UBC Social Ecological Economic Development Studies (SEEDS) Student Report

An Investigation Into Culturally Appropriate Building Designs for First Nations at UBC Farm

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Abstract

This investigation sought to evaluate different styles of Aboriginal housing design, with focus placed on designs that could be considered culturally appropriate for the Vancouver area. Ultimately, this building will be erected at the UBC Farm, and will be used as a community and activity center for Aboriginal Bands from different areas. Although this project's scope was mainly focused on local housing styles, other Indigenous housing styles were included for background information. However, special consideration was given to Musqueam housing designs, as the UBC Farm is situated on traditional Musqueam land. Since this report serves as a cultural investigation, it focused more on broad cultural and design considerations, as opposed to specific construction techniques or measurements.

Five designs were investigated: Tipi, Grass House, Plank House, Pit-House, and Wigwam. The Tipi and Grass House designs were used for background information, while a triple bottom line (Social, Economic, and Ecological) assessment was conducted for the Plank House, Pit-House, and Wigam. Special consideration was given to the social assessment, as the main focus of this paper is to determine a culturally appropriate design. This investigation suggests that the Plank House is the most culturally appropriate design for the Vancouver area. The Plank House has many design features common to different Bands in BC, and was expressly suggested by Musqueam Elder Larry Grant as the design of choice for community buildings. However, it is the most costly of the designs considered, both in terms of construction and energy loss. In contrast, the Pit- House was the next most culturally appropriate design, while being the least expensive in terms of materials. The Pit-house uses the natural insulation of soil to reduce energy loss, making it the most sustainable design considered. The Wigwam was neither the most culturally appropriate, nor the most economically feasible.

This report recommends that the first building constructed at the UBC Farm should be a Plank House design, since it appears to be the most culturally appropriate. However, if there are considerations for other buildings in the future, a Pit-House design would be recommended, as it is the most economically feasible, and only slightly less culturally appropriate.

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GLOSSARY

Plank House - A type of longhouse that was built by Northwest Coast Aboriginal Peoples
Pit-House - A circular, dugout dwelling with a domed roof frame, built by the Coast Salish people.
Wigwam - A semi-spherical dome shaped dwelling built by North East Coast Algonquians Indians.
Musqueam - A First Nations Band that resides in Greater Vancouver area, in the province of British Columbia
Residential Schools - Boarding schools administered and controlled by the Canadian government for Indian and Inuit children, and were subsequently closed due to their abusive nature
Bands - A division of an Indigenous tribe; a group of individuals who move and live together
Factor of Safety - Refers to the ratio of the maximum stress that a portion of material can withstand before collapsing
Solar Orientation - When the building and windows face in a specific way that contribute to higher heat loss or heat gain depending on the direction
Geoexchange System - A system where water or air can be cooled naturally via an underground pipe

LIST OF ABBREVIATIONS

APSC - Applied Science
UBC - University of British Columbia
IUCN - International Union for Conservation of Nature

1.0 Introduction

1.1 Overview

The University of British Columbia (UBC), much like the rest of Canada, has a long and complex history with rfinegard to Aboriginal relations. Past events still hold much sway in the minds of many local Aboriginal peoples, particularly the Musqueam (whose land UBC is situated on) (Elias, 1995). It is with this history in consideration that the UBC Farm wishes to build a culturally appropriate building on UBC farmland, as a community center to be used as a resource for many different Indigenous Bands in the Vancouver area. Furthermore, this report will investigate issues surrounding why culturally appropriateness is needed, and explore different housing styles and designs appropriate to Aboriginal peoples of the Vancouver area. In addition, three local housing styles will be considered in a triple bottom line assessment, with particular importance placed on the cultural appropriateness of design. There will also be a brief review of two other non-local housing styles. Moreover, a critical review of the learning process that occurred over the duration of this project will be conducted, with emphasis placed on ethics and cultural understanding.

1.2 History of Residential Schools

Like almost all Canadian Aboriginals, the Musqueam suffered during the colonization of Canada by European immigrants. The effects of which were not constrained to geographic displacement, but also to cultural displacement through the residential school system.

The residential school system was put in place by the Canadian government and administered by Christian churches, and was designed to assimilate Aboriginals into European culture (Elias, 1995). The residential school system has been recently been cited as cultural genocide (Tait, 2003), the impacts of which are still felt strongly today, as children who were raised in the school system never learned Aboriginal culture or traditions. In addition, since many Aboriginals were raised without cultural influence or parental guidance in the residential school system, they were unable to pass on that knowledge to future generations. Moreover, this lack of cultural guidance is one reason commonly attributed to the unfortunate rise in

homelessness and addiction rates Aboriginal youth face today; this correlation is often spoken collectively as the intergenerational legacy of Residential schools (Tait, 2003).

Aboriginal peoples of Canada experienced widespread geographic displacement during European colonization. Although an in-depth history of Aboriginals and Métis peoples in Canada is beyond the scope of this project, it is nonetheless an important consideration in why cultural appropriateness is needed. Like many other Aboriginal bands in Canada, the peoples of British Columbia suffered massive displacement from their homelands during the last two hundred years. The Musqueam were no exception, and currently they are relegated to only a fraction of their homelands, while UBC and Vancouver proper occupy a large part of traditional Musqueam land (Pickford, 1953).

1.3 Need For Cultural Appropriateness

It is important not to misconstrue cultural appropriateness with political correctness. Being culturally appropriate is to be knowledgeable, understanding, and, most of all, non-judgmental about another's culture. Given the hardships and displacement the Musqueam have endured, it is paramount for a leading institute like UBC to recognize the rights of a marginalized population, especially in a country like Canada, which is a stalwart supporter of human rights. UBC is viewed as both an academic and community leader, and thus has a unique responsibility to promote cultural acceptance and community involvement.

