The New Green Field Hospital in Ontario

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Tye Farrow is a leader in the design of buildings that lift the human spirit by drawing on themes from nature. Working from his firm in Toronto, Tye has designed projects in Canada, the Middle East and the Caribbean. His contribution to healthcare design at the Credit Valley Hospital and Thunder Bay Regional Health Sciences Centre in Canada is viewed internationally as setting a new standard in health care architecture. A graduate in architecture of the University of Toronto, Tye also received a Master of Architecture in Urban Design from Harvard University. His award-winning work has been published in such British journals as Architectural Review Magazine and AD Architectural Design.

If the delivery of health care and the creation of architecture share the common goal of improving the quality of life then the role of health care architecture has never been more important. While there are codes that mandate the essentials of fire and life safety, there are few guidelines that capture the qualitative or humanistic aspects of building design. As the maintenance of health is rising to the top of the health care agenda, it is clearly time for a change.

The Thunder Bay Regional Health Sciences Centre[1] , a new 375-bed, 680,000 square foot hospital in Thunder Bay Canada, has positioned itself to do just this. Challenging accepted truisms in health care design, its dramatic use of wood and multiple-height interior spaces flooded with natural light creates a dynamic and innovative space for healing. More than simply a regional hospital, it presents itself as the physical manifestation of a design paradigm that recognizes the benefits of the cohesion between the science and the holistic art of healing.

By using this facility as a case study, this paper will explore: the project objectives; summarize the philosophical and methodological drivers for design; explore methods for the delivery of green field hospitals in the Canadian context; and illustrate how design and material selection and intentional site planning can increase patient well-being, reduce patient and user stress, and still allow a facility to remain fiscally and operationally responsible.

A Starting Point

As the first new green field hospital in Ontario under the province's new restructuring directives, the objectives of the new hospital were fourfold:

1. Meet the client's tight budgetary and scheduling requirements.
2. Respond to the rugged natural context and northern Canadian vernacular;
3. Create a more humanistic environment for health care;
4. Provide a functional building that meets Ministry Standards for operations.

The project began initially with two existing hospitals, one of which was 50 to 75 years old with numerous additions. Through a provincial initiative to restructure the public health care system, the government issued a directive to

close one of the hospitals and expand and renovate the other. It was believed by the Hospital Administration that they could get better value for money by building a new hospital in the centre of the community next to the local university and strengthen the teaching component of the hospital, versus renovating the existing. However, a detailed programme analysis conducted by the architect team determined that the money would be better spent if it built one new regional facility rather than renovating its two existing local hospitals.

The government approved the process and began development in May 1999. The Hospital also mandated a rapid turnaround time. Eschewing the traditional lump-sum construction process in favour of the construction management approach -the first of its kind in Ontario for a new hospital- it was delivered in just 4 ½ years versus the traditional 8-10 years. The project was substantially completed in October 2003, with the first patients being transferred in February 2004.

The initial design first evolved out of both an ongoing process of research into the hospital as a typology, fused with an interpretation of Ontario's rugged North West context including the cultural, economic and ecological wealth of the region. Additionally, the client firmly believed that most hospitals were not designed to enhance healing and thus required a rethink. To facilitate this process, the design and Hospital Administration team conducted a study tour of over 40 health facilities throughout Canada, the United States, and Europe to understand and research successful (and not successful) design options.

This resulted in a manuscript by the architect team entitled Humanism in the Art of Healing: Beyond Form Follows Function in Health Care Architecture [2]. As a vehicle to study the history and roots of healing, it sought to develop a context, and outline a number of design principles that would serve as a benchmark decision making for both the architectural and the client's team. The document also served as a parallel document to the functional program by setting the future appearance of the architecture without prescribing an actual scheme.

Figure 1 *Aerial view of the Thunder Bay region*

By laying out a number of design issues against which the final architecture would be measured, it also generated a discourse on ideas surrounding the design including:
• building typology;
• context including the ecological, cultural and economic history of the North West;
• the public role of the hospital as the centre of the community;
• innovation in typical hospital programmatic elements such as nursing areas and cancer radiation bunkers;
• the tectonics of construction;
• materiality as it relates to the North West;
• issues of changing seasonal light.

The result is a comprehensive design that embodies the principles originally set out in the Humanism manuscript but also one that meets the functional and programmatic criteria of the Ministry of Health Functional Program. The project has also been awarded some of the highest awards in Canadian architecture, having received the 2005 Ontario Association of Architects (OAA) Award of Excellence and the 2005 Royal Architectural Institute of Canada (RAIC) Gold Medal for Innovation in Architecture.

