2022 Canadian Green Building Awards

KEARNS MANCINI ARCHITECTS

The Putman Family YWCA

Hamilton, ON

The elegant new design has re-introduced the YWCA to the artistic Crown Point neighbourhood. The architectural intent of the project was to be part of the existing community, be reflective of Hamilton as a Steel Town and use local manufacturers where possible. A one-story podium, designed to pay homage to the surrounding contextual fabric, will connect the community programming with the street.

The building consists of a five-story 50-unit multi-family social housing residential component with a one-story + basement Community and Enterprise Centre podium. The design also includes multiple outdoor amenities that vary in privacy and program led by YWCA Hamilton.

Built to the Passive House (PH) International Standard, the building consumes 90% less heating and cooling energy than conventional buildings. Today, the Passive House High-Performance Building Standard is the only internationally recognized, proven, science-based energy standard in construction, and is the most rigorous building standard in the world.

To meet this standard, the building consists of a unique total precast system with a sandwich panel which forms the thermal, air-tight, structural, weathering, and aesthetic façade in one factory-built component.

The PH building offers supreme health, comfort, and energy efficiency, aligning with the YWCA's core values of providing comfortable, healthy, secure, resilient, and safe housing for women.

1

Strategic Decisions

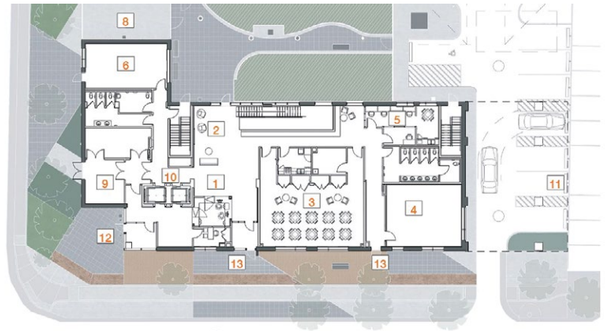
The YWCA is Hamilton's first affordable housing residence for women and children. Of the 50 units, 15 were reserved for women living with a developmental disability. Priority for all units was given to women from marginalized and Indigenous communities who have experienced domestic violence and homelessness. The property will also house spaces designed for community gatherings, an Innovation Centre, a community garden, a flexible area for seniors, and health and wellness programming. The building was built on the site of the disused YWCA swimming pool.

In taking on PH design standards, the client wished to pursue a factory-built solution to reduce the construction risk of a high-performance building. Given the size and scale of the building, using modular wood would be unfeasible for the YWCA. Instead, a factory-built concrete building could significantly reduce the embodied carbon from a conventional cast-in-place. The precast concrete and steel materials were manufactured in Hamilton.

2

Community

In 2021, rent prices in Hamilton skyrocketed more than 14%, leaving many with the impossible choice of either paying for shelter or paying for food. Hamilton's waiting list for social housing is over 6,000 people. Women face unique barriers in securing safe and affordable housing and are the most vulnerable to homelessness. Safe and secure housing is a haven for many women and children, offering a bright future and protection from abuse. The YWCA meets the community's goal to provide women and children with a stable home and the resources and opportunities required to rebuild their lives.



Site plan / Plan du site N

1. Resident and community reception / Réception pour résidents et membres de la communauté
2. Open seating area / Aire ouverte avec chaises
3. Senior's centre / Centre pour aînés
4. Community centre auxillary space / Espace communautaire auxiliaire
5. Administration / Administration
6. Multi-purpose / Fonctions multiples
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12. Resident entry / Entrée des résidents
13. Community entrance / Entrée communautaire

The use of dark and light colours reduced the mass of the building, which fitted pleasantly into the established community.

3

Site Ecology

Using precast concrete from a local manufacturer reduced the use of traditional formwork, auxiliary elements, and waste. The process reduced erection times, truck idling, traffic congestion, construction site emissions, site lighting etc., leading to far less noise and pollution and dramatically reduced environmental impacts on the site. The redevelopment of the brownfield site uses existing nearby infrastructure like road networks, electricity networks and amenities. This lessened the need to further develop surrounding land, preserving acres of undeveloped space.

