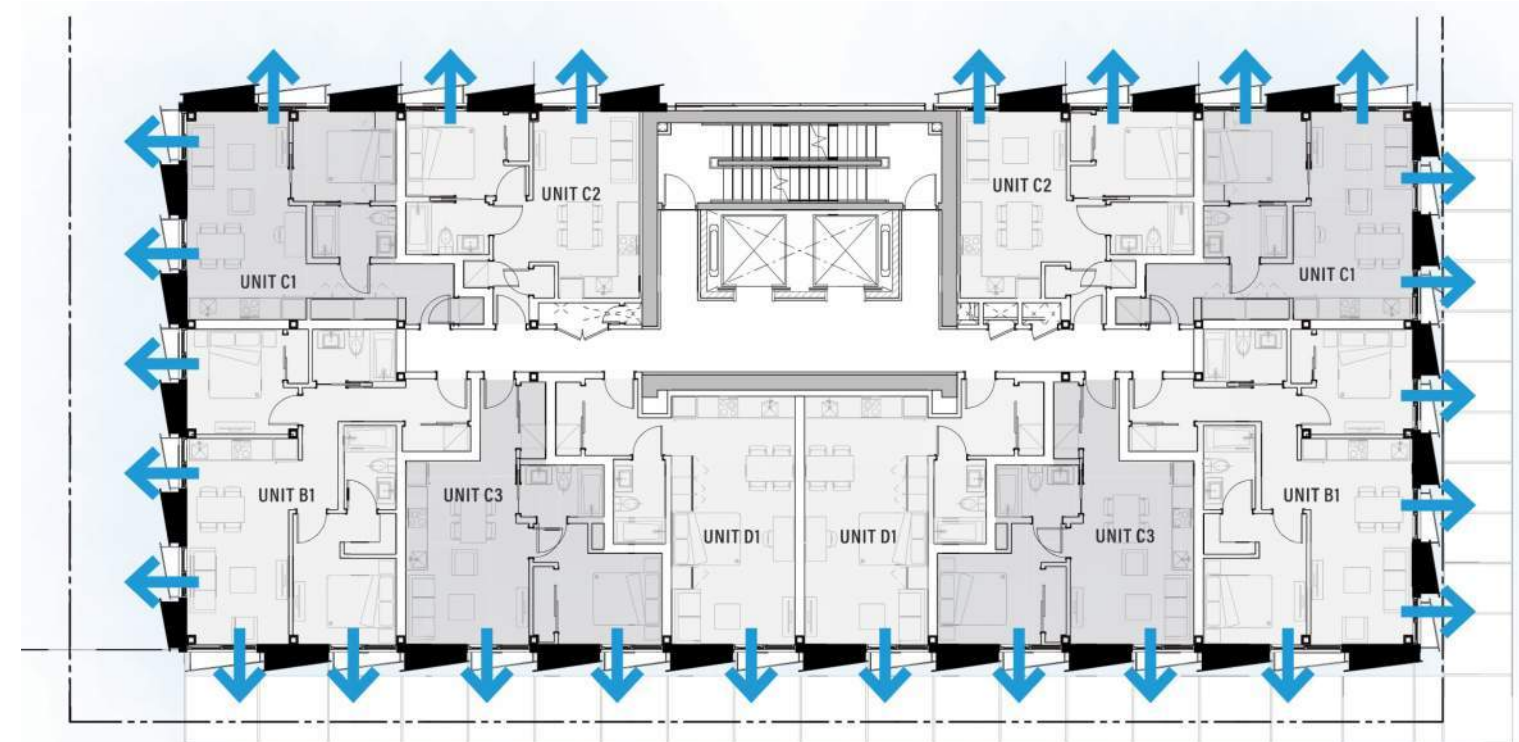
Considering the many challenges of providing balconies, if individual private balconies are to be provided, a full redesign of the project would be required to change the structure to conventional concrete construction.

# Proposed – Juliet Balconies

Our proposal has been designed with juliet balconies at each window, allowing large openings, access to fresh air and cross ventilation.

