

Typology, Energy, Sufficiency

On Housing in Yellowknife

An essay inspired by the project:

A Change of Mine:

A closed gold mine in Canada's sub-arctic becomes an opportunity for sustainability

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An airplane lands in Yellowknife. January
photo: author

introduction

Capital of the Northwest Territories, Yellowknife is the only settlement in the territory to be legally defined as a city. It is located on the northern shores of Great Slave Lake amidst a harsh and rugged landscape that has inspired generations of adventurers, artists and explorers. The vast land of the NWT is 3 426 320 square kilometres is inhabited by a population of 37 000. (http://www.get2knowcanada.ca/get2_nt.html) Current trends show an urbanization of the population as many move from small communities to the capital city. Yellowknife now represents 44.5% of the territorial population up from 28.6% in 1976. ([http://www.stats.gov.nt.ca/Statinfo/Generalstats/Scan/Socio-Econ%20\(2005\).pdf](http://www.stats.gov.nt.ca/Statinfo/Generalstats/Scan/Socio-Econ%20(2005).pdf))

The urban fabric of Yellowknife as it is seen today began first as a meeting place for the Dene peoples and then was used as a trading post for furs. Rapid urban growth and development in the city occurred with the mining boom in the 1940s. The mines located nearest to the Yellowknife city centre include the infamous Giant Mine and Miramar's Con Mine. Giant Mine remained in operation until 2004 with processing occurring at Con Mine after 1999. (http://nwt-tno.inac-ainc.gc.ca/giant/gmp_e.html) Con Mine was closed at the end of 2003.

In 1967, Yellowknife was selected as the capital city of the NWT bringing with it permanent government jobs -people less linked to the extraction based industry. The second mining boom that ensured continued growth and investment was the discovery of diamonds in the region in the early 1990s. Canada now ranks as one of the top three diamond producers in value, in the world. (<http://www.cbc.ca/news/background/diamonds/>)

With these years of rapid growth in an isolated sub arctic region, housing has become an important issue and sometimes a real problem for the citizens of Yellowknife. Intertwined with the issue of housing, infrastructure and energy production struggles to keep up with demand and development.

The following research examines the typology of housing and infrastructure in Yellowknife referencing other northern, isolated communities within Canada's Territories. Working towards a specific goal of self sustainability, it becomes clear that a re-examination of how we build and on what kind of grid is required to provide a sustainable house and community. A specific solution based on this knowledge is examined in the competition project A Change of Mine as the closing of Con Mine manifests a large opportunity within the city fabric to utilize these ideas.



City view at night with northern lights
photo: courtesy Mark Cascella



View to New Town from Pilots Monument
photo: author

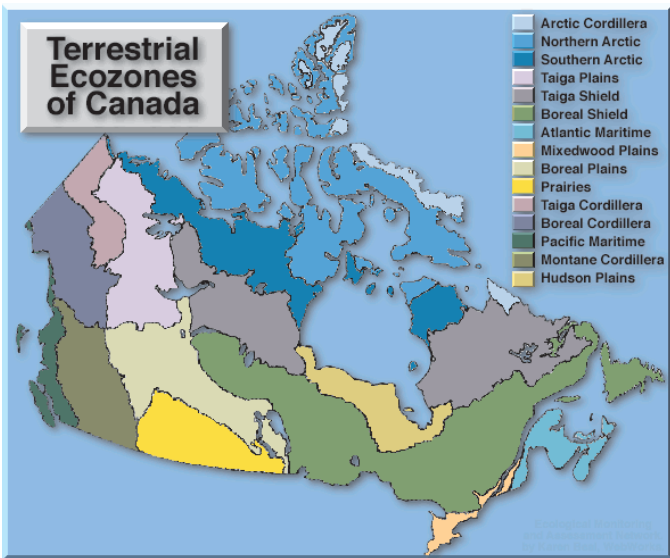


Locator Map: Yellowknife and North slave region
www.pwnhc.learnnet.nt.ca/research/regionmap.gif

1.0 Landscape, Climate, Eco-region: A brief overview

Massive, crystalline Archean rocks form broad, sloping uplands and lowlands, with numerous small lakes and eskers that drain into Great Slave Lake. Bedrock outcrops are common, and maximum elevation reaches about 490 m asl. Permafrost is discontinuous to continuous, with low to medium ice content with sparse ice wedges throughout.