4

Light & Air

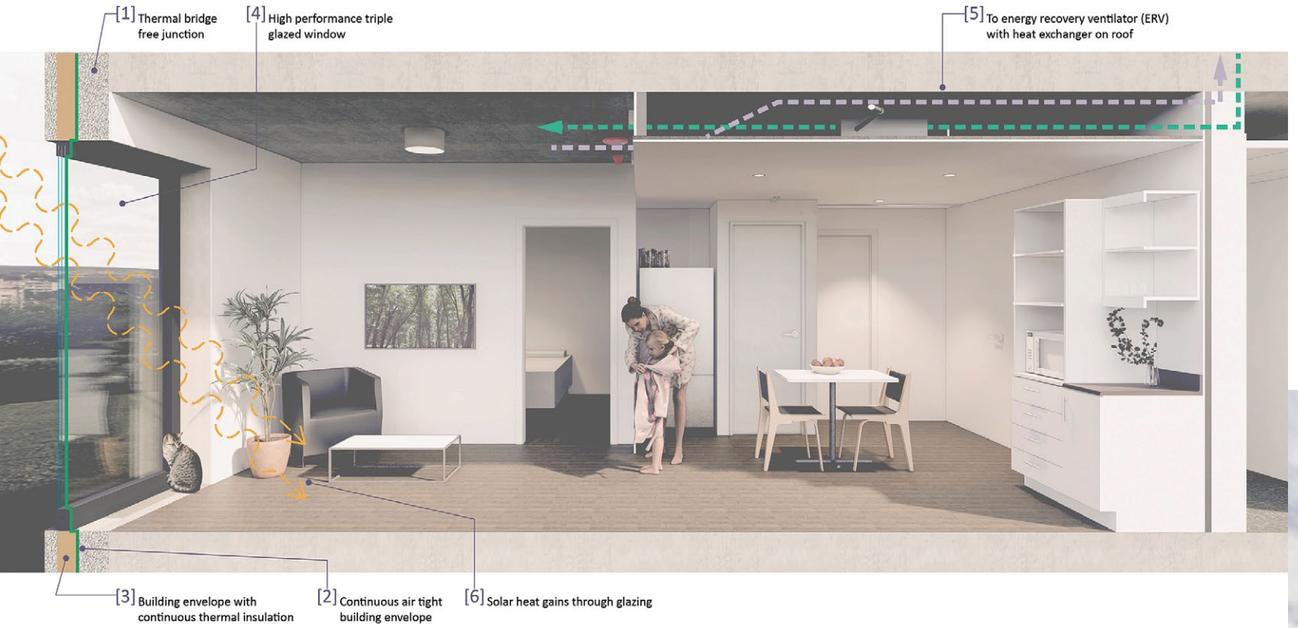
All occupants have 100% access to operable windows. The PH-Certified energy recovery ventilator provides constant HEPA filtered fresh air supplied to all occupied rooms throughout the 24/7. The building's ventilation system eliminates air quality issues decreases the risk of mould and spreading viruses, and helps to achieve thermal comfort. The building is massively airtight, making it possible to provide exceptional quality air at a significantly low air flow rate. The ventilation system provides most of the heating by recovering 85% of the heating / cooling already in the building. All lighting is LED and common spaces have occupancy sensors.

Natural lighting design was essential to the project by using exterior glazing windows, and sky lighting reduced artificial lighting requirements and saved energy.

5

Wellness

The project has specifically designed spaces to promote health, mental wellness, safety, and community belonging. Residents have access to the 6th Floor Residents Lounge, including communal and laundry areas and a rooftop patio where children can play. Residents can enjoy the outdoors in a secure private zone during the warmer months. Families residing in the building will also have access to the multipurpose and community spaces.



PASSIVE HOUSE STRATEGIES

Healthy Environment
PH ventilation systems can remediate most allergens, particulates, infectious agents and toxic compounds.