## Juliet Balcony Strategy

- Each room has a juliet balcony
- 26 juliet balconies per floor
- Total: 598 juliet balconies



Typical Floor Plan Showing Location of Juliette Balconies

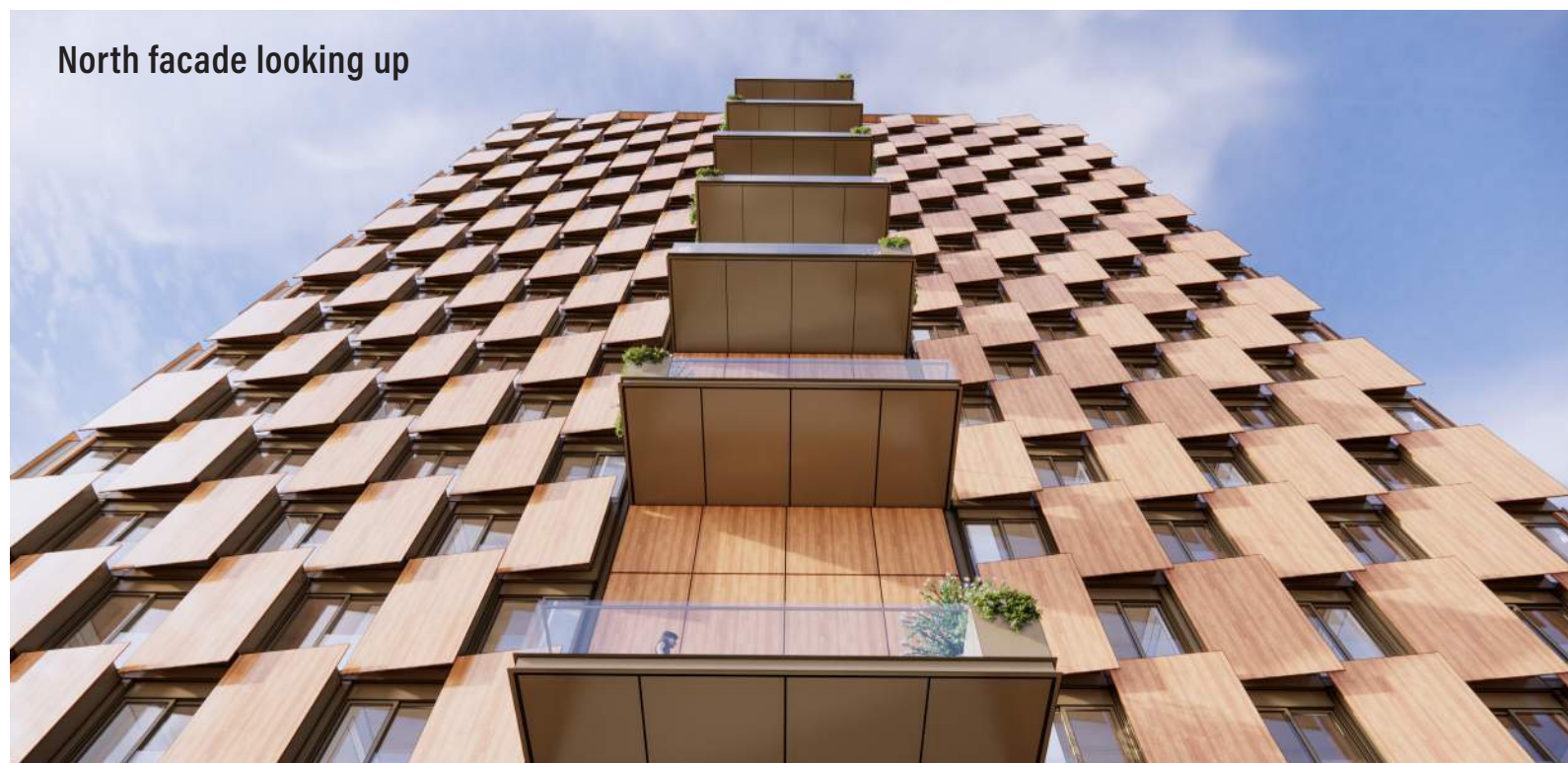


# Proposed - 8 Common Balconies on North Facade

We are proposing large common balconies for private and communal gatherings with views of water and mountains.

