EXPLORING THE DIVERSITY OF GREEN BUILDINGS

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INTRODUCTION

25 years of experience in sustainable architecture and 10 years of experience in designing LEED-certified buildings and providing LEED consulting to projects has allowed our firm, Prairie Architects Inc., to collect a great deal of experience on green buildings. Through the years, we have come to realize the great diversity of what it means to be a green building and the multitude of avenues that can be followed in order to pursue that end goal.

Factors such as building type, location, and owner representation can have a dramatic impact on what sustainability opportunities are available to a project. This article examines the process of determining the path to a green building through three case studies of recently constructed projects in Manitoba, Canada. Through each case study we will reflect on the challenges encountered as well as highlight the successes and opportunities that were found.

KEYWORDS

owners, diversity, building types, urban, rural, LEED

DIVERSITY OF GREEN BUILDINGS

In sustainability we often talk about biodiversity and the importance of having a high level of diversity in our ecosystems to maintain their integrity and health. The concept of diversity is critical when we look at green buildings as well. The strength of our building stock and health of our neighbourhoods will be strongest when sustainability is not viewed as a one-size-fits-all approach, but rather recognizes the uniqueness and variety available and works to achieve green buildings from many different perspectives.

There is not a single path to creating a green building, which is shown by the various rating systems available for certification. Not only are there various certification programs available, but there are also numerous paths that can be taken within these rating systems. (One exception to this is the Living Building Challenge,[1] where all program requirements must be met in order to achieve the full certification.) This variety of systems and paths allows the building owner and design team to create a green building that fits with the owners' sustainability goals, as well as being the best fit for the building type and location.

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DIVERSITY OF CLIENTS

Our clients are as diverse as the buildings they occupy. Even though they represent a large variety of backgrounds, education, positions in their company, and knowledge of the building industry, they all end up in the same position of representing their building in the design process.

The reasons our clients have for going down the green building path also have an extreme range. Some of the common reasons we have seen over the years include personal values, a sense of corporate responsibility, marketing angles, a desire to keep up with the standard set by their business type, and economics. In Manitoba, all provincially-funded projects are subject to the Manitoba Green Building Policy[2] where they are expected to target LEED® (Leadership in Energy and Environmental Design) Silver certification. Since the policy's inception in April of 2007, this has brought us a new group of clients who may or may not have sought out a green building on their own, but are now doing it regardless.

With this diversity of interest in green buildings we encounter different levels of support and enthusiasm for the process. Some owners just care about getting a plaque at the end or some figures for their brochure, with minimal cost impact; while others are helping us to set goals and priorities while driving the process from beginning to end. All of them may achieve a green building, but interested and knowledgeable building owners can make an enormous difference, particularly when LEED certification is desired and involved. This type of client has the ability to bring their knowledge to the table to make a better building and may present other sustainable opportunities that might not have been possible otherwise. This was definitely the case with the Churchill Northern Studies Centre that will be discussed in more detail.

THREE SUCCESS STORIES

In order to illustrate the unique paths that can be taken, along with the related challenges and opportunities, we will present three case studies of green buildings that have been constructed in the last few years. All of the buildings have very different owner groups, structures, design teams, and construction processes, but all achieved a high level of sustainability. Two projects are located in Winnipeg, Manitoba, and the third is located in a remote area of northern Manitoba, close to Churchill.

West End Cultural Centre

The West End Cultural Centre (WECC) is a performance venue in an inner-city neighbourhood of Winnipeg. The group formed in 1987 as "a non-profit organization to present music outside the mainstream, support emerging artists, and provide opportunities for citizens to be involved in the arts."[3] They were located in an 80-year old church that had a great deal of character and importance to the community, although not a heritage site. However, this important community resource also had a major structural issue, poor insulation, and accessibility issues, so the group began the process of moving forward with a major renovation and addition to their building.

The owner group for this project consisted of the general manager of the WECC, as well as various technical staff from the facility and board members. The group was committed to an integrated design process (IDP) and selected their architect and project manager for their commitments to sustainability and proven past performance. The project started out with three clear goals established by the owner group:

1. Be structurally sound and environmentally sustainable
2. Have increased physical capacity
3. Offer improved programming and patron facilities

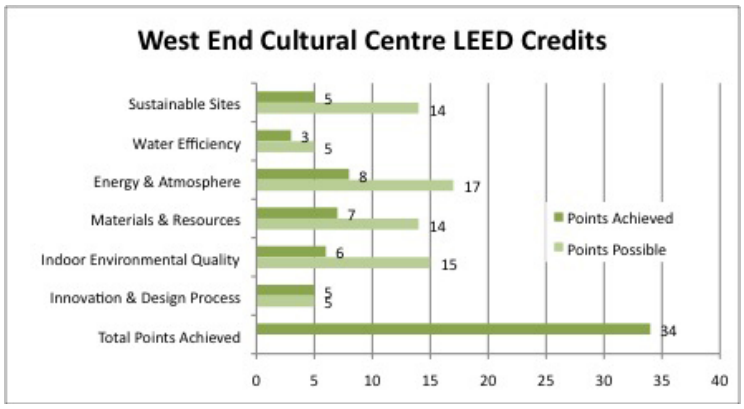
The goal for sustainability was not very detailed, but it was clear from the outset that it was a priority to the owners, setting the stage for future discussions at each IDP session. The WECC has a commitment to sustainability in their everyday practice, so the team worked to translate their informal green policies into a building that met their standards. Early on in the process, the owners committed to using the LEED certification process to verify their green building. The LEED checklist was used during the IDP sessions to help guide conversations and allow the owners to select areas and specific strategies that met the needs of their venue and organization.

