

## Engineering Strategies and Practice

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### Examples of Client Project Proposals from Winter 2017

#### Device or Structure

- Harbord Village Bike Infrastructure. How many bikes are chained to front fences and porches? Look at existing options (mid bock bike racks) and suggest where they could be installed. Come up with new ideas for innovative, unobtrusive, attractive and interesting ways to secure bicycles from theft.
- Throughout the Grange Community, there is a wide range of construction activities, from new large-scale condominiums to retrofitting of heritage buildings. One element these diverse construction sites have in common is their public face: hoardings (boards that go up around the construction site) that create an unpleasant streetscape and pedestrian environment, and lack any public engagement or ingenuity in their design. Are there cost-efficient hoarding designs that also provide opportunities for artistic expression to improve the pedestrian realm and streetscape for long-term construction projects in Toronto?
- Pueblo Science is a Toronto-based charitable organization focused on advancing science education in low-resource communities around the world. We are looking to design a water purifier to help families in coastal areas of the Philippines have access to salt-free drinking water. The purifier must use locally available materials and be affordable. Design and assembly of the purifier will be taught by teachers to high school students, who will in turn bring it to their families.
- The challenge I want to propose is a wearable upper-limb cooling/warming system. At the moment, athletes use a limb cooling tool to prevent injuries prior to practicing and competing. A marketed product is currently in use (<http://www.gameready.com>). The problem with that system is that it is quite bulky and requires the athlete to sit beside the pumping unit during the intervention. The ideal solution would lead to a prototype that would cool the arm (biceps and triceps brachii muscles) and all elements of the solution would be wearable (i.e., user can move around and practice with device).
- We need an easier way to move our car around. The ESP team is to design a push bar/jacking device for our Formula SAE Racing car. The design needs to work with our 2017 car, but being able to work on or be retrofitted to work on future cars would be a desirable trait. Safety for our users is a primary concern. The design should fall within our tight budget constraints and must be manufacturable using our current team skill set and the equipment in the FSAE shop or U of T Mechanical Engineering machine shop.
- Water and air filtration canopy for urban streets. We are looking to design a canopy that is rugged but easy to install on pavement that would provide a method for capturing storm water. It has to be able to house plants and should be easy to maintain.
- Coding enhances creativity and drives people to cooperate, work together across physical and geographical boundaries and communicate in a universal language. As the introduction of coding is most effective when initiated at a young age, numerous means, such as LEGO robot kits, are employed to introduce young students to coding. However, such means remain too expensive for mass adoption. This project aims to develop a more accessible coding introductory tool for elementary school students that does not necessarily mimic existing tools. Project deliverable will be considered for commercialization.

## Process or System

- Family Service Toronto is a not for profit, social services agency, providing counseling support to clients in a variety of different programs. There always is a wait list, but we also have many cancellations, no shows etc. FST has an intake unit, with staff dedicated to coordinating intake and clients' first visits. However, the process does not appear to be as streamlined as it needs to be, leading to inefficiencies, duplications, gaps in wait list management etc. We need a review of the systems (including human elements, systems and environmental contexts) with suggestions for ways to improve our systems and processes.
- LEAF has been helping residents in the GTA plant trees on their property for 20 years. Our focus within our tree planting programs has always been on quality rather than quantity. With the use of new technologies, we are looking to increase our reach while maintaining this quality by re-evaluating our internal processes. The goal is to have a new system of information management and use of technology that could increase the number of homes getting trees through LEAF while decreasing our paper use and carbon footprint.
- Regenesys receives a lot of donations and lost items from the York University community (clothing, books, electronics, etc). We operate the Free Store to minimize mass consumption and reduce the waste going into the landfill. The students will be tasked with creating a system to manage and track the inventory of items, to determine if an item should remain in stock or removed from the inventory, and to process and store items neatly and in an organized fashion in a confined space.
- Alert system. Home healthcare workers often have to spend a long time travelling between their patient homes and are often late for their appointments because they do not currently have a good system for being alerted of the traffic conditions. They are also very busy and need a simple system to help them navigate their daily schedule. We are looking to develop a system that would help them better manage their time and alert them of traffic conditions in an intuitive manner.
- Our field teams mostly work on the road and it is often challenging to stay connected with colleagues in head office, and share context, knowledge, and priorities (in both directions from and to head office). How can we design better interactions and dissemination of knowledge and information?
- We operate call centers as an important channel to help service our customers with their many needs and questions. With a high volume of calls ranging in topics, there are many important insights and customer demands. Identify how to seamlessly capture and communicate insights to the business.
- Our field technicians are required to perform groundwater sampling from groundwater monitoring wells. There are physical demands on the technician's body related to repetitive motions, bending, and lifting. We are interested in a solution, device and/or process to reduce or eliminate ergonomic challenges encountered during groundwater purging and sampling. Upwards of 50 litres of water are purged from the wells manually, using various water recovery equipment. Sample bottles are filled, which requires several manual tasks done concurrently. Purged water not required for analytical testing is collected in pails and moved to drums located onsite.

