UBC Social Ecological Economic Development Studies (SEEDS) Student Report

THE HOURGLASS NEW SUB INTERACTIVE INSTALLATION PROPOSAL

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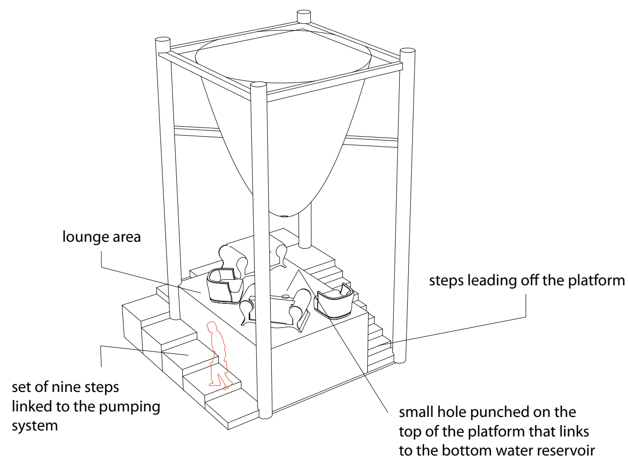
CONCEPT, PROJECT PURPOSE AND OBJECTIVES

While fresh water scarcity is a global concern of increasing magnitude, it is often brushed aside as we do not encounter its implications directly. The goal of this project is to engage students on a daily basis and to point to this international issue.

When faced with an overwhelming global crisis such as growing fresh water scarcity, what power do we hold as individuals and tas communities? Do we have the potential to lend a hand and help improve the situation? The proposed installation is an exploration of these questions. We wished to capture the notion that fresh water is running out, and hence the element of time became an important component of the project. We sought to provide a means for students to replenish this depleting supply.



original concept

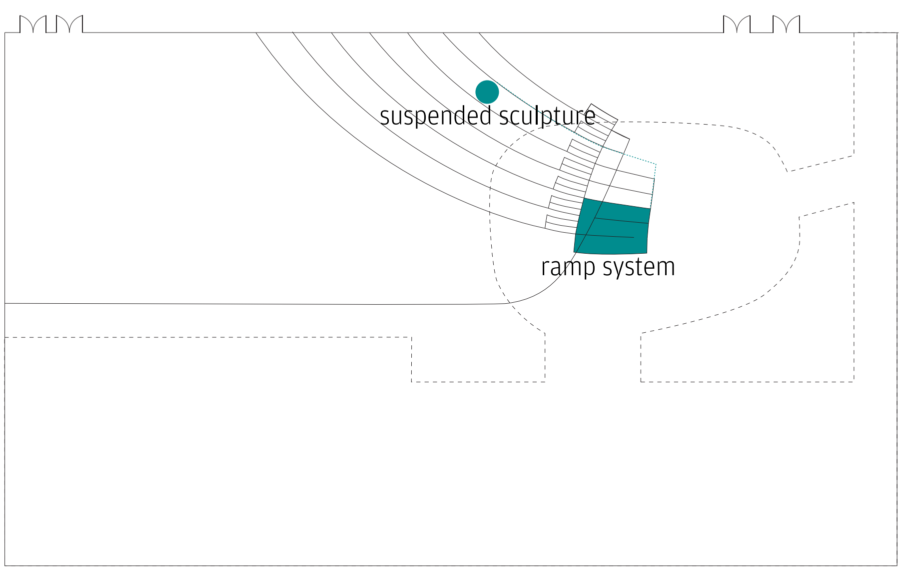
The imagery of an hourglass filled with water drove the early conceptualizations of the project. We imagined the visual power that a leaky container filled with water would have in the new SUB atrium. We then set out to design a kinetic system through which students could refill this container. As the diagram above describes, the original mechanical system used the same principles as our current one, but consisted of a series of steps instead of ramps.

We shifted from using steps to using ramps to simplify the mechanical system and make it easier to maintain in the long run. Moreover, we departed from the generic, rigid form of an hourglass and pushed to integrate the installation into the new SUB. We looked to activate the atrium and enhance its lighting, not impede it.

