GNG11103

Design Project User and Product Manual

ENVIRONMENTAL ANALYSIS BUILDING

Submitted by:

Green Earth and Soul - G17

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Table 1. Acronyms

Acronym	Definition
BOM	The projects bill of materials
OAA	Outside Activity Area
BIM	Building information modeling, 3D design and modeling software

Table 2. Glossary

Term	Acronym	Definition
Autodesk REVIT	REVIT	A BIM software used to design buildings are 3D infrastructure

1 Introduction

The primary objective of this project was to create a service that would enable indigenous peoples to analyze their environment and carry out research and surveys on their pure land. The building was designed to be accessible, sustainable, and culturally representative. The proposed solution for this project is designing a bi-level cylindrical structure that is linked to a central area. The building model was generated using Autodesk and Revit software. Furthermore, to guarantee the accurate representation of the final product, a tangible physical prototype will be provided. This prototype will encompass several aspects such as the choice of materials, the placement of windows and doors, and the overall design of a single-story structure. Additionally, the project will involve the expertise of local artists and other relevant categories to cater to all client requirements.

This project will specifically cater to the Algonquins of Pikwakanagan First Nation, targeting a specific group of clienteles. This project has been organized based on a design thinking framework that involves identifying the user, gathering essential information, generating various conceptual designs and benchmarks, selecting the most optimal global design, initiating the prototyping and testing phase, and ultimately concluding with the final project.

2 Overview

The need for an environmental research building with a lab section and offices for the Algonquin of Pikwaknagan First Nations is needed because of its importance to address environmental concerns, promote sustainability and ensure accessibility for people in the community. While connecting the the cultural identity of the Algonquin people and involving the community within the decision and contributing a building to educate and facilitate such events. Such that it can be a symbol of harmony between modern environmental research while maintain the traditional indigenous values.

Main needs:

- Educational
- Culturally connected.
- Sustainable
- Accessible

The building must reflect indigenous culture while still remaining functional. This goes beyond the physical structure and is left back to the individual consumer to use.

Our building contained a vert iconic design within its circular build to produce and narrate the story of a circular campfire which is included within the meeting area. A dome shaped roof with a skylight to both provide natural lighting as well as represent a place to discuss and reflect.
It has a user-centric build with the one story design to provide accessibility for people with limited mobility. It contained flexible workspaces for community work within the common area. It contained space on the walls for local artist murals.
It has a walk-in lab design from the freezer and loading area to provide for easy access and transportation routes for specimens.
There is an exterior landscape with the trees and plants providing an outdoor workspace as well with an enclosed gazebo.

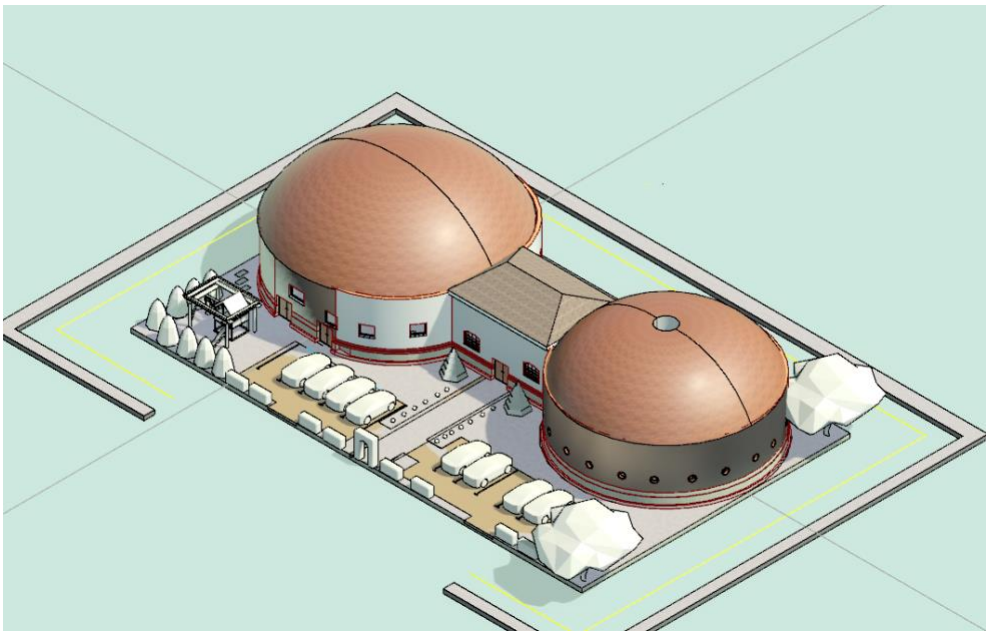

Figure 1 REVIT Prototype representation

Figure 2 Physical Prototype representation

The building is 8000 square feet, with a domed roof an outdoor area, accessible parking and accessible doors. It has workspaces, lab areas and common areas with break spaces.