The UBC Farm currently has many of these types of programs, including the Vancouver Native Health Society Garden Project, Maya in Exile Garden, and Institute for Aboriginal Health Garden. Nonetheless, there is still much room for expansion, as the UBC Farm has become a welcoming beacon for many different Aboriginal bands, not only Musqueam. Moreover, the fact that UBC and Vancouver Proper are both situated on traditional Musqueam land further underscores the need for respect, in the form of cultural understanding, to be displayed in the buildings constructed there. Although it may seem superficial to offer such a small compensation for so much loss of land, perhaps it is a beginning to a better end.

Furthermore, since inaccurate representations of Aboriginal peoples have contributed to negative stereotypes, a need exists for a re-education of the general population, which can be

facilitated through events held at culturally appropriate buildings. In addition, culturally appropriate buildings provide a place for Aboriginal youth to become reacquainted with their history and have a place to develop a sense of community, both of which help prevent, and manage, addiction and mental health. Providing a safe and appropriate place is more than a token of goodwill on the part of UBC; it can be a place to rebuild the traditions of the past, and help secure a better future for Aboriginal youth. Although past mistakes can never be undone, it is through initiatives, like culturally appropriate buildings, that reconciliation can begin.

1.4 Construction Considerations

Regardless of the chosen housing design type, the building must be suitably constructed for the Vancouver area. The selected design would need to be suited for the damp and rainy Vancouver weather, as well as being able to maintain structural stability should the soil factor of safety decrease. In addition, the costs of construction, heating, and maintenance needed to be taken into consideration when choosing the housing design and materials. Likewise with sustainability, different materials needed to be considered for ensuring an environmentally, as well as culturally, appropriate design. Moreover, none of these practices should interfere with native believes or traditions.

2.0 Grass House & Tipis

2.1 Grass House

This building design was selected because of its traditional native architecture. Constructed in the Southeastern plains by Caddoan-speaking tribes, such as the Wichita, Hasinai, and Caddo peoples. The Grass house is a dome-shaped structure with a frame of poles, which were bent toward the interior ring of the structure. They were then bound together at the top, where the pointed domes were then enclosed with thatched grass, except for the center of the roof for the purpose of allowing smoke to exit. A circular shaped structure was used because circles are a central, symbol that "represented a dwelling place of all people" (Nabokov, 1989). Estimated floor diameter varied between 18 to 30 feet. Pecan, elm or hemlock trees, striped of their bark, were mainly used in building the framework of the house. Dried pieces of swamp and buffalo grass were then tied together in tight bunches for thatching the frame of the structure. Horizontal sapling stringers made out of willows reinforced the frame. The stringers could be as wide as 60 feet across at the base. Lastly, yard-long cottonwood needles were used to stitch the horizontal stringers and pieces of grass together (Nabokov, 1989).

2.2 Tipis

This structure was selected because it is one of the most prominent traditional building structures for the Canadian First Nations. Tipis were used for sleeping, storage and "placement of holy objects followed by social customs" (Nabokov, 1989). The structure of the Tipis resembled a tilted cone with its steeper side facing westward. The cones of the poles were positioned so that the cover fits tightly at the front, where it was stitched together with carved willow pins. The tilted cone form allowed the fire to be directly under the smoke flaps, and provide structural support against the strong Northwest winds. The basic framework of Tipis included three or four straight Pine or Red Cedar poles that were pointed and tied together at the top with ropes. Approximately 12 to 15 deer, buffalo, antelope or moose hides were stitched together with sinew into a semicircular cover, which was then pinned to the ground by large rocks or stakes. "Sometimes individuals painted their own tipis to illustrate their battle exploits, or depicted symbols related to their experiences during fast induced visions" (Nabokov, 1989).

3.0 Plank House

3.1 Background

The name Plank House was most commonly used when referring to this characteristic building design of the Northwest Coast Aboriginal Peoples (see figure 1 below). Based on its structure and usage, it is classified as a type of longhouse. According Musqueam elder Larry Grant, this type of building is called 'Big House' in native languages. L. Grant (personal communication November 6, 2012).

Figure 1: Northwest Coast Plank House. Photo taken by Tim Shi

This design was chosen as one of the primary building types because Plank Houses are unique to the BC area, and are known to have great cultural significance. Northwest Coast Aboriginal peoples took advantage of the expansive forest, and used Cedar trees to build their homes. Since the Coast Salish people have a unique type of Plank house design, with a special cultural meaning, it was felt that this design warranted further investigation.

3.1.1 Building Materials

Thuja plicata, also commonly known as western or pacific red cedar, is a tree native to western North America and the Provincial tree of British Columbia. Red cedar was the wood most commonly used in Northwest Coast Salish culture (Garrick, 1998).

3.1.2 Building Structure

There were two distinct roof types in northwest coast: shed type, and gabled. Both shed and gabled type plank houses existed among the Musqueam. For this project, a shed type is more suitable due to its lower cost.

A shed house consisted of two rows of posts, 2 to 3 feet wide and 6 to 8 inches thick. These posts are placed 12 to 14 feet apart, with the shorter ones at the rear of the house. The houses varied from 25 to 60 feet in length. In addition, a lattice of small round wood rafters was constructed at right angles and tied with witches to these beams (Sturtevant, 1978, p. 54).