## Common Balcony Strategy

- Located at every third floor / 8 in total
- Large programmable space / 3 m deep × 7.8 m wide / 250 ft<sup>2</sup> each
- Private or communal gatherings



# Common Balconies



# Proposed - Outdoor Amenities: Rooftop & Ground Floor

We are proposing to use all available outdoor area for amenity.



# Rooftop Outdoor Amenity: BBQ / Lounge



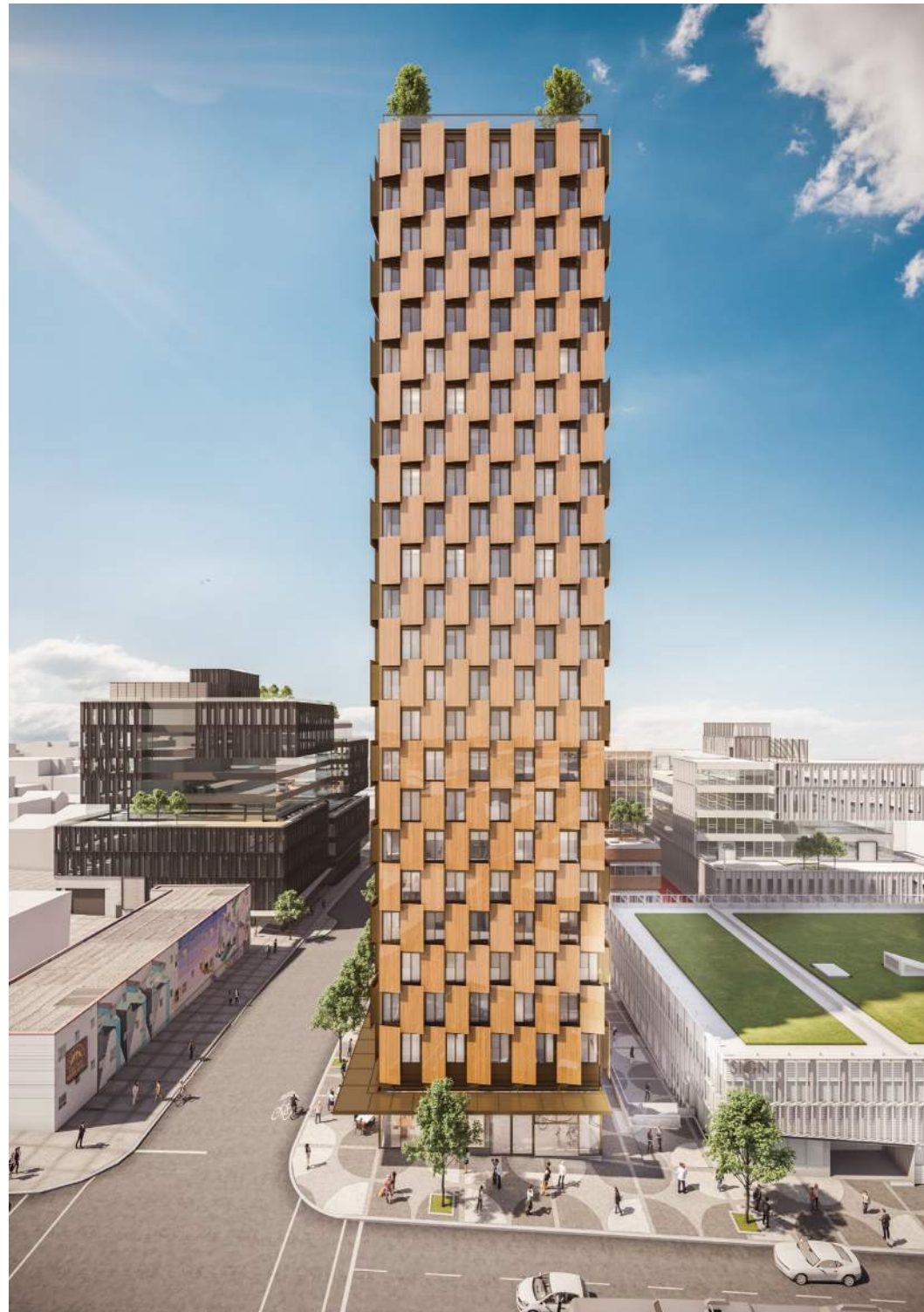