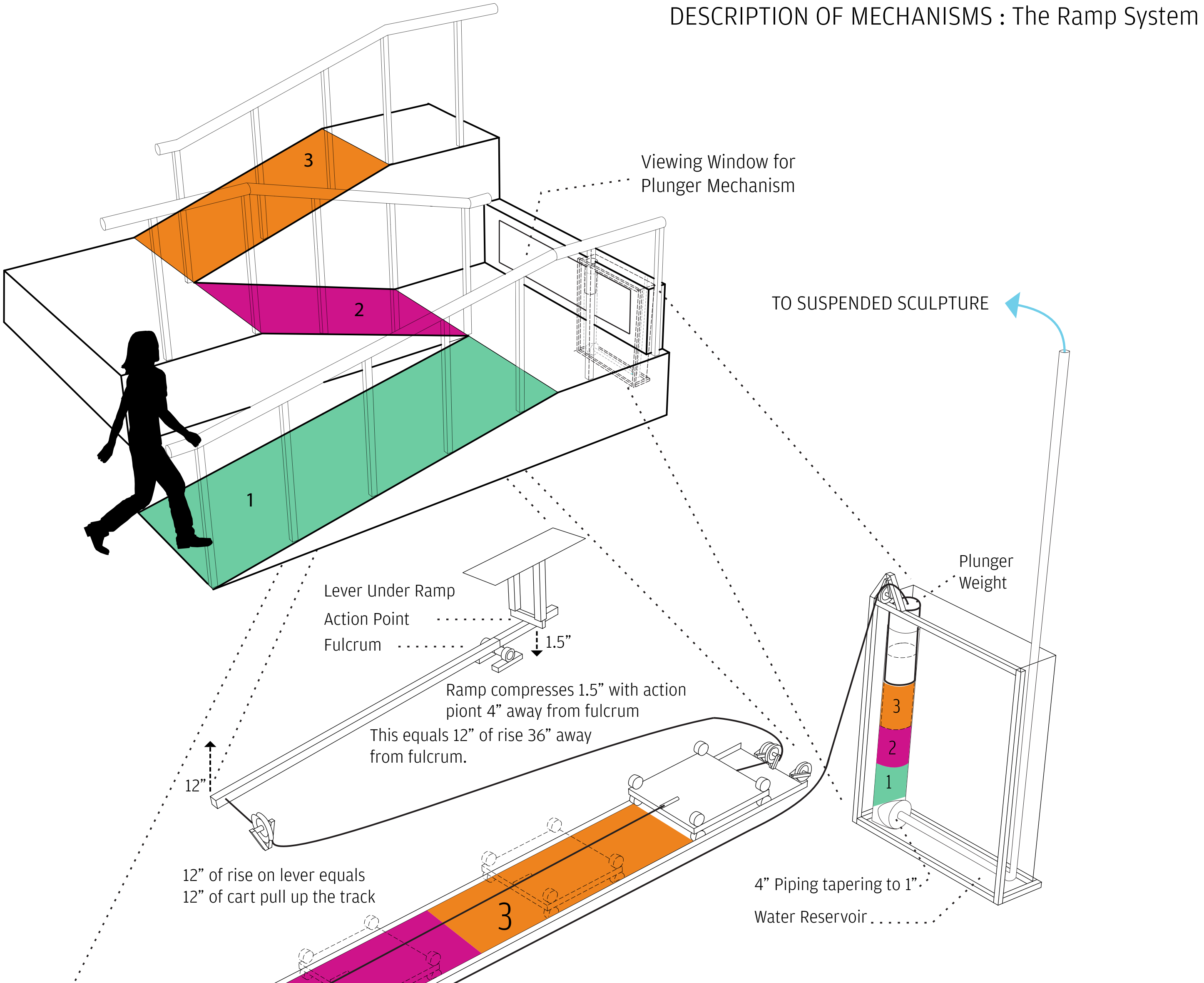
SUMMARY OF THE PROPOSED INSTALLATION

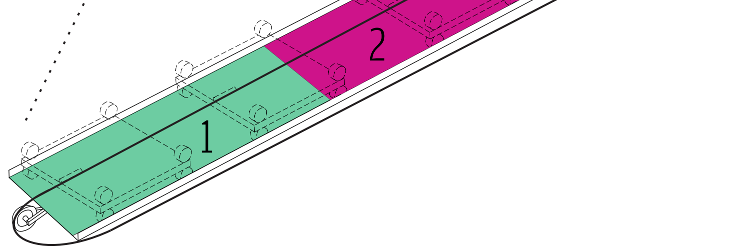
The proposed installation consists of two parts, a system of three ramps embedded into the amphitheater like steps of the new SUB atrium, and a sculpture that is suspended from the ceiling. As participants walk up the ramps, a plunger mechanism pumps water through a pipe into the sculpture. The sculpture expands and contracts as water flows through it and serves as a visual marker of student participation. Once the water has gone through the sculpture, it drips into a metal receptacle located on one of the steps and is channeled back into the water reservoir located by the ramp system. The sound of the dripping is amplified by the metal receptacle and creates a meditative atmosphere in the area directly surrounding it.

When student participation is interrupted, the dynamic components of the installation slowly come to a halt as water fully empties from the suspended sculpture.


suspended sculpture
ramp system

DESCRIPTION OF MECHANISMS : The Ramp System





Prototype achieved 5' of water height from only 6" of plunger drop using a 23lb plunger. Full scale project will achieve 17' of water height by using 66lb plunger with 36" of plunger drop and adjusting lever point.

