C A M P F I R E

BERGEN INTERNATIONAL WOOD FESTIVAL 2016 | DESIGN COMPETITION

STEFAN BERRY | 20322270 | ARCH 686 COMPETITIONS ELECTIVE



Festival Team | Maple Buddies

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Design
Build

D E S I G N

Fig. 1 - Bergen, Norway - Site Context

Green Transition was this years theme for the 2016 Bergen Biennale International Wood Festival. This festival has been installed to celebrate and promote the use of wood in the construction industry from the wood producers of Norway. But even more so it is to showcase the adaptability and creativity that can be constructed from standard members of wood. The organizers urged participants to "challenge wood constructively, structurally and in terms of form. The festival is intended to inspire people, developers and the business community to use wood more."[1]

The site of this years festival was located along the inner bay of Store Lungegardsvannet, a linear park along the shoreline that connects the city centre to some of the outer residential neighbourhoods at the foot of Mount Ulriken. Paths follow parallel to the waters edge from one end to the other with trees and shrubs scattered throughout. Water was on one side and the rail yards were on the other, the width of the park varied at points from 15-20 metres at times. It also became evident when we picked our work site within the park that the whole waterfront in which we were located was an infill redevelopment based on the subsoil conditions we found while digging the pile holes for the base of our structure.

Norway has a long history tied to the use of wood in construction. The vernacular architecture is predominantly constructed with wood due to its abundance and adaptability in a country where the environment can be harsh and changing from season to season. Many of the Norway's oldest structures were built using heavy timber and wood. Timber is a modest material and abundant throughout the country, stone is abundant as well, but it takes a more energy to construct a building from stone than wood does. Therefore, only the wealthiest could afford stone construction, it took time to shape and move the material and in finished buildings it was not the greatest insulator so fires within had to be bigger and burn more to keep it warm.

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1 Wolff, Simon. "Bergen International Wood Festival". 2016. http://www.bergenwood.com/nyheter/2016/3/16/kiohgm5gusrmsnyinawyfurcr102w4

Fig. 2 - Traditional Architecture

Fig. 5 - Norwegian Mountain Hut

Fig. 3 - Prostho Museum/Kengo Kuma

Fig. 4 - Campfire Gathering

Fig. 6 - Firepit Pavilion

When beginning discussions about designing an entry for the festival we talked about creating a structure for the gathering of people, a place to rest and observe and investigate the structure we were going to build. We investigated shapes, rooms, indoor and outdoor spaces that we thought would create inspirational ideas and would connect with our entry them of campfire. Our research began by looking at traditional Norwegian mountain cabins and fishing huts. Both of which were small spaces with simple wood frame designs to separate the exterior from interior.

Norwegians value their natural landscape and the outdoors in the same way that many Canadians value an outdoor lifestyle. Both cultures have a deep connection to the nature and the wilderness that makes up most of the countries geography. When venturing out into nature, the communal gathering space is usually the campfire area. With that in mind, we titled our project "campfire", as a place within the city that could be a gathering place for people to come together. Instead of the focal point of the space being a fire pit we planted a sapling tree amoungst a mound of dirt and stone. Designed as a contemplative space, we wanted people to gather around a single growing tree, observing its complexity and fragility which usually gets lost when a sapling grows in a forest amoungst thousands of other forms of vegetation.

The use of wood as a building material was also very familiar to the people of Norway, as they are a seafaring nation and particularly apt at boat construction. Wood is a material that is easily transportable, in a country filled with vast waterways and rocky terrain, it can be moved relatively easy from one location to another. The method of building in less desirable locations led to the construction of buildings being done by placing them on piles and stilts (fig. 2+5) either into the ground or settled on weight transfer groupings of stone. This meant that their structures could be built on the rockiest of terrain, but it also provided protection from rotting wood as the structure was elevated from the ground were moisture would accumulate.