2.1 Cautions & Warnings

To obtain a full copy of the REVIT design, please email Aya Ali, aali270@uottawa.ca, for the copy as well as the addition of any other measurements and data or photos requested.

WARNING, the REVIT requires specific access allowance, if any issues please review section 5 for trouble shooting.

3 Getting started

Here, would be provided a general walkthrough of the prototypes.

3.1 Configuration Considerations

For the physical prototype (refer to Figure 2): The base of a lot is represented by cardboard with glued green sheets of paper on top of it. The building is made of cardboard and is shaped into a dumbbell-like structure which is covered with cork. Doors are drawn on the surfaces using a marker. The inner walls are represented by thin cardboard pieces. The main entrance is marked as a drawing and has a pathway leading to it, which is designated by small wood blocks. As for the layout of the office building (rightmost from the entrance): 19 offices on the curvature and the board room in the middle. The leftmost structure accommodates the lab and common area of the building.

For the software prototype: The building is made using Revit software and follows the scale of the final product. The layout is the same as it is described for the physical prototype with the addition of more interior and exterior details as well as accurate window and door representations.

3.2 User Access Considerations

The list of possible users is provided below:

i. The client: project's customer, who is looking for solutions of his needs in the prototype.
ii. Students: the prototype is used in educational purposes to showcase design thinking processes and their results.

For physical prototype universal restrictions placed on accessibility or use are avoiding moisture and external force impacts on the prototype.

For software prototype universal restrictions placed on accessibility or use are avoiding making changes in a prototype.

3.3 Accessing/setting up the System

For physical prototypes: As it represents a model of a building it does not have any working features and could be placed on an even and dry surface which would be large enough to fully accommodate it.

For software prototypes: To access the prototype on Revit, one must have an account on the Autodesk website and have a subscription or student access (for further information about the Autodesk account refer to the Autodesk website and/or your institution). To receive a copy of a file with the prototype, refer to section 2.1 of the document. The file could be opened by using Revit software downloaded from the official Autodesk website.

3.4 System Organization & Navigation

For physical prototypes: The system is organized as a model of the dumbbell-like building with exterior parking and an outside activity area. The right side of the building consists of offices and the boardroom. The left circle of the building consists of a common room and lab space. Two circles are connected by a hallway which also accommodates the main entrance.

i. Offices

19 of them are placed on the curvature of the building.

ii. Board room

It is situated in the middle of an office building.

iii. Hallway

Wide corridor that connects two parts of the building and accommodates the main entrance

iv. Common area

It is accessed right from the hallway as one enters the left part of the building. Includes two washrooms designated by the walls.

v. Lab

Has access from the lean-on/unloading area represented by a cut-out from the wall of the building. If one looks vertically down starting from the cut-out, there would be a sanitation unit, then storage, freezer and dryer rooms placed side by side, and finally main lab area.

vi. OAA

It is located below the left side of the building and to the left top of the parking lot.

For software prototypes: The system is organized as a model of the dumbbell-like building with exterior parking and an outside activity area. The right side of the building consists of offices and the boardroom. The left circle of the building consists of a common room and lab space. Two circles are connected by a hallway which also accommodates the main entrance.

i. Offices

19 of them are placed on the curvature of the building.

ii. Board room

It has a table for 18 people placed in the middle of the office building.

iii. Hallway

Wide corridor that connects two parts of the building and accommodates the main entrance. It has an emergency exit closer to the common area and features a mural by the local artists.

iv. Common area

It is accessed right from the hallway as one enters the left part of the building. Includes two washrooms designated by the walls, a kitchenette, a dining table for 4, coworking spaces and a sofa.

v. Lab

Has access from the lean-on/unloading area represented by a cut-out from the wall of the building. If one looks vertically down starting from the cut-out, there would be a sanitation unit, then storage, freezer and dryer rooms placed side by side, and finally main lab area. The laboratory is equipped with 7 computer workstations, a mobile workbench and cutting tables with sinks.

vi. OAA

It is placed under the left side of the building and to the left top of the parking lot. Features a gazebo for outside activities and provides coworking space during warmer days.

vii. Roof

For circle-shaped buildings they are domes and for the hall it is sloped. The office building roof features a window on top of it.