The owners were very involved during design and construction and in the LEED process. The WECC dedicated one of their staff members to assisting the project manager with construction documentation for LEED and ensuring the owners' requirements were being met. Since the WECC is a non-profit organization, it was extremely important to minimize the downtime of the venue because it is a major source of revenue. In order to do this, construction scheduling was critical and the decision was made to maintain the existing venue while the addition was constructed.

After many years of fundraising, design, and a year of construction, the revitalized WECC opened their doors on May 25, 2009. The new facility has 13,000 square feet of space, increased their capacity from 300 to 380, as well as added an 80-person multi-purpose room that can be used for small concerts or community rentals. They also have a new lobby and bar area so patrons no longer need to stand outside waiting in the cold winter temperatures, along with modern, water-efficient washrooms to better serve their customers. And of course, a new wall constructed on the existing building is now structurally sound, with the added benefit of the staff no longer needing to wear coats inside. In February of 2012, they received a LEED Silver Certification from the Canada Green Building Council (CaGBC), completing their green building process.

The project received 34 credits over the six categories of LEED (see Figure 1). In Sustainable Sites, the project did very well for its location with regard to the pre-existing site, access to transit, and not adding additional parking while providing two carpool spaces. WECC also received credits for providing bicycle storage and shower facilities, and for reducing light pollution into the night sky and over the project boundaries. To reduce water demand for the building, the majority of plants around WECC do not require any irrigation, and for the

FIGURE 1.



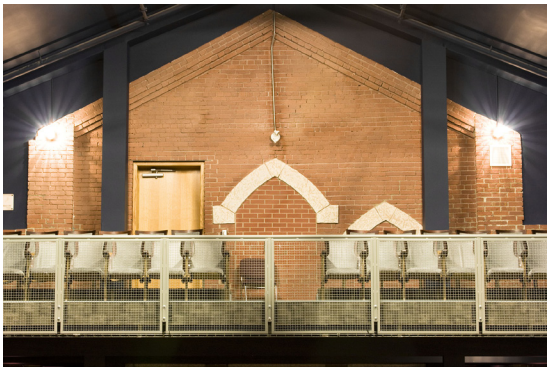
garden beds that do, the water is provided by collected rainwater from the roof. 6L/3L dual-flush toilets and waterless urinals provided an additional water savings of 29% for water used inside the building.

WECC achieved seven credits for energy efficiency by achieving 45% energy cost savings compared to a building constructed to the Model National Energy Code for Buildings 1997 (MNECB). This was achieved through the use of a geothermal heat pump as the central plant, radiant flooring and valence cooling units in the auditorium, with hybrid heat pumps in other occupied areas, an ERV, and energy-efficient lighting.

86% of all construction waste was diverted during construction using some unconventional practices involving community reuse. 19% of the total building materials were reused from other deconstructed buildings. For example, theatre seats and marble were obtained from a deconstructed theatre. Solid oak doors and curtain wall glazing were obtained from a building reuse wholesaler. These items would have been too costly to purchase new, but because they were available for greatly reduced costs, the designers worked to incorporate the reused materials into the design and create maximum impact.

The landscape design was also impacted by availability of materials. A patio area and planters were created using 2,100 bricks, three limestone arches, and six limestone sills that had been deconstructed from the existing WECC. Of the new materials used, 10% contained recycled content and 12% were regional materials. This included many of the products we expect such as concrete, steel, and carpet tile, but one unique product contributing to both recycled and regional was the wood flooring for the multi-purpose room. Wood Anchor in Winnipeg has built a business from collecting the municipal Elm trees removed by the city that have contracted Dutch Elm Disease and using the wood to make flooring.

To ensure a high level of Indoor Environmental Quality, low-emitting products compliant with the South Coast Air Quality Management District standards for Volatile Organic Compound (VOC) levels were used for all paints, coatings, adhesives, and sealants. Composite wood products contained no added urea-formaldehyde and carpet products met the Carpet and Rug Institute Green Label certification. An indoor air quality management plan was also implemented



during construction and carbon dioxide sensors are used to signal the mechanical system when additional fresh air is required in spaces. The project had a wealth of innovation to choose from for the innovation credits under LEED. One credit was achieved for a worker-training program during construction that trained inexperienced workers in green building. The WECC also achieved three credits for their own initiatives including education, composting, and green housekeeping.