Enhanced Comfort Level
No temperature swings or drafts creates a consistent indoor condition during all seasons.

Wellness
The elimination of toxins, and consistent temperatures means an overall improvement in wellness.

Energy Efficiency
The building does more with less; using very little energy and utilizing renewable resources, helping preserve oil and gas.

Resilient
The building maintains a consistent temperature for long periods after power is lost providing resiliency during extreme weather events and power outages.

Affordable
Efficient building design, coupled with high quality, coordinated and sequenced construction, reduces construction costs and operating and maintenance costs.

6 Water Conservation

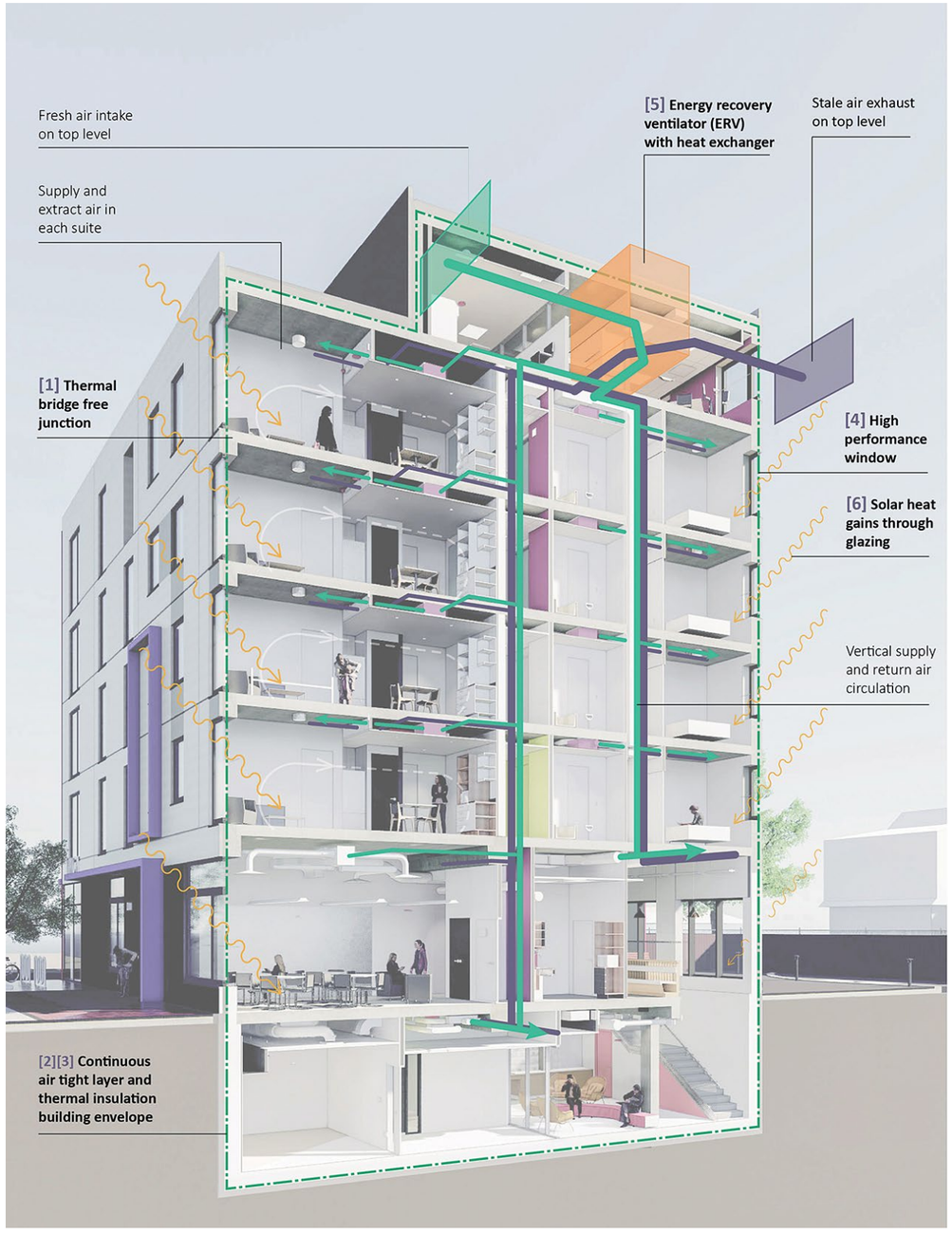
The project design addresses water quality and conservation from the ground up. Water usage is reduced through low-flow fixtures and fittings. The PH rigorous design requires that all hot water system losses are removed. This reduces the amount of water wasted to achieve the perfect temperature at the faucet and minimizes domestic hot water recirculation. Native plantings significantly reduce irrigation within the outdoor amenities. The facility uses water-efficient commercial washers and energy-efficient dryers.