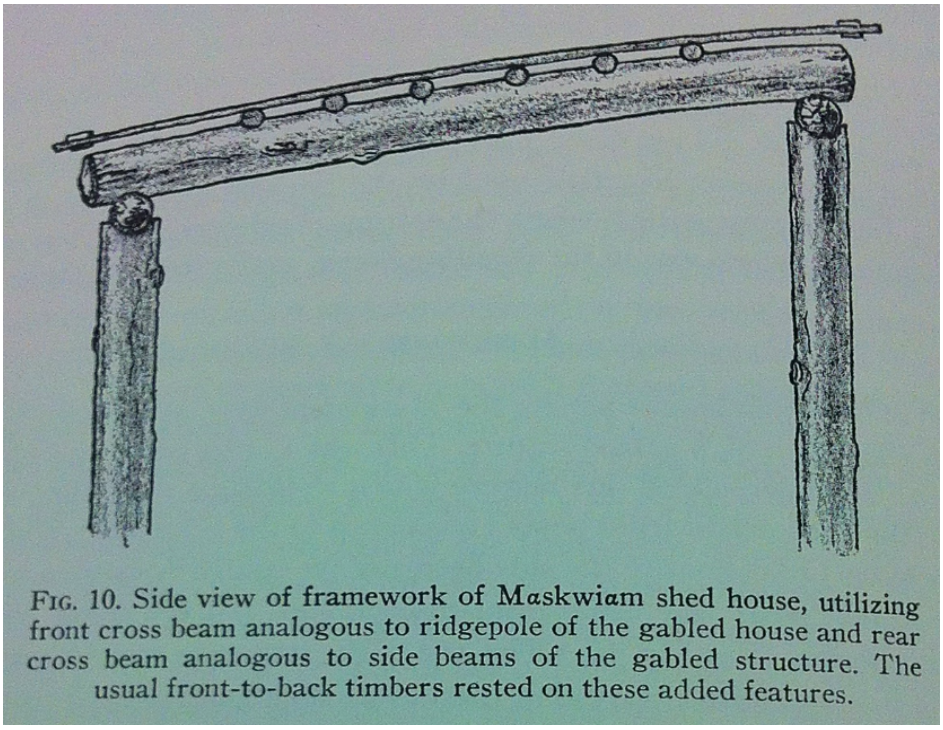

FIG. 10. Side view of framework of Maskwiam shed house, utilizing front cross beam analogous to ridgepole of the gabled house and rear cross beam analogous to side beams of the gabled structure. The usual front-to-back timbers rested on these added features.

Figure 2: Shed type Plank house, taken from *Handbook of North American Indians* (Sturtevant, 1978, p.54).

Cedar roof planks (~3 feet wide) were overlapped and placed on top of the rows of rafters, then fastened with Cedar bark ties. Wall planks were similarly affixed. Moreover, these roof planks were often gouged out on one face to both overlap, and interlock, so as to provide watertight drainage off the shed roof. The roof was held down with either rocks or small logs placed along the roof's length.

The fire pit was located in the centre of the house. In addition, according to Elder Larry Grant, when the fire pit was used, the centre cedar roof planks were removed for airflow. L. Grant, (personal communication, Nov 6, 2012).

The ground level of the Plank Houses was not excavated. Instead, the floors were tamped earth covered with sand. The horizontal wall planks were tied between pairs of saplings, and would be removed from the post and beam frame and transported by canoe to standing frames at summer harvesting camps (Nabokov,1989, P. 236).

3.2 Triple Bottom Line Assessment

3.2.1 Social

The structure of the shed type Plank House selected was associated with the Musqueam (or Maskwiam, as referred to in the reference) people. Plank Houses from different first nation bands may vary. For example the Haida six-beam house has a unique totem pole in the front each house. Musqueam Plank Houses use design features that are common to many different Indigenous Bands around BC. Hence, this design could be considered culturally appropriate by other bands in BC region. Elder Larry Grant suggested that, similar to the UBC Long House, artwork from many BC First Nations Bands should be attached to the beams inside the plank house, to create a place of cultural harmony for all BC Bands. L. Grant (personal communication, Nov 6, 2012).

3.2.2 Ecological

In general, wood is natural, renewable, recyclable, biodegradable, nontoxic, a good insulator, and requires relatively low manufacturing energy costs. In particular, Red Cedar, the major building material for Plank House, is available locally in BC. The International Union for Conservation of Nature (IUCN) has evaluated Red Cedar to be ‘not endangered’ due to its large quantity and growth rate. Therefore, using Red Cedar as the primary building material equates to a low ecological impact, and thus can be considered a sustainable design.

3.2.3 Economic

Red Cedar is considered one of the best choices for housing or deck construction due to its natural resistance to moisture, decay, and insect damage. In other words, the maintenance cost of a Red Cedar shelter can be low by industry standards. Furthermore, based on the traditional structure descriptions, a 'shed' type Plank House predominantly requires: posts, round wood beams, roof and wall planks.

The estimated price for Red Cedar materials for a 16'X12' Plank House is ~$4000 before tax. The estimated price is based on the currently available material dimensions (traditional Cedar Posts were larger). Moreover, since traditional Plank Houses are much larger, the costs were calculated using a scaled down design. A smaller design would also help reduce transportation and construction costs (please see appendix B for full cost calculation tables).

Table 1: Cost of Plank House Materials

Parts (All cedar)	Number of parts	Price ($)
8"x 4' x 4'	22	524.48
8" x 12" x 2"	81	3440.88
Total Cost (before tax)		3965.36

(Intercity, 2012)

4.0 Pit House

4.1 Background

The Quiggly Hole, most commonly known as 'Pit-House', is a circular, dugout dwelling with a domed roof built by the Coast Salish people (Goldi Productions Ltd., 2007). This type o structures was investigated because they were used, and built, by the Aboriginal Bands of BC. In addition, the structure seemed to be structurally stable and well insulated, which could be beneficial during long winter months. Accordingly, it was selected for the triple bottom line assessment.