CART AND TRACK

Each ramp has a lever connected by a cable that grabs and pulls the cart up the track. Increasing the distance the cart travels up the track for further plunger drop can be adjusted by increasing the length of the lever away from action point. For example, if we increase the length away from the fulcrum to 48" with the action point still at 4", the rise would then be 16" for each ramp and 48" for the three ramps.

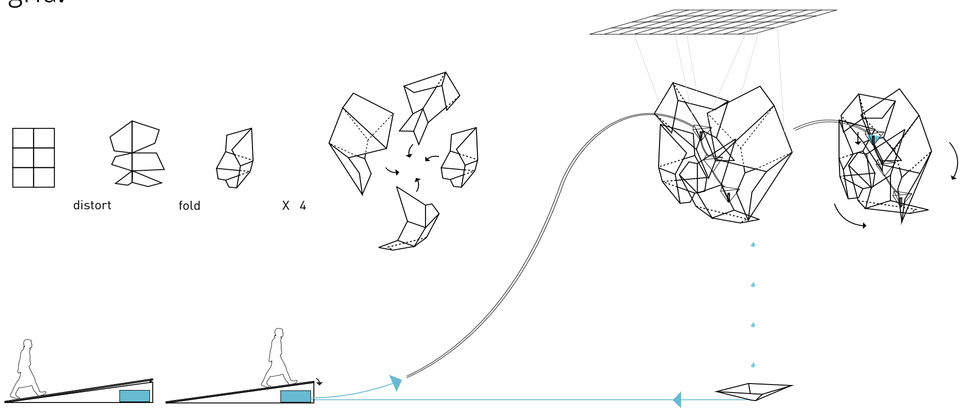
VARIABLES TO INCREASE THE HEIGHT OF THE PUMPED WATER :

a. Increase the plunger weight.
b. Increase plunger drop by lengthening the cart track.
c. Gain distance on track by changing the lever point.

The increase in force to move the lever can be countered by increasing the weight of the ramps, and in turn the spring strength that returns the ramps to their original position would also be increased.

DESCRIPTION OF MECHANISMS : The Sculpture

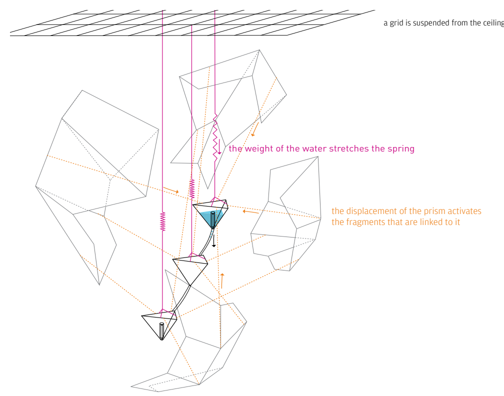
The hanging sculpture consists of four polyhedral armatures. A grid hung from the ceiling provides anchor points from which to suspend the sculpture. Inside the suspended structure, three receptacles are linked by clear tubing. Each receptacle is connected to a spring, which is in turn suspended from the grid.