(http://www.worldwildlife.org/wildworld/profiles/terrestrial/na/na0612_full.html)



map from: http://www.ec.gc.ca/soer-ree/EnglishFrameworkNardescanada_e.cfm

Located in a sub arctic region known as Taiga, the North Slave region is included in the zone of transition between the Boreal forest and the more barren Tundra. Tree growth is limited by the short growing season. Some common species include tamarack and stunted black spruce. For the most part, there are areas of little to no topsoil and the air is dry with little precipitation (mean precipitation in the range of 200-400mm per year). The coordinates of Yellowknife are 62° 27' 0" N, 114° 21' 0" W. At this altitude, winters are long and dark but do have some low-angled sunlight hours. Summers are mild with high angled sun with periods of time where the sky does not achieve full darkness.

Information from the recent compilation of 30 years of weather data by Environment Canada was published in the local paper *The Yellowknifer* (p9 Aug 24, 2005.) compared Yellowknife to 100 other Canadian cities conveying to the reader some clear statistics about the local climate:



Yellowknife Bay, rock and Jack Pine on Former Con Mine settlement

http://www.wsd1.org/aesl/provimag/nwt-tree-jack_pine.jpg 3

Plenty of number ones:

- Has coldest spring (March through May) with an average temp of -5.67C degrees
- Coldest year-round temperature of -4.58C
- Has the most days below -20C (110.13 days)
- has the most hot and cold days 110.66
- has the longest snow cover season of 190.62 days
- has the most days with snow more than 10cm deep with 164.62 days
- sunniest summer 1033.98 hours
- sunniest spring 797.96 hours
- Most extreme wind chill -63.99C
- driest winter air



Traditional Dene Territory

image from: <http://collections.ic.gc.ca/nativepeoples/MapHtml/denemaplg.html>

2.0 The Roots of Home

“Aboriginal cultures can recall another type of existence from recent memory that was stable, complex, whole and self sufficient.”

(Fancott, *Healthy Housing in the North* p15)

Although the history of the Northwest Territories as we know it begins with traders arriving in the region in the 1700s, the area surrounding Yellowknife has been home to the aboriginal peoples for thousands of years. It is said that Dene people first arrived in the NWT 10 000 years ago. (<http://www.yellowknife.worldweb.com/FeaturesReviews/TownCityReviews/8-163.html>) This group of people lived in a sustenance economy dependent upon the caribou herds. The caribou provided food, clothing and shelter for the people. Nothing from the animal provided the source for life.

Caribou skin lodges (also referred to as tipis) are considered the main traditional housing type in the north Slave region. The construction includes wooden poles as frame (trees of small stature being readily available) and the skins of the caribou were



Local caribou: the source of livelihood for early Dene
Image from *Yellowknife: How a City Grew* p 18



Caribou skin lodge 1925

<http://pwnhc.learnnet.nt.ca/photogallery/Galleries/Traditional%20Life/Tents%20Igluos%20and%20Cabins%20Gallery/tents%20igloos%20andcabins0002.html>

used as cladding and insulation. They were relatively simple to put up and take down and they were easily transported on sled either by people or dogs. The simple design of a frame with layers of material allowed the tipi to be changeable depending on use and weather. The construction of the tipis was adapted during the coldest winter months. For example, the tents were banked with snow protecting from winds and insulated more heavily. (<http://collections.ic.gc.ca/nativepeoples/dene.html>)

Early tipis have been described as much larger and squatter than those built in the 20th century. They required 75-80 caribou skins and were large enough for four families. Doors were always located on the east and northwest sides of the tipi - whereas in more modern examples such as the ethnographic study done with the Willow Lake Dene in 1975, there is more flexibility on door location depending on weather and microclimate. (Janes, 1983 *Archeological Ethnography among Mackenzie Basin Dene, Canada* p 31)