4.1.1 Building Material

Both Red Cedar (Thuja plicata) and Canadian Hemlock (Tsuga canadensis), were both commonly used for the basic framework of the Pit House. Sinew was used to fasten the beams together for support, while bark, dirt, grasses and earth were used to seal the walls and frame (Nabokov,1989).

4.1.2 Building Structure

The house consisted of four straight wooden beams, approximately 15 feet long, which acted as pillars. Another four to six pieces of wood, 20 to 30 feet long, created the four main roof beams (Goldi Productions Ltd., 2007). Each roof beam had one end planted in the soil, with the other end was connected back to the square-shaped smoke hole at the top of the structure. Thinner wooden pieces were placed perpendicularly to the roof beams, where the thinner perpendicular wooden pieces filled in the gap between the roof beams. Approximately 5 thinner wooden pieces varying from 5 feet to 20 feet were used in the construction (Nabokov,1989).

The walls and frames of the pit houses were then sealed and insulated by a mixture of bark, dirt, grasses and the earth from the original pit. People would enter through a ladder that rested at an angle, which could rest on ground level or in the side of the roof (Goldi Productions Ltd., 2007).

The fire pit was located in the center of the pit house so that the smoke could exit through the smoke hole directly above it (Nabokov,1989).

Figure 3: Pit-House Structure, taken from *Northern Aboriginal Communities, Economies and Development* (Elias, 1995)

4.2 Triple Bottom Line Assessment

4.2.1 Social

Pit-Houses were originally built by the Salish-speaking tribes, such as the Thompson, Shuswap, and Lillooet (Nabokov,1989), who lived in the interior region in BC. Therefore, it would be considered culturally appropriate if built at the UBC Farm. However, it was primarily built and used by the bands in the interior region, rather than used only in coastal regions. As a result, this design could represent different bands from many regions in BC.

4.2.2 Ecological

As previously mentioned, wood is a sustainable building material. Additionally, the deforestation rate of Canada is only 0.02% annually (Carlwood Lumber Ltd. 2012). The excavated earth is used to seal the walls and the frame of the house; hence no new earth needs to be transported. Moreover, this design uses sustainable materials, as the

materials do not need to be processed, transformed, or delivered for the construction of the house (assuming local Red Cedar is used).

4.2.3 Economic

Hemlock or Cedar timbers are used for beams, flooring, and exterior trims (Illingworth Ingham Timber, 1998). Furthermore, the Pit-house will be able to maintain its structure even when heavy pressure is applied to the frame. The materials used also have resistance to splitting, and excellent screw holding abilities (Illingworth Ingham Timber, 1998). This can help reduce maintenance cost.

For the framework of the Pit-House, the major required parts are four long straight beams, four to six pieces of wood, and five to ten thinner wood pieces varying in length.

Table 2: Cost of Pit House

Parts (All hemlock)	Number of parts	Price($)
12'x2”x12”	31	791.28
12' x 2” x 8”	6	57.6
14' x 2” x 8”	4	44.8
Total Cost (before tax)		893.68

(Hefler, 2012)

The estimated materials cost for the Pit-House is approximately $900 for the basic framework. However, this estimation may vary depending on transportation and labor costs (please see appendix B for full cost calculation tables).

5.0 Wigwam

5.1 Background

Wigwams (shown below in figure 4) were selected for investigation, as they were a very prominent building style of Canadian Aboriginal architecture. Additionally, they appeared to be low cost and durable. The word Wigwam refers to a one or two family house of round or oblong floor plan. Today, Algonquian Indigenous architecture only exists far from its regional homeland. The Kickapoo tribe in Kansas, Oklahoma, Texas, and Northern Mexico still use wigwams and follow seasonal residence patterns (Nabokov, 1989, p. 65).

Figure 4: Wigwam, taken from Native American Architecture (Nabokov,1989, p. 73)

5.1.1 Building Structure

Traditionally, Algonquians Aboriginals used flexible poles, which were bent and fasten together in the center, making an Arch (shown in figure 5). Oak or Willow was the preferred material for poles. In general, Wigwams varied from 7 to 20 feet in diameter, and 5 feet to 9 feet in height. Since Wigwams are most often seasonal structures, the details of materials for cover varied with the culture and local availability. However, common materials included grass, brush, bark, rushes, mats, reeds, hides or cloth.

