PROJECT PROGRAM- The function of the building needs to resemble that of a machine. Each piece needs to serve its purpose with utmost efficiency due to the desired small building footprint. The space is divided into two main components with two minor additions. The two main pieces involve the restaurant area with community gallery and the research lab for the university / EPA. The two additional spaces include the boat washing station for exiting boat users and the marina area at water level. The restaurant space needs an approachable entrance linked with the gallery space to provide a cohesive dining experience for visitors and locals.

The goal is for folks to enjoy the more relaxed recreational end of the project after work or a day on the lake. This involves elaborate landscaping, views to the lake and an open concept feel. The public part of the lab is to be very welcoming for groups of tourists or students, so it needs open spaces with display areas and views to the lake. The lab also needs to have a balance between showing off exciting work and the privacy needed to conduct experiments as well as put on exhibits and classes for the university. This requires two entries, one for the restaurant and one for the lab space. The additional spaces are able to function on their own aside from the two main spaces as boaters must have access at all times.

DESIGN PROBLEM- This thesis dives into the conflict of building vs the shoreliness of MN. The idea is to create a design concept that doesn't simply prove to be resilient against the harsh shores of Lake Superior but to become something that actually gives back to the environment. This means offsetting the amount of harm it may be doing, and then some. All this is to be accomplished while also creating a space for the UMD and EPA folks to conduct and present their research to the public. In addition to this there must be recreation and relaxation spaces so all people to enjoy the building and the shoreline.

SITE- The project is located on the north eastern edge of Duluth Minn where the Lester River meets Lake Superior. While this site proves to be a great feat of a buildings strength against the shoreline it also becomes quite a challenge. There are many competing factors such as:

-Boat trailer parking

-Entering and exiting on to busy HWY 61

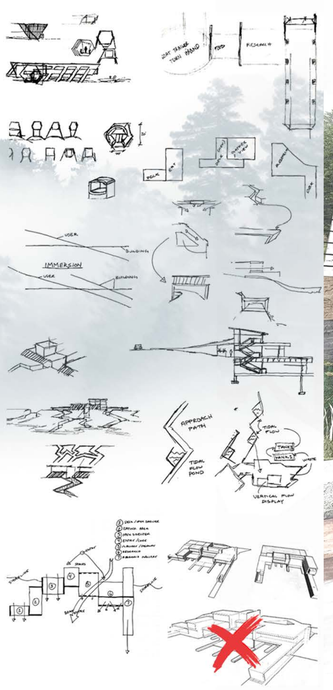
-Aggressive north westerly winds creating large waves

-Keeping enough beach space on the western side of the Lester River

-Not blocking the lake views from HWY 61 and the houses to the north

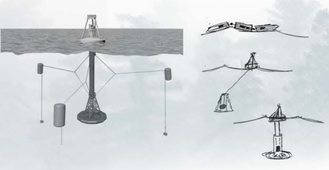
HISTORY- Though the Lake Superior shoreline has been developed in many different ways ranging from Native American dwellings to logging and mining facilities, the basis behind this project is centered around community use and research. The history behind this typology resides in the old Duluth Fish Hatchery, or what is more recently known as the UMD Limnology Lab station. Though the building has been closed since 1977 the site is still known for its interaction with the health of the lake and association with water research. While the general language of the building is not entirely seen in the project design the framed roof style is.

DESIGN PATH 1- This first design path was highly based upon the programmatic needs of the project with inspiration coming from the sense of immersion people get when they enter the water from a beach.



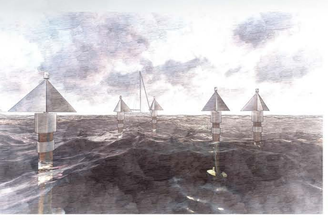
ISSUES AND SOLUTIONS- These types of projects are known for their negative impact on the environment via immediate decay or decay in the future. This means that steps must be taken to both protect the building from factors that could increase this decay as well as steps to give back to the environment to offset what it's presents may take away.

A goal was for the building to immerse itself into the steep landscape of the shoreline while the entry paths allow folks approaching to feel the same.



A living machine design was introduced to this concept as another way for the building to connect and give back to its local environment.

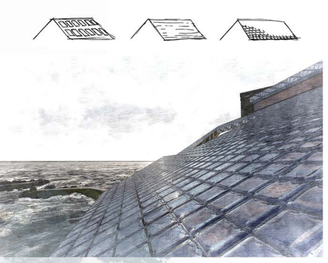
Turbine buoy – The Turbine Buoy is a combination of both a low rpm wind turbine system and a wave power buoy. It allows for renovable off shore energy generation that takes advantage of the constant wind and waves produced by the lake.