A Canadian Vernacular

It goes without saying that the image a hospital projects reflects its identity, history and collective memory. This project is no exception. Thunder Bay is a community of approximately 120,000 in Northwestern Ontario, close to the Manitoba border. Sited on the top end of Lake Superior, the hospital serves a geographic area equal to the size of France.

The city was created approximately 25 years ago out of a forced amalgamation of two adjacent communities, Port Arthur and Fort Williams. Replete with the rugged vernacular of the Canadian north, its history is rooted in local pulp and paper industries and the national railway that helped unify the country.

From a building layout perspective, the building set out in a 'T' configuration, orientated north-south to respond to the path of the sun. To the west, the main entrance is located in the crutch of the 'T' creating a sheltered civic urban plaza. The edge of the plaza is lined on two sides by the hospital while the other two sides are flanked by an arcade for market activities and an outdoor amphitheater, created by a deliberate grade change. This plaza also frames the horizon view of Mount McKay, a major geographic feature of the City.

Figure 2 *Aerial view of the hospital*

Figure 3 *On-site stromwater retention ponds cleanse rainwater and provide fish habitats*

This resulting urban room now serves as a place of congregation and a significant civic point for the celebration of important events; a space that was previously absent in the community.

The design of the landscaping is thus based on a direct interpretation of the regional landscape characteristics. The site was part of a 60-acre parcel of which close to half was reserved for natural environmental areas comprising of undisturbed bush, and a network of bogs and natural drainage channels leading to the McIntyre River.

Large tracts of exposed Canadian Shield also characterize the area; a fractured rocky geography created from the sheer physical force of nature. It is typified by the plateaus such as Mount McKay, which rise vertically out of the land resulting in cliffs shattered in geometric yet precise natural patterns. Equally inspirational was the linear patterns of black spruce that run deep into the bush, reminiscent of the surveyor cut lines, typical for the region.

A series of ponds and wandering paths form the outback to the building, designed so as to celebrate the local landscape and to invite local species back to the site. Storm water run off is channeled through a series of connected ponds that cleanse and cool the water prior returning it to the McIntyre River. The ponds are also designed as cold-water fish habitat breeding areas to help repopulate the river with native species.

In northern Ontario, wood is the prime raw material that drives the pulp and paper industry and is a major employer of the community. In the past, timber was the major structural element used to build the heroic railway bridges, spanning vast river gorges that formed the link connecting Canada. This image of the curved wood trestle bridges is memorable indeed and is deeply ingrained in the collective memory of the region.

The most salient evidence of this is the main public concourse by its use of wood and its ability to capture and distribute natural light. While the dramatic three-storey wood and glass walkway serves as a main circulation route, it also curves to follow the path of the sun to allow deep penetration of light and enhance the comforting perception of the hospital. Conceived as a path through a forest lined with trees, the wooden concourse symbolizes and fosters a direct connection to nature.

Knowing this, Thunder Bay is the first hospital in Canada to gain approval for the use of wood as a primary structural element. As wood is a combustible material, its structural use is limited.

However, by working directly with Provincial Building Code staff and the local Fire Marshall it was illustrated that wood was indeed an acceptable design and performance equivalent to steel.

The necessary safeguards were achieved by physically separating the wood and steel elements into separate fire zones, undetected though by the public. In total, over 1090 pieces of glue laminated members -some over 65 feet in length- were used. [3]

Wood was also used extensively within the Cancer Radiation Bunkers. Like the main public concourse, it was chosen for its positive and comforting effect on a patients' psyche during what is clearly a stressful and often lengthy procedure. The ability to produce a place that feels familiar, will ultimately increase patient well being, reduce stress and recovery times.

Figure 4 *Historic railway bridges are a symbol of the Canadian north*

The exterior of the building is clad in a mix of cut tindal stone and an aggregate masonry unit made of crushed tindal stone and cement, both in a mix of smooth, bush hammer and a rough surface treatment. The material, native to the region, was chosen so as make reference to the Canadian Shield and while offering a material of quality, versus the typical brick or pre-cast cladding of most southern Ontario Hospitals.