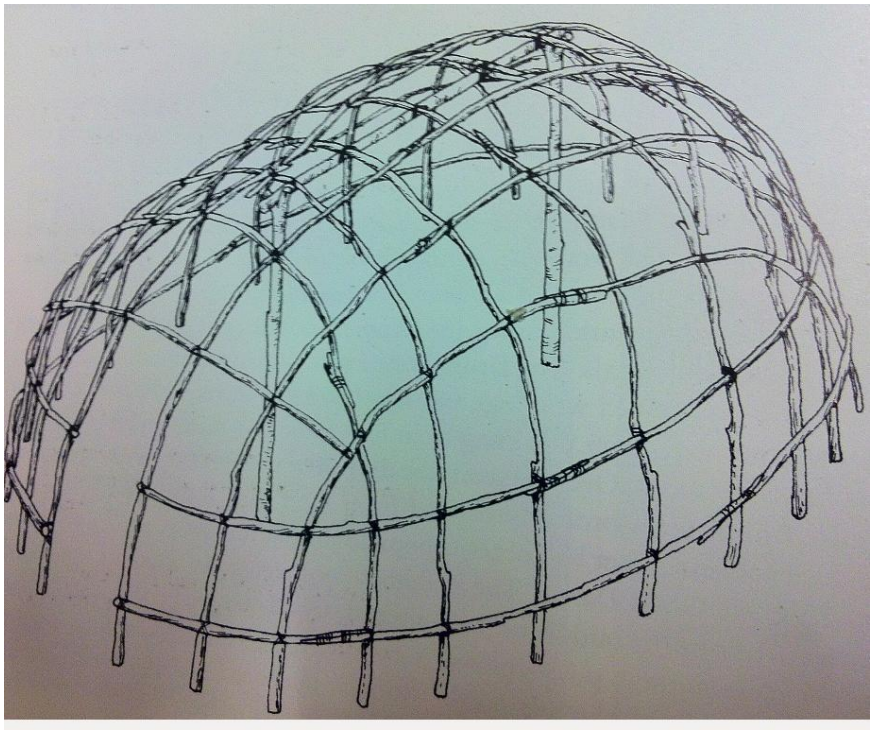

Figure 5: Wigwam structure taken from Native American Architecture (Nabokov,1989, p. 67)

5.1.2 Modern Wigwam

The book *Native American Architecture* gave the following example of a modern wigwam design (see figure 6 below). Aside from the arch shape formed by poles, this Wigwam used modern building materials. Compared to the Wigwams built from traditional materials, this Wigwam is more durable and has much lower maintenance and material costs (Nabokov,1989 p. 73).

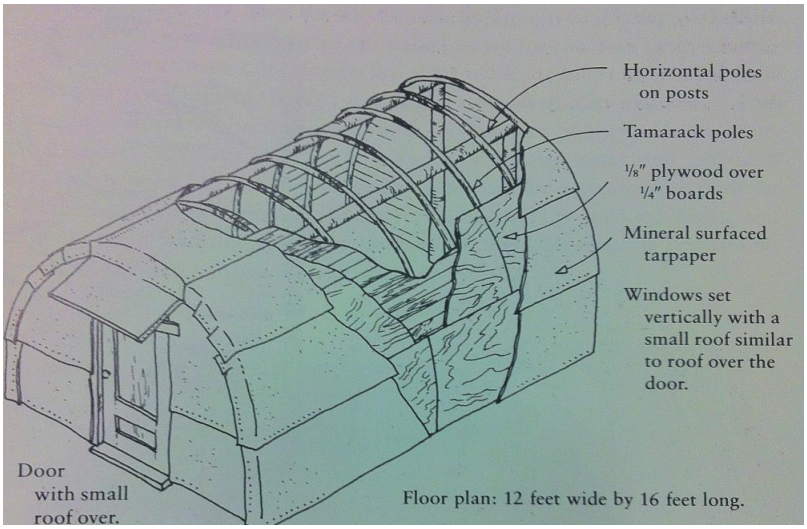

Figure 6: Modern Wigwam Taken from Native American Architecture (Nabokov, 1989, p. 73)

5.2 Triple Bottom Line Assessment

5.2.1 Social

The modern Wigwam (shown above) has a very flexible selection of building materials (materials that could be incorporated into local culture). However, the Wigwam was the most common housing style for the East Coast Algonquians Aboriginals, and similar building structures did not exist in the Northwest coast. Consequently, the Wigwam is not deemed to be a culturally appropriate building that could reflect local Aboriginal culture. However, the low cost of Wigwam allows more capital to be invested in local artwork. With extra local artwork, a Wigwam style shelter might be able to provide a culturally appropriate environment. However, there may be more culturally appropriate designs for this area.

5.2.2 Ecological

The modern Wigwam example mentioned above uses plywood and tarpaper as cover material. Both have been proved to be toxic free and long lasting materials. As a result, there will be little impact to the environment, as the materials will not need to be replaced, and do not 'leak' chemicals.

5.2.3 Economic

The initial cost of building a wigwam, with modern material such as plywood and tarpaper, can be relatively low. Furthermore, the long term maintenance costs are also low and predictable. To build a 12'(W) x 16'(L) x 8'(H) Wigwam, the following materials are needed:

Table 3: Cost of Wigwam

Parts	Number of parts	Price ($)
16'x4"x4" (red oak)	2	23.98
30' x 1" x 1" (red oak)	16	95.92
75' x 1.5' tar paper	34	529.70
4'x 8' x 1/4 " plywood	24	467.13
4'x 8' x 1/8 " plywood	24	311.42
Total cost (before tax)		1505.41

(World, 2009) (Home, 2011)

6.0 Overview Of Learning Process, Ethics and Culture

The following is a chronological account and description of the project as it unfolded, with a narrative of some of the problems we faced and experiences we garnered.

We started this project with a visit to the UBC Farm, where we met with Véronik Campbell (one of the project stakeholders) to clarify some of the project goals. The meeting was invaluable as it clarified the purpose of the project, and provided us with a chance to experience the UBC Farm. The farm itself is far removed, both geographically and in spirit, from the main UBC campus. For us, the farm was respite from the campus, and we were astounded to see the breadth of ongoing projects at the farm (both academic and cultural). Being able to see the Indigenous Herb Garden, Vancouver Native Health Society Garden Project, Maya in Exile Garden, and Institute for Aboriginal Health Garden and smokehouse (built by UBC civil engineers), was eye opening and brought a sense of gravity to the project.