Churchill Northern Studies Centre

The Churchill Northern Studies Centre (CNSC) is a non-profit research and education facility in Northern Manitoba that was founded in 1976.[4] Located 23 km east of Churchill, it is in a remote location with very little access to services and in the extreme weather conditions of Canada's north. The vision of the CNSC is "to understand and sustain the North." They are situated at a key northern location where three biomes meet—the marine, northern boreal forest, and tundra. Perhaps most famously, they are located in the heart of polar bear territory, but it is also a key environment for many other northern wildlife and plant life, as well as a key research location for climate change issues.

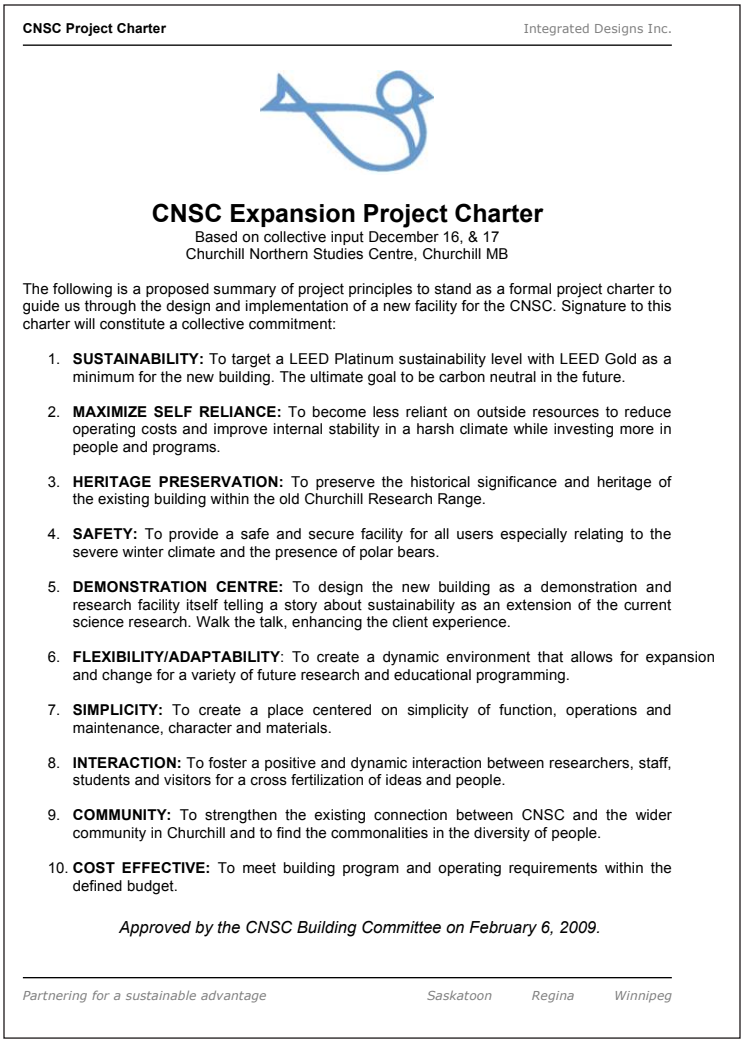
Construction of the new facility began in the summer of 2009 and the building opened its doors in August of 2011. The facility operates year round and features dorm accommodations for resident researchers and visitors, as well as laboratories, classrooms, and a cafeteria. Increased demand for both northern research and tourism in recent years had increased the demand for services offered by the CNSC and they wanted to expand beyond the existing facility that was no longer meeting their needs.

The owners group included building staff and researchers, and was lead by their executive director. Early on they hired a project manager to help guide them through the process. The project followed an Integrated Project Delivery Model that brings the general contractor and sub-trades into the process during design to better facilitate the IDP process and improve construction documents and costing. As part of the IDP process, a survey was sent to past researchers and visitors to the building from across the world for their input in the design process.

During the initial IDP session the CNSC building committee drafted a Project Charter to help focus the design team and create a basis for all decisions to be made from (see Figure 2). The first point listed was for Sustainability and set a minimum target of LEED Gold for the building as well as the possibility to be carbon neutral in the future. Other points also related to green building such as maximizing self-reliance, heritage preservation, flexibility, simplicity, and community. The charter set a path toward a green building but did not dictate a clear set of requirements or priorities for how this was to be achieved. Once again, being a non-profit organization, a focus of the project team was to reduce operational costs for the CNSC to help them become more economically sustainable over the long term.

To help address the many unique situations they face in their location, a key source of design input was from their building operations staff. These situations included snow drifting, long, dark, and extremely cold winters, and polar bear safety—or the combined issue of snow

FIGURE 2.



CNSC Project Charter — Integrated Designs Inc.

