

Case Study 4

Inuit Housing

Project
Inuit Community
Architect



Pilot Nunavik Duplex

Quaqtaq, Nunavik , Quebec

Alain Fournier, FIRAC, EVOQ Architecture,
Montreal, Quebec

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Source: Alain Fournier, EVOQ Architecture

Nunavik comprises the northern third of the province of Quebec and is the homeland of Quebec's Inuit. Inhabitants of this region call themselves Nunavimmiut and almost all 12,000 live in 14 villages along the coast of Hudson Bay and Ungava Bay. Designing and building housing suitable for Nunavimmiut families and their northern environment is a challenge. It is being tackled collectively through a pilot project; a duplex designed as a prototype of sustainable housing that could be built throughout Nunavik.

Project Initiation

Housing in Nunavik brings many parties to the table. The Société d'habitation du Québec (SHQ), Quebec's housing agency, has the responsibility to fund social housing across Quebec. The SHQ works collaboratively with the Kativik Regional Government (KRG), the Kativik Municipal Housing Bureau (KMHB), and the Construction Division of the

Makivik Corporation. Over the years, these entities have provided housing for thousands of families throughout Nunavik.

In 2012, as part of their ongoing efforts to improve housing design, the parties formed a steering committee and invited community stakeholders from across Nunavik to participate in a two-day housing design charrette. The goal was to design a new, improved, two-bedroom duplex that would be culturally responsive as well as better adapted to climate change and preservation of the tundra. The house also needed to be highly energy efficient, with improved aerodynamics to reduce wind resistance and associated heat loss. The expectation was a design that would achieve a level of efficiency equal or close to the Passive House standard.

Once built and occupied, the prototype duplex would be subject to rigorous quantitative and qualitative evaluation for its cultural and environmental performance. From beginning to end, this pilot housing project would exemplify best practices that would guide future sustainable housing development.

Co-design Process

The Société d'habitation du Québec (SHQ) took the lead to organize the two-day design charrette. Gathered around the table were SHQ and Nunavik officials, an architect, an engineer, and seven residents from four villages in Nunavik. The residents were drawn from among Elders, families, mothers, youth, young adults, hunters, and women who practice traditional sewing and represented a cross-section of Nunavimmiut tenants.

The outcome was a report illustrating, listing and explaining housing preferences of the various tenants. The overriding theme was that sustainable housing design goes beyond technical issues of safety, energy

and environmental considerations to embrace cultural responsiveness and empowerment. The Kativik Municipal Housing Bureau invited Dr. Mylene Riva, assistant professor at the McGill University Institute for Health and Social Policy, to attend the design charrette as an observer. As part of a multi-university project called Living in Northern Quebec, Dr. Riva would be involved in designing the socio-cultural evaluation of the duplex prototype.

Following the design charrette, the steering committee commissioned architect Alain Fournier, FIRAC, of EVOQ Architecture, to develop the concepts into tangible designs and technical specifications. All parties had a long and trusted working relationship with Alain Fournier because of his deep experience in northern architecture, including more than 15 years designing housing in Nunavik. According to Shun-Hui Yang, Makivik's director of project construction, "Alain knows the North. He has designed all the social housing for Makivik. As an expert in housing architecture, Alain comes with ideas and innovative solutions that are a good balance – not luxurious or elaborate, but practical, to code and keep tenants safe."

“For Inuit and First Nations, sustainable housing design goes beyond technical issues of safety, energy and environmental considerations, to embrace cultural re-appropriation and empowerment.”

Alain Fournier, FIRAC, Architect, Director, EVOQ Architecture

For architect Alain Fournier, this project consultation process was a departure from his typical co-design approach with northern Indigenous communities. “EVOQ always meets and dialogues with small groups where they normally gather – the youth centre, Elders’ home, women’s groups. We want to understand what they want, both practically and culturally, and support their way of life. By the time we were hired for the Nunavik duplex project, the key features were already determined. Having said that, a number of the requests resonated well with what EVOQ had heard during co-design sessions for other housing projects.”

A two-day Passive House standards seminar kicked off the architectural design phase. The Société d’habitation du Québec hired a qualified trainer so they, EVOQ and the Nunavik agencies would have a common base of understanding. The standard requires greater insulation and air tightness, better quality doors and windows, and reduced thermal bridging. It treats the sun as a source of free energy by paying close attention to house orientation and windows. The goal was to come close to achieving the Passive House standard in sub-arctic conditions.

