The Robins

Deliverable E - Conceptual Design

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Client: Frederick Conn

Prototyping and Test Plans:

Test ID	Test Objective (Why):	Description of Prototype used and of Basic Test Method (What):	Description of Results to be Recorded and how these results will be used (How):	Estimated Test duration and planned start date (When):
1	Test the door Our design uses a hinged door for easy access to the inside, so it needs a hinged door that can stay locked and sealed throughout the day.	Use a prototype with the hinged door installed. Open and close the door repeatedly to check for ease of movement, latch security, and if it's sealed and insulated properly.	We will record whether the door stays closed and sealed after repeated use. These results will be used to determine if the design meets functionality standards	Estimated time: 30 mins Should be done before: Nov 17th
2	Test the mounting of the bat box An important aspect of the box that the client asked for is easy mounting	Use a prototype of the bat box with mounting hardware. Test by attaching the box to various surfaces such as trees or posts to assess how easy it is to mount the box on different surfaces .	Record ease of mounting, stability under normal conditions, and any required adjustments. Results will determine if design modifications are needed to improve mounting.	Estimated time: 2 hours Should be done before: Nov 17th
3	Test the touchpad sensor of the landing pad This is the upmost important aspect of the box, in which it should be able to count the populations of the bats using the box.	Use a prototype with the touchpad sensor installed. Use weights that represent the weights of both bat species. Calculate the velocity at which they land and record the sensor's response to different amounts of force.	Record the sensor's response to light touches compared to lots of force. Results will help optimize sensor sensitivity and ensure accurate bat detection.	Estimated time: 1 hour Should be done before: Nov 17th
4	Test the water resistance It rains a lot in	Place the prototype in an environment that simulates rainfall such as under a hose.	Record the box’s overall resistance to water. The results will help	Estimated time: 30 mins Should be done

	Ontario spring and summer! Right through the seasons which this box will be used. Water resistance is crucial for the bat box	Observe any damage to the box.	add any necessary sealants.	before: Nov 17th
5	Test the insulation of the box Bats need a box which should be able to stay at a tolerable temperature.	Use a temperature sensor inside the prototype and place it in various temperatures to test the insulation capacities.	Record internal temperature changes relative to outside conditions. Results will make sure the temperature inside the box is a comfortable temperature for the bats.	Estimated time: 1 day Should be done before: Nov 17th
6	Test the cleaning of the bat box One of the box requirements is that it needs minimal touch ups, meaning the box should be able to stay clean and be easy to clean.	Try cleaning out the box after leaving it out for a few days using tools to test the difficulty.	Recorded using notes made whilst cleaning the box, if we run into any issues, try to find solutions. Also checking for any pests	Estimated time: 3 days Should be done before: Nov 17th

Project Task Plan:

Task ID	Task Description:	Estimated Duration (Days):	Owner:
1	Create digital 3D model of design	1	Maria
2	Gather all materials for project	3	All
3	3D print prototype #1	2	Jonathan
4	Test prototype #1	1	All
5	Record observations and results	1	Lara
6	Determine design and objective for prototype #2	3	All
7	Update target specifications and BOM	1	All
8	Create prototype #2	5	All
9	Test prototype #2	1	All
10	Record observations and results	1	David
11	Update target specifications and BOM	2	All
12	Create prototype #3	5	All
13	Test prototype #3	1	All
14	Record observations and results	1	Sophia
15	Get feedback from potential users	1	Jonathan
16	Update target specifications and BOM	3	All

Project Risks:

Project Risks	Contingency Plans
Team members not completing tasks on time	Account for tasks that take a longer time to be done, therefore, increase the time duration
Problems that may occur while constructing the prototype	Build the prototype early on, in order to account for any obstacles that may occur
Issues that occur while making the final sketches	Allow teammates to give their opinions in order to fix the issues that may occur

Design Making:

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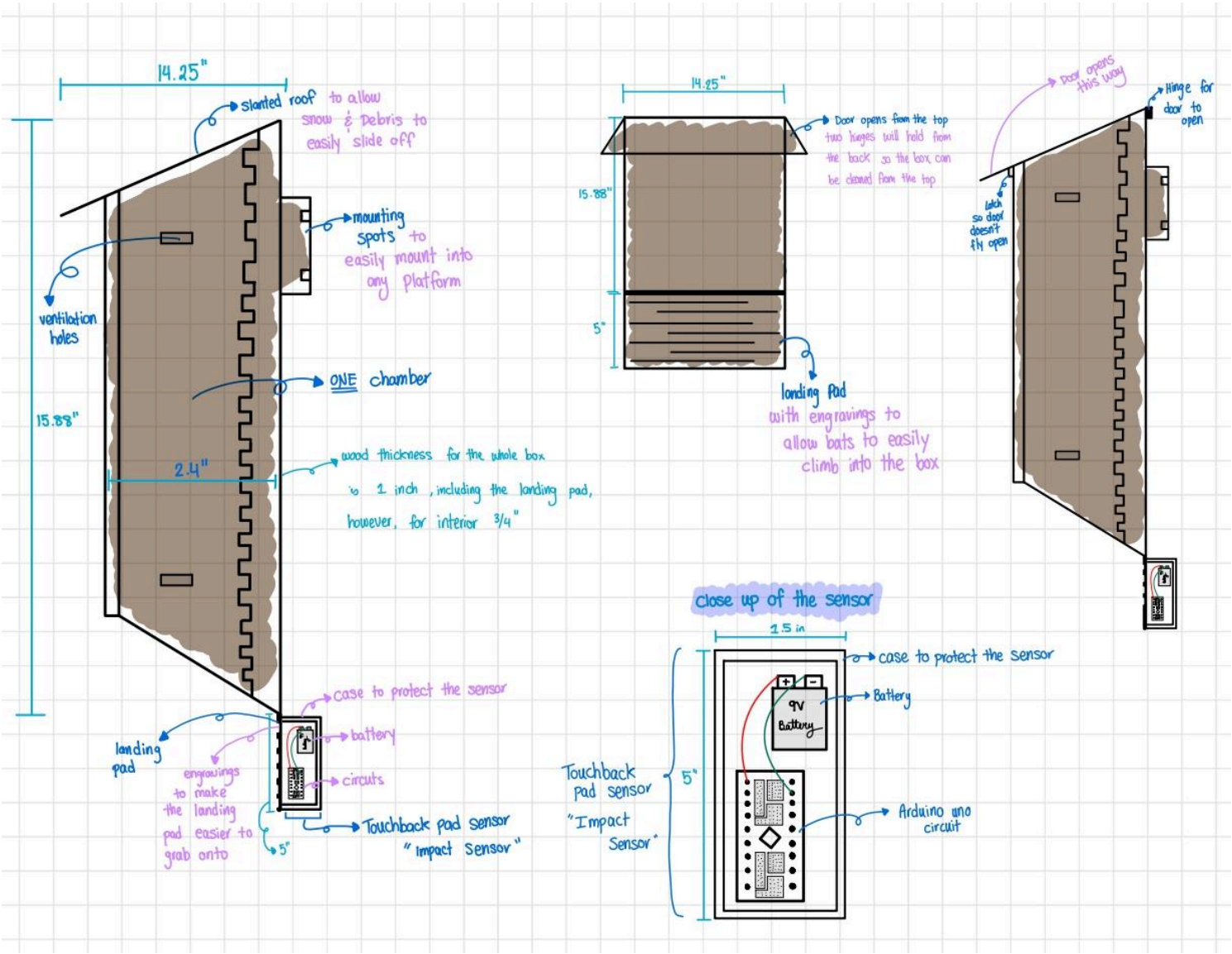

Our finalized design features a cedar wood structure measuring 15.88” x 14.25” x 2.4”, with a single chamber, ventilation holes, and an engraved landing pad to help the bats easily enter the box. It includes mounting spots for easy installation on various platforms, with an exterior wood thickness of 1 inch and an interior thickness of ¾ inch for strengthening and durability. The slanted roof allows for snow and debris to easily slide off and is hinged at the back for convenient maintenance and cleaning, secured with a latch to prevent it from opening. Additionally, an impact sensor, housed in a protective case, will function as part of an Arduino Uno circuit powered by a battery, ensuring that it will not get damaged during severe weather.

Budgeting and Costs:

Materials:	**Description:**	**Cost:**
Cedar Wood	Main material of the bat box.	$50-$55
2 Door Hinges	2 door hinges for the door to allow easier cleaning.	~$5
Door Latch	Used to keep the door closed when not in use.	~$6
Vibration Sensor	To sense when bats land on the landing pad.	~$5
Microcomputer	To compute data received from the vibration sensor.	$20-$28
Battery	To power the microcomputer and vibration sensor.	~$5
Nails/Screws	To assemble the box.	~$2

Total Potential Costs ~ $93 - $108

Average Potential Costs: ~$99.50

Manufacturing & Installation Equipment Needed:

Equipment:	**Description:**	**Cost:**
Table Saw	Used to manufacture box	$400 + ~$20/blade
Laser Cutter	Manufacture box for electronics and raster design graphics	$600
Hand Router	Cut slats for bats to climb and vents	$130 + ~$10/bit
Electric Drill	Used to manufacture box	$70 (includes batteries, charger, bits, case)
Post Hole Digger	Used to install box	$70
Hand Tools	Tape measure, pencils, hammer, ripsaw, triangle, clamps, sandpaper	$90-100
Safety Equipment	Safety glasses, steel toe boots, gloves, dust masks	~$100/person
Soldering Iron, Wire Stripper	Assemble electronics	$70