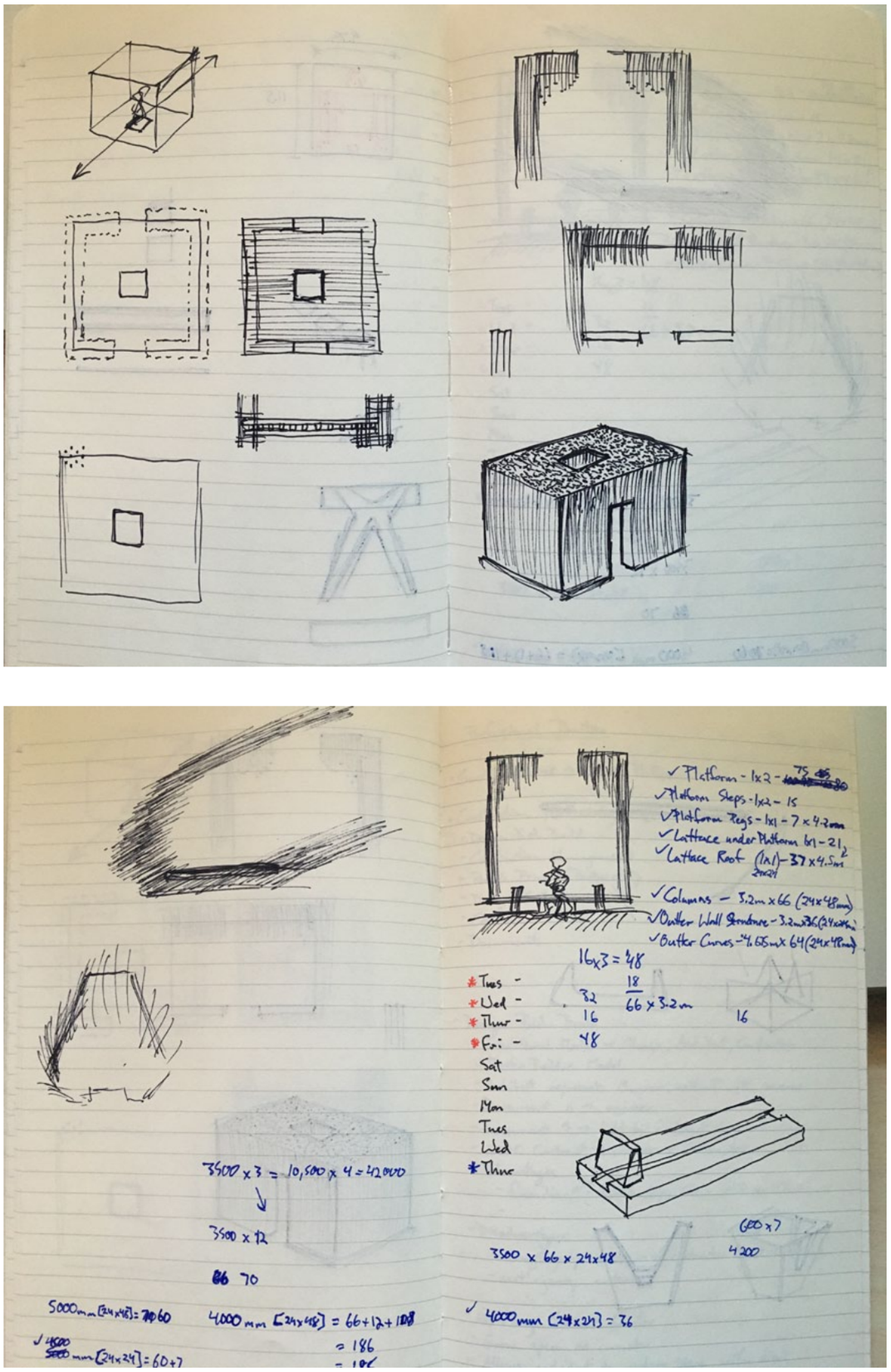