NATIVE PLANTS

The project used Native Plants to improve soil, air and water quality by removing toxins and pollution. They provide a home for many species that are becoming increasingly rare. By using locally adapted native plants species instead of exotic species increased biodiversity and reduced water consumption.

LOW-FLOW FIXTURES

The project used low-flow fixtures which provided the YWCA with significant savings on their water bill and was a sustainable and eco-friendly measure for the project.



7 Operating Energy Present and Future

The building's total energy use is 135kWhr/m2/year based on a treated floor area of 3,511 m2 totalling 473,985kWhr/year. The building recovers 85% of its heating and cooling from the ERV which also provides constant HEPA filtered fresh air. Internal heat gains from electrical sources add heat to the space. The windows are an integral part of the HVAC system. Heating and cooling are provided as a backup through a VRF air source heat pump. The building is airtight and low tech, orientation was determined by the site location and required scale of the building, windows were sized optimally for their orientation using passive design strategies. The building uses standard and local HVAC equipment to meet the minimal heating and cooling requirements, heat demand is 10.7kWhr/m2 and cooling demand is only 7.6kWhr/m2 based on the TFA. As the EUI and emission factor from hydro is so low it takes very little to offset any emissions from this building. It can easily offset any emissions.

PRINCIPLES OF PASSIVE HOUSE

[1] ELIMINATION OF THERMAL BRIDGES

Thermal bridges are areas in the construction where there is a structured path for heat and cold to enter or escape. Passive House design removes thermal bridges, providing consistent, internal temperatures.

Thermal Bridge-free and compact design:
≤ 0.01 W/m

[2] CREATING AN AIRTIGHT CONSTRUCTION

This keeps the warm or cool air inside the building, preventing it being lost through gaps in the envelope and reduces demand on HVAC equipment because there are almost no losses within the system. Unwanted air flow causes uncomfortable cold spots or drafts and can put the building at risk.

Tighter Envelope:
≤ 0.6 ach continuous air barrier

[3] HIGH QUALITY EFFICIENT INSULATION

Passive Houses have uninterrupted insulation wrapping the exterior surfaces to reduce the heat transfer between the indoor and outdoor spaces.

*Super Insulated recommended (*climate dependent):*
u ≤ 0.15 W/m²K (R_{eff} = 38ft2 °F.hr/Btu)

[4] HIGH PERFORMACE WINDOWS

Passive Houses use high performing windows that are air tight, insulated and thermally broken, keeping the heat within in cooler months and operating in reverse in the warmer months.

*Triple Glazed Windows Uwindow (*climate dependent):*
≤ 0.8 W/m²K (R_{eff} = 7.09ft² °F.hr/Btu)

[5] PASSIVE HEATING TECHNOLOGY

Energy Recovery Ventilators are used to reduce high humidity, pollutants and odours by replacing stale air with fresh warm (or cooled) air. The heat exhaust air is also used to pre-heat new exchanged fresh air entering the building.

Energy Ventilation / Heat Recover Unit:
≥ 75% efficient

[6] PASSIVE SOLAR GAINS

The sun is the primary source of heat for passive buildings. Therefore the orientation of the building, smart shading strategies, and the dimensions and location of windows, are crucial to mitigate active heating and cooling.