2.1 The Permanent Single Family Home

New materials for building were introduced to the area as first contact was made with the natives and trading posts were established. With contact, it has been documented that the local peoples began to not only clad their structures with caribou hides but also with canvas fabric (used for tents) purchased from posts and some even opted for the European style four sided tent. Life had shifted from hunting caribou to trapping various other animals to trade for things such as guns at the trading post. As the 20th century progressed and new materials were introduced, the local Dene adapted the tipi further by



Tipis constructed with purchased materials Fort Simpson 1922. Note permanent structure and four sided tent in background

image from: <http://pwnhc.learnnet.nt.ca/photogallery/Galleries/Traditional%20Life/Tents%20Igluos%20and%20Cabins%20Gallery/tents%20igloos%20and%20cabins.html>



Dene winter cabin
<http://pwnhc.learnnet.nt.ca/photogallery/Galleries/Traditional%20Lifeents%20Igluos%20and%20Cabins%20Gallery/-1979-073-0144.jpg>



Home in Dettah with modern tipi.
photograph: author

using such materials as sheet cardboard, burlap, polyethylene plastic, spruce or birch branches in any combination (Janes p36).

The nomadic life in the North Slave region (and thus the use of the caribou skin lodge as the main source of dwelling) came to an end by the 1950s as the first nations populations were settled onto permanent reservations. They are represented in the Yellowknife area as the communities of N'Dilo and Dettah. The caribou skin lodge remains as a tradition, with a recent initiative in 1999 to keep the knowledge alive with the Dogrib Caribou Skin Lodge Project (visit <http://pwnhc.learnnet.nt.ca/exhibits/lodge/pageone.html> for more information on this community project)

In addition to new material being used in the tipi structures, the permanent home - as it was understood by people of European descent was introduced to the area. The log cabin was a building type brought with Europeans upon early contact and was adopted by aboriginals although many still preferred the tipi for the higher indoor air quality (Janes p40). The construction of the log cabin was relatively simple and the boreal forest was able to provide the lumber. Other materials for windows and roofing were brought from southern Canadian centres. Trees were selected based on appropriate size, stripped and brought to the site - sending the logs down river was the most efficient mode of transportation. The style of the cabin (i.e. the dovetail corner vs the saddle notched corner) depended on a combination of factors such as the skill of the builder, time required, concern for permanence. (Janes p43) The log cabins used by the Dene on Willow Lake are described to have little interior division based on use. Instead, for the most part, the cabin is a open room with many functions.

The Dene continue to use the caribou skin lodge and some structures can be seen in Dettah and N'Dilo. However, the function has shifted to that of an outbuilding used in conjunction with permanent homes. They are partially covered or uncovered depending if it is being used or if the people are waiting



Log structure nicknamed 'slant 6' by local cabbies. HBC style corner used.
Image from Yellowknife Diamond in the Rough p31



Shack located in 'the woodyard' Old Town.
image from Yellowknife Diamond in the Rough p31



Houseboats
from Yellowknife: How a City Grew p 11

for warmer weather use at a later date. Caribou hides is not used as cladding anymore.

2.2 The homes of Yellowknife's Old Town:

Settlement in early times concentrated around what is today known as Old Town. There was uncontrolled building during a gold rush boom during the 1940s and the property delineations from this era are reflected in maze like property plans today. No infrastructure was laid out in the rocky region and homes went without electricity and plumbing. Some of these original structures remain in Yellowknife today as people choose to live in shacks and houseboats. Some long for a 'real northern experience' while others make the decision based on the high costs of rent in conventional dwellings. Most structures are now connected to the city grid for electricity but heating is generally supplemented by local lumber for fuel, or a delivery of natural gas by truck. No structures in the Old Town area are connected to the plumbing grid. The most basic shacks and houseboats use a 'honey bucket' (plastic bag) for human waste and the residents are responsible for bringing it to the Fiddlers Lake facility. Most homes in old town have tanks located within the building that collects sewage waste and a truck with a tank and pump will weekly empty the tank and deliver to the facility. Water is delivered by truck in a similar manner.