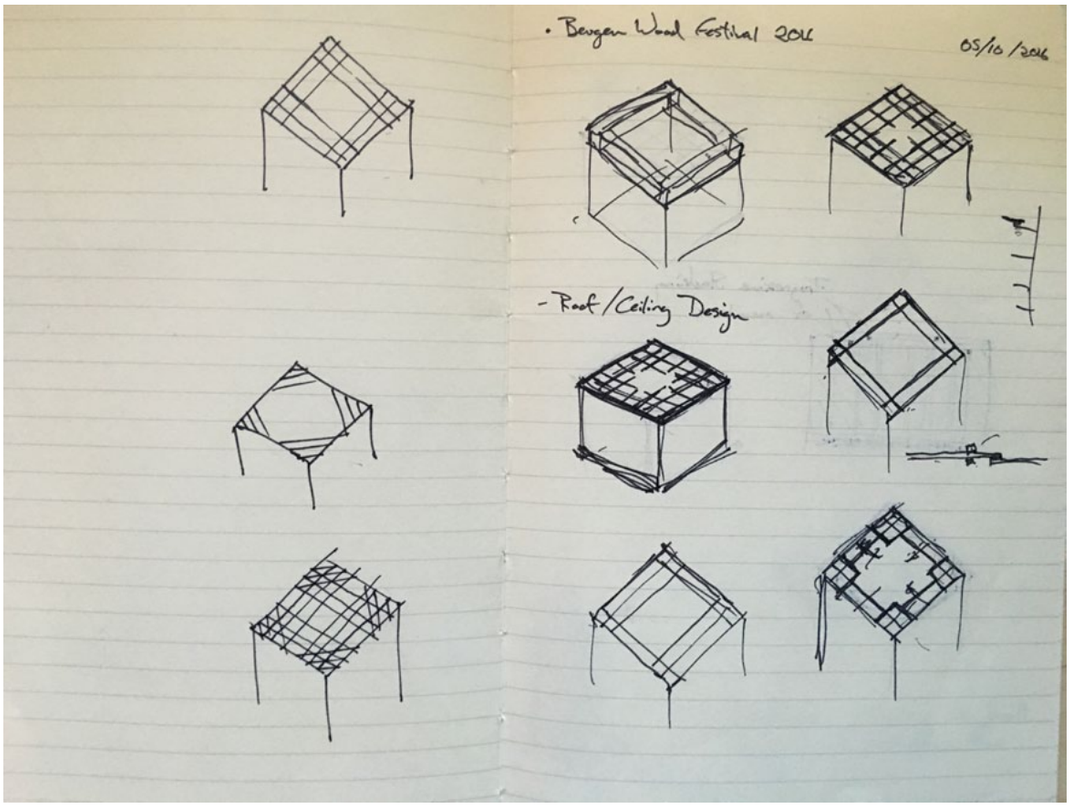