Our excursion to the UBC farm brought newfound purpose, after which we began our investigation in earnest at the UBC Museum of Anthropology (MOA). It was of great value to start with a more hands-on approach to learning, as opposed to simply learning about culture through a book. We took a guided tour through the museum, experiencing different aspects of Aboriginal culture from housing styles to art history. Being able to see and experience culture brought a much deeper understanding to the role that culture and history plays in not just building styles, but in all aspects of life. Subsequently, we followed up with a literature review in the MOA library, which allowed us to place a greater context and understanding around what we just experienced.

We then continued our study in the MOA library and the Xwi7xwa library, both of which were very valuable resources, as they specialized in Indigenous culture and history. During this time we also proceeded to contact the UBC First Nations Studies Program administrators to inquire about speaking to an Aboriginal representative. After many referrals to different members of the department, Rick Ouellet (Student and Community Development Officer) and

Linc Kesler (Director, First Nations House of Learning and Senior Advisor to the President on Aboriginal Affairs) both recommended we contact Larry Grant (Elder in Residence for the Aboriginal House of Learning).

At this time we had a brief meeting with both Véronik Campbell during APSC 261 class time, and Hannah Lewis (the other project stakeholder) at the UBC farm. During the meeting with Hannah, we further focused our project goals, and learned more about the relation the UBC farm has with local Aboriginal peoples. However, what we found most valuable was Hannah's perspective on Aboriginal culture. We had already decided that an interview with Larry Grant would bring a much greater level of understanding to the project, but none of us had ever spoken with an Elder. Hannah was able to share insight, and teach us how to address a respected Aboriginal figure like Mr. Grant. We learned about the respect that should be directed towards an Elder, and the cultural implications of gift giving. This served to further our understanding of what it means to be culturally appropriate, and made us realize the extent of knowledge and understanding that is required to be truly culturally appropriate.

However, there were concerns with research ethics and protocol in relation to the interview with Mr. Grant, Elder-in-Residence at the First Nations House of Learning. Coordinator of the UBC APSC 261, Carla Paterson, investigated these issues, and determined that there was no need for an ethical review of this project at this time. Dr. Paterson passed on advice about appropriate protocol for interviewing Mr. Grant from Rick Ouellet, of the First Nations House of Learning. Mr. Ouellet advised that our team go to the UBC Longhouse on a Tuesday afternoon when Mr. Grant would be present, ask to speak with him, explain the purpose of our interview, and if he agreed that he was willing to be interviewed, ask him if he had any concerns, or if there were any protocols he'd like us to follow. According to Mr. Ouellet, this would be the most respectful way of approaching Mr. Grant and recognizing his status as an elder.

We then visited the UBC First Nations House of Learning to speak with Mr. Grant. Since Hannah had mentioned gift giving, we gave Mr. Grant a selection of fair trade organic teas as a token of our appreciation for his time. Mr. Grant was kind enough to offer us a place at his table while he was eating lunch. Furthermore, the conversation that ensued definitely brought a new

perspective to the project, not just at a factual level (as we learned a lot about housing design), but more at a fundamental level; the type of learning that could not come from a textbook. L. Grant (personal communication, Nov 6, 2012). (Please see appendix A for the full interview notes).

Mr. Grant was a very nice man, certainly with a stoic air of dignity. We very much enjoyed hearing what he had to say; he spoke with such reverence about the building styles and Musqueam culture. Quite enrapturing, and there came a realization that that a building in Musqueam culture is not simply a building made from trees and grass, it is so much more. It is more like something that is part of a family or community, and represents the bond that is shared. Moreover, with these considerations in mind, we now focused on finding ways to bring cultural ideas and beliefs into a modern building design.

Although much of our investigation was focused around local Aboriginal culture, we also allotted a significant amount of time to architectural, materials, and structural investigation. Specifically, we contacted a local architect, Jason Burtwistle, who focuses on sustainable building designs and residential layout. He placed a significant emphasis on making the building part of the farm "ecology", explaining how it must work with local systems, not against them. He further elaborated on this point by breaking down the different systems of the farm, and suggesting how the "inputs and outputs" of the building and farm could be used in a symbiotic relationship with the farm. For example, extra water or food compost from the house could be used to improve crops via fertilization. In addition to this focus, he also specified ways to reduced energy consumption. "Solar orientation" was a key idea, where the orientation of the building and windows, and tree coverage could either function to heat or cool the building, depending on the desired outcome. Furthermore, he specified that the "Pit-House" style of housing would provide the best thermal insulation, although the excavation costs might be high. Further considerations were good air circulation (as cedar and other materials being used are prone to mold), and geoexchange systems (where water or air could be cooled naturally via an underground pipe). J. Burtwhistle (personal communication, Nov 12, 2012) (Please see appendix A for the full interview notes).

We also attempted to consult Michael Reynolds who is an architect made famous by his radically sustainable building designs. Unfortunately, he declined his consultation services for this project. Furthermore, perhaps his declination was for the best, as Mr. Grant suggested not using 'garbage' in the construction of the building (as it would not be culturally appropriate).

Throughout the project our views and preconceived notion progressively changed. We cannot begin to describe the value in pursuing a project like this. Even though we have all traveled and experienced other cultures internationally, we were oblivious to the cultural richness and diversity in our own backyard. Yet, the greatest value lay in our discovery of what it means to be culturally appropriate. Perhaps a more accurate description would be cultural empathy, where one must have a deeper empathic understanding of culture, rather than simply a knowledge-based overview. We believe that the true value of education lies in lessons like this, lessons that go far beyond the pages of a textbook.

7.0 Conclusions and Recommendations

7.1 Conclusions

As this investigation utilizes a triple bottom line assessment with particular emphasis on cultural appropriateness, the conclusion and recommendations will take into special consideration the cultural impact of each suggestion.