# Rooftop Outdoor Amenity: Gym



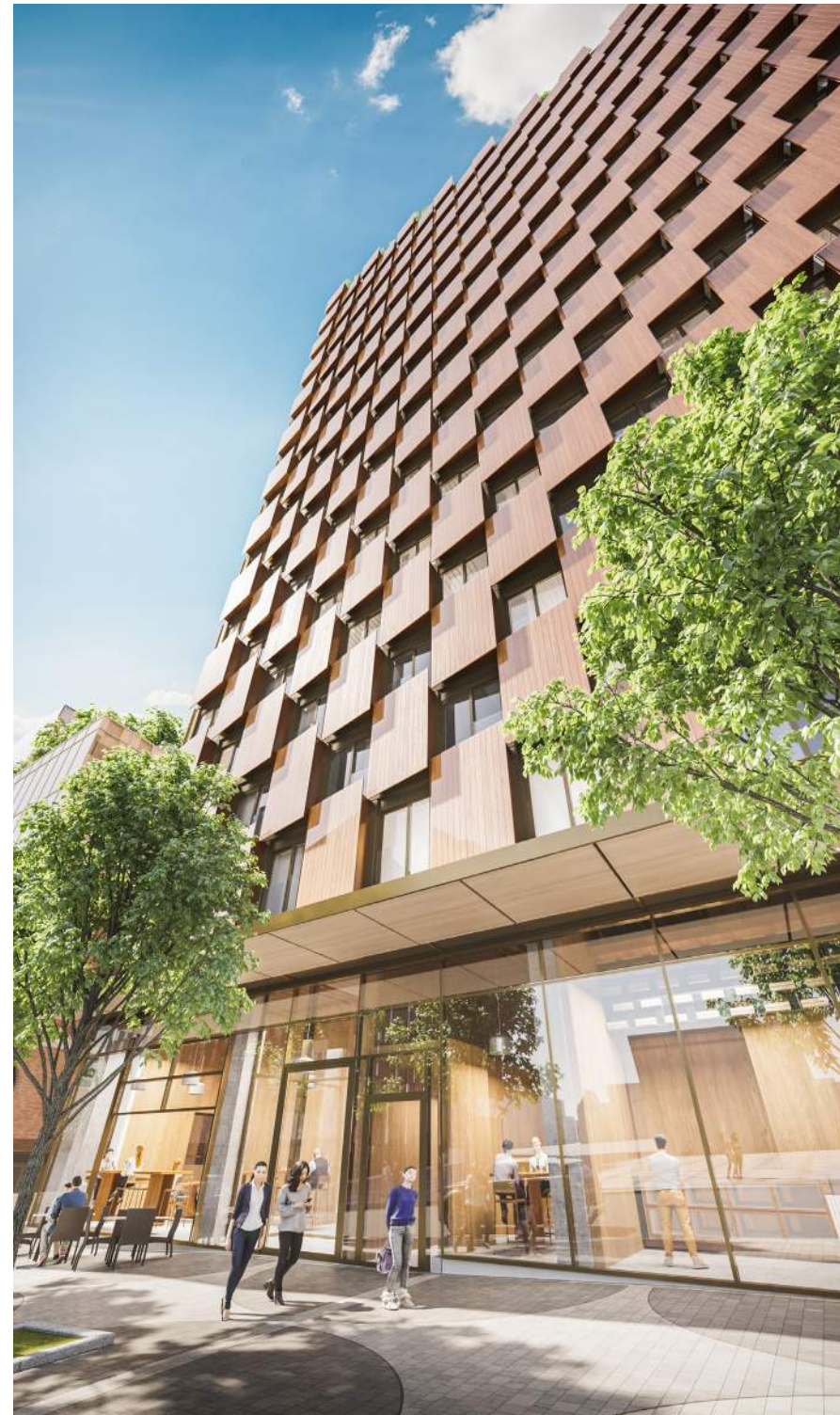
# Ground Floor Outdoor Amenity: Lounge & Children's Play Area



# Renderings



East Elevation



View from East 5th Avenue looking up tall wood tower



PROTOTYPE - (M5 RENTAL HOUSING)



# Materiality & Public Art

A palette of carefully chosen materials has been selected to complement the natural, warm, and welcoming tones of the interior mass timber structure.