Fig. 7 Preliminary Sketches/Concepts



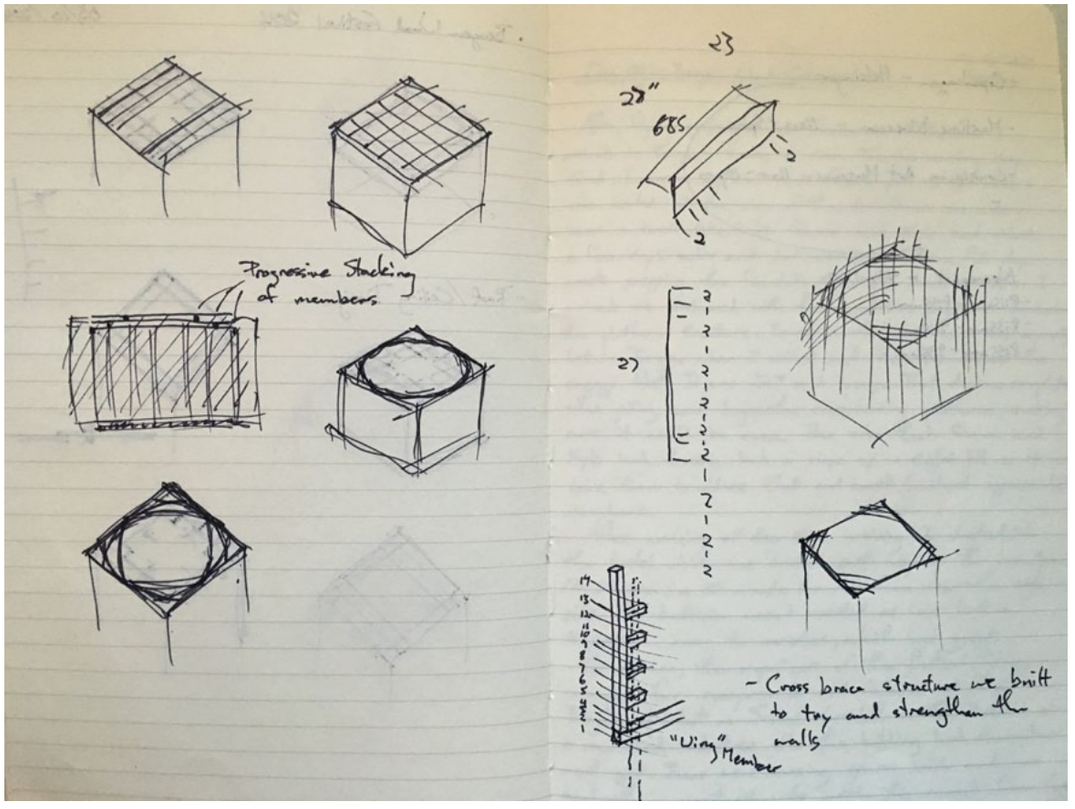


Fig 8. Pavilion Structure Concepts

Fig. 9 - Concept Sketch

Fig. 10 - Conceptual Render

Wood has internal biological cell and fiber structure that makes it suitable for building with conditions of tension and compression present. The fiber strength of wood varies through the different varieties, between hard and soft woods. We were informed that the wood we were given was Norway Spruce, a commonly used softwood harvested and produced within the country. Its colour comes off as a neutral to warm creamy white with a hint of yellow.

We looked at examples of other pavilions, wood structures and geometry that created an interesting narrative and spoke to the way wood has been intrugel throughout architecture from very basic huts to elaborate and intricately designed structures. Small gathering spaces, place that were intimate are what drove our mindset. When looking at images of campfires (fig.4+6), there is a spatial quality there that is usually overlooked. That of the clearing created for the fire surrounded by a perimeter line of trees. In between the firepit and the perimeter are usually some sort of elements for sitting whether constructed or found they are often the place for rest.

We looked to geometry to help use create proportions that were appealing to the human eye. Using the golden ratio, in plan becomes and elevation, and an overlapping of horizontal and vertical members. The project, Prostho Museum Research Center by Kengo Kuma (fig.3) inspired our structural design and connection process. As well, we looked at the visual effects of simplistic repetitive work as viewed from different angles achieved in that project and wanted a similar replication in our project. Certain angles obstruct visual capabilities while others allow someone to see through.