CNSC Expansion Project Charter

Based on collective input December 16, & 17
Churchill Northern Studies Centre, Churchill MB

The following is a proposed summary of project principles to stand as a formal project charter to guide us through the design and implementation of a new facility for the CNSC. Signature to this charter will constitute a collective commitment:

1. **SUSTAINABILITY:** To target a LEED Platinum sustainability level with LEED Gold as a minimum for the new building. The ultimate goal to be carbon neutral in the future.
2. **MAXIMIZE SELF RELIANCE:** To become less reliant on outside resources to reduce operating costs and improve internal stability in a harsh climate while investing more in people and programs.
3. **HERITAGE PRESERVATION:** To preserve the historical significance and heritage of the existing building within the old Churchill Research Range.
4. **SAFETY:** To provide a safe and secure facility for all users especially relating to the severe winter climate and the presence of polar bears.
5. **DEMONSTRATION CENTRE:** To design the new building as a demonstration and research facility itself telling a story about sustainability as an extension of the current science research. Walk the talk, enhancing the client experience.
6. **FLEXIBILITY/ADAPTABILITY**: To create a dynamic environment that allows for expansion and change for a variety of future research and educational programming.
7. **SIMPLICITY:** To create a place centered on simplicity of function, operations and maintenance, character and materials.
8. **INTERACTION:** To foster a positive and dynamic interaction between researchers, staff, students and visitors for a cross fertilization of ideas and people.
9. **COMMUNITY:** To strengthen the existing connection between CNSC and the wider community in Churchill and to find the commonalities in the diversity of people.
10. **COST EFFECTIVE:** To meet building program and operating requirements within the defined budget.

Approved by the CNSC Building Committee on February 6, 2009.

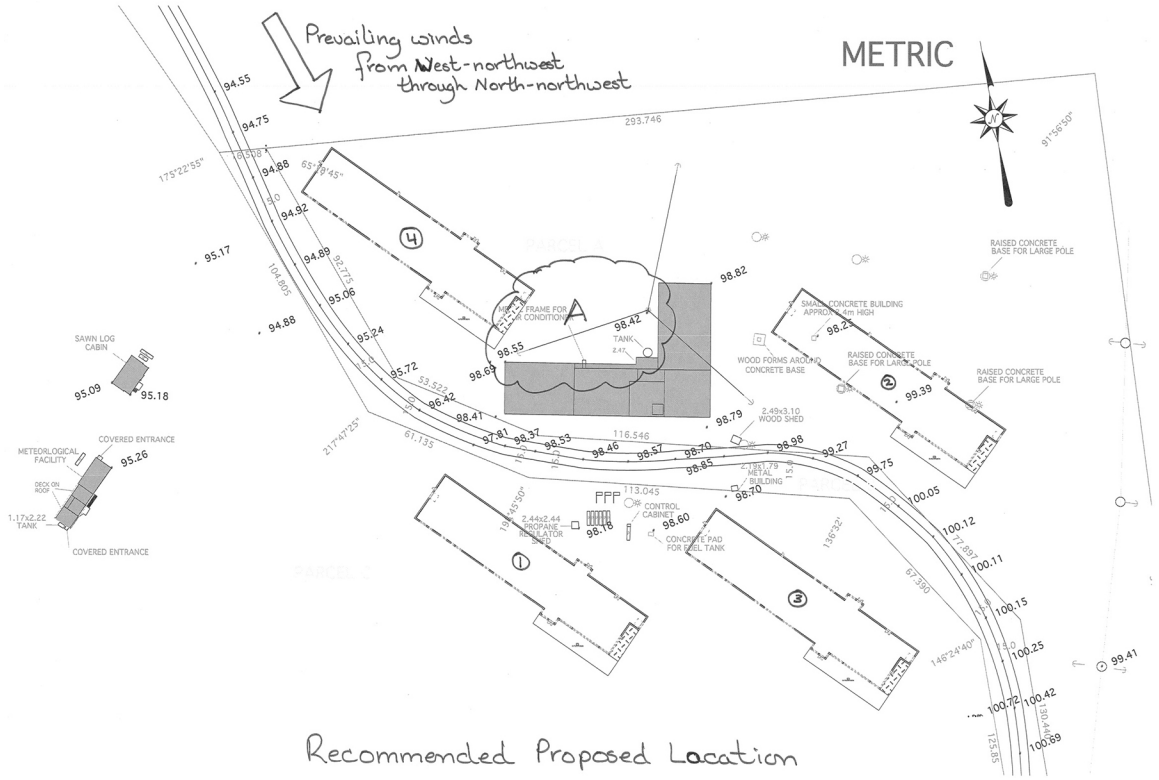
Partnering for a sustainable advantage — *Saskatoon* *Regina* *Winnipeg*

drifts against the building allowing polar bears to climb onto the roof. There were also challenges related to frequent power outages and no access to water or sewage, which in the winter requires water and sewage to be trucked to and from the town of Churchill.

Due to the complexities of the project location, combined with the unique operations of the building, it was crucial to have an experienced design team that could bring expertise to the project. In addition to the typical consultants, experts on snow drifting and wind were brought on board to help with everything from building location and orientation to the decision to raise the building off of the ground. The IDP process allowed the design team to work through many challenges and pull from the knowledge of the owners group to help lead to better decisions for the building.