The main structure of the building above-grade will be constructed in steel as the main vertical support of the CLT floor panels that will be visible in the interior spaces and welcome the public into the common areas.

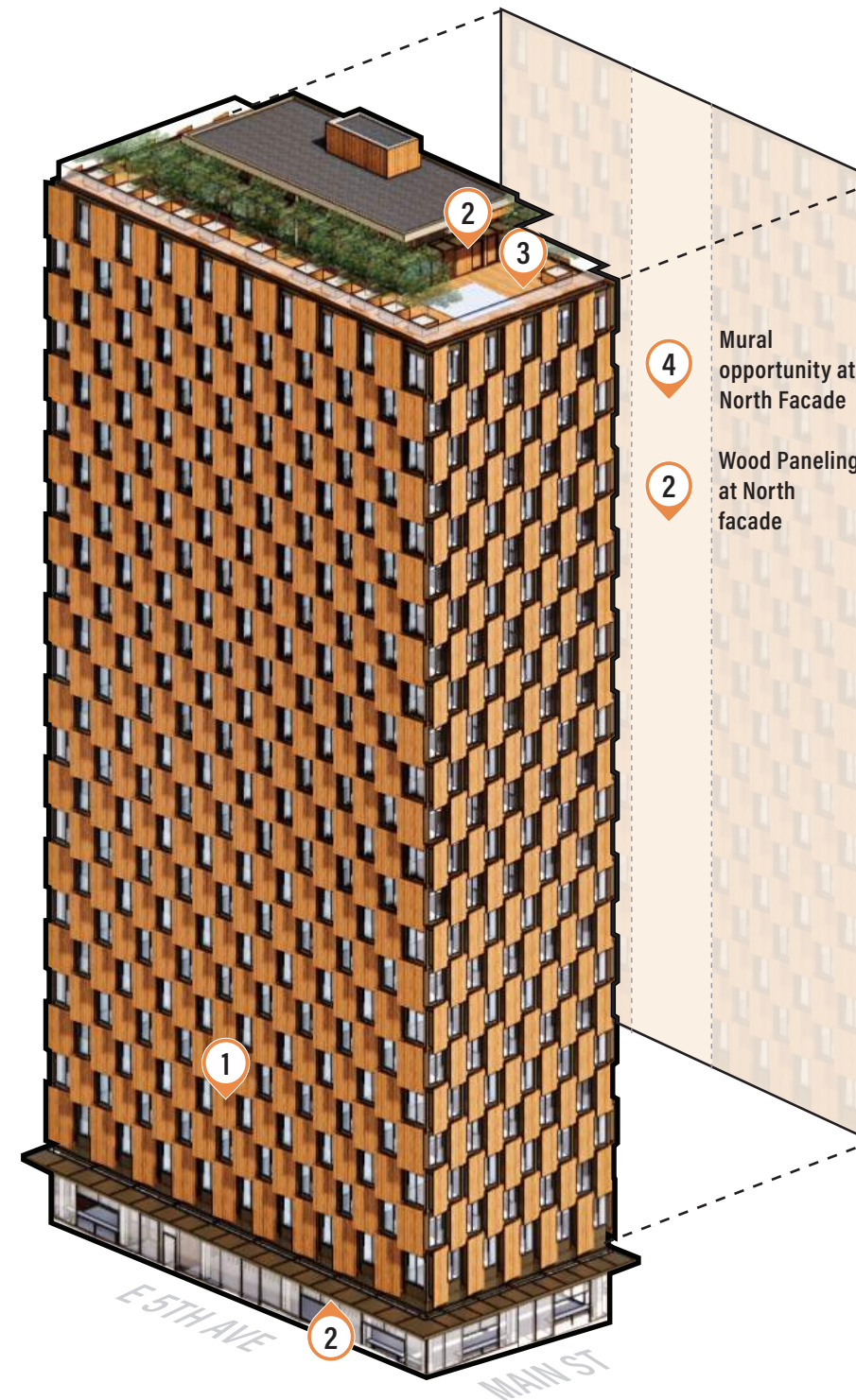
The exterior of the building will be clad using a laminated panel rain-screen system that will showcase the appeal of real wood and animate the facade. This outer skin is part of a high-performance insulated envelope that responds to the surrounding environmental conditions.