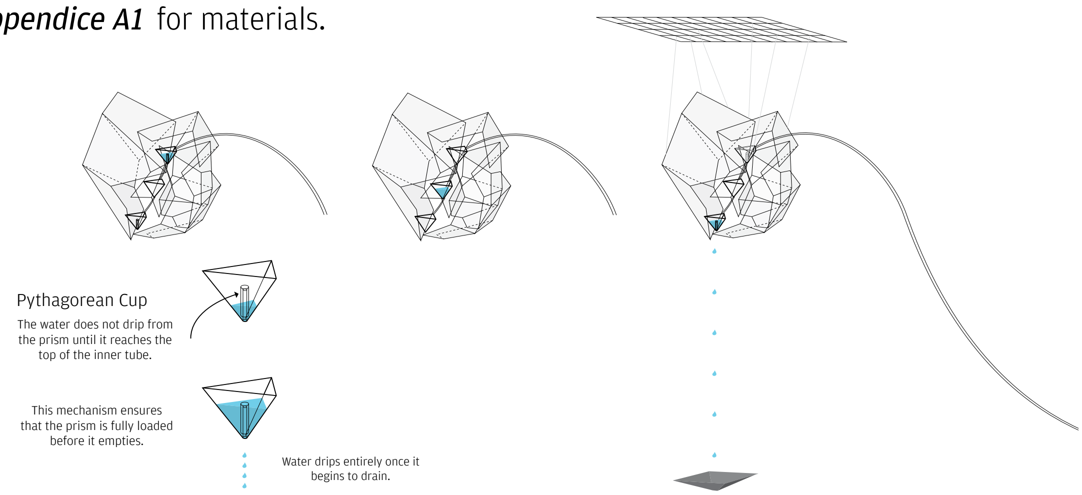
Each receptacle is attached to the sculpture fragments at different points. As the first receptacle gets full, the weight of the water causes it to descend. As this receptacle sinks down, it moves the armature attached to it. As the first receptacle drains water into the subsequent receptacle, it rises back up, triggering a second set of movement.

The water is drained from the first into the second and then the third receptacle, and the process repeats. However, because each receptacle is attached to the sculpture fragments at different points, three distinct sets of motion ensue.

Finally, water is dripped from the third receptacle into a last receptacle at the bottom of the armature structure which leads back to the reservoir hidden inside the ramp system.



Note: This system is closed and the only opening is at the bottom extremity, where the water drips into the metal receptacle below.
See Appendice A1 for materials.



QUESTIONS RAISED DURING THE SHOWCASE : A Dialogue

"How much water gets pumped up? Does it travel all the way to the sculpture after each student?"

The water needs to travel about 15 feet from the bottom reservoir to the top suspended sculpture. A set of one way valves will be installed inside the tube leading to the sculpture. As described in the mechanism description section, the amount of water pumped up depends on ( ). In the scaled-up project, it may take several participants to "pump" the water all the way to the sculpture. The required collaborative effort would in that case add a fitting attribute to the installation.

"how might the ramps be misused? What if students hang out on the ramps?"

It would be difficult to misuse the ramp system, as all of the exposed edges will be capped with stainless steel edges only removed from the under side of the ramps. The pipe that delivers water to the upper part of the sculpture can be stainless steel up to a safe height such that people cannot tamper with it. Tread strips could be added to the platform for enhanced traction and skateboarding prevention.

The system is triggered when the top ramp is stepped on. The person standing on the top ramp, does not have to get off the ramp for it to trigger. The cart that plunges the weight is automatically released as soon as the last ramp is compressed. With the current design, the water will plunge only once even if multiple people stay on the ramps. Consequently, if everyone were to stay on the ramps for an extended amounted of time, the mechanism would not reload until the first ramp is free from loading. The system reloads when the first ramp decompresses for any period of time. Therefore, as long as at some point there is no one on the first ramp for a brief moment, the system will reload. This mechanism could be altered by linking the first ramp to the cart in the same way that the second and third ramps are connected to it. Currently, the mechanism that links the first ramp to the plunger system is slightly different from that which is used for the second and third ramp.