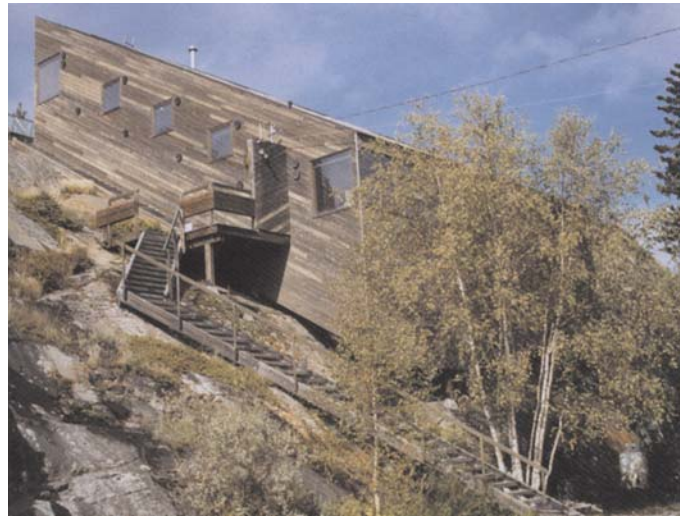
Beyond shacks from early gold rush times, Old Town also includes examples of single family residences. An inspiring example of modern homebuilding in Old Town includes the home of Gino Pin, an architect in the region since 1971. His home is built on Latham Island in Old Town. The legend of his home includes a tale of a site that was slated for a road by government officials from 'the south'

who did not know the real rock-cliff condition that existed on the site. Upon realising that a road was impossible, the site was deemed unusable - no one could imagine construction of a home on the site. The underlying message of his story is that decision making was commonly made without consideration to natural landscape. Contrary to this approach, the Pin residence hugs the side of the rock with a number of platforms creating rooms as the rock slopes upward. Local people sometimes refer to its shape as the 'pink eraser' house. Wood construction throughout, the home also includes some thoughtful outdoor microclimates making valuable outdoor life possible for a slightly extended amount of time.

2.3 New Town

By the 1940s it was decided that to the south west of the old town, a modern New Town complete with underground infrastructure and a grid street system would be laid out. First surveyed in 1945, (<http://www.cpaws.org/grassroots-chapters/nwt-greenmap.pdf>) New town was based on the modern, efficient plan of Edmonton. Rock, bog and most natural landscape features were removed and replaced by a city grid. The dream of the suburban-style single family home with a grassy front and backyard had arrived in the north. Today, growth pushes towards the southwest and the grid gives way to the curving cul-de-sacs of suburban Yellowknife.

Construction costs in Yellowknife are extremely high as there are neither local materials nor processing - the trees, perhaps appropriate for caribou skin lodges and a small number of log cabins do not have the quality required for commercial lumber purposes and no processing facility exists. Construction materials are further inhibited by the limited shipping schedule to the north. During spring



Pin Residence, Latham Island, Old Town.
image from *Yellowknife: Diamond in the Rough*
page 25



Aerial photo July 13 1945. Main spine of new town.
Image from *Yellowknife: An Illustrated History* p109

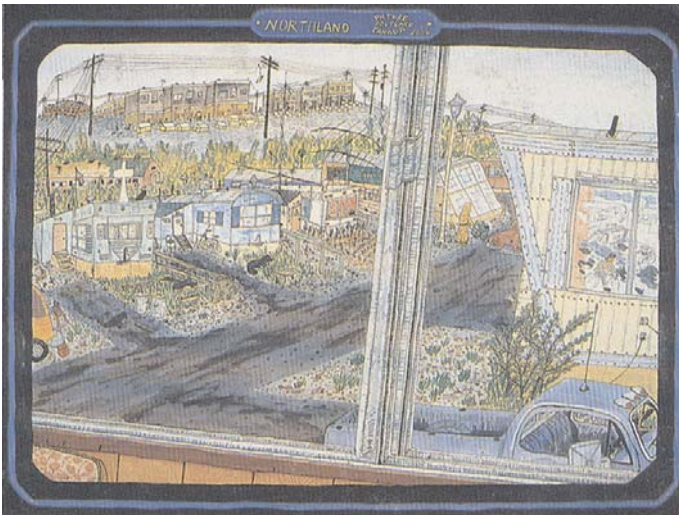


Blocks 30-32 of Yellowknife's New Town April 1949
image from *Yellowknife an Illustrated History* p117



