

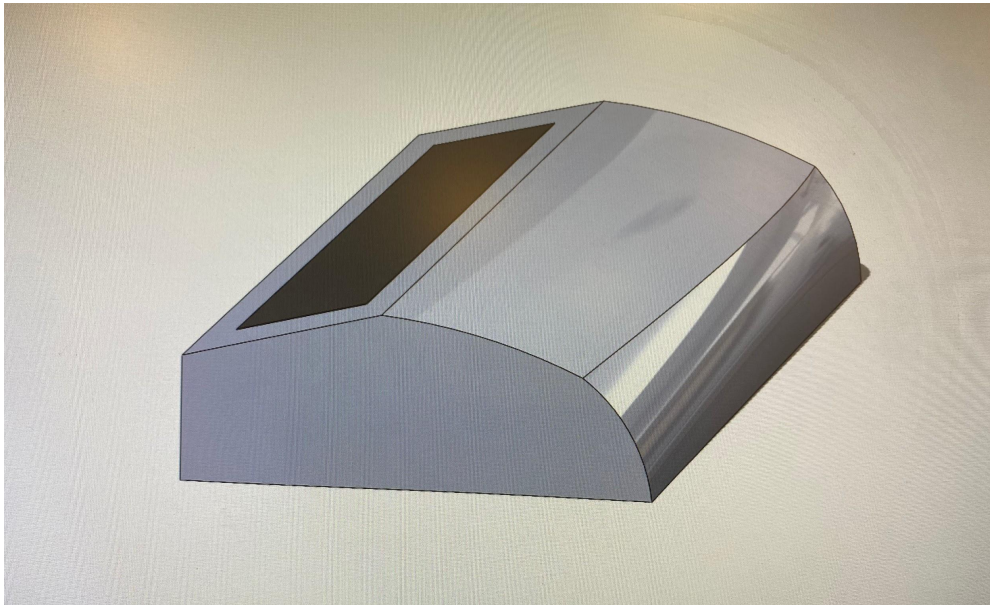
## Deliverable G: Prototype II & Customer Feedback

### Introduction

This deliverable introduces our second prototype, a SolidWorks 3D model of the exterior of our Guardian building accompanied by an updated floor plan. Additionally, the results of the prototyping test plan outlined in deliverable F are provided and discussed. Furthermore, an analysis of the critical components of this prototype is provided along with a prototyping test plan for the third and final prototype.