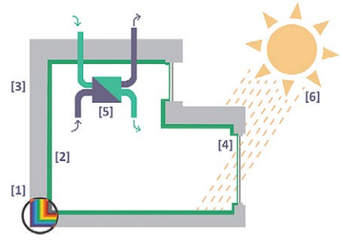
Passive House Energy Certification Requirements:

Specific Heat Demand
15kWhr/m².yr

Specific Cooling Demand
15kWhr/m².yr*
(climate dependent)

Primary Energy Demand
120kWhr/m².yr

Primary Energy Renewable Demand
60kWhr/m².yr



Courtesy of Kearns Mancini Architects Inc.

8 Materials and Resources

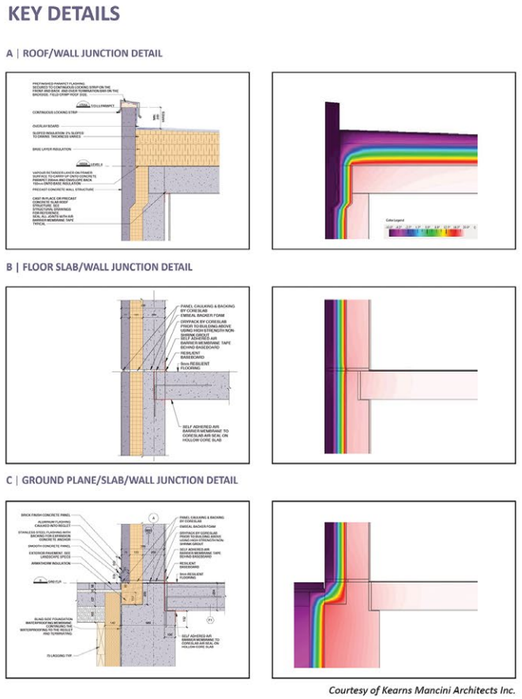
Early project team collaboration allowed the incorporation of all required PH insulation and air barrier specifications with the highest quality. The whole structure was manufactured in one local precast concrete facility under controlled conditions. All envelope elements were captured in one composite panel, moisture control, insulation and the structure. Hollowcore prestressed elements allowed for a much lower depth to span ratio providing the lowest concrete per area in floor areas for high rise buildings and the lowest GWP per SF of building.

Due to the nature of the precast assembly system, installation and erection methods were low-tech and swift using only a single crane and a flatbed trailer.

Hollowcore floor being installed

Hollowcore floor being delivered

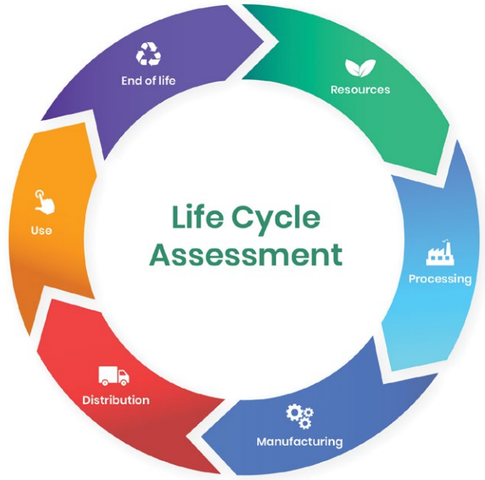
Hollowcore floor installation finished

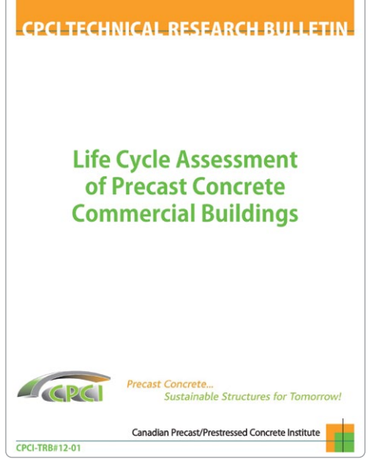


Courtesy of Kearns Mancini Architects Inc.