Ariel view of Yellowknife's New Town (Old Town at Top) 1947

Image from: *Yellowknife: An Illustrated History* p109



Northland Trailer Park Rendering

image from *Yellowknife: How a City Grew* p 79



Con Mine Trailer park

image: author

break up and the fall freeze, the ice road over the Mackenzie River cannot support trucks and cars and due to the high ice content, it is unsafe to run the summer ferry. Thus shipping is limited during those times to air travel and a project must either wait or pay the large air cargo rates. A bridge crossing the Mackenzie is slated for completion in 2007 - opening the region to year round road access.

In addition to the lack of local materials for construction, there has been a consistent shortage in both skilled and unskilled labour. Skilled tradespeople are often flown in from Alberta and during their stay live in a local hotel to work on a project further exacerbating construction costs.

One common, timely solution used to house the citizens of Yellowknife has been the prefabricated home. In Yellowknife, prefabricated homes generally come in the form of a concrete trailer (also known as a manufactured home). A shock to new arrivals to the city, a new 'single - wide' trailer on a small parcel of land costs around \$190 000. Although deemed a reasonable solution, trailers are generally not produced for long term living nor are they designed for extreme temperatures. After ten years many residents are left with dilapidated trailer homes. Many residents opt to add onto and renovate the trailer - sometimes to the point where there is more addition than original trailer.

In spite of high construction costs, permanent homes have also been built. Some opt for a standard suburban home with a front and back yard in the New Town area. These homes (generally single family and town home developments) are generally platform wood framed with aluminium siding as the exterior material. Masonry is prohibitively expensive in the region and is a rarity in residential construction (the Yellowknife City Hall is one of the few structures

in the city that uses brick). Construction is very comparable to homes built in Alberta.

Higher density dwellings have also been built. A recent project completed in 2003 by Polar Developments saw a new high rise apartment building be built near the city core. Its form is based on the standard concrete high rise condo with 110 units. The site on which the building stands has been blasted to near perfect flatness and the square form and its 14 stories have led to some wind problems particularly around the front entrance. However, the building is popular among residents for its newer construction and the commanding views of Yellowknife Bay and the city. The unit layouts are for the most part, generous keeping in mind the need for ample of storage for winter and summer gear.

3.0 Energy Overview of the NWT

Intertwined with the essence of housing in the north, the provision of energy and infrastructure becomes a key aspect to the idea of 'home'. Being an isolated region, the idea of self sufficient energy both for the community and individual homes has always been a goal for residents.

The main sources of power in the north slave region are the Snare Hydro Dam and diesel generation. Large scale hydro, though 'clean' has negative impact on fish and wildlife while diesel generation is extremely unclean and inefficient, as only one third of energy content of fuel is turned into electricity. (<http://www.aea.nt.ca/pdf/GuideCommunities.pdf>) It is also volatile in cost and extremely expensive in northern regions. Ironically, the region is rich in oil and natural gas, but it is shipped to Alberta for processing then resold to the territories and transported to isolated villages. The cost at this point is so high; communities receive government subsidies to off-set high energy costs.