### 1. Prototype

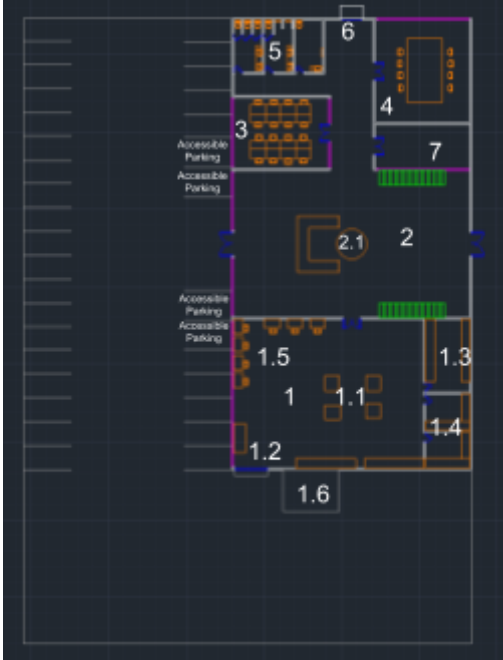
#### 1.1. 3D model



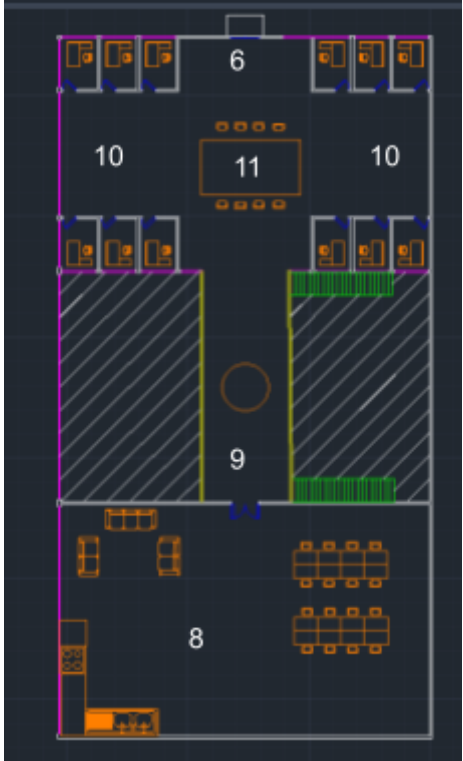
*Figure 1* - The initial CAD rendering of final conceptual design. Black represents solar panels. Half of the building is shaped like a canoe and the other half is representative of a modern building. Future renderings will include more details and coloring.

1.2. Floor Plan

**AutoCAD Floor Plan**  
*First Floor*



*Second Floor*



## **Legend**

### *First Floor*

#### 1. Lab Space

The lab space is the main work area for the Guardian Program. There are four multipurpose, mobile workstations in the lab which can be used for a variety of tasks such as sample analysis, experiment preparation, etc. There is direct access to the parking area as well as a garage door which opens directly onto the loading dock. This will make the transfer of contents in/out of the lab more efficient. In the lab, there is access to a freezer room for sample storage as well as two, dry storage areas for lab equipment, samples or automotive parts/tools. Along the perimeter of the room are monitors which can be used for data collection or general work tasks that the Guardians may need to do. Finally, adjacent to the lab space, in the parking area, is a lean-to for vehicle storage.

#### 2. Lobby Area

This space was designed to be a floor-to-ceiling open concept gallery where the Guardian Program can display photos, videos, murals, or their history/work. There is a skylight found directly above the lobby which provides the space with plenty of natural light. In the centre of the lobby is a large, cultural statue that will extend upwards to the bridge on the second floor. A check-in/front desk can be found next to the statue, opposite to the front door. Stair access to the second floor can be found in the lobby.

#### 3. Temporary Office Space

A room designated for individuals who do not work at the building everyday (ie they may not need a permanent office). Located on the first floor for convenience.

#### 4. Meeting Area

The meeting area on the first floor provides more privacy than the meeting area on the second floor and can be used for meetings with guests, clients, investors, etc.. Located near the temporary office spaces in case the guests require a work space for the day.

#### 5. Restrooms

On the left is the women's bathroom and the men's bathroom is in the middle. An accessible bathroom equipped with a changing station is found on the right.

#### 6. Elevator

Elevator is located at the end of the hall. It provides access to the second floor for those who cannot use the stairs.

#### 7. Exhibit room

An exhibit room can be found adjacent to the lobby area and can either be used for special events or for extra storage space as needed.

### *Second Floor*

#### 8. Break room

A break room, equipped with a kitchenette and seating, can be found on the second floor for employees.

#### 9. Bridge

Since the lobby has a floor-to-ceiling open concept, a bridge is used to connect the two halves of the second floor (i.e. the break room to the office space). The stairs down to the first floor can be accessed via the bridge.

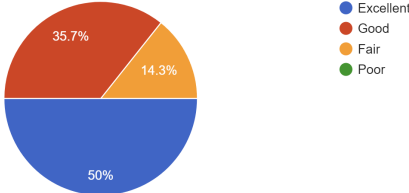
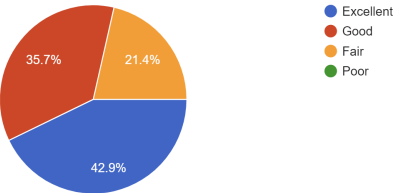
#### 10. Permanent Office space

A dedicated office space containing 12 permanent offices can be found on the second floor for individuals who work at the Guardian building on a daily basis.