Fig. 11 - Conceptual Massing Render

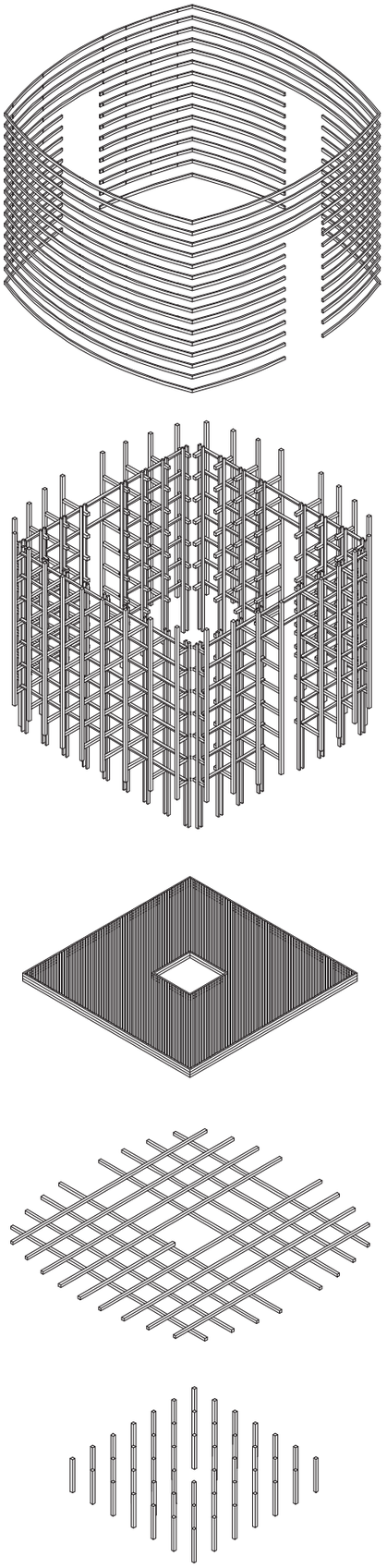
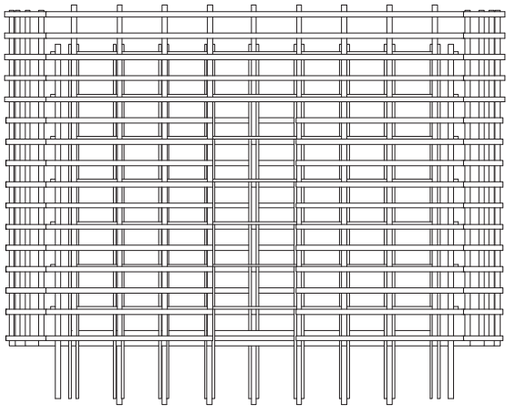
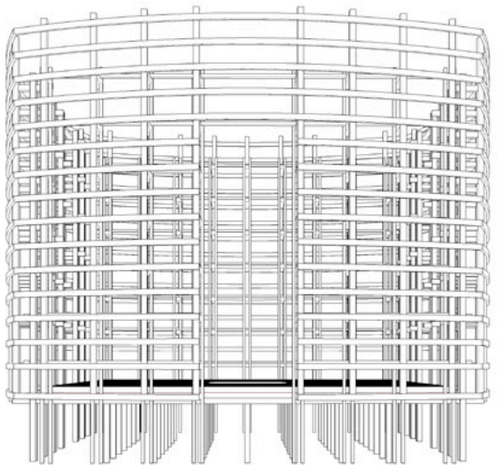
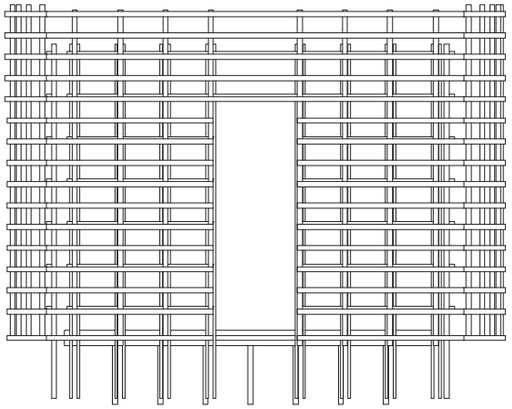
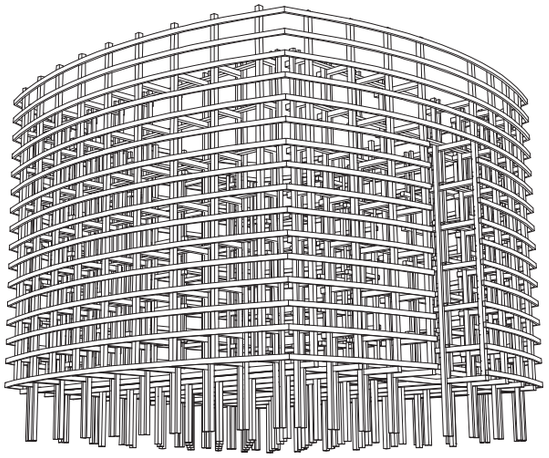