Due to both economic and cultural reasons, green power sources are considered seriously in northern communities. In 1996, the Northwest Territories Power Corporation approved a developmental wind program. Problems with the test sites included maintenance issues and failure of the machinery due to cold temperatures. Production at the Cambridge Bay test site was affected by temperatures below -35C, a standard winter temperature throughout the north. (http://www.nunavutpower.com/pdf/WindPowerReport_1.PDF) Improvements and development has been made to the wind turbines and the increasing cost of fuel encourages further wind development. The main issue preventing more widespread use is the lack of expertise in installation and maintenance. There are simply very few people in the north who know how to maintain or fix wind turbines

Solar power remains a relatively reliable power source in the sub arctic even with decreased productivity in the winter. In Yellowknife, there are some large-scale public buildings including schools and a new federal government building (thus far unnamed) by Manasc Issac that include photovoltaic panels. However all are connected to the city grid for auxiliary power. (the Manasc Issac building for example, does not store any excess energy nor does it add to the grid). It is not feasible as a sole year round energy producer. Due to winter darkness, there needs to be an auxiliary power.

There is great potential in the area for geothermal heating. With the return of Con Mine land back to the city, it is hoped that the mine waters can be harnessed at a large scale at



Snare Hydro Project
image from <http://www.ntpc.com/grey/supply/hydro.html>



New federal government building located downtown Yellowknife. Note photovoltaic panels and sun shading device. Expected to receive LEED silver.
Architect: Manasc Issac
image: author

the Robertson shaft for space heating purposes similar to the system being utilized Springhill, Nova Scotia where an industrial park is heated through former coal mine waters. (<http://town.springhill.ns.ca/Geothermal/geotherm1.htm>)

Current studies are being done on the feasibility of the Con Mine Robertson shaft where 6000 ft below ground, the temperature approaches 20C. Upon environmental remediation on the site development in the area around the shaft can begin. Although it may be decades before the land is cleaned up enough for commercial or residential use, the high water temperatures show the geological feasibility for geothermal in the area.

3.1 Energy and the Typology of Housing in the North

Small scale energy for self sufficient homes is generally used in cabins, shacks and houseboats where connection to the grid is difficult or impossible. Photovoltaic panels are commonplace on these types of homes. Biomass has historically been used by residents for space heating and is still consistently used throughout the region. Living off the grid in Yellowknife can mean fewer creature comforts that people in new town or other areas of Canada take for granted. For example, deluxe washer dryer sets for laundry and a dishwasher are generally a luxury that is beyond the means for shack/cabin residents creating their own electrical power with limited water supply. Thus, living off the grid is a generally a conscious choice of lifestyle for the residents. Some houseboats/shacks are so basic, even bathing occurs at the local gym or at a friend's house.

Supplying energy for a single or two-room

structure can be relatively simple - especially if the residents make the conscious choice to live with less. However, the question of providing self sufficient energy for a larger development- especially without auxiliary power becomes immensely complex. For example, geothermal energy for heating would seem like an obvious solution but this system requires a consistent electrical source to power the pump. Thus the question of self sufficiency rests in finding a reliable, consistent, renewable electrical source. There remains no example of a multi-unit housing development in the Territory that is self sufficient in terms of energy and waste. There are however, encouraging statistics about energy use in the north. Even though NWT's average annual temp is below freezing, and there are long periods of darkness, its energy consumers are using only 64% of the typical Canadian family. Consumption of electricity has been declining in relation to national trends. (<http://www.iti.gov.nt.ca/iea/pdf/documents/energy.pdf>). Thus, cultural and economic forces make self sufficient energy even more feasible in the region.

3.2 Self sufficient Infrastructure, alternative electrical power: sewage waste

Cogeneration is a blanket term that describes the dual creation of electricity and heat during the electrical generation process. Increasing awareness regarding energy conservation brings hope to users of inefficient diesel generators in isolated northern communities. Co-generation offers a simple way to increase the efficiency of the diesel fuel generators, using the heat produced in the process to also heat water or air. This requires that a building be in relatively close proximity to the generating station.

Cogeneration is currently being used world wide in varying manners. One of which is utilizing the natural breakdown process of sewage to create methane for power generation. This has inspired the idea for an alternative energy source described in the competition: A Change of Mine. A significant amount of sewage (all inhabitants of Old Town, N'Dilo and Dettah) is trucked to the lagoon near Fiddlers Lake. Instead, it can be delivered to the much closer the Con Mine Site for anaerobic processing, methane production, and finally electrical output. Even more ideal would be the conversion of the



Four large digester tanks sit behind the fuel cell power plant at the wastewater treatment plant in Renton, Wash.
image from: <http://www.msnbc.msn.com/id/5335635>



Community Garden, Yellowknife

photo: author

diesel septic trucks to utilize bio-diesel created from cooking oil of local restaurants.