Applying Passive House principles, the design concepts from the design charrette, and his own experience of designing in the North, architect Alain Fournier set to work on preliminary drawings. The Kativik Municipal Housing Bureau took the initiative to circulate the drawings to a small cross-section of people in Nunavik. The feedback received was useful in developing the final design and construction drawings approved by the steering committee.

The resulting prototype house design is truly innovative. Because the road network does not always track the path of the sun, the houses have a reversible entryway, so that the living spaces always face the sun, even if they are on the wrong side of the road. The houses are on piles driven

deep into the ground to preserve the permafrost. The Venturi effect of the wind clears the snow from around the piles and through the open exterior steps. The entryway to each house includes a cold porch for storing gear and butchered game and a warm porch for coats and boots, with a lock-up for hunting rifles and ammunition. The houses have a low-elevated floor system to run the heating pipes and ventilation ducts to address the problem of cold floors. Large windows facing the sun brighten and warm the interior spaces. Increased insulation, tighter doors and windows and low thermal bridging help make the homes quiet and comfortable.

The large central area combines living, dining and kitchen spaces. It is equipped with a mobile island counter to enlarge the space for communal gatherings and traditional “country food” feasts eaten on the floor. Each home has a set of high-density polyethylene floor panels that can

Source: Alain Fournier, EVOQ Architecture



be laid out as cutting boards for the game. Enhanced overhead lighting creates better conditions for women to sew.

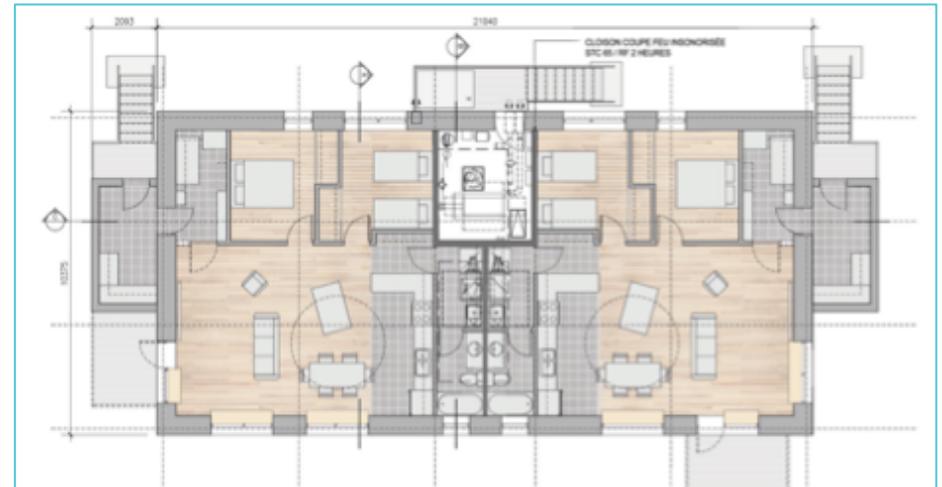
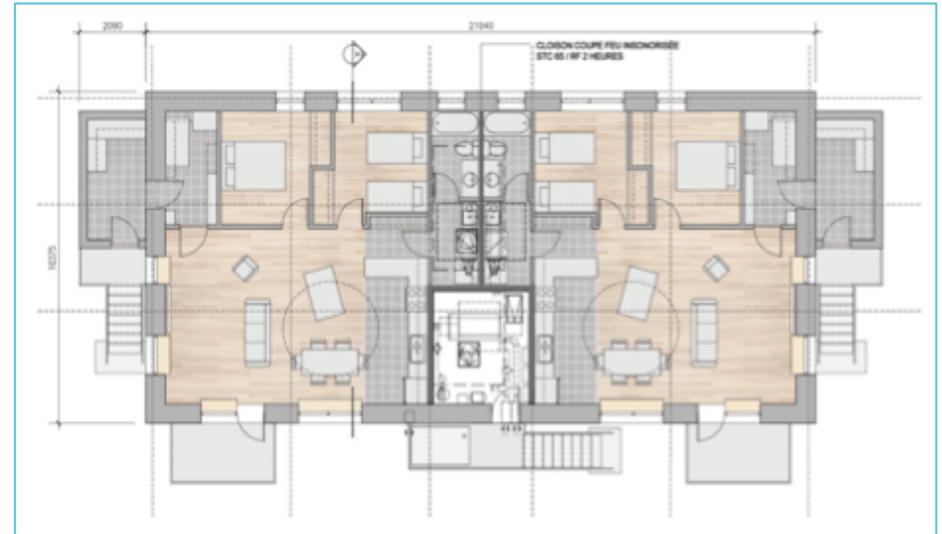
Other features that enhance livability are a separate laundry room and sink, a dual purpose second exit and balcony, increased storage space and heavy-duty finishes.