The two housing styles that were investigated in less depth (Grass House and Tipi) provided excellent points of cultural reference for many traditions that exist in Canadian Aboriginal culture. Furthermore, in all the housing styles studied, buildings have a special significance (far more so than European culture), and spiritual factors are often design considerations. For example, the circular structure of a Tipi represents the 'dwelling place' of all people, and the painted canvas has great cultural meaning. Moreover, the background gleaned from investigating non-local styles allowed for a deeper investigation into the Plank House, Pit-House, and Wigwam styles.

Although only one type of housing design can be chosen, it was a recommendation of Mr. Grant that artwork from many different Bands be placed in the structure (similar to how the UBC Longhouse displays artwork from many Bands around BC). In addition, each band, and possibly each elder, may have different ideas for what a culturally appropriate building should be. Hence, it is important to note that this report was only able to recommend a design most bands will think appropriate. The Plank House was the style recommended by elder Larry Grant, and was also the style selected for the UBC First Nations House of Learning. However, it was the most costly, and the most difficult to heat.

In contrast, the Pit-House style of housing was deemed to be the most cost effective in terms of energy conservation, as soil is an excellent insulator and their low profile allows for reduced heat loss from wind. However, due to the moist nature of the Point Grey climate, air circulation would be a major design consideration, as stagnant air will cause accumulation of moisture, which will cause mold growth. Moreover, the Pit-House is also the least expensive to construct, while the Plank-House is most expensive

Lastly, the Wigwam design, although cost effective, is not a design local to the Northwest Coast, and thus would not be considered culturally appropriate. It is the most durable and cost effective design, as although the material costs for the Pit-House are less, the Wigwam requires far less labor. Moreover, although the Wigwam is an excellent and durable style of building, it is not recommended as a potential design for the UBC Farm.

7.2 Recommendations

From a design perspective it appears that the Pit-House is a more sustainable choice because it involves less materials (as the walls will effectively be made from earth), and is more energy efficient (as the earth is an excellent insulator). However, robust air circulation systems would need to be considered to prevent mold. Nonetheless, it seems that the Plank House would be the most culturally appropriate design, as both the literature, and elder Larry Grant, recommended it as the most culturally appropriate design. In addition, the UBC First Nations House of Learning uses a modern construction of the Plank House design, further confirming that the Plank House design is culturally appropriate. Therefore, it would be recommended to use the Plank House design as the design of choice, focusing on insulation techniques and solar orientation to reduce energy consumption.

In addition, it was suggested that there is a possibility for additional building construction at the Farm, which could be an opportunity for other building styles to be employed. Hence, given that this report will serve as a basis for other buildings to be built in the future, perhaps a future Pit-House design could be implemented to encompass more cultural diversity in BC, while taking advantage of the design's inherent benefits. Moreover, Jason Burtwhistle also suggested using multiple buildings as a functional 'ecosystem', where each building exists symbiotically, using resources of neighboring buildings and its environment. J. Burtwhistle (personal communication, Nov 12, 2012). If the UBC Farm is planning to construct multiple structures, this report suggests consulting an architect specializing in multiple building sustainable design planning (please see appendix A for the names of local architects recommended by Mr. Burtwhistle).

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Appendix A: Interview Notes

Notes from Jason Burtwhistle Interview

‘Ensure the Musqueam are involved in the design and building process.’

Note: Jason Burtwhistle took a class specifically on what first nations culture means in reference to building design. The course, residence planning in first nations communities, was taught by architect Daniel Millette. He underscores that different approaches need to be taken from traditional design and building practices.

- Key contact: Patrick Stuwart. He is a local architect who is first nations himself, and has done lots of work in First Nations in BC.

Building Design Considerations:

- CIRS building is a good example. Break the function of a building into different systems (water, power, heat).
- Make the building with consideration to its environment: more as part of a system. Then see how the building impacts or can improves its environment.
- Take water for example: How can you use the excess of the water of the UBC Farm or rainwater, in the building? Or, how can you use excess water from the building to irrigate the farm?
- Think about the whole area as an “ecosystem”. Look at inputs and outputs of farm system and building, and learn to use them in a symbiotic relationship.
- This is the concept of “Passive Haus”, a German Standard making passive buildings (extremely low energy requirement).
- Use high insulation in walls, and consider triple walls or roof layers for added insulation.
- Solar Orientation: If you have windows facing north this will contribute to higher heat loss (effective in summer). Windows on the South side equates to higher heat gain and low heat loss.
- Suggests having windows on the south side to have heat gain, but add screens, shutters ect so that excess heat can be blocked in summer.
- Pit-house would be best for heating- soil is an amazing insulator. It also has a very low profile, which will reduce heat loss from wind.
- Pit-house will have higher construction costs because of the excavation that needs to occur.
- Plank house will have highest heat loss due to large wind profile above ground, and hard to insulate walls (because of wooden poles).
- Wigwam will be durable, and slightly less heat loss than Plank House.

- Think about sunlights, and use a geoexchange system for cooling (run a tube underground to cool the air for air conditioning, which can be implemented in any design).
- For heating in winter use a heat exchange unit, which captures heat leaving the building.
- Mould and moisture considerations: but make sure you handle air properly (stale air = mold). Ensure proper ventilation to prevent mould. Wood helps regulate that (a little bit- depends on the type of wood).
- If air system is underground, and use it as an air conditioning system in to put basement substructure underground

Low cost solutions:

- Rammed earth: taking dirt and compressing it. High insulation and strong properties, often used instead of concrete. One example in Vancouver Van Dusen garden buildings (new visiter center) → uses lots of rammed earth (used a bit of cement). You get lots of properties of concrete, hold on to heat, but can be used sustainably.