At-grade, a CLT panel canopy will provide continuous rain protection along Main Street and East 5th Avenue. The retail and urban relationship will be further enhanced by display areas and overhead doors that will be open during summer. A roof-top deck will provide inviting open-air leisure areas and extensive greenery.

## Public Art

Public art will be an integral part of our project. Our proposal will extend the canvas and enrich the Main Street area with mural art. The level 1 facade facing the lane and the 25 storey core wall on the north facade provide opportunities to enrich the area with mural art to support the expanding collection of public art in the neighbourhood.

We are strong supporters of emerging artists, both local and international. We recognize the importance and quality of public art in Vancouver and embrace public art as a means of contributing to the community, and we look forward to working with the City and the community to create a public art program for this building that will be inspiring for those who live, work, or visit the area.



Front of Building



1 Glazed Panel with Integrated Wood Veneer



2 Wood Paneling

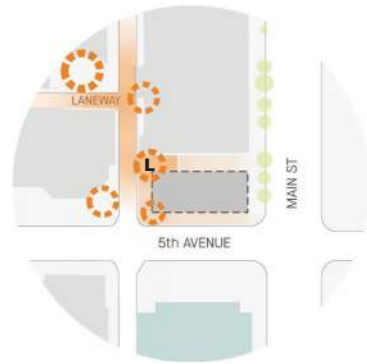


3 Outdoor Amenity



4 Mural Artwork

# Landscape Principles



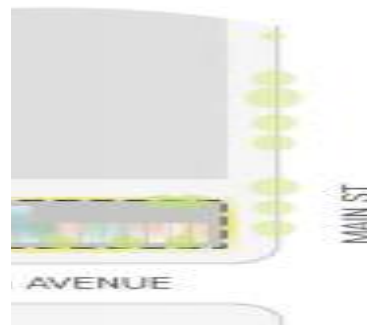
## Anticipate the Future

The wider Campus incorporates M1 & M2 (complete) and the soon to be built M3, M4 and M5 buildings, as well as the future tower and retail at M6. There are multiple access points to the lane from these buildings, activating the lane and providing an opportunity for plaza connections. It is intended to upgrade the lane for the benefit of all these sites.



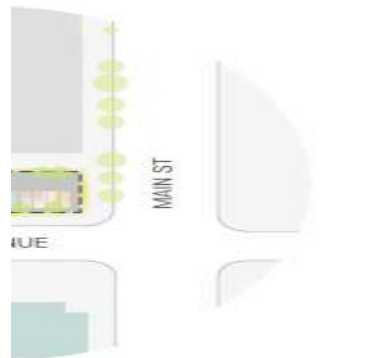
## Inside / Outside

Create spaces that provide opportunities for the blurring of interior and exterior boundaries. The retail edges of the building provide opportunities for the storefronts to engage the street. Covered patio areas could spill out along Main Street and 5th Avenue and draw people into the campus.