9 Building Life Cycle Considerations

With a life span of 100 years, the building will provide residences and community services for many years. Life-cycle factors were considered for all building components and systems, and the design reflects the permanency intended for its uses, according to PH standards, while acknowledging that future generations may need to alter or renovate. This can be achieved given precast concrete reusability, demountability, and loading capacity benefits. Some materials used are warranted for 50 years.





Technical Research Bulletin
www.cpci.ca/en/resources

Precast Concrete Double Wythe Insulated Building Envelope Panel being installed on the 1st floor

Double Wythe Insulated Building Panel being installed on the 5th floor

10 Education and Information Sharing

As the first Modular Total Precast PH mixed-use building constructed in Canada, there was a learning curve for all parties involved. As part of the education sharing process, KMAI is working on a case study with the Canadian Precast/Prestressed Concrete Institute (CPCI) and Coreslab Structures. Public education began in late 2021 and continues at conferences throughout 2022. CPCI will also present a seminar on the paper findings on CPCI Learn on Demand Education Platform.

THE PASSIVE HOUSE TOTAL PRECAST CONCRETE CASE STUDY WILL BE PRESENTED AT THESE VENUES

CaGBC BUILDING LASTING CHANGE 2022

Building Lasting Change 2022 is on, returning to Toronto's Beanfield Center from June 1st to 3rd, 2022. Programming will include a mix of panel discussions, presentations, and hands-on workshops.

MODULAR AND OFFSITE CONSTRUCTION SUMMIT

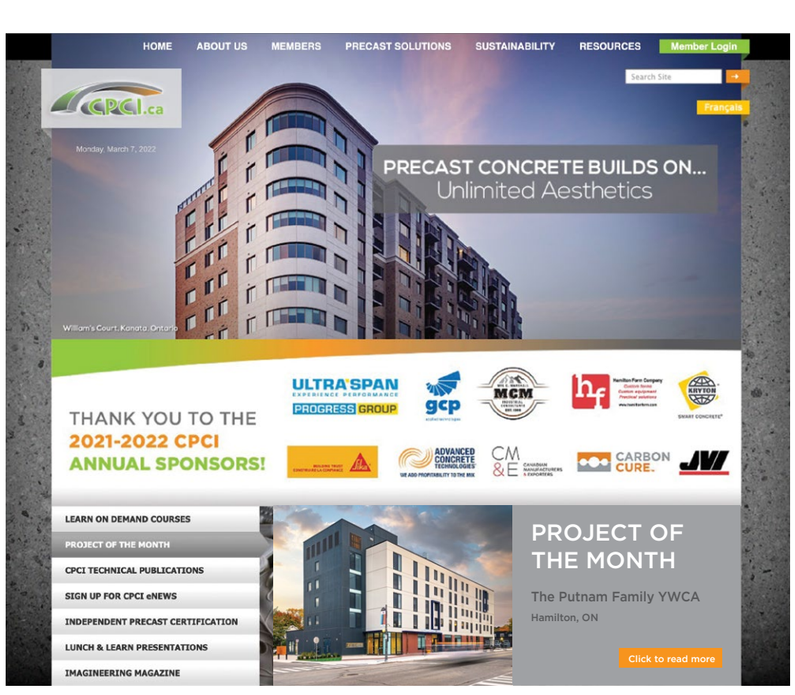
Edmonton, Alberta, Canada
July 27–29, 2022
This international multi-conference brings together academic and industry professionals to discuss pressing topics in modular and offsite construction research and practice.