3.5 Exiting the System

For physical prototypes: To prepare the model simply cover it in a plastic bag that would stop moisture, then mark the hood. Put it away from external impacts by placing it, base facing down, on the shelf that would fully accommodate it. Avoid putting any objects on top of it as it might damage the model.

For software prototypes: To exit the Revit file click on the “Close Tab” button in the top right corner of the screen.

4 Using the System

Based on our design, we offer two primary prototypes: an analytical prototype utilizing Revit to create a more authentic representation of the building, and a physical prototype as an additional feature to showcase the structure's real-life appearance. The analytical prototype included several new features: two domes for each building, a sanitizing room, an outdoor gazebo, an extra parking lot, a local artist showcased in the main hall, additional offices, and a top glass window. The physical prototype incorporated wooden elements, grass, automobiles, and outdoor plants. Each of these elements will be thoroughly described and accompanied by a visual representation.

4.1 Given Function/Feature

Beginning with the analytical prototype, two wooden domes have been incorporated for each building. One dome is positioned above the lab and common area, while the other will be situated over the offices area.

Nevertheless, a subtle distinction has been observed in both structures. An extra glass pane will be installed on the top of the office domes to allow natural light to enter the board room.

Furthermore, the uppermost window symbolizes the positioning of a bonfire at the centre of the aperture in traditional indigenous architecture, allowing smoke to escape. This design also incorporates triangular windows around the dome to facilitate the removal of snow.

The second addition is the sanitizing equipment positioned in front of the freezer and oriented towards the loading area. The purpose of this is to prohibit the entry of any bacterial materials into the freezer from the loading area.

The third element comprises an outdoor gazebo, designed to serve as a focal point for indigenous people seeking a gathering location for outdoor activities. The gazebo will be constructed using wood materials, symbolizing and honouring indigenous culture.

Transitioning to the subsequent characteristic, we have local artists. This feature was proposed from the inception of our benchmarking process, and the client expressed great satisfaction with this specific concept, prompting us to showcase it prominently in the main hall to ensure that anyone entering the building can easily observe and appreciate the indigenous artists and culture.

Moving to the physical prototype, the objective was to replicate the design completed in Revit, but construct it in the physical world in order to more faithfully depict the actual building. As a result of scheduling difficulties and limited availability at the Makerepo lab, We opted to manually construct it utilizing environmentally friendly materials such as board, genuine grass, wood components, and various other subsystems.

Additional elements such as vehicles, grass, and trees have been used to enhance the overall aesthetic with a more organic and realistic appearance. The exterior materials clearly indicate their composition as wood, serving as a reflection of the indigenous culture that will be included into the design.

However, all other details will remain unchanged from Revit, including updated office numbers and structural modifications based on client feedback. The layout includes a common area, a lab area with a mobility table and an access door to an outdoor activity area (gazebo location). The lab area is equipped with sinks for sectioning work, a computer workload bench, and a designated area with a freezer, storage, and dryer placed adjacent to each other for convenient loading. The lab area is designed to maximize space efficiency.

5 Troubleshooting & Support

The physical prototype made by one of the students in our group stands out for its size and the details of the little structures and sub-structures put in it during creation. Some of them are brittle. An example of it can be the dome. The broken structures should be swapped with the same ones, it is not hard to make them because most of them do not take much time to make and do not cost much. Also, the size of the prototype might become an issue during transportation however the weight of it is small. It is not recommended to have the prototype standing at the windy weather.

5.1 Error Messages or Behaviors

- The material that was used to make the prototype was cardboard. If it folds the user should swap the folded detail with a new one.
- The dome of the prototype is very breakable so the user should be careful to use it.

5.2 Special Considerations

The prototype is made of cardboard so the customer should avoid water, rain, or any wet surfaces while troubleshooting the prototype. The size of the prototype may become a problem while the transportation.

5.3 Maintenance

For the physical prototype, repeated dusting and cleaning to avoid any build-up of dirt.