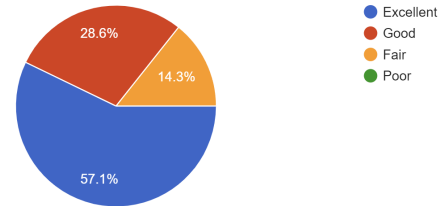
#### 11. Meeting Area

The meeting area on the second floor has less privacy than the meeting area on the first floor and can be utilized for casual meetings. It can be found in the centre of the office space as it could be a useful space for team collaboration and/or daily check-ins for example.

### 1.3. Prototyping Test Results

Test ID	Test Objective	Description of Prototype used and Basic Test Method	Test Results																				
1	Survey of Layout/Exterior Design	To gather input on the exterior design of our building, we will craft a comprehensive survey that invites a diverse range of perspectives. The survey will be designed to be accessible and user-friendly. It will include a mix of open-ended and multiple-choice questions to encourage detailed feedback while ensuring ease of response.	<p>For this survey, we asked participants to rank the 2D design of the layout (floorplans) from excellent to poor. We also asked participants what they liked/disliked about the floorplans and what changes/improvements they would make. Finally we asked participants what they thought about the exterior design/architectural style and what changes/improvements they would make.</p> <p>Link to survey: <a href="https://forms.gle/zzcc3oW3FZDjcwXL7">https://forms.gle/zzcc3oW3FZDjcwXL7</a></p> <p><b>Question 1: How would you rank the general floor plan? (i.e. the convenience of the placement of each room).</b></p>  <table border="1" data-bbox="992 825 1398 1016"> <caption>Question 1 Results</caption> <thead> <tr> <th>Rank</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Excellent</td> <td>50%</td> </tr> <tr> <td>Good</td> <td>35.7%</td> </tr> <tr> <td>Fair</td> <td>14.3%</td> </tr> <tr> <td>Poor</td> <td>0%</td> </tr> </tbody> </table> <p>Most of the participants supported the layout of the general floor plan. A few participants felt as though there was a decent amount of wasted space. Other comments included possibly having a bathroom upstairs, having another set of stairs, and the breakroom being too big.</p> <p><b>Question 2: How would you rank the layout of the offices? (i.e. the convenience of the layout)</b></p>  <table border="1" data-bbox="992 1423 1398 1614"> <caption>Question 2 Results</caption> <thead> <tr> <th>Rank</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Excellent</td> <td>42.9%</td> </tr> <tr> <td>Good</td> <td>35.7%</td> </tr> <tr> <td>Fair</td> <td>21.4%</td> </tr> <tr> <td>Poor</td> <td>0%</td> </tr> </tbody> </table> <p>Most of the participants supported the layout of the upstairs offices and the meeting area. Most participants liked the central meeting area and thought it was great for collaboration while a few others were unsure about it. Other comments were made about liking all the windows and having a lot of wasted space.</p>	Rank	Percentage	Excellent	50%	Good	35.7%	Fair	14.3%	Poor	0%	Rank	Percentage	Excellent	42.9%	Good	35.7%	Fair	21.4%	Poor	0%
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**Question 3: How would you rank the layout of the laboratory? (i.e. the convenience of the layout).**



Most of the participants supported the layout of the laboratory. Comments were made about liking the mobile workstations, if there are any safety kits, fire extinguishers, moving the loading dock, and if there is enough storage.

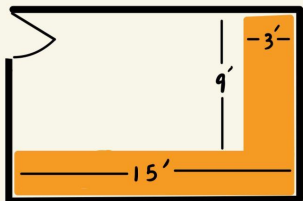
**Question 4: What do you like/dislike about this design and its architectural style? Do you think that this exterior design will mesh together well with the interior design (the floor plans shown above in a previous question)?**

**If you do not think that this exterior design will work well with the interior design, what would you change to improve the exterior design?**

Responses:

- I think it looks good. I just think perhaps it should not be as flat on the side with the glass windows(maybe have a slanted roof part to it?)
- This design is a great representation of the Algonquin culture! Very unique and interesting exterior design.
- Yes I think it's a great concept!
- Maybe add a skylight at the top to let in more light on the other side
- I like the canoe style and the glass wall. A unique mix of modern and traditional architectural styles. My only concern is with the ceiling height of the second floor on the side with the roof slant.
- I really like that it's supposed to represent a canoe. I also like how the front of the building it glass so it lets in a lot of natural sunlight
- Love the canoe aspect, not sure if having an all glass front is smart tho, if there is a storm or something it would be very vulnerable

2	Accessibility	<p>We will ensure that the building's entrances and room doorways are sufficiently wide to accommodate accessibility for individuals using wheelchairs, walkers, and other mobility aids. In our 3D prototype, we will incorporate scale models to validate and confirm the accessibility of different areas within the building. It's important to note that we will also be introducing an elevator within the building and constructing an exterior ramp to ensure that the structure is universally accessible to all individuals.</p>	<p>According to ADA Accessibility Standards, the following requirements are satisfied:</p> <ul style="list-style-type: none"><li>- Total number of parking spaces provided in the parking facility. (1 accessible parking space per 25 parking spaces)</li><li>- Accessible bathroom.</li><li>- Minimum door width of 32 inches</li><li>- Accessible route to connect accessible facilities within the site.</li></ul>

3	Storage Testing	How much handheld lab equipment can be stored in the storage rooms in the laboratory?	 <p>X 2 storage rooms 3 levels of shelves in each storage room + space underneath shelves</p> <p><u>Shelf storage space + space underneath shelves:</u>  <math>(15'(3') + 9'(3')) \times 8 = 576 \text{ ft}^2</math>  Total storage space: <math>576 \text{ ft}^2</math></p> <p>Now lets assume that the average piece of handheld lab equipment takes up roughly <math>1 \text{ ft}^2</math> of space</p> <p><math>\therefore</math> approximately 576 pieces of handheld lab equipment can fit in the two storage rooms in the laboratory.</p>
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## 2. Client Feedback

Note: We have still not received the feedback on our design from the clients. We expect to have it by the next deliverable.

<p><b>Donald Williams - Director of Operations/Plant Manager at Kennametal Stellite, P.Eng in Metallurgical Engineering.</b></p>	<p><b>Elizabeth Mulvenna – P.Eng in Mechanical Engineering</b></p>
<ul style="list-style-type: none"> <li>- Ensure that there is enough room inside the loading dock doors for a forklift/any small industrial vehicles to transfer large contents if needed.</li> <li>- Could make more space outside the loading dock for larger trucks to maneuver. (In case a larger truck needs to deliver/pick up something)</li> <li>- Could install a scale on the loading dock to weigh incoming/outgoing contents.</li> <li>- Provide/install lab safety equipment. (ie eye-wash stations, emergency showers etc.)</li> <li>- Check the fire code regarding the communal workspace area – may need to have a second emergency exit for a room of that size/capacity.</li> <li>- The break room/kitchen is very big, some of that space could be used for something else.</li> <li>- May need a man door beside the loading dock to make the process more efficient.</li> </ul>	<ul style="list-style-type: none"> <li>- Ensure that the loading dock is a safe distance from the rest of the lab to limit risk of injury to laboratory workers.</li> <li>- Could potentially install a swing/harness system near loading dock to make transfer of contents easier.</li> <li>- Provide/install fire extinguishers, sprinkler systems, fire alarms etc.</li> <li>- Because of the large opening in the lobby between the first and second floors, indigenous items could be suspended from the ceiling. (ie canoes, animals etc).</li> <li>- May want to either leave the intended gallery room open to the lobby or have a glass wall so that it is visible to visitors.</li> <li>- Will likely want another bathroom or two upstairs because of the number of offices. It would be cheapest to have these bathrooms above the existing bathrooms.</li> <li>- The Lean To is slightly close to the loading dock, could shift right a couple meters to provide more space. (Reduce the risk of damage to company vehicles or contents being transferred)</li> </ul>

### 3. Analysis of Critical Components

- The main hall of the building will be a gallery of some sort to display photos, videos, murals, etc. to represent AOPFN culture/heritage.
- Elevator available for accessibility of building to those who can not take stairs or, if stairs would strain them.
- Lab space is designed with the function of a maneuverable workspace that has easy access to the outdoors and to storage.
- Movable tables in lab area so lab workers can move the layout to fit their current needs
- Solar panels on roof to lessen carbon footprint and promote the cultural ideas of sustainability.