## Energy, Environment, or Nature's Complications

- Economical Composting System for Toronto Families Living in a Residential High-Rise Building.
- I would like to build solar powered Green Houses in Ontario's Northern Communities. The solar power would provide lighting and potentially some heat & watering capabilities. I would also use a wood stove as an alternative heat source for year round growing of non-GMO fruit & vegetables.

- **Lighting Efficiency Cost Reduction:** In our hair salon, there are over 200 spot lights on the ceilings consisting of four floors. In the summer, excessive heat is created from these lights which cause the air conditioners to run at maximum capacity. Bulbs routinely burn out and are difficult to replace. With the increasing cost of electricity in Toronto and the introduction of LED lighting, we are looking for a design upgrade that will keep the salon cooler, require less replacement and maintenance and require less electricity. The cost of the design must have a payback period of less than two years to have the potential of management approval.
- **Retrofitting Photo-voltaics and Other Renewable Technology in an Urban Environment.** In the city of Toronto and other growing cities, condominiums are usually the most common residential property. Condos increase the population density in a certain area, yet residents still have a comfortable amount of space. Often times a balcony is attached to the apartment. However, the balcony is infrequently used by residents due to many deterring factors such as pests (i.e. spiders), winds, weathering, and condo restrictions. If this space is not being utilized, it should be re-purposed in a way such that it is beneficial for the condo residents, and environment. Your job is to design a retrofit consisting of green technologies that can be applied to various condo (and other resident types) balconies. The retrofit should be designed in a passive way, such that it does not interrupt the resident's typical habits and activities. One should also be considerate of the volatile weather of Toronto, and ensuring the design can withstand such environmental demands.
- **Creating urban infrastructure in the lane ways of Little Italy.** This area is filled with lanes and potential for creating more needed housing small businesses and other economic possibilities. The challenge for the group is how to create sustainable infrastructure and services to allow for more life and activities in the lanes. Using new technologies and systems for water, heating, cooling, waste collection, green roofs, etc. How could this be accomplished?
- **Our community needs more greenery but has limited ground space.** Green walls would be an ideal addition, but we don't know how or where to design, build and maintain multiple green walls - both attached and free-standing - inexpensively and efficiently, using volunteer labour.
- **Typically noise (from nearby businesses, etc) is one of the biggest issues that face urban dwellers and is one of the top two-three complaints that the city and residents associations hear.** Can the students undertake a project to work with the Harbord Village Resident's Association to come up with innovate designs that can help abate noise and make the area more pleasant to residents and passers-by. Designs could apply to homeowners (what can people do to block out outside noise), businesses (especially bars and patios, can they do anything to be better "neighbours") and finally city infrastructure (trees, sound barriers, etc.)

### Space or Accessibility

- **Traffic Calming:** Solutions to address access to the Athletic Centre at the Huron St. entrance. During our summer camp program, and at times throughout the year, parents dropping off their children by car contribute to a hazardous zone of pedestrians, cyclists, cars and trucks. Propose changes for a safe drop off/pick up, other traffic considerations and accessible parking.
- **Determine cycling patterns on residential streets Harbord Village.** How many riders go the wrong way, and on which blocks? Are there locations where a contraflow lane might be useful? Are there any unsafe intersections (for bikes, pedestrians, cars)? Are there any opportunities to improve safety through intersection design, signage, bike light change buttons?
- **The Lakeshore/Jameson connection is one of Toronto's most dangerous intersections, and we are looking for ways to re-think the connection on Jameson from the Martin Goodman Trail to Lakeshore Blvd W.** The goal is to provide design suggestions to make a safe and efficient connection for all road users, namely pedestrians, cyclists, disabled, and vehicles.