Although many of the design concepts introduced in this option carried through to the end of the project, the bulk of the design was deemed too heavy handed and simply didn't put enough poetic emphasis on the site and its surrounding beauty.

BREAKING THE ICE

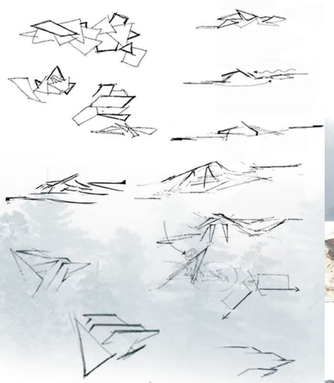
A TRANSPARENT EXHIBITION

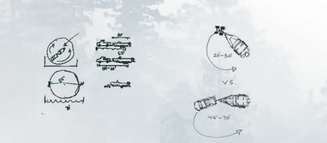


NEW INSPIRATION- A major redesign of the project came mid semester with the new seed of inspiration being the phenomenon of "ice stacking" on Lake Superior. This happens when the lake freezes 1"- 6" and then a breeze comes and pushes the sheets onto shore resulting in a chaotic breaking and stacking of ice plates.

Roof – Three options of solar roof were explored, ranging from a panel array to a full solar sheet, and the Tesla solar shingle system. The shingles were chosen for their aesthetic appeal, allowing for solar energy collection while matching the architecture of the area.

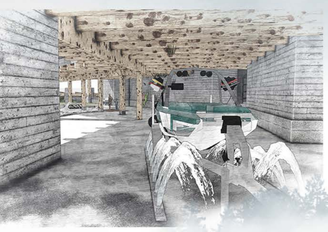
DESIGN PATH 2- The form of the project redesign was based off of the in depth study of a section of ice stacking. Taking note of the unique forms overlaying and reflecting off of one another created a lot of opportunities for a design concept.

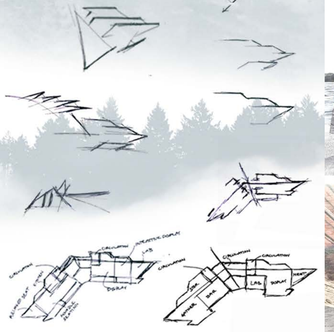




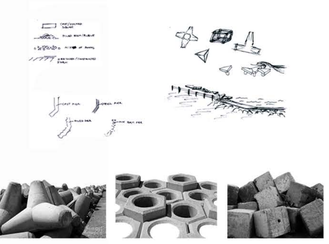
Through the design process I am taking a look at each form potential on both a plan or elevation option. With this in mind I then adjust the forms to fit the building programs needs while still keeping the sense of "ice stacking" in tacked.

Cleaning – Boat trailer maneuvering and cleaning were a large concern because of the square footage they would take up. There for this project proposes small electric rovers that pull the trailers from the parking lot and launch the boats via GPS and remote. These robots are able to turn a boat around in half the distance and also scan the boats for invasive aquatic organisms in the cleaning area. This will speed up the docking and cleaning process for boaters.



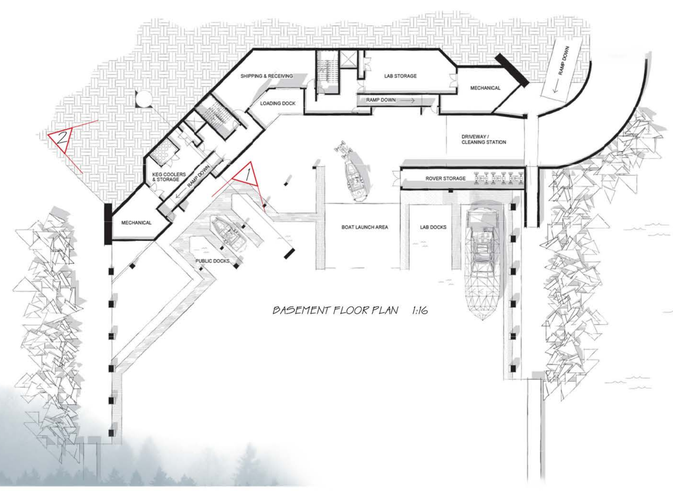


The symmetry of the design comes from a reflection found off of one of the ice plates in a photo that had been studied. This reflection resulted in the same general form but with added length, which worked out very well of the additional space needed in the laboratory wing.