All the unique situations and challenges led to a distinctive building design with many exceptional green building features. Decisions on building location, orientation, elevation, and to some degree interior layout, were based on the specific location and climate. RWDI was hired early on in the design process to assess the wind and snow conditions and make recommendations on building location with relation to the existing building, as well as review options related to the site plan, building shape, and elevation. They reviewed four options

FIGURE 3.



for the building location (see Figure 3) and recommended option one as ideal for reducing snowdrift effects from the existing building; however, the owner preferred option two for proximity to the existing building, not requiring a highway to be crossed between buildings, and maintaining views to the historical rocket range. RWDI then recommended the building be pushed further north and maintaining a 20 m distance between to reduce the impact of the existing building. Some snow-drifting effect was anticipated on the access road between buildings, but the owner was accepting of this in order to meet their other goals. Another large impact of RWDI's work on the project resulted in the building being elevated 1.5 m above grade to allow the prevailing winds to flow under the structure and reduce snowdrifts on the southwest and southeast facades. The orientation of the building was specifically chosen to reduce impact of the winds for snow drifting around the building. This was weighed against other angles that may have been more optimal for providing passive solar gain and daylight.

With significant heating requirements for a large portion of the year, energy efficiency was a key factor in making this building as green as possible. A well-insulated envelope, (R40) including triple-glazed windows, helped to reduce the mechanical loads to start with, and then the mechanical engineer took on the challenge of identifying the most appropriate systems and innovative solutions for the project. This included a made-in-Manitoba heat recovery system designed to handle the extreme cold where many heat recovery ventilators (HRVs) may be prone to freezing. It is a dual-core heat exchanger with 85% heat recovery efficiency and has no requirement for defrost. Other features include sensors and timers to reduce equipment running when not needed, energy-efficient commercial kitchen equipment, a solar wall to

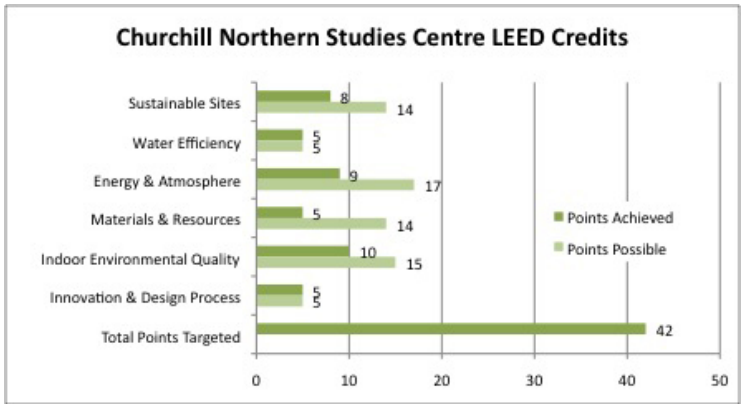
pre-heat fresh air for the kitchen and cafeteria, as well as recirculation of computer room waste heat through under-floor plenum.[5]

Since water must be either pulled from the lake in the summer or shipped in from Churchill, water efficiency was also a key design feature. Waterless compost toilets and waterless urinals are used to significantly reduce the water required by building occupants. Storage tanks are used to store lake or town water and there is also grey water recycling from lavatories and showers. All wastewater is treated onsite by two 5,000 Litre biofiltration vessels indoors and two bed sand dispersal fields outdoors.

Architecturally, a focus was placed on creating spaces with high levels of natural daylight and views to the expansive outdoors. This was of great importance since building occupants may spend great deals of time indoors during the extreme weather. Also, the daylight hours are extremely limited in the winter, so it was critical that all of the occupants benefit from the short amount of time there is light. The choice was also made to use light-coloured roofing and site materials for the project, although there is an ongoing debate on the effectiveness in northern climates.[6] The team decided to pursue these as there is still a benefit to reducing heat islands during the summer and no negative in the winter since the entire ground and roof would be covered with snow and highly reflective regardless.

The project is registered with the CaGBC and is targeting LEED Gold certification (see Figure 4 for targeted LEED credits.) The project will be submitted this fall to begin the certification process.

FIGURE 4.



Sturgeon Heights Community Centre

The Sturgeon Heights Community Centre (SHCC) is the amalgamation of two community centres in the west end of Winnipeg. One of the buildings was located on site and would be deconstructed as part of the project. The SHCC opened in February 2012 and provides the community with a new gym facility, a multi-purpose room with a kitchen, and an indoor viewing area for future hockey rinks in the field.

From the very first discussion about this project it was clearly established that it must be a green building, due to the provincial funding it receives. As such, it falls under the Manitoba Green Building Policy and must meet the following five requirements:

1. Use an Integrated Design Process
2. Minimum level of energy efficiency of 33% better than the MNECB and meet Manitoba Hydro's Power Smart Design Standards
3. Life-cycle costing of the building or building systems
4. Minimum LEED Silver certification
5. Preference for low- or zero-carbon renewable energy source

These clear guidelines were a good start for establishing the green building process for the project and some initial targets. Through the IDP process and use of the LEED scorecard, further goals were established to meet the requirement of LEED Silver while also meeting the requirements of the City of Winnipeg, the General Council of Winnipeg Community Centres (GCWCC), and the future board of the community centre. The large number of owner participants created a larger IDP group, and with it potentially longer meetings, but in the end the input of all members was critical and everyone contributed to the process.