5.4 Support

Email: ayaali2182@gmail.com or aali270@uottawa.ca for receiving the REVIT file

6 Product Documentation

6.1 Subsystems

For BOM reference tables in the document “Bill of Materials” provided in Makerepo.

i. Building
ii. Lab
iii. Storage room
iv. Freezer area
v. Dryer room
vi. Office
vii. Board room
viii. Common area
ix. Kitchenette
x. Washroom
xi. Garden

Table 3. List of used software

Item name	Description	Type	Prototype	Source	Cost
AutoCAD	To create a 3D model	Software	1,2,3	Online	$0 (Provided by the University)
Enscape	To assign materials and add furniture	Software	2,3	Online	0$(Student Account)
Revit	To create 3D model	Software	2,3	Online	$0 (Provided by the university)
RSMean	Construction cost and Details	Website	1,2,3	Online	0$(Student Account)

6.2 List of Equipment

Table 4. List of Equipment

Item name	Description	Prototype

Personal computer / Laptop	A device that can support Computer Assisted Design software.	1,2,3

6.3 Testing

i. Office building area

The area of the right side of the building was increased to approximately 3500 square feet to accommodate a boardroom in the middle and 19 120-feet offices (Figure 3), as requested by the client.

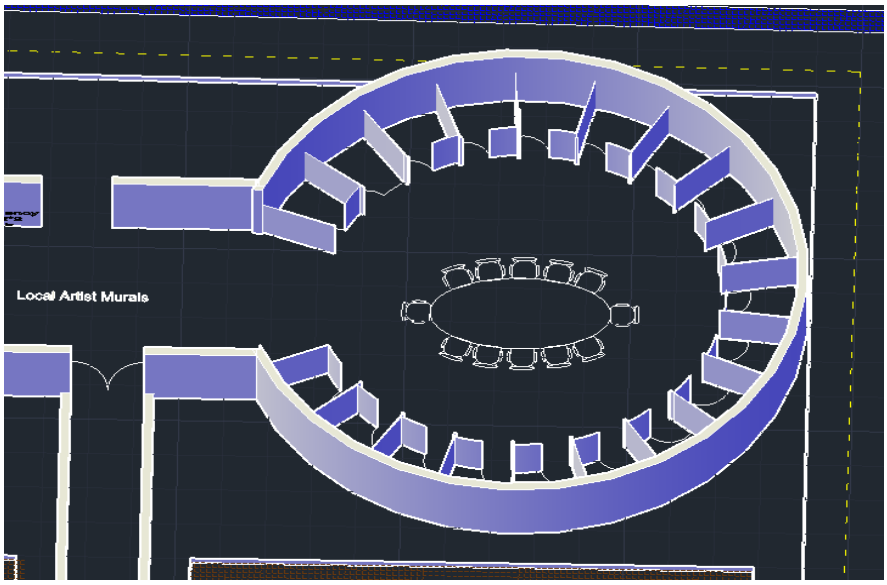

Figure 3 Sketch of the office building in AutoCAD

ii. Building roof

Client expressed a concern about snow build-up and lack of natural light in the boarding room. In order to provide a solution to the problem the flat roof was swapped to a dome roof for the left and right circular buildings and angular roof for the hallway. Moreover, a circular window on top of the dome roof provides necessary illumination (Figures 4-6. Roofs from different perspectives).

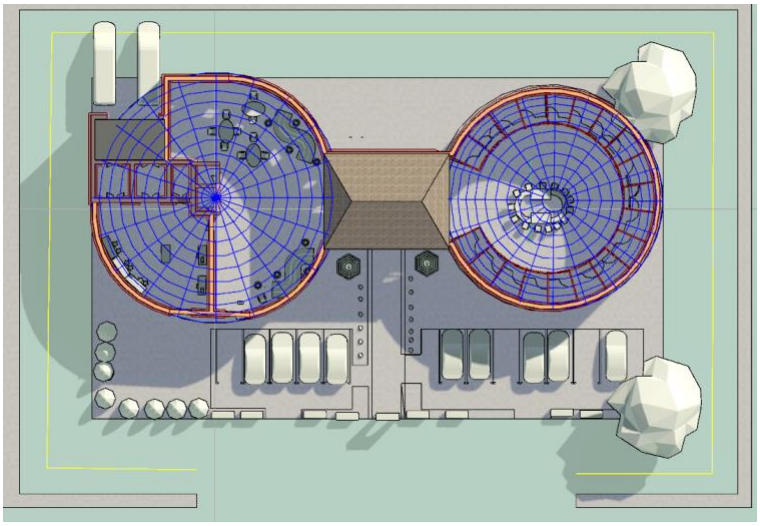

Figure 4 Roof from the top.

