

Vertical Growing Tower for Urban Farming

Introduction

- The Common Roots Urban Farm is restricted by law to utilizing 10% of BiHi Park for agriculture.
- Objective is to create a vertical gardening system that integrates into the existing raised beds to maximize yield and minimize land footprint.
- Project scope includes designing, building, and testing a prototype and recommending suitable materials, crops, and future manufacturing plans.



Key Requirements

Client Needs:

- Weight of any individual component must be less than 20 kg.
- Must not use power or running water and have few mechanical components.
- Dimensions must be within 1.5 m x 1 m x 1m.
- Minimum productivity requirement is that the crop yield must be 4 times greater than the base 'footprint'.
- Growing medium must be soil.
- Materials must withstand sun exposure, water, corrosion, and strong winds.

Key Concerns:

- Watering requirements and moisture retention.
- Ease of use, ease of assembly.

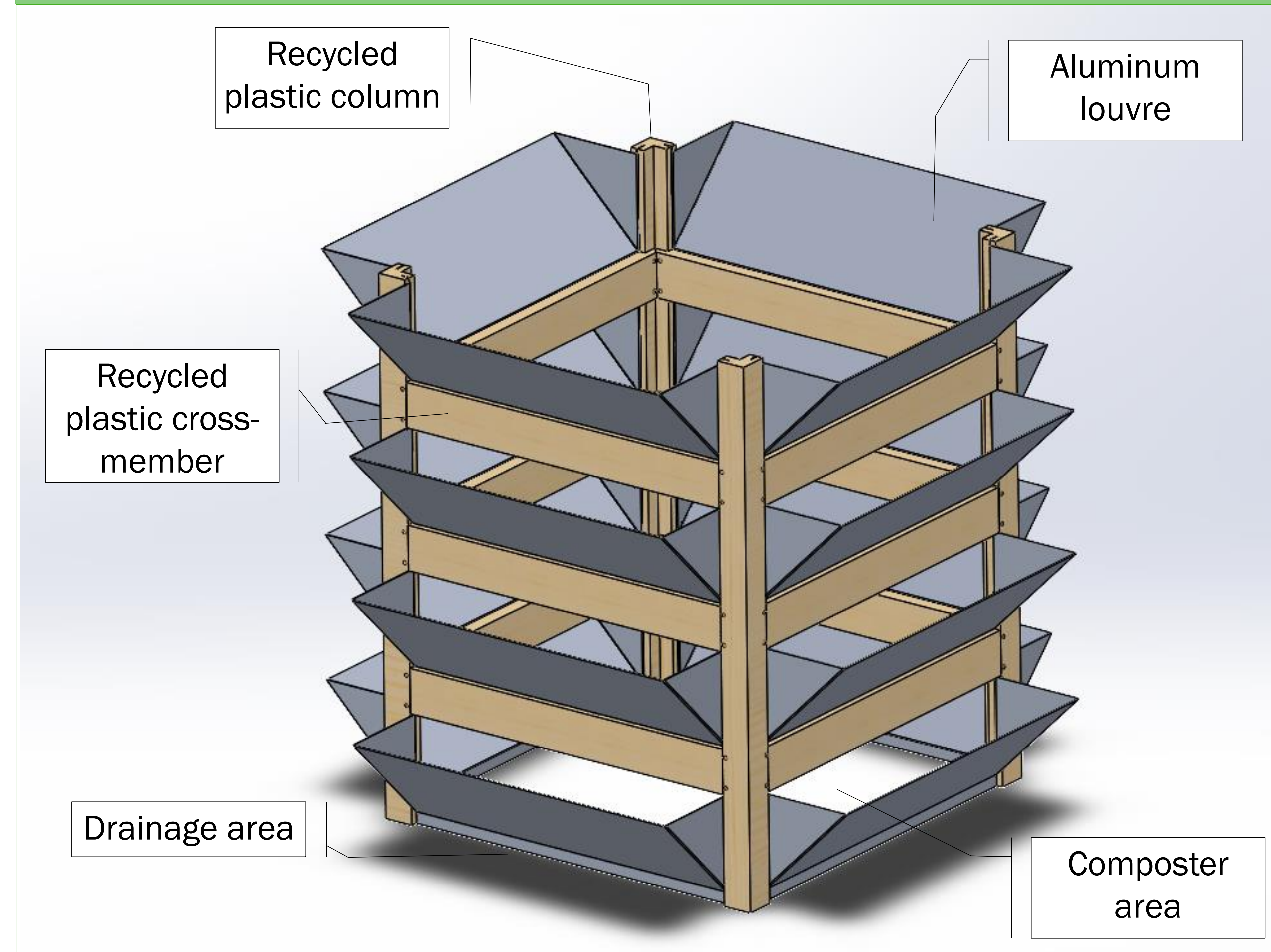
Design Process

Design process took inspiration from modern vertical gardening techniques and took several iterations of design & material choices.

Design and Testing Details:

- Modular, stackable, soil-based growing tower with capability of housing a vermi-composter through the centre.
- Available growing area increased by a factor of 4, increasing total crop yield.
- 14-gauge 6061 sheet aluminum: robust, corrosion and UV resistant material.
- Goodwood Plastic lumber: cost effective, longer lifespan than any wood, readily available locally, easy to work with.
- Finished dimensions: 91 cm x 100 cm x 100 cm
- Weight test to ensure components meet requirements.
- Drainage test to estimate watering requirements and water retention.
- Tipping force test to ensure stability in inclement weather and winds.
- Assembly process tested to ensure easy, intuitive setup.

Details of Design



Recommendations

- Yield testing of the prototype should be carried out to confirm the productivity requirement.
- Test different crops for suitability in the planter.
- For balcony use, modify the design to include a drainage tray that will contain mess and increase the total base area to reduce load on balcony.
- Increase width of columns to decrease material warping.
- Use thinner gauge aluminum to make bending easier and lower cost.
- Add or remove tiers as desired to better fit growing space.
- Add landscaping fabric to increase water retention if necessary.

Conclusion

- Completed growing tower prototype for integration into raised beds on the Common Roots Urban Farm BiHi site.
- Detailed plans and recommendations for future fabrication of additional planters.
- List of recommended suitable crops.

References

- Burgess, S., Rideout, D., & Welch, D. (2020, October 13/16). *Dalhousie Capstone Meeting*, Microsoft Teams.
- Burgess, S. (2019). [Urban Roots Community Garden] [Photograph]. *Common Roots Urban Farm*. <https://commonrootsurbanfarm.ca/2019/07/23/this-week-on-the-farm-july-15th-21st/>