Since the City of Winnipeg provides funding for community centres within Winnipeg, it was a critical member of the owners' group. The city has community centre guidelines that formed part of the Owner's Project Requirements and outlined what was required. There was also a clear focus on what aspects would be funded for the project rather then a general wish list. The GCWCC was able to provide critical feedback on community centres as a whole in Winnipeg, as well as guidance as to the direction of community centres and any changing trends that were being seen. The SHCC board was able to provide input into specific community issues and details on how the existing centres were being used and any requirements that weren't being addressed.

The IDP process helped the team to identify key spatial priorities in the first meeting so that space and budget limitations could determine what spaces would be included and what wouldn't be a part of the project. It was determined that the key spaces would be a regulation-size gym, multipurpose room able to accommodate 250–300 people (key for revenue generation for the centre), skate room/viewing area, dressing rooms, and a kitchen. The building design was fairly straightforward due to the specific nature of the spaces being designed.

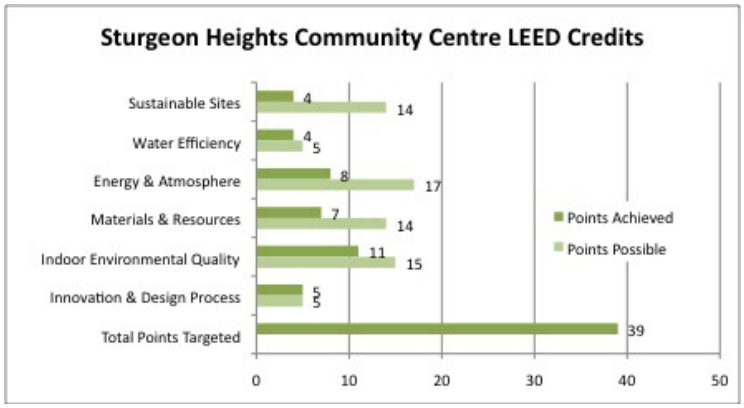
The owners' group was clear from the beginning of the process that they were not interested in "buying" LEED credits and beyond the target of LEED Silver were not specific on

how sustainability should be achieved in the building. Through the IDP process it was determined which LEED credits, and therefore what green building initiatives, best served the budget and the building to maximize sustainability of the project.

SHCC is currently going through the LEED certification process at the CaGBC with a target of certifying in the fall of 2012. The project submitted with a possibility of achieving 39 credits, which is the threshold to LEED Gold certification (see Figure 5). Credits are under review so have not yet been finalized but some of the key green features of the building include:

- Access to alternative transportation for occupants
- Water-efficient fixtures for a reduction in water of over 40% (achieved with 1.9 LPF urinals, 6L/3L dual flush toilets, and 1.9 LPM lavatories)
- Drought-tolerant landscape design requiring no irrigation
- Energy cost savings of 48% compared to the MNECB (R40 roof, R21 envelope, energy recovery ventilators (ERVs), 94% efficient condensing boiler supplying nine hydronic heat pumps for heating, T5HO lighting with daylight sensors)
- 84% diversion of construction waste including deconstruction of existing community centre on site
- 23% recycled content in new materials (including concrete, drywall, fibreboard, steel, gym flooring and others)
- 30% regional materials (primarily from concrete and steel)

FIGURE 5.



- Durable Building
- Construction Indoor Air Quality Management Plan including building flush
- Low-emitting materials
- Access to daylight for 80% of occupants and views for 99%

While most of the credits were fairly straightforward and attempted to provide sustainability in the most cost effective way, a few key steps towards incorporating some sustainable practices into city building projects were achieved. The first was the deconstruction of the existing community centre instead of the traditional demolition. Over 50% of the existing building was either salvaged or sent for recycling, contributing significantly to the overall diversion rate of 86%. The other major impact of targeting LEED was the incorporation of natural daylight into the spaces. Glazing was incorporated into the gym on the south and east sides with the south side using a translucent insulated glass unit to provide even diffuse daylight and reduce issues with glare. Through actual measurement, 94% of the gym registers at over 250 Lux and this space can often be used during the day without turning on the lighting. Light tubes were also incorporated into the corridor and office to bring natural light into areas that might not have otherwise received enough.

CHALLENGES AND SUCCESSES

The three projects highlighted may all be green buildings, but that is where their similarities end. It can't be said that one was a superior building or more positive experience. There were positives and negatives to each project that made the experiences all extremely educational as to what can be achieved.

West End Cultural Centre

For the West End Cultural Centre, there was a clear sustainable strength right from the beginning—building reuse. The design decision to reuse existing building stock is one of the most sustainable decisions that can be made early on. Not only does it extend the use of the materials and the embodied energy they represent, but reusing the existing inner city site also eliminated any work that would be required to tie into services, create roads, or develop transit to a new site.