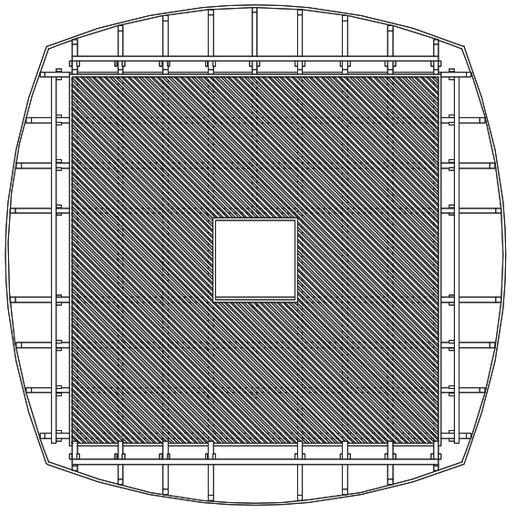
Fig. 12 - Exploded Axonometric











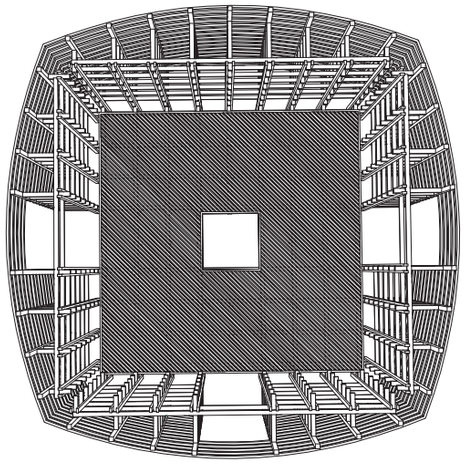


Fig. 13 - Final Design/Building Drawings

The transfer from paper to actual built form was complete and there was a sense of balance between the site and structure. The scale, proximity to the pathways, interior space and proportions made for an appealing structure that used the material of wood. According to "Beneath the pleasure generated by the juxtaposition of order and complexity, we can identify the subsidiary architectural virtue of balance. Beauty is a likely outcome whenever architects skillfully mediate between any number of oppositions, including the old and the new, the natural and the man-made, the luxurious and the modest, and the masculine and the feminine."[1]

The standard wood members provided to each team were 1"x2" and 2"x2" cuts at various lengthes, but many were 10'-12'. With these, each team was challenged to exploit the natural structural and design capabilities of the material. We were provided tools and screws/nails to adjust and fasten the wood to our liking.

Part of the design process involved us estimating the amount of wood, and each size type, we thought we would need to build our pavilion. Our rough calculations, based on our design, were around 300 24x48mm members and 150 48x48mm members and we were told that the lengths of each member would be roughly 8" to 12". Once we were on site and building we made changes to our design, as mentioned before. The number of lengths needed did not change too much, but rather the types of each length changed. As we had changed out the decking members from 24x48 to 48x48 pieces. Out of curiousity we also wanted to estimate the cost of our pavilion based on the materials used. We did our best to try and find the price from Norwegian suppliers but this became a little difficult. So we turned to the Canadian wood industry for their price on the same wood sizes and used that pricing. With the wood, used and scrapped, screws and nails we came up with a price of $523.98 CAD

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1 Botton, Alain de. "The Architecture of Happiness" Pantheon Books. New York, New York. 2006.

B U I L D

Day 02 - Columns/Crossbeams

We began by creating a solid foundation to support what would be the rest of the structure above, as well as additional forces from people moving on the platform. Our design wanted to create the effect of the entire structure floating on thin vertical members. Using 48x48 member pieces cut at various lengths we began to place piles into the ground. Because of our choice of site, the ground plane was not flat but rather on a small hillside, we had to make sure the top of all the piles was level. An issue that arose early on was the fact that while digging holes for the piles we realized that the soil below was part of a reclamation of the land and contained rocks and concrete pieces. These two factors slowed our pace down for the first two days, but we were able to get the wood members in the ground in the grid pattern that we desired.

The cross beam members were then positioned across the face of the piles/columns to begin to connect them together and add stability to them as a whole. This was the primary purpose for these members. But they also were cut at specific lengths so that they would hang out from underneath the platform (that would be built next) and provide a connection point from which we planned on fastening the 'wings' to the frame. The beams were laid out to create the grid pattern, based loosely on a beam and joist system found when floor framing in a building or outdoor deck. "The simplest method of beam and joist framing is to have the joists rest on top of the beam, in which case the top of the beam is level with the top of the sill plate."[1]

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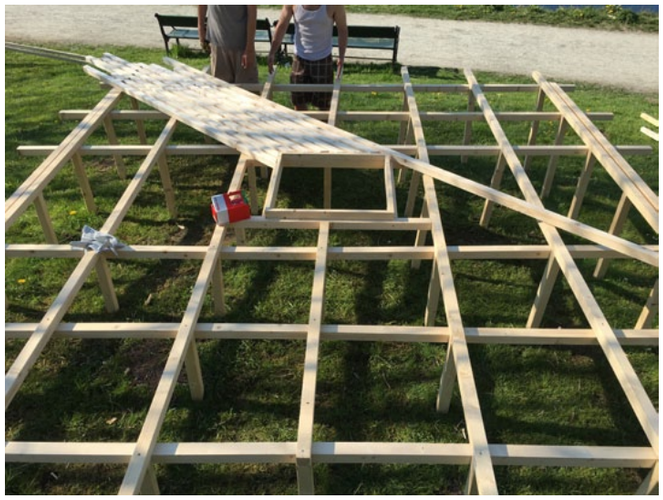
1 Kesik, Ted J. "Canadian Wood-Frame House Construction". Canada Mortage and Housing Corporation. Canada. 2003



