

Problem Statement: The client requires a durable, eco-friendly bat box that is capable of monitoring the number of bats that use it while providing a safe and habitable environment.

or

Design a scalable, sensor- integrated bat box prototype that tracks the entry and exits of bats in southern Ontario bat habitats. The solution must ensure robustness and complexity, environmental friendliness, cost effectiveness, and an ease of maintenance. It must also focus on consistent and accurate data collection while maintaining a safe and suitable environment for bats, particularly regarding temperature and bat movement.

Needs:

Client Need	Ranking
Prototype Budget/cost (\$50-150)	4
Environmental Impacts	3
Consistent Data Collection	2
Temperature monitoring	6
Ease of Installation and maintenance	5
Safe and Suitable Environment	1

Summary

Environmental considerations

Environmental considerations for the bat box design include the use of eco-friendly, ethically sourced materials to reduce environmental impact. The box must be weather-resistant, capable of withstanding outdoor conditions such as direct sunlight and fluctuating temperatures. To manage guano accumulation, equipment should be placed away from the bottom of the box. Given the bat boxes' constant exposure to sunlight, integrating small solar panels for energy efficiency is a viable option. Lastly, the design should prioritize minimizing disruptions to bats and other wildlife, ensuring the box is functional without negatively impacting surrounding species.

Technical requirements

The technical requirements for the bat box design emphasize sensor longevity, with devices needing to function reliably from April to October. The system should ensure consistent data collection, tracking all bat entries and exits, while timestamps are an added bonus. Additionally, it must operate quietly to avoid disturbing the bats. Any sensors or panels mounted on the box should be positioned in a way that does not interfere with bat activity. Temperature monitoring is also crucial, with a focus on ensuring the internal temperature remains below 40°C to maintain a suitable environment for the bats.

Design Considerations

The bat box design will utilize thick plywood or insulated materials, ensuring durability and proper insulation, with $\frac{3}{4}$ inch spacing between slats to allow bats to roost and move freely. A single entry/exit point will facilitate easy bat access. To prevent interference from guano buildup, equipment should be side-mounted. Designed for use in both public and private spaces in Southern Ontario, the boxes will be compact and scalable, with production limited to under 100 units annually. The tracking system prototype must be built to actual size, and maintenance should be quick and efficient, taking no longer than 30 minutes.

Budget Constraints:

The prototype cost is \$50 - \$150.

Additional Considerations:

Providing detailed reports on the sensors; outlining their effects; data collection methods; public diagrams and models. The client emphasizes the importance of tracking costs, with extra data being appreciated but not essential. Additionally, the project will assess the performance of both the sensors and the overall functionality of the bat box.