Building Process

In Nunavik, building logistics and conditions are always a challenge. The design charrette took place in 2012. When the architectural design and technical drawings were completed and received signoff in 2014, it was too late for materials to make it onto the 2014 sealift. Construction commenced in 2015.

The Makivik Construction Division operates a full-service housing construction company which undertook the project. They liaised with the EVOQ architects who were on site frequently for inspections, as were Société d'habitation du Québec personnel who lent their technical expertise. Some of the materials were standard for Nunavik housing, such as the window sizes, but with different configurations for the prototype house. Similarly, Makivik routinely uses commercial grade fittings for door handles and other components that are subject to wear and tear. Some elements in the prototype were not typical such as drilled piles, increased insulation between rooms, and very high-quality doors and windows.

While much of the construction was done by Inuit tradespeople, the mechanical and electrical work was sub-contracted. According to Makivik, local hiring provides training opportunities and helps the regional economy.



Source: Alain Fournier, EVOQ Architecture

As a final step, a comprehensive remote monitoring program was installed. Sensors and other equipment were set up to measure 17 variables ranging from heat recovery ventilator functioning to energy usage.

“We always have Inuit apprentice carpenters on the building site. They are proud of their work and feel a great sense of satisfaction and achievement.”

Shun-Hui Yang, Director of Project Construction, Makivik Corporation

Outcomes and Reflections

In January 2016, two families moved into the new pilot duplex located in Quaqtqaq, Nunavik. Duplexes are the most common housing form in Nunavik, and the steering committee will be able to directly compare the pilot duplex's performance with current housing stock. Duplexes are best suited to typical tenant family compositions while making more efficient use of land and mechanical systems.

Eleven months later, researcher Rudy Riedelsperger arrived in Quaqtqaq to undertake the socio-cultural evaluation, using an open-ended question grid designed with Dr. Mylene Riva. Rudy Riedelsperger visited the tenant families and found both expressed high levels of satisfaction with their new homes. In one half of the duplex, a young couple with one child was thrilled to have their own home rather than sharing overcrowded accommodation typical in the North. As a hunter, the man appreciated having

a secure lock up for his rifle and a place to butcher and store his game. With electrical plugs in both porches, the couple was looking forward to buying a freezer.

The other tenant family was a mother and her adult daughter. They found their new house warm, bright and sunny. The older woman, who sewed sealskin hats and boots, used the balcony to store the pelts outdoors, but out of reach of dogs and other animals. It was touching when she presented Rudy Riedelsperger with a pair of her hand-made boots.

With such a small sample, a full-scale socio-cultural assessment of health and well-being indicators was not possible. However, in general terms, Rudy Riedelsperger was able to observe that, “tenants used the space and features in the home in the way they were meant and the design captured their cultural needs and preferences. It could be concluded that the house was on the right path.”

The Société d'habitation du Québec began physical monitoring in January 2016, soon after the tenants moved in. They have now collected enough data to begin analysis of energy consumption, air circulation, and humidity, among other indicators. According to Hélène Arsenault of SHQ, the goal is to assess whether the equipment and features of the prototype house measurably improve livability and environmental sustainability, with a view to adopting them as better practices. She observed that some of the architectural innovations could be easily implemented such as the kitchen layout, the secure storage cabinet for hunting rifles and ammunition, and the floor panels that can be laid out as a cutting surface for the game.

The agencies comprising the steering committee continue to meet every three months to monitor the pilot and make decisions about new housing

development. Makivik Project Director Shun-Hui Yang notes that a number of the prototype's features and architectural innovations could be replicated. Her favourite feature "was the care taken to place and orient the building and increase the size of windows to capture the heat and light of the sun. In community design, this could become a consideration."

Architect Alain Fournier emphasizes that the reversible entrances are a true innovation because they allow optimal positioning of every house for solar gain. For him, the pilot duplex project exemplifies best practices. "Too often, housing prototypes are not monitored, and this four-party steering committee, not typical for housing projects, could become a prototype as well," he says. "It reflects a very exciting time in Nunavik where the pace of the Inuit taking charge has greatly accelerated all across the board – politically, socially and technically."

The pilot housing project is on track to demonstrate best practices in the following areas: process, collaboration, architectural design and innovation, monitoring, cultural empowerment, energy efficiency and climate adaptation. These best practices will guide future sustainable housing development throughout Nunavik.

"Housing sustainability in the North means physical sustainability and socio-cultural sustainability."

Rudy Riedlsperger, Researcher

Sincere thanks to those interviewed for this case study:

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