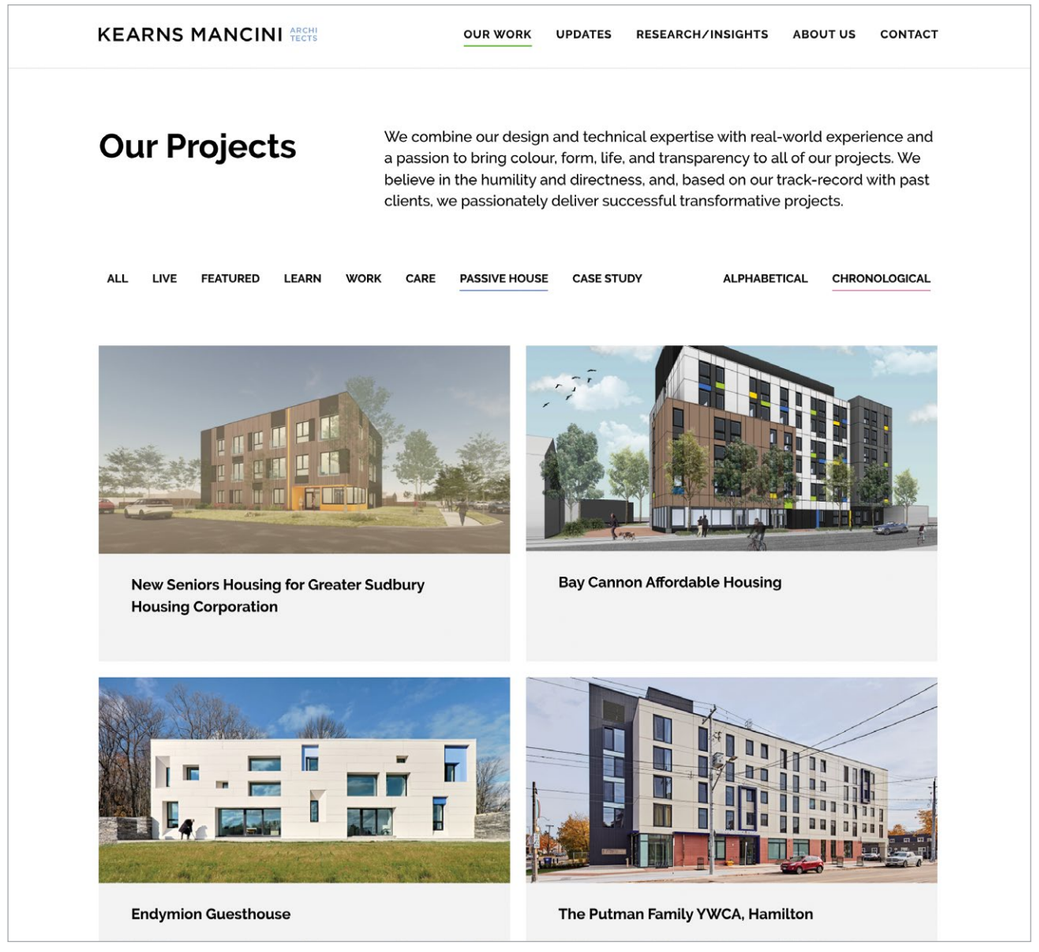
LEARN ON DEMAND — PREFAB PRECAST CONCRETE FREE EDUCATIONAL WEBINARS

A continuing series of Interactive Educational courses designed for AEC Professionals. In the fall of 2022, CPCI will present a course on Passive House with Total Precast Concrete.

ADAPT-ATION BANFF SESSION 2022 | MAY 6/7 Alberta Association of Architects (AAA)

Upholding the standard of practice for architecture and interior design in Alberta.






Y·W·C·A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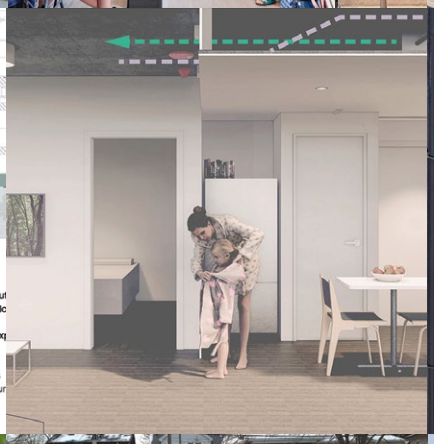


A
B


SOUTHAM FAMILY YWCA


[1] Thermal bridge free junction


YWCA