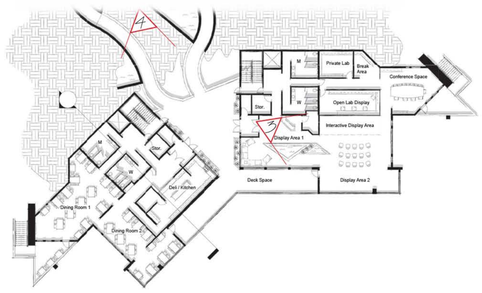


Wave Breakers – These have been used around the world to mitigate the damage to safe harbors induced by large swells during storms. There are many different manufactured options but custom breakers that match the inspiration of project were the appropriate option.

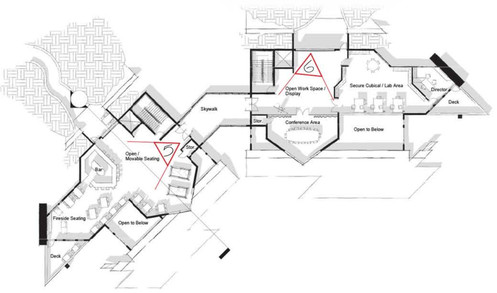
With the allotted time for design coming to a close this option proved to be much more fitting for the project and the site than the previous iterations. Meaning, this is one right answer.



BASEMENT FLOOR PLAN 1:16



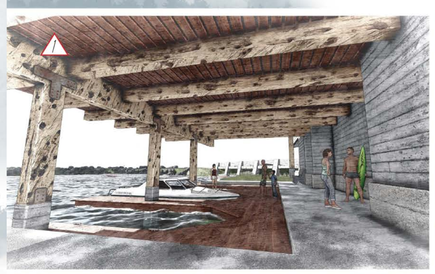
LEVEL ONE FLOOR PLAN 1:16

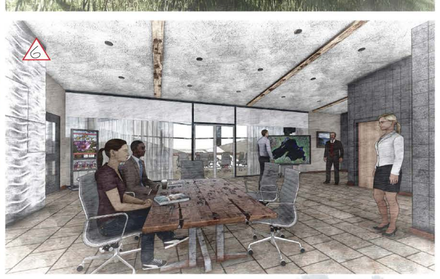


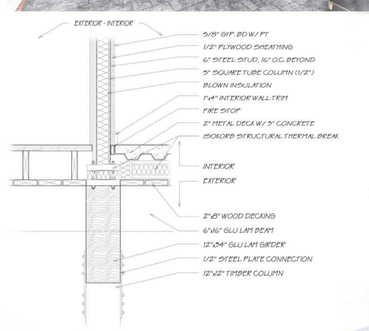
LEVEL TWO FLOOR PLAN 1:16

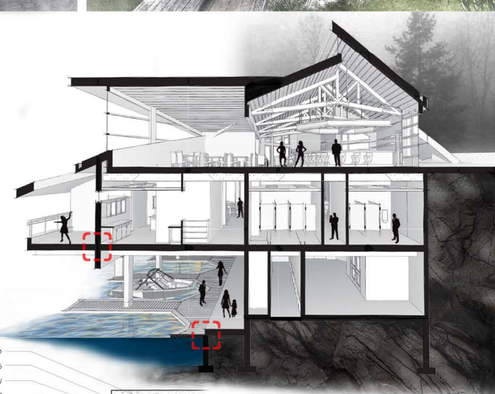
In the past there has been a unique stigma with boathouses and their harsh effects on lakeshores within Minnesota. This finding has led to them either being banned or putting limits on their repairs, but this may not be the correct answer to the issue. Rather than letting these buildings crumble into the land over time, the better choice is proper removal and replacement with a superior design. Through this large scale boathouse paired with a multi-use marina based on Duluth's lakeshore, we are able to set the new standard for what it means to build along a shoreline. This facility displays the potential for a long term solution to the current issues related to boathouses on Minnesota lakeshores. The architecture creates a space that not only educates visitors about the aquatic issues paired and their ideal solutions, but draws folks into the unique relationship between building and shoreline. Displayed in plain view, are the proper foundation, structure, architectural style and material use which all sum up ways to limit negative impacts on the local environment.

To truly drive home the importance of this facility and its improved educational and environmental impact, it plays host to multiple venues that help to deliver this message to the public. These venues include educational lab area, recreation, eating and event spaces. The tenants that fill these areas include the local colleges paired with government entities (EPA) and private party restaurant owners. This thesis dives into the issues encountered in the past along with potential solutions for the future. It is all done with the hope that a connection between unique aquatic research education and the curious public may be made within the architecture of this design. With the end goal being to better the health of our lakeshores, both on a micro and macro level scale.









WEST ELEVATION VIEW 1:16

SOUTH ELEVATION VIEW 1:16

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