"What if students drop items into the bottom receptacle?"

One could easily imagine that some students may collect the water as it drips from the sculpture into the metal receptacle set on one of the atrium steps. Some may even drop items into it. One approach is to place a "do not drop items in this water" sign. However, placing a griddle over the metal receptacle, a filter in the small pipe channeling water back to the reservoir, and adding chlorine to the water so that it does not become contaminated may be sufficient.

"How is the water channeled back into the reservoir by the ramp system?"

A small flattened tube will be placed in the rise of one of the steps. This tube will need a slight slope so that the water can flow back into the reservoir. The tube will need to be fastened at regular intervals to ensure the safety of pedestrians.

"Are the ramps accessible? If not, could they be modified to become accessible?"

The current angles and length of the ramps are 11 degrees and 2.6 m for the first, and 15.8 degrees and 1.8 m for the second and third. According to the BC Accessibility Handbook, for a ramp of up to 6m long, the maximum gradient is 1 in 10, or 5.7 degrees. The ramps would need to be redesigned to be 5.1 meters long in order to be accessible.

"The suspended sculpture looks quite small in the rendering. Could it be bigger?"

Yes. We placed the sculpture between the glazing and the nested lounge, to highlight the spacial compression of that area. However, even in that location, the size of the sculpture could be adjusted. Alternatively, the sculpture could be pulled further away from the nest lounge and blown up more considerably.

SELECTION CRITERIA : A Response

Integration into the New SUB atrium
Creative, artistic and aesthetic contribution

Aesthetically, we considered how the project would integrate into the new SUB atrium. With the existing design of the Atrium being a high traffic congested space, we looked into designing an installation that could levitate above the ground while allowing itself to be complementary, and non-intrusive to the other architectural elements found in the Atrium, such as the Nest Lounge.

With these considerations in mind, the ramp system is designed to be embedded into the curvilinear steps of the SUB Atrium. The translucent materiality of the suspended polyhedral structure allows for various patterns of shadow to be cast into the atrium but does not impede the lighting of the space.

Reduction of ecological footprint

This installation means to reframe definitions of sustainability and power. It does not necessitate any sources of electrical power but utilizes the kinetic power of participants instead. Most materials used for the prototypes were recycled. For the scaled-up version, we would push to use local and sustainably sourced materials.

Student engagement, education and outreach

An important aspect of our installation is the participation of the student body and public in order to fully utilize the human body to move the mechanics of the sculpture. The participation of individuals as they physically walk on the installation enables the kinetic motion of the sculpture. If there are no participants, the water supply powering the installation becomes exhausted and the hourglass runs out of water. The immediate consequences, the wilting of the hovering polyhedral, is visually displayed as a result. The urgent sense of time and action suggested by the immediate effects of the installation encourages students and the general public to engage in the dialogue of environmental concerns revolving around water consumption - a growing global concern.

Moreover, on the steps located beyond the ramps, we project that students might gather upon going up the ramps. This space has the potential of becoming a forum for discussion around water consumption and sustainability. In the event that this project is taken forward, we will outreach to sustainabiliy student organization accross campus and seek collaboaration: one or several group could for instance use the space for fundraising activities.

Safety, longevity and feasibility

The installation is designed to be low maintenance. With the eventual evaporation of water in the installation, we would seek to involve the UBC Campus Sustainability Office to harvest 50L of rainwater for the sculpture once every year and add chlorine to the water. Another potential collaboration is one with UBC Custodial Services Office. Potential debris in the metal receptacle with collects the dripping water would need to be removed so that they do not accumulate.

The replacement of mechanical parts will be minimal as there are no wear gears, only springs, pulleys, and a cable. The custom manufactured springs that sit under the ramps are guaranteed for life and will sit in stainless steel housing. The mechanical and ramp system is designed so that all cables and springs are easily replaced by simply unhooking them or by unscrewing a couple of nuts. Parts are also common enough and can be easily found ‹ the ones used in the prototypes were all purchased in hardware stores. There will be a side locked door access to all parts that would need to be replaced.