Additionally, the terrazzo flooring of the main corridor is themed as a river through the seasons. Beginning with images of ice breaking up, the pattern progresses to spring flowers, fish in summer and concludes with fall leaves floating on water. Along the river's edge are sitting areas, or camps, equipped with stone fireplaces and hearths. Inexpensive in relation to the overall cost, this was designed to set a theme of comfort. This typology also continues itself throughout the main routes of the hospital creating gathering points.

Figure 5 *Wooden concourses evokes images of the northern vernacular*

Humanism in the Art of Healing

At the root of the project's efforts is a fundamental belief in the necessity to restore Humanism to the process of healthcare. Humanism is based on the idea that concern for human interests, values, and dignity is of the utmost importance to the care of the sick.

The results of this philosophy are environments that have a connection to our social and inner lives; places that evoke images, feelings, meanings, and sentiment. They are also about a complex bouquet of influences that affects all of our senses: like the way sunlight throughout the day, falls across surfaces. Or like the texture of the rock outcrops or bush in fading light or the weathering effects of wind, rain and snow in the north - these are the lines of the faces creating texture to touch; the personality of place in the North.

Humanism thus asks a simple question: what makes every great place unique in its own right? In doing so it looks to understand how it is that the play of light and sound, the very feel of materials is transformed in certain places and can change the ordinary into the mystical thereby changing the way we think, move, and perceive our existence? In the north, this is realized by the direct connection to nature, to the seasons, and most importantly, access to natural light.

The benefits of direct natural light, particularly in the northern region cannot be underestimated and the effective realization of these values is integral to the full expression of Humanism. Harvard biologist E.O. Wilson wrote, in The Biophilia Hypothesis, (Shearwater November 1993) of our deeper attachment to nature that extends far beyond the narrow demand for physical sustenance to include a broader range of intellectual, emotional and spiritual needs.

The Biophilia thesis infers that it is impossible to detach from nature without also compromising human spiritual existence.

Figure 6 *Wood trusses mark the entry to cancer treatment bunkers*

Knowing that daylight hours are limited in the north, and that the connection to outdoors is so strongly rooted in the collective consciousness of the local population, the necessity to make the connection, and to open itself to nature was a first-order priority.

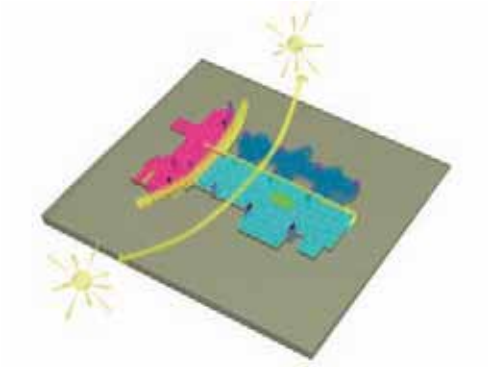

Figure 7 *Building orientation traces the path of the sun*

The carrying cost of people – recruiting, employing and retaining them- is a hundred times as great as the cost of the average building and nowhere is this more significant than in hospitals. Thus the goal was to give the inhabitants of this facility -both staff, patients and visitors- the feeling that they had spent the day outdoors, versus the usual perception in many hospitals that one would not see daylight until the weekend, and specifically in northern climates in which the daylight sun hours are limited.

As such, the main concourse (as well as main public circulation corridors) has been intentionally oriented to maximize light penetration into the building at various seasons while controlling its penetration of light with sunshades.

Using virtually no heating or cooling, it has been designed as one of the first hospitals in the province to use passive solar energy to reduce its mechanical operating costs throughout its life.[4]

Thunder Bay is also the first cancer radiation bunker in Canada, and apparently the sixth in the world, that allows sunlight directly into the heart of the bunkers. While technically challenging in the control of radiation given the obviously strict requirements of Atomic Energy Control Canada, the impact on the psychological well being of the patient and health care workers is enormous.

Figure 8 *Publics corridors have access to views and natural light*

In bunker design, laser lights are focused on pre-painted marks on the body that allow the exact treatment of the radiation to penetrate the body to an exact point. This requires a very low light level so the lasers are visible. As a result, the team began to study art gallery design solutions that allow the penetration of natural light, in focused ways, on paintings that should be viewed in natural light but could be damaged by the same source. Through a number of options, the team devised a solution that would bring the north light straight down along a modeled wall

to illuminate a garden below. This way the light would fluctuate in intensity as a cloud passed overhead while keeping the day light focused at the foot of the treatment bed.