Utilising the sewage from truck pumped areas denotes a lack of full self sufficiency in that the not all the sewage comes from the housing project. However, the sewage is otherwise being unused. A building at a larger scale requires electrical output beyond what solar and wind generation create. During the winter, there are periods where there is both very little sun and very little wind. Thus cogeneration of sewage represents a consistent energy source. (for a full description of the energy system, see A Change of Mine write up and Panel 3)

The greenhouse as described in A Change of Mine would encourage more locally grown foods and flowers lessening dependence on the south for such items. Current plots at the Yellowknife community gardens are full and citizens all around the community partake in gardening during the short season. The people who live in the units will thus have a year round place to supplement their fruit and vegetable needs. Sewage would also be taken care of in a sensitive way through the living machine and upon full treatment water can be returned into Great Slave Lake.

4.0 Notes on Modern Sustainable Design:

Building type:

Whereas self sufficient single family homes are not uncommon in Yellowknife, there remains a real need for an examination into the possibilities of self sufficient multi-unit housing. Multi-unit structures in the north have cultural, economic and environmental aspects that are appropriate and sensitive. For example, people of the Northwest Territories are more amenable to renting. In fact, there are about twice as many renters as there are owners in the NWT (four times the national rate) (fancott 24). Smaller units can house the large transient population or the numerous young professionals. The economic and environmental benefits of multi-unit development vs single home development are



Polar Developments residential tower under construction
image:http://www.yellowknife.ca/__shared/assets/Blue_Book5.pdf



Typical town homes in Yellowknife
image: author

clear. Multi-unit structures use less energy in comparison to single family homes. One statistic shows that a two-storey row house uses 30% less fuel than a one-storey detached house of the same floor area. (Fancott p 24). They have a smaller foot print per household, trades people are more willing to travel for larger projects and materials can be purchased 'in bulk'. Also, shared amenities such as an entertainment facility or recreation room can save energy as well decreasing some space requirements in individual units. There is also a social benefit to living amongst people and sharing amenities. Life in Yellowknife can be isolating and during the dark winter months, activities and company are often welcome.

Increasing density near the city core is also a desirable aspect as Yellowknife is not immune to rampant sprawl that other Canadian cities face particularly as the economy continues to grow at a fast rate. Towards the southwest of the city, inhabitants have no choice but to drive vehicles to get anywhere. Densifying the area around the urban core gives inhabitants the option of walking to work or shops. Even during the winter, a 10-20 minute walk is a feasible and reasonable expectation of local people. Travel time would perhaps even be saved as most people warm up their vehicles for at least 5-10 minutes and even in a small city, traffic is becoming an increasing problem.

Solar Design:

The element of sunlight becomes a defining aspect when designing at high latitudes. At Yellowknife's altitude (62° 27' 0" N), the sun becomes a missed element in the winter and can be a nuisance during the summer. On December 21st, the sunlight hours range between 11:00am to 3:15pm. The altitude of the sun on this date is 4.5 degrees. The consequence of the low angled sun is that vertical walls become an effective surface for solar gain. In stark contrast, June 21st has no full darkness whatsoever and the sun angle reaches 51.5 degrees. During the summer, the sun rises about 35 degrees east of north then travels southward and sets about 35 degrees west of north. This wide arc that the sun follows through the summer, gives southeast walls a potential for solar gain and west walls for over heating. Thus orientation of the structure has great importance with regards to these phenomena. Adjusting and siting based on solar gain during the winter reduces energy costs and also helps offset depression caused by continuous lack of sunlight. Glazing should be directed towards the equator but sun shading is also of utmost importance and in an extreme climate has to be structurally substantial. Trellises with nearby planters are an excellent way to control sunlight with vegetation (vines) growing in for the sunny months and dying of during the winter. Located in an area where residents can trim the vegetation based on where they want sun or shade would be ideal, giving them control over their sun needs.