APPENDICE A1 : Materials and Budget for Scaled Up Installation

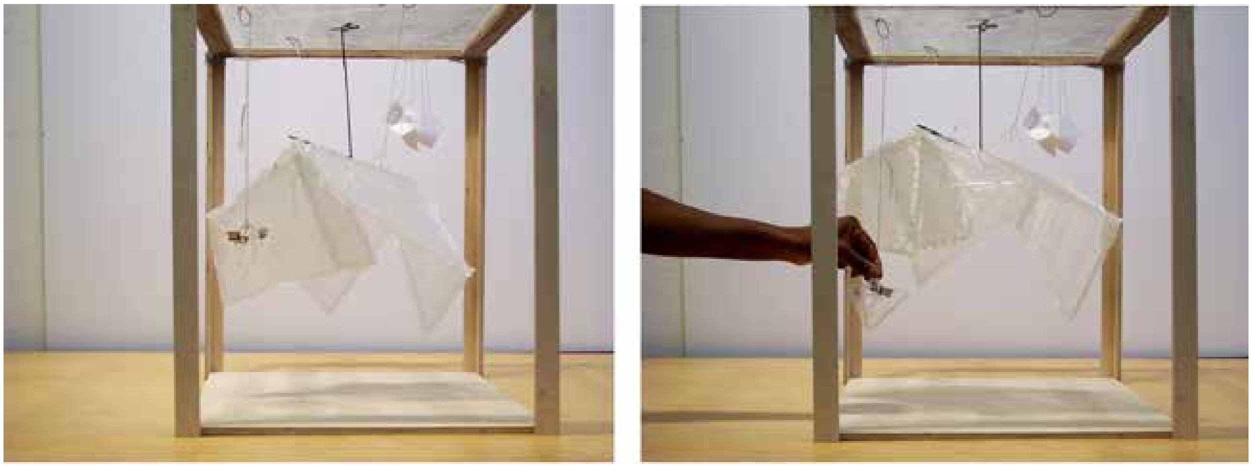
Material and Cost Description at Full Scale			
Material	Size and Number of Items	Price	Material Use
Stainless Sheet	2- sheets 16guage 5x10’	$600.00	water reservoir, stainless framing to cap ramps, cart track
Stainless Pipe	1 -1” stainless pipe 20’	$200.00	Pipe that carries water
Spruce Plywood one side nice finish	14 - ¾” sheets 4x8’	$447.30	ramps and exterior sheathing
Pine	10 - 2x6” studs 16’	$77.50	ramp and platform framing
Pine	24- 2x4” studs 8’	$68.16	ramp and platform framing
Pulleys	10	$200.00	aircraft cable guides
Aircraft cable	1 roll 1/8”	$10.00	pulling system
Custom springs	3 manufactured springs	$100.00	ramp return system
Cable connectors	8 connectors	$5.00	cable ties
Plexi glass	1 - 1/16” sheet 1x2 ’	$10.00	plexi glass prisms
Rubber matting	27’x3’ of rubber matting	$300.00	applied on ramps for traction
Wood or steel	31.5 ’ of railing wood	$1000.00	railing
	or steel	$2000.00	railing
Carbon Fiber	48’ of 1/8 carbon rod	$100.00	framing for suspended sculpture
Mesh	roll of nylon meshing	$20.00	envelope material for sculpture
Metal Shop Time	estimated 100hrs $30 per/hr	$3000.00	access to full metal fabrication shop, fabrication of new pully and cart system
Total		$6537.96	if steel railing is used
Total		$5537.96	if wood railing is used

APPENDICE B1 : Process Pictures

Showcase Presentation

1st Prototype : Step System

2nd Prototype : Ramp System



One fragment of the sculpture : the plexiglass prism is pulled down to represent the weight of water pumped into the sculpture. Four such polyhedral fragments make up the whole sculpture.

The Suspended Sculpture : Brainstorming

Model Making