Another positive aspect of the WECC project was the smaller scope. Since it was a relatively small project, there were a lot of synergies that could be made with the community. The project manager/general contractor had a strong skill set in developing community resources and enhancing the sustainability of the project on a local level. As a direct result of his efforts we were able to achieve significant construction waste diversion of 86%. He put the word out in the community that building materials would be available and community groups as well as individuals came out to collect materials throughout the deconstruction process. Letters were collected from all people indicating how they would be using the materials and quantifying how much they had taken. This would not be possible with many contractors, or on larger projects, but it was an enormous success on this one.

Perhaps one of the strongest green influences on the WECC was the consistent presence of the owner group and their commitment to the sustainability of the project. From the initial targets, selection of the design team, and the many programs they continue to run post-occupancy, the strong leadership shown by the owners set a tone for the project that was respected by all involved and followed through until completion.

The project was not without it's challenges. Working with an existing building may be sustainable but it also provides some difficulties by limiting options. For example, daylight was difficult to provide in many of the existing spaces. Energy modelling of an addition and renovation also had its challenges and is not as straightforward as a new building project. The smaller scope and focus on local workers meant we were dealing with many trades who had not previously been on a green building work site and thus collecting information on materials used was not an easy task.

Working with a non-profit arts group also meant that budget considerations were front and centre. This limited some of the scope, particularly for the renovation of existing spaces once mandatory upgrades to structural, mechanical, and electrical were done and therefore limited the ability for further changes to enhance the sustainability. Another key design challenge was the location of the project in the inner city. Crime is a major concern and created considerable debates around aspects such as exterior glazing, safety of patrons in parking areas, and exterior lighting levels.

These challenges made the LEED certification for the project more difficult than for a more straightforward new construction project. The limitations of a small urban site, tight budget, and building renovation removed the opportunity for many credits that may have otherwise been targeted. As mentioned above, the challenges of working with trades not familiar with the LEED process also delayed documentation submittals past construction and delayed the certification process longer than is ideal. However, the other successes achieved through the strong IDP process and the unique problem solving helped to overcome these challenges and complete the LEED Silver certification, making it one of the first certified performing arts centres in Canada.

Churchill Northern Studies Centre

Many of the challenges of this project have already been discussed—the remote location, extreme climate, polar bears, frequent power outages, and access to water and sewage just to name a few. Early on in the design process it was very apparent that this was not an ordinary project. The remote location would prove to be a challenge beyond the design and also become a construction challenge (as did the polar bears who prevented work on several days). Materials all needed to be shipped a great distance and could only be shipped during certain times of the year. Construction waste was a challenge for the project as well, since all waste needed to leave the site by truck. An effort was made first to reduce the amount of waste generated during construction since there was an associated cost (both financially and sustainability) for removing any waste products. The Town of Churchill has some level of recycling and the contractor worked with individuals in the community to find other reuse destinations for the waste building materials. Not only did materials require shipment but so did people. The budget for the project was essentially reduced once all the travel and accommodation fees for all the trades were incorporated.

The mechanical systems were a priority to achieve energy efficiency, yet the project needed to deal with the reality that local

trades people available for maintenance may not be experienced with complicated systems and unique equipment. An effort was made to provide the most innovative, efficient system possible while making it feasible to maintain. Items such as the solar well helped to find this middle ground. The many innovative mechanical solutions—a challenge to develop in their own right—provided other challenges for energy modelling of the project and many unique workarounds to effectively reflect the energy savings achieved in the building.

In spite of all the challenges, there were some extremely strong successes on the project as well. The first would be the strength of the design team and of the owners group. This collaboration led to many great design decisions and an exceptional building. The owners provided many unique benefits due to the nature of the building. The fact that they are research scientists studying in a northern climate gave them great insight into the need for sustainability and a desire to push the project beyond the standard. They wanted a building that was a true statement of sustainability and of what their centre stands for. In addition, their skills as scientists and characters living in a remote community would also prove beneficial in design decisions. They fully supported ideas such as waterless urinals, composting toilets and recycling grey water that can often be difficult to sell to clients. When the requirement of water testing was raised by the mechanical engineer, the clients quickly identified it was something they did already and have people trained to do, so that would not be an issue. This was also an example of the importance of having owners at the IDP sessions to ensure the design team is not making incorrect assumptions about the owners' desires and abilities. The owner also took on the landscaping. Since many of their researchers are experts on local vegetation, they took it on as their own project to restore any disturbed land as best as possible with native plantings.