Similarly when you enter a radiation treatment room, you move through an entry maze in and look directly at the treatment machine, a potentially overwhelming experience. In this instance, the machine was rotated so upon entering you look past the machine to the sun lit garden beyond, a significant break though in bunker design both for staff and patients.

Natural light is also considered in the patient rooms as well. Each private patient room has a wooden framed inglenook containing a day bed where a member of the patient's family can sleep overnight, which helps in the healing process and the health care delivery by nursing staff.

Clearly the impact of dwindling resources and increasing health delivery costs will have a significant impact on staff moral. As a result, the quality of the environment in its ability to attract and retain staff has never been more important. It is for this reason that the main nursing stations are oriented with direct views to outside through three-storey, mini atriums in each of the inpatient areas.

As much as do patients, all staff need individualized control over comfortable personal environments, access to natural light and views, proximity and visibility to the patients in their care and efficient work paths. A people-centred workplace therefore translates into a perpetually renewing investment in improved patient care and reduced staff stress.

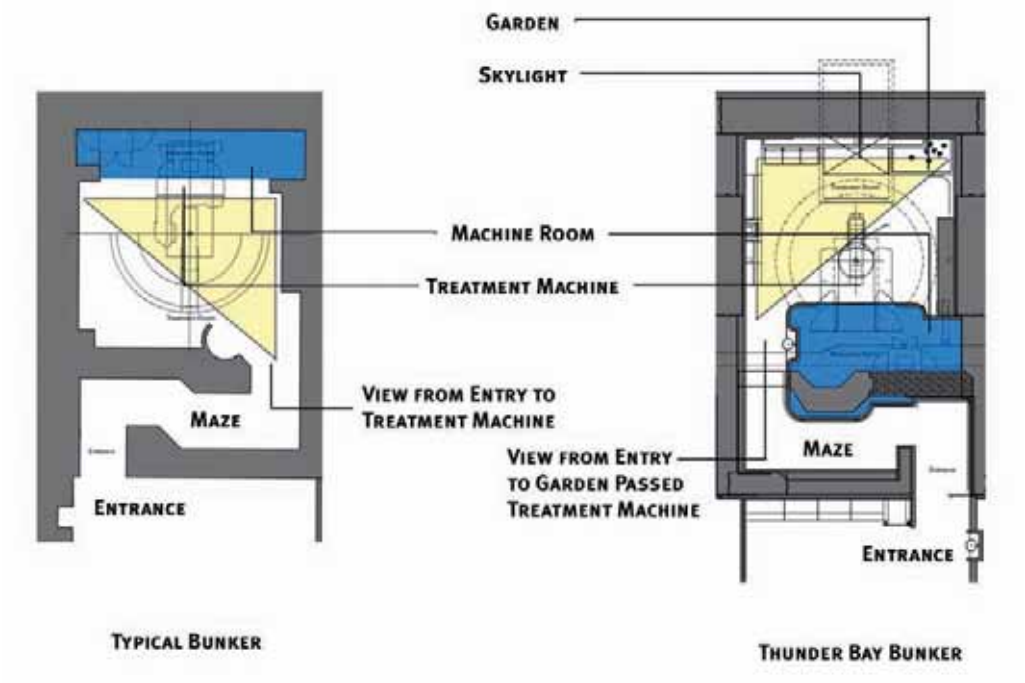

Figure 9 *Contrasting radiation bunker plans*

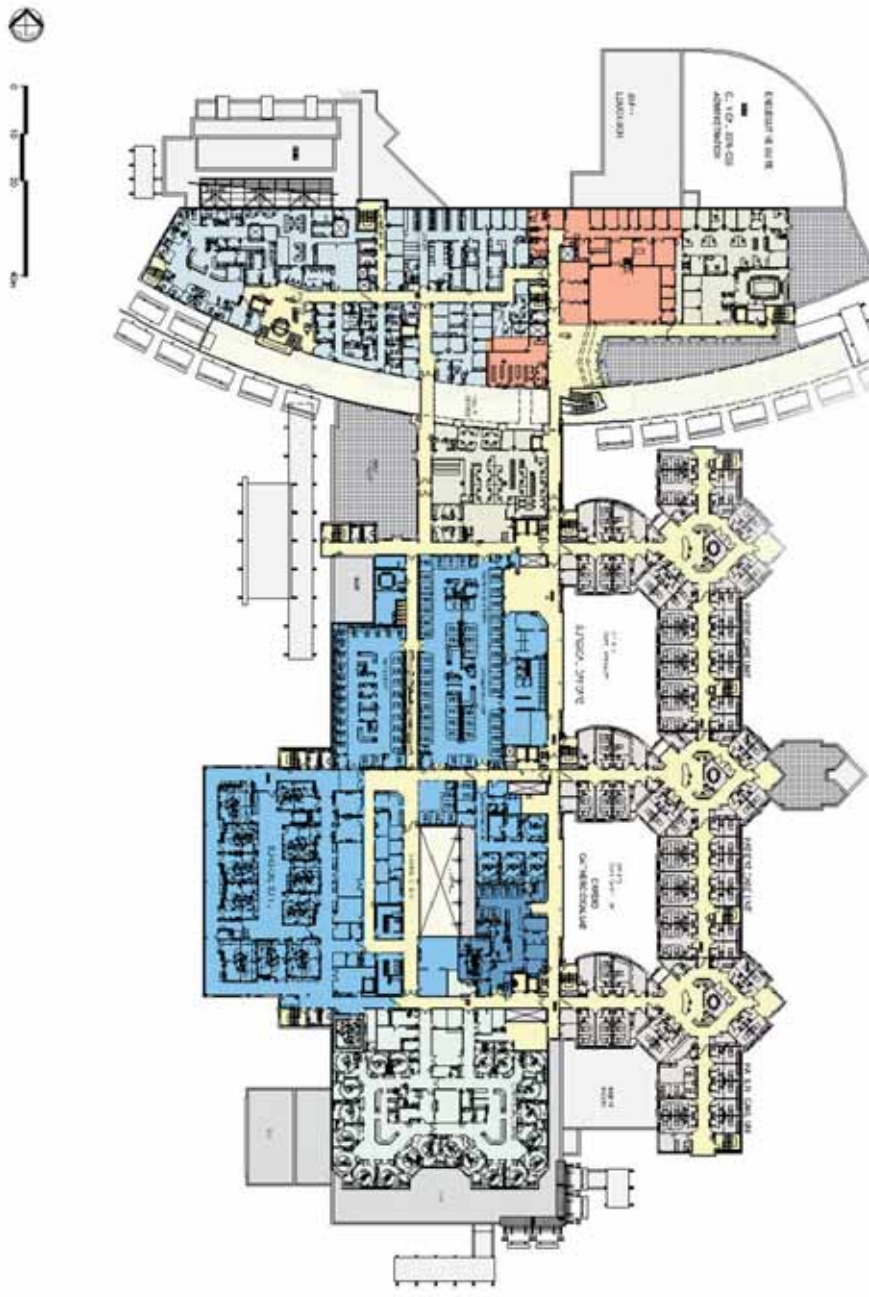

Figure 10 *Floor plan third floor*

Figure 11 *View of the cafe´ bathed in natural light*

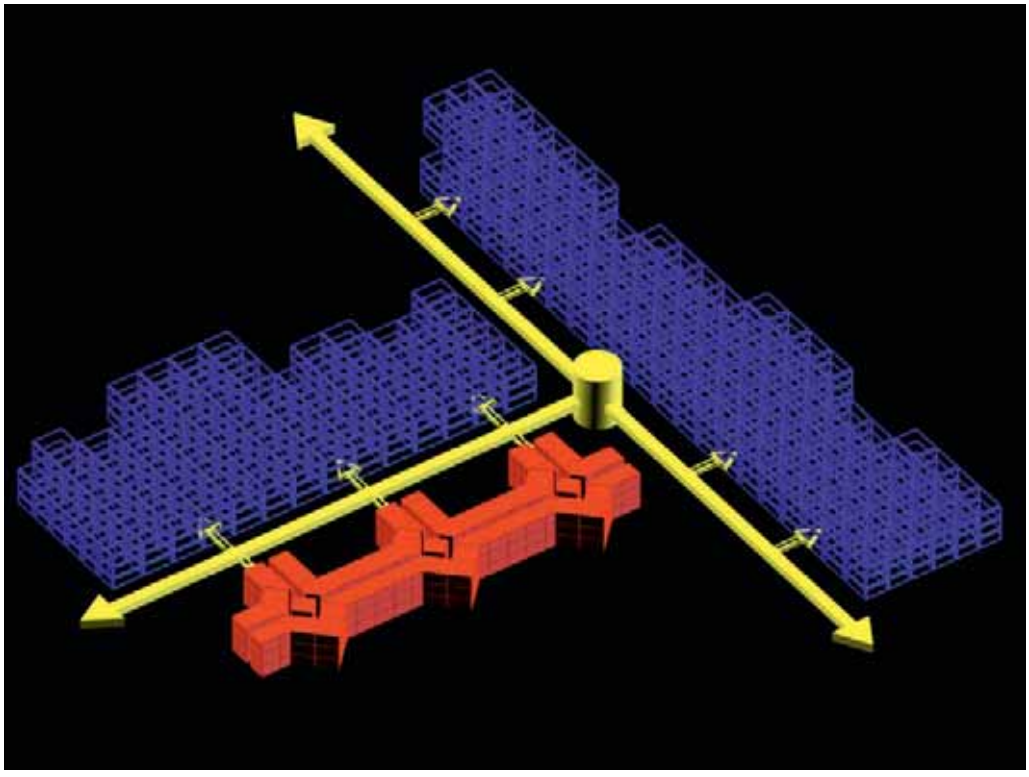

Figure 13 *Basic building composition*

Creating Functional Buildings

Beyond the aspects of Humanism, the hospital was also charged with meeting specific standards of operation as set out in the approved functional program. Thus, the Primary Organization of the hospital was developed as follows:

The building has been designed as a three-storey structure. At its western edge, the building is buried one storey below ground making the second floor the main entrance level.