- Use recycled materials.
- Any existing buildings, or if they're cutting trees to clear room for building, how could we use that.
- Is it possible to use trees from the UBC farm as material for building? (Will there be trees cleared for construction?)
- From energy point of view, biggest cost is windows. Limit the number of windows. Rule of thumb: no more than 40% should be glass, anything more and you're losing more energy than gaining.

Ecosystem

- Think of the building as part of a system. In the first building constructed, build it with the consideration for future buildings. Ie. Put in heat or water exchange systems that can be used by future buildings: flexibility in the future where another building could latch on and use the same systems.
- Ensure that none of the future buildings are going to be blocking the sun path onto existing buildings
- Think of it like a habitat: each building can be playing a different role: they all play off each other → when one resource isn't being used, transfer the energy or resource to another building.

Note: Once you get into food consumption in buildings, you have lots of opportunities. Look at biproducts of the building and inhabitants, and how they could be used at the farm. Food compost implementation.

Notes from Elder Larry Grant Interview

Interview notes for Elder Larry Grant

What is the difference between Longhouse and Plank House? Which should we use?

- longhouse is an English name, Musqueam First Nations would call it a Big House.

In your view and experience how could one incorporate culture into a building?

- The shape of the building is the most important. Many different cultures can be incorporated as accents through art, but the main structure is the most important.
- Must have a culturally appropriate floor area design (earthen floor types: gravel, pebbles, dirt, grass). The structural poles and beams are in a special configuration. All the boards are parallel. I also recommend looking into the Museum of man.

Is there a specific building style that will be used for community events?

- The Longhouse (Plank House) is used for community events, and would be my recommendation

We recently saw a film about building houses using garbage to increase sustainability. Would it be culturally appropriate to use tires and other forms of garbage as construction materails?

- This is not the best idea for being culturally appropriate.
- If you look at the Marpole area in Vancouver, it has become "something of a garbage heap"; they also found burial remains there. Garbage has become a bit of a more sensitive topic
- Could cause the underlying assumption that First Nations houses are of lower status since they were built with 'garbage'.

Is there a restriction for what we can build there? Are any styles of building reserved for a specific purpose at a specific place?

- No considerations for different types of land use.
- Although you may have issues from UBC for building permits- as you need a permit for a 'permanent' structure at UBC, and you don't need one if there is not concrete.

Is there a way to go about building/designing the building? (ask elders).

- Contact the local band leaders, specifically the administration of each band- ie. the elders.

- The "process is most important, you don't want to make the community an afterthought."
- In terms of collaborating with UBC: talk to Ken McGregor and Leona Sparrow (official liaison for Musquem). Most important is contacting them
- Memorandum of affiliation- Musqueam is only band who had one with university

Is there any flexibility for changing from traditional materials?

- No problem with concrete or other building materials for the general structure.
- However, the floor has to be earthy. UBC Longhouse used a pebble hybrid floor, which is culturally appropriate. May actually run into problems with UBC safety codes for this.

Does he have any suggestions about how we go about this project?

- Artwork is a key consideration.
- The wooded boards that encircle the top of the longhouse can be carved and attached to beam.
- Look into having art from many different bands. Traditionally art was on the inside: carvings were on boards then attached to the walls and upper beams.
- Archways at MOA were carvings from Musqueam.
- There are contemporary examples at Stanley Park.
- For longhouse, use many different poles and art from all over BC. Do have Musqueam style, but make sure people are exposed to diversity.
- So have at least one piece of Musqueam art, but then have good representation of other art styles from around BC.
- Make sure that the local peoples are involved in the planning and construction processes

Were you involved in any previous building processes (longhouse)?

- Was not involved in the UBC Longhouse building.

Final notes:

- Whole family lived in the house, then additional sections of the house were added. So there is a sense of family and community in each house.
- Houses become part of the family, and protect the community. More than the idea of houses in western culture.

Appendix B: Raw Cost Calculations

Cost of Plank house	
Long (ft)	16
wide (ft)	12
Height (ft)	8
roof slope (degree)	15
roof area (sq.ft)	198.7726154
total wall area	448
Number of Post :	22
Cedar 8'x4"x4" price (Posts)	23.84
Cedar 8'x12"x2" surface area (sq.ft) (wall and roof)	8
Cedar 8'x12"x2" price	42.48
post cost :	524.48
wall cost:	2378.88
roof cost:	1055.482588
Total cost:	3958.842588

Cost of Pit House (wood parts only)	
Radius (ft)	10
Length of top surface frame (ft)	12
total top surface area (sq.ft)	376.8
surface of 12" x 12' x 2' hemlock	12
price of 12" x 12' x 2' hemlock	25.2
top post price	9.6
number of top post 12" x 8' x 2' hemlock	6
ground post price	11.2
number of ground post 14" x 8' x 2' hemlock	4
total surface cost	791.28
total top post cost	57.6
total ground post price	44.8
total cost	893.68

Cost of Wigwam	
Long (ft)	16
wide (ft)	12
Height (ft)	8
total area (roof + walls)	749.584
plywood 1/8" x4 ' x 8'	12.97
plywood 1/4" x4 ' x 8'	19.5
unit area plywood cost combined	1.01375
unit area tarpaper	0.706666667
Red oak 50'x1x1' (poles)	11.99
Red oak16'x2"x2" (posts)	11.99
Number of poles	16
number of posts	2
Total cost tar paper	529.7060267
Total cost of plywood	778.56
Total cost of Red oak	215.82
Total cost	1505.416807