Day 03 - Platform

The decking portion was to add some of the greatest rigidity to the structure. This is because it acts as the joist portion in the flooring system, laying on top and fastened to the beams. In our initial design we had planned to use 24x48 members of wood but due to a lack of that wood type that day and the realization that it would take longer to cut more of those type members, we decided to use 48x48 pieces. We used the centre square opening as a set point from which to begin laying out the members at 45 degree angles in relation to the cross beams. To create even spacing between the diagonals we used 24x48 pieces. As the assembly moved along we could feel the overall structure becoming more solid. To save on time we left the ends of the members at various lengths and decided we would use a circular saw and do a run on each side to cut them even. After laying the deck, we wanted a more finished look so we capped the edges with 24x48 members, on both the exterior and the interior opening.

Day 04 - Wings/Walls

The next step in the process was to create what we called the ‘wings’. These were pre-assembled members of 24x48 and 48x48 pieces precisely measured and custom fit to each placement along the cross-beam structure. Each side had six wings except for the side facing the water which did not have an access opening and required seven wings. Because of the terrain we had built on, the slope meant that we had to adjust the individual heights of each member so that the tops would all be level and consistent around. We fastened each wing into place individually, finishing one wall at a time, and connecting the wings on each side by taking 24x48 pieces and interlacing them through the inner lattice of the wings.

Day 05 - Facade/Roof/Seating

Once all the wings were up we could then focus on one of the last elements to place on our campfire pavilion, which were the bows that would create a curved vented façade on the exterior. In our initial design we had created an equally spaced number from bottom to top providing greater density and obscuring of visuals in and out. When it came time to place the bows on the wings we realized that we had run low on time before the judges were to come around and look at our work. So we made the decision to try and create a gradient of bows with the density and number of them thinning out as they were placed from bottom to top.

One item we decided to leave un-designed, and to the end of the build, was a roof structure that would fasten and connect all four walls together. We came up with many concepts and tried a few out, but settled on one that would leave as much of the canopy top open. We took 24x48 members and diagonally at 45 degrees attached them from one wall to the next at the corners. This provided some much needed stability and prevented the walls from shifting and moving independently from one another.

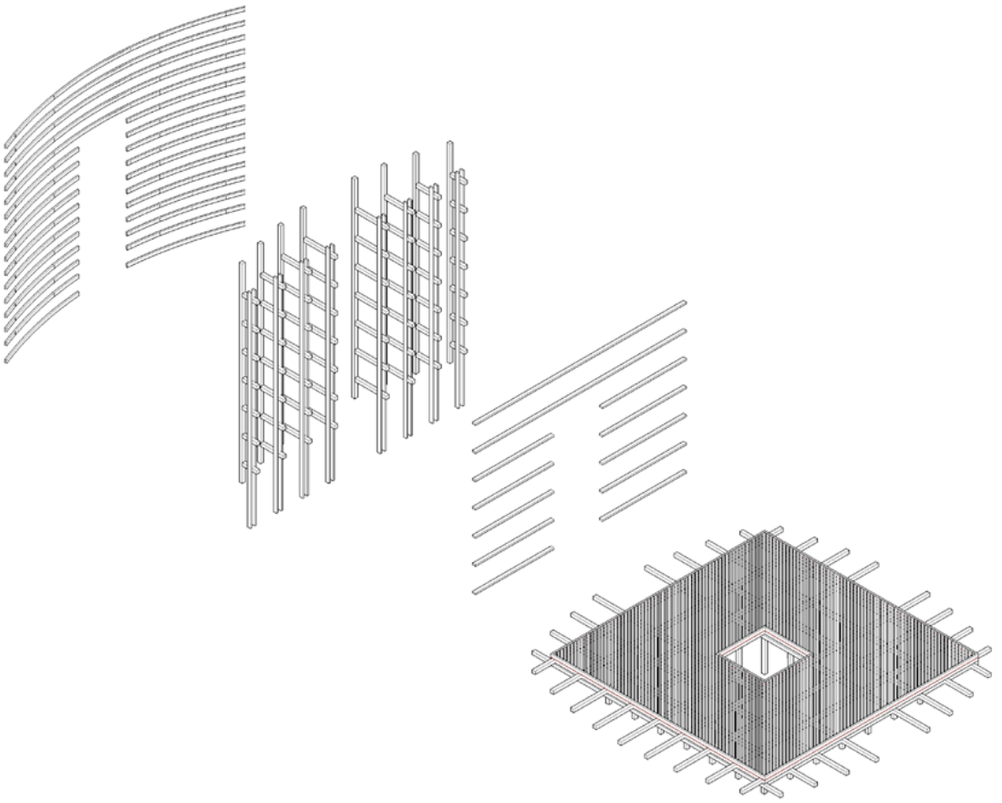
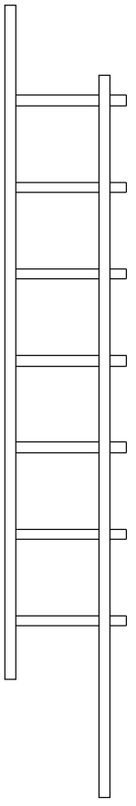