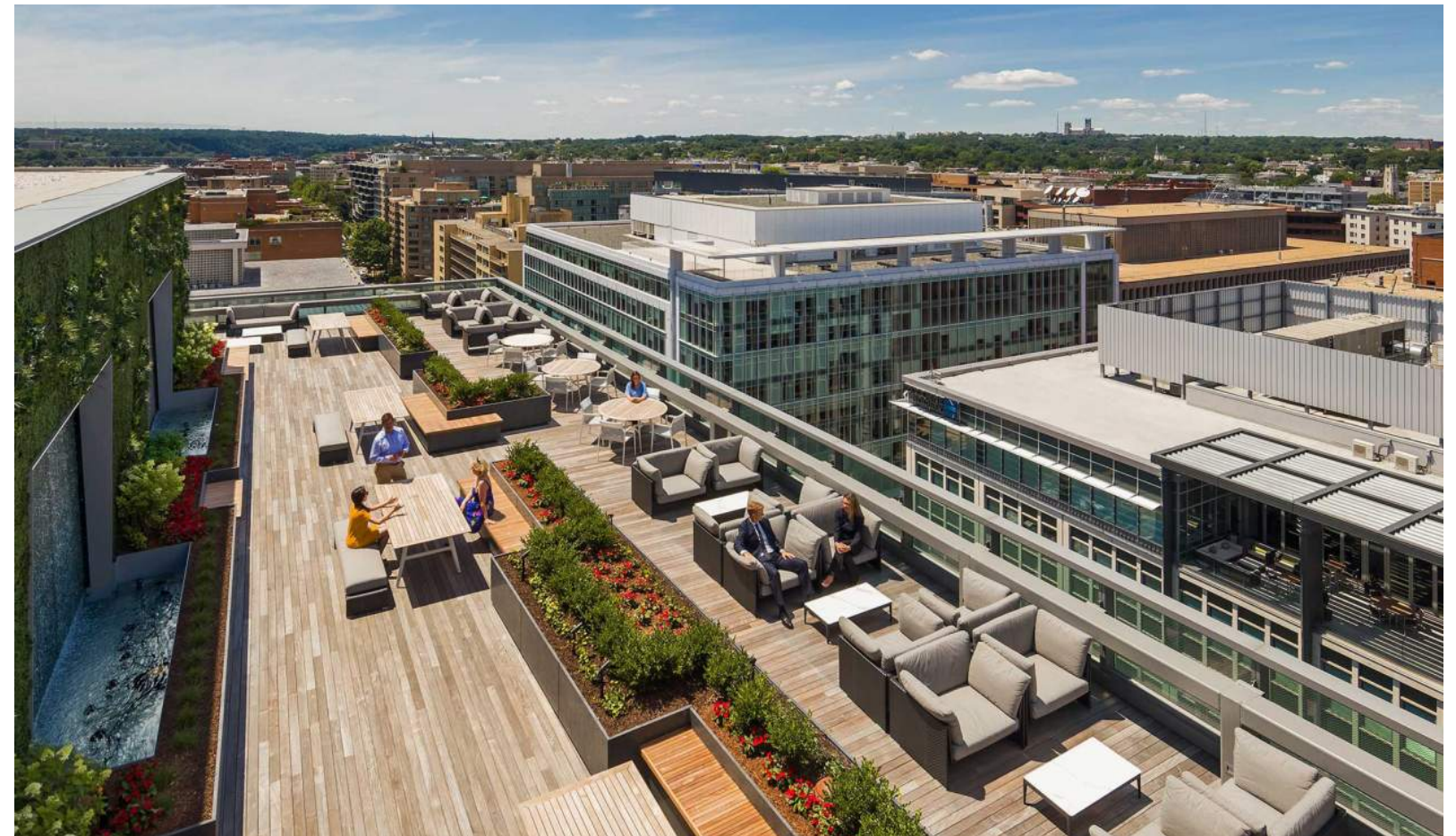
## Grading as an Opportunity

The site has substantial grade change along Main Street and the alley that posed both challenges and opportunities. On the laneway edge, this creates opportunities for direct access to bike rooms and minimizes the amount of frontage devoted to back of house services, maximizing opportunities for active frontage on Main and 5th to enrich the public realm.