Separate entrances have been organized for the Emergency, Maternal Child, Mental Health and the Cancer Centre. The entrances are located in relationship to the ends and edges of the "T" shape.

These side doors are advantageous in that they speak to the differences of people undergoing radiation treatment versus those that are giving birth. It is also effective from a SARS control standpoint.

Traditionally, hospitals are designed with the departments such as operating suites and clinics in a podium with the nursing/patient beds placed on top.

Unfortunately, the grid for the podium is different from that of the patient's beds as well as the mechanical and electrical services and shafts, which can create many conflicts. Both the upper and lower portions are compromised and the construction coordination is complex, especially for an accelerated construction schedule.

As a result, the two were separated and placed side by side. This allowed the use of a flexible modular frame of 9m x 12m, which houses clinical departments, to sit on their own and adapt and change over time. The patient beds are attached along side. Following this logic, they can be constructed conceptually as separate buildings. The advantage of the grid is that it can expand or contract easily during design or construction due to changing programme needs, which it did.

Conclusion

Architects often use the word 'spaces' to describe the buildings they design and the physical areas created by them. At Thunder Bay, we first designed places, not spaces; small moments and humanistic vignettes that transcend their efficiency by becoming places where people feel cared. And it is in these places, where the realms of public and private overlap, that provide opportunities to subtly articulate different thresholds, or blend and mix functions to generate different uses and activities for both the patients and staff.

It is the first hospital in Ontario to use wood extensively through the building and has charted new ground in the design of cancer bunkers. It is also the first hospital in the province to use and embrace sustainable environmental design concepts in both the building and site strategies.