Construction methods, materials

Platform framing dominates residential construction in the area. It is simple, quick, and familiar to the local builders and carpenters. Larger structures are framed in steel but the envelope is often made of wood frame construction. (Strubb *Bare Poles* p124). This method has outlasted numerous prefabrication schemes that have been tried in the north.

Wall construction at high latitudes for residential use generally includes a greater amount of insulation than in southern construction - utilizing both batt and rigid insulation. Typical wall construction from inside to out include:

- gypsum wall board (or other interior cladding material)
- vapour barrier (polyethylene)
- fibre insulation between wood studs
- plywood sheathing
- spun olefin membrane
- polystyrene insulation
- air space (wood strapping)
- siding (wood or aluminium)

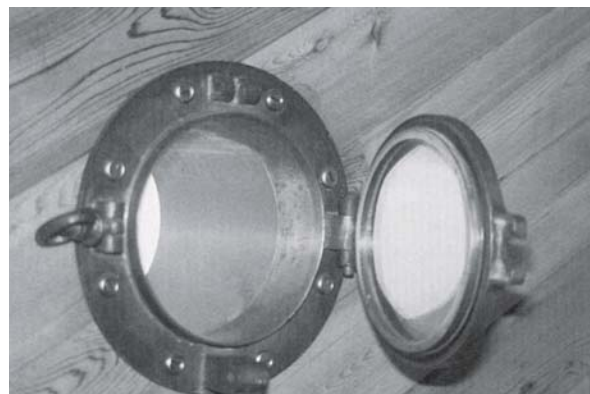
The aforementioned lack of local materials continues to plague construction in the region. Reusing materials from abandoned buildings (for example, the remaining bunk house on the Con Mine site could provide materials for the competition housing development) remains an excellent way to decrease the amount of new materials that need to be shipped to the region. Furthermore, rough sawn timber from the local wood needs to be examined and used where appropriate. Natural stone in the area abounds and there is also potential to utilize this material.

Ventilation and windows

The main function of the window and ventilation must become separate in northern conditions. The small market of consumers in the northern regions means that no windows are specifically designed for an extreme climate. Based on a more temperate climate, the moving parts in conventional windows are prone to breakage and leaking in the north. Thus the role of the window is that of day lighting, solar gain and view. Natural ventilation should be provided through other means. In early times, the hole at the top of the tipi was one workable solution. For modern design, ventilation holes strategically located in the building envelope are a successful way to allow for natural air movement. The same port hole used in boat construction is an excellent way to provide vent holes in a structure. They are economic, and controlled by the occupant.



Platform framing in Rankin Inlet
Image from Bare Poles p 124



Porthole from interior
Image from Bare Poles p130

Conclusion:

History has shown that high technology solutions are brought to the north with the optimism of the great technological fix. However, the extreme power of climate in the region tends to send complicated machines with moving parts into disarray. The solutions that have long term potential are simple, often low tech and have a community, hands on aspect. A sensitive use of emerging technology such as co-generation, solar, and geothermal and tried and true low tech solutions is the best method of achieving self sustainable housing in the north.

The vast expanse of uninhabited landscape and extreme climate conditions continue to inspire ingenuity and conservation in its inhabitants. Yellowknife with its robust economy and enlightened citizens has an opportunity to be an example for high quality, self sustainable housing throughout the country. It is a land where economic and cultural factors come together creating a city where self sufficient housing is a culturally sensitive and pragmatic approach. By reviewing how the typology of housing and the required infrastructure has developed; such as the elegant caribou skin lodge, the simple early structures through to modern well planned design/construction we can gain this valuable knowledge from the past.

The return of Con Mine land back to the citizens of Yellowknife provides a perfect opportunity for developing sustainable housing and infrastructure as examined in the competition. Instead of reliving the 1900s where the landscape was razed for development, there is opportunity for stewardship and creativity in design and how we provide energy for our homes in the north.



On an ice road to Dettah
photo: author

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