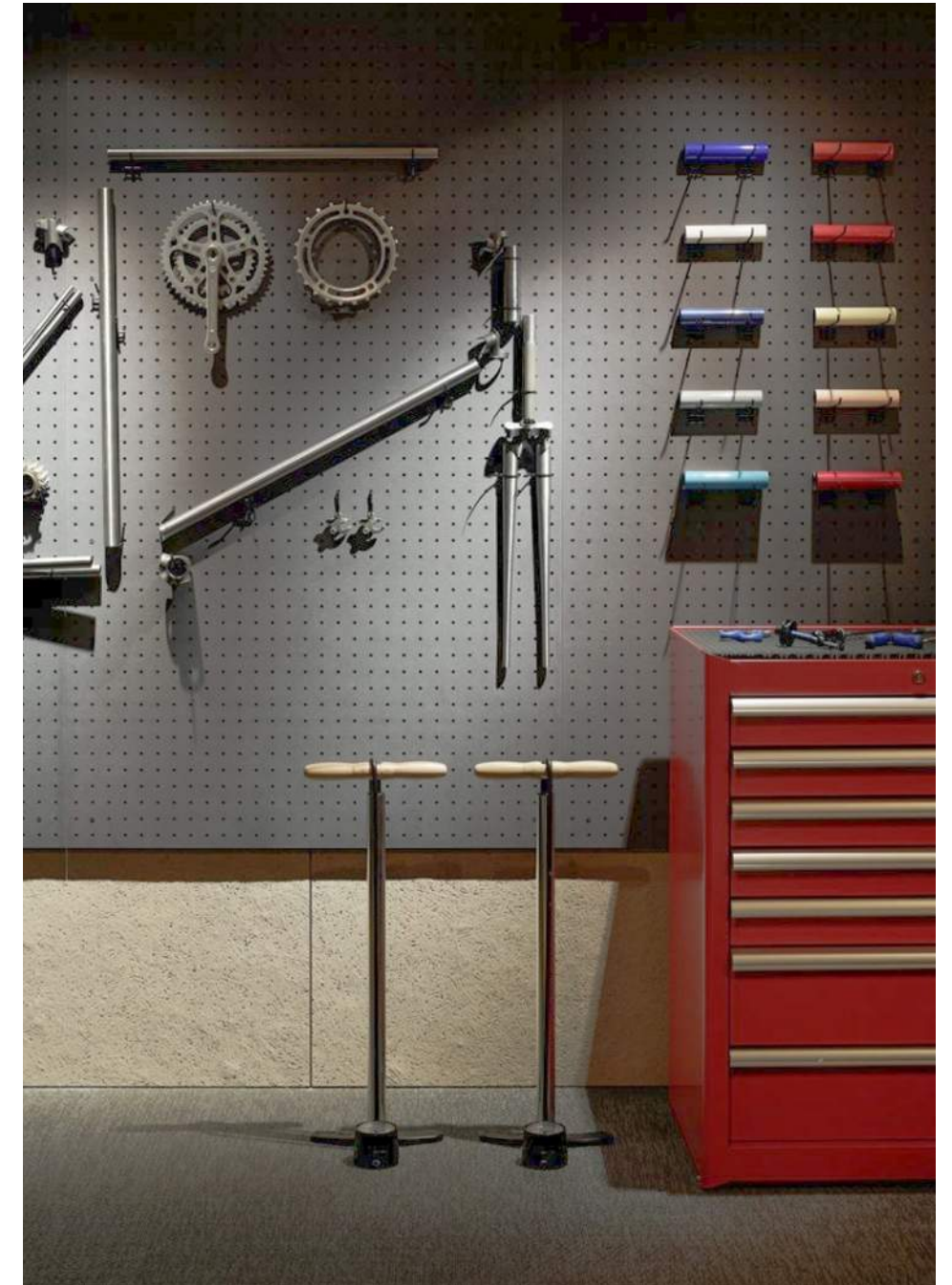
## Sustainable Landscapes

Create vibrant landscape that revolve around sustainable concepts. The rooftop of the building provides an opportunity to capture rainwater and plant urban agriculture. The urban agriculture would become a productive, aesthetic, and engaging social space for the residents and visitors alike.



Rooftop Amenity & Roof Garden

# Amenity Bike Lounge & Bike Repair Area



Enhanced bike facilities including a bike cafe will encourage green transportation in Vancouver.

# Residential Lobby & Amenity



Bike art displays will celebrate and support bike culture.



PROTOTYPE - (M5 RENTAL HOUSING)