But beyond these firsts, the true measure of its success is by the people who use its spaces on a daily basis. Today the hospital commands a staff new-hire waiting list and competes for doctors internationally – a feat unheard of in the Canadian north.

Footnotes

1. The Thunder Bay Regional Health Sciences Centre was completed by Salter Farrow Pilon Architects; Farrow Partnership Architects and Salter Pilon Architects, successors.

2. Humanism in the Art of Healing is a self-published manuscript, authored by Tye Farrow of Farrow Partnership Architects. Copies are available through the author.

3. Interestingly the Construction Manager originally resisted the use of wood because of the uncertainty -as it hadn't been done before- and the perceived expense of the material. Our Construction Managers priced both a wood and steel structure for comparison and found that the wood structure, all in -including fire suppression- to be slightly less expensive than a steel solution yet offered far more value for its qualitative aspects. The building was designed so that the steel structure could be erected on its own, then the wood structure inserted within the steel frame, thereby allowing the two to be constructed independent of each other. This allowed the team time to fine tune the details of the wood structure while the repetitive steel package could be tendered earlier. The wood structure erection lasted approximately 3 months.

4. Interestingly, provincial health officials were originally resistant to the amount of south facing glass, not understanding the operational cost savings it offered through passive solar energy. Both this design and a two-storey space were modeled to quantify the operational costs, and the two were found to be equal from an operational cost perspective. This space, having been open for about a year and a half, uses virtually no energy in the summer or winter.

Figure 5, 6 ,11 Photo Credit: Peter Sellar Klik Photography