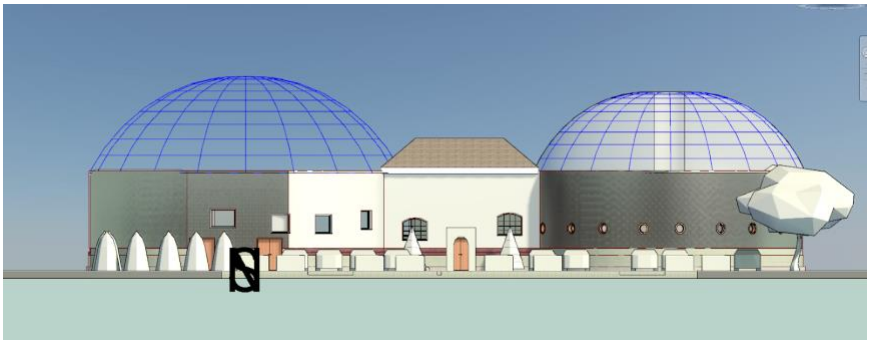

Figure 5 Roof from the front.

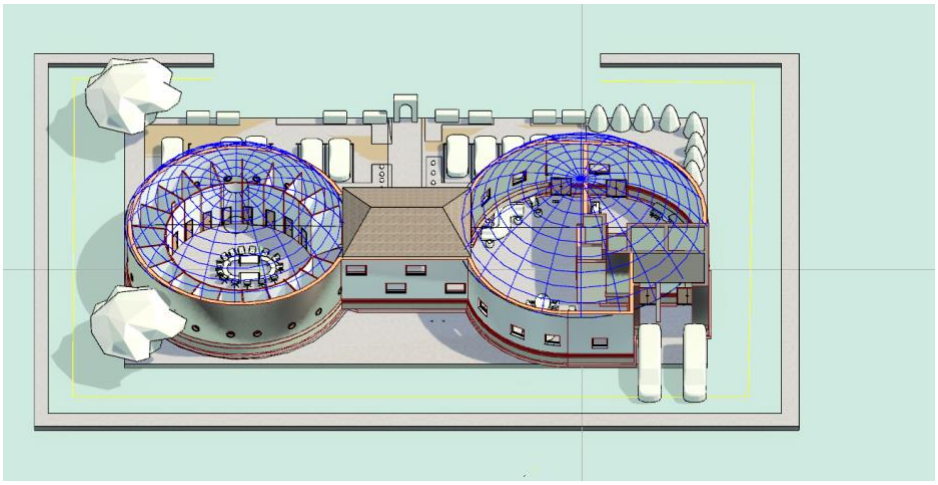

Figure 6 Roof from the back.

7 Conclusions and Recommendations for Future Work

While working on this prototype we experienced many difficulties with the prototyping and testing of the designs. For the next groups, I would recommend making more prototypes in the beginning. That would potentially allow us to make more tests on it and have a more specific design for the final presentation. If we had more time on the prototype, we would make a more specific physical prototype, consider the cost, and make the actual virtual tour that would allow the user to understand it more deeply. Unfortunately, we abandoned the dome for the physical prototype due to the time limits. If any group of students would like to continue this project, I would recommend starting with estimating the cost of the materials you would need to make the prototype.

8 Bibliography

HTTPS://WWW.COASTESSENTIAL.COM/UNIVERSAL-DESIGN-FOR-ACCESSIBLE-HOMES/

HTTPS://MICROSOLRESOURCES.COM/TECH-RESOURCES/ARTICLE/WHAT-IS-REVIT-USED-FOR/

HTTPS://EN.WIKIPEDIA.ORG/WIKI/AUTODESK

HTTPS://EN.WIKIPEDIA.ORG/WIKI/ENSCAPE

APPENDICES

9 APPENDIX I: Design Files

Table 3. Referenced Documents

Document Name	Document Location and/or URL	Issuance Date
Makerepo	https://makerepo.com/ypoli036/1886	Nov 23, 2023
Deliverable B	Makerepo Portfolio	Nov 23, 2023
Deliverable C	Makerepo Portfolio	Nov 23, 2023
Deliverable D	Makerepo Portfolio	Nov 23, 2023
Deliverable E	Makerepo Portfolio	Nov 23, 2023
Deliverable F	Makerepo Portfolio	Nov 23, 2023
Deliverable G	Makerepo Portfolio	Nov 23, 2023
Presentation	Makerepo Portfolio	Nov 26, 2023
Deliverable I	Makerepo Portfolio	Nov 29, 2023
Bill of Materials	Makerepo Portfolio	Dec 10, 2023