Sturgeon Heights Community Centre

Sturgeon Heights Community Centre falling under the Manitoba Green Building Policy poses both a strength and a challenge for the project. In this and other projects in the same position, we find there is strength in having the LEED target known and established early on in the project, as this can often be an item of debate for the owners and delays clear goals until much further in the design process. The challenge can come from a lack of understanding of the policy and what it entails and means for the project. In other experiences we have found owners' groups that are uninterested in sustainability and are simply doing it because they have to and are not entirely supportive of the process. This wasn't the case however with the SHCC and we found a very engaged owners' group, even though they were not green

building experts. Part of our process in early design is to provide education to the group on the entire process, the LEED credits, and what it means to build a green building, to try and ensure this type of cooperation from the start. The education process, combined with a driven owner, made the requirement of green building a great success for this project.

There is no doubt that dealing with an owners' group that has different groups being represented presents a challenge for the project. Each individual group has slightly different priorities and represents their own set of interests. This, combined with a short timeline due to funding from a federal stimulus program and limited additional financing available, meant there were many complexities to a simple project. The IDP process became essential in moving the project forward efficiently and with clear goals and tasks at each stage. With representatives from all groups involved in the process, everyone was aware of why decisions were being made and thus little time was spent revisiting items that were already decided upon. The maintenance staff for the future building was also present during design and construction which provided some invaluable input on operations and usage.

This project surprised us a little in its high level of success as a green building. It's a fairly standard project that had not sought out to be highly sustainable—and in fact only pursued it out of provincial legislation—and yet exceeded their targets for LEED and submitted for certification with a possibility of hitting Gold. When we started to look for the answer it became clear that there was no one key moment or decision that achieved the success but rather the entire process and all the little decisions. The commitment to LEED from day one was a key step since it started the project off on the right foot. The design team took this commitment seriously and involved the LEED consultant from early conceptual design through every IDP session and consultant meeting, continuing throughout construction. This ensured that sustainability and the LEED targets were discussed at every meeting and that the project team was aware of how decisions they were making impacted the greenness of the building. The commissioning agent was also brought on early and highly involved in the design and construction processes, as well as occupancy. The contractor was also very involved, with the site supervisor acting in the role of LEED liaison with the LEED coordinator. Often we see a safety representative or an office staff member designated to collect and coordinate LEED documentation so this was a unique experience. It was also very successful because having the LEED representative on site every day meant that he was in constant contact with the trades, was aware of when materials would be arriving on site, was able to visually check all materials to ensure compliance, and worked to keep the site committed to erosion control, indoor air quality, and waste management.

CONCLUSION

The three projects we have examined cover a wide scope of green building potential but only scratch the surface of the variety of buildings being done. All buildings have the ability to incorporate sustainability regardless of the building type, location, or owners' group. There may be unique challenges to all of them that require coordination and thinking outside the box, but rarely are these challenges so great that they cannot be overcome. With these challenges come a large number of unique opportunities that would not be present in other projects, and if they are used effectively, can boost the sustainability of the project in ways that may not have been anticipated.

In all three of the projects one consistent measure for success was the owners' commitment to the green building process. This anchored the team to the goals and reinforced the direction and decision making when required. In all cases the target of sustainability was established early, even if not with clear project targets, and was held constant throughout the project.

The Integrated Design Process was another successful measure for moving the goals and targets into reality and helping to flush out the details of what they meant for each project. IDP is discussed a great deal with green building, but it really is essential whenever a project wants to consider doing something outside of the status quo. It ensures that the owners are having real input and the team isn't making assumptions on their behalf. For projects pursuing LEED, it also ensures that the credits being targeted are the appropriate ones by having open discussion with all design team members impacted by the targets and can identify opportunities that might not have been pursued otherwise.

Green building, and in particular LEED certification, is often categorized as not appropriate for certain situations, such as non-profit organizations, building types such as housing, or buildings in remote locations. Our experience has been that all projects with the desire to build green can achieve their goals when the appropriate targets are put together with the right team.

PROJECT TEAMS

A special thank you to all the project teams and owners' groups for exceptional design and construction processes and for creating unique and inspirational green buildings.

WECC

Project Manager: Milestone Project Management
Architect: Prairie Architects Inc.
Mechanical Engineer: Faraci Engineering
Electrical Engineer: MCW/AGE Consulting Professional Engineers
Structural Engineer: Kowalchuk Consulting Engineers
LEED Consultant: Prairie Architects Inc.
Commissioning Agent: MCW/AGE Consulting Professional Engineers
General Contractor: Milestone Project Management

CNSC

Project Manager: Integrated Designs Inc.
Architect: Prairie Architects Inc.
Mechanical Engineer: Enermodal Engineering
Electrical Engineer: Enermodal Engineering
Structural Engineer: Crosier Kilgour & Partners Ltd.
LEED Consultant: Integrated Designs Inc.
Commissioning Agent: Integrated Designs Inc.
General Contractor: Penn-Co Construction
Wind & Snow Consultant: RWDI Consulting Engineers & Scientists

SHCC

Architect: Prairie Architects Inc.
Mechanical Engineer: Faraci Engineering
Electrical Engineer: Williams Engineering
Structural Engineer: Wolfrom Engineering
LEED Consultant: Prairie Architects Inc.
Commissioning Agent: Enermodal Engineering
General Contractor: Three Way Builders

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