- Temporary office spaces on the first floor for easy access; as well as being cost efficient.
- Important locations such as the bathroom and the meeting room are on the first floor so that it is easy to get to them for people with disabilities.
- Building designed with the culture of AOPFN in mind (solar panels,communal workspaces, main hall)
- Lean-to for storage of vehicles.
- Storage has a walk-in freezer for sample storage.

#### 4. Prototyping Test Plan - Prototype III

Test ID	Test Objective	Description of Prototype used and of Basic Test Method	Description of Results to be recorded and how these results will be used	Estimated Test duration and planned start date
1	Exterior Guardian Accessibility	During the client meetings, the client mentioned a need for Guardian trucks to easily access the lab space. This test will evaluate the efficiency of the lab access from the exterior (i.e. maneuver space, size of loading dock/garage door, etc). Scale models of 1500 Chevrolet trucks will be used for the test.	This test will reveal if there is enough space in the dedicated area adjacent to the lab as well as the size of the loading dock. We expect there to be enough room for two trucks at a given time to pull into the loading dock with sufficient space to load/unload samples. We have anticipated the potential for expansion (i.e. more guardian teams which would require more trucks) and have ensured that there is room to expand the loading dock. If the test reveals that there is insufficient space, then we will expand the loading dock using the space described above.	Duration: 2 days Start date: Nov 10
2	General Safety Standards	This test will be used to assess whether our design for the Guardian Building adheres to the safety standards in Ontario, specifically the fire safety standards. The layout of the building will be evaluated using the Ontario Building Code to ensure that there are " <a href="#">barrier free paths</a> ", <a href="#">sufficient emergency exits</a> , etc.	This test will provide us with the necessary information to ensure that the building meets the safety requirements. If the test fails, the floor plan will be changed accordingly to follow the Ontario Building Code.	Duration: 1 day Start date: Nov11

3	Sustainability	This test involves the integration of solar power through the installation of solar panels on the roof and an evaluation of the quantity of solar energy we expect to harness. The test would encompass a thorough site analysis, considering factors such as geographical location, orientation, and potential shading from nearby obstructions.	The results of this test would entail a long-term evaluation of the solar panels' daily energy output, accounting for variations in weather conditions. The gathered data would then undergo detailed analysis to assess the efficiency and overall performance of the solar power system.	Duration: 2 days Start date: Nov 15
4	Evaluation of the Roof	In addition to incorporating solar panels onto our roof, we would like to test the roof's structural integrity. This test will encompass assessments of stability, drainage, and other pertinent factors to ensure the overall functionality of the roofing structure. We could test the drainage capabilities by doing a rain test using a controlled water source such as a hose or a sprinkler system. Simulating water flow to mimic various levels of rainfall intensity.	The results of this test would appear to be whether or not the drainage system is functioning properly, the water should drain away quickly. If not, the water will linger and eventually pool on the ground.	Duration: 1 day Start date: Nov 17

**Wrike Snapshot:**

<https://www.wrike.com/frontend/ganttchart/index.html?snapshotId=VxPgWbYKqpBcUIEW9d1clIVx2mPJp9Ok%7CIE2DSNZVHA2DELSTGIYA>

**Conclusion**

In conclusion, the second prototype and the results of its corresponding tests will be used to iterate and create our final prototype. The second prototype has been proven to pass all of these tests, however the feedback from both surveys (Prototype I & Prototype II) along with the feedback from potential clients has highlighted a couple areas that we plan to improve upon moving forward. We will implement these improvements through the creation of our third prototype and will evaluate it using the test plan that is provided above.