Fig. 14 - Exploded Wall Layers



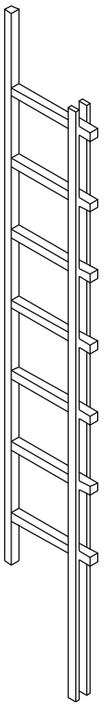
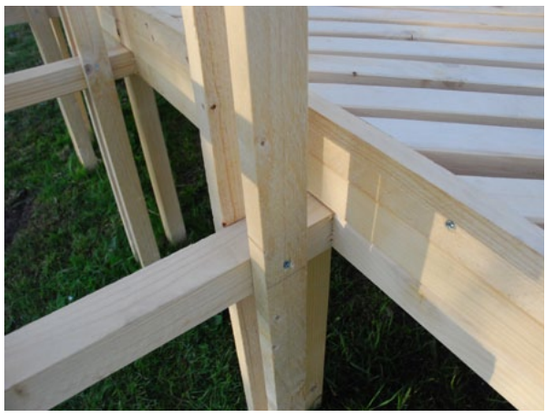


Fig. 15 - Wing Structure



The process of assembly was a process that we needed to figure out and create a timeline in which we could complete the construction of the campfire pavilion. We created parts that would overlap, interlock and connect in certain ways to increase the strength and the visual appeal in the complexity at a small scale compared the the overall look of the pavilion. A visitor only recognizes these intricate parts of the design when up close and within the structure. There you can see the complexity and design work that went into utilizing the material.

The Wings were constructed seperately, using 24x48 and 48x48 members fastened together, inspired by interior stud and exterior facade systems we created a hybrid element that formed a wall assembly.

From concept to design refinement to actually building the pavilion, I felt like it was a great progressive process we went through. As with most design projects , more time could have been spent figuring out certain design issues before travelling to Bergen, but with limited time between us teammates and our end of term school commitments it was good. Our site selection, though not ideal due to the slope of the ground plane, actually made for a more unique and interesting juxtaposition between it and the level plane of the decking. Because the pavilion was placed higher up on the slope, people walking along the adjacent pathway along the water were just below eye height of the deck. This allowed them to see the change in the ground plane through the field of structural supports holding up the structure.

Day by day we had a planned schedule of what tasks needed to be finished that time so that we could complete the project by the end of day on Friday. Issues arose during the construction that were unforeseen at the beginning which challenged this plan. One was the lack of decent tools to be shared amoungst all groups, some drills were just not powerful enough and the batteries died pretty quickly. Which meant that we had to have a charger on site charging multiple ones at a time. Another issue was the distribution of power to the site, because it was in a park the organizers had to bring in gas powered generators and extension chords to allow each group to use the tools given to them. During some of the days the generators ran out of gas and there was none left to share, so there was time spent waiting for important cuts to be made because of no power source. Finally, one big issue was the lack of 24x48 members near the end of the competition. When all groups submitted their initial design proposals they were also suppose to submit an estimate of how many members of type of wood they would need. It became evident that many groups did not and so the type we need was not available until the second last day of the competition. This put us behind a bit, but we got as much done as we could without those pieces we needed and were ready for the moment they would arrive.

The festival provided a great outlet to create a temporary architectural structure to engage the public with the material and design project. Locals were able to see the variety of projects being built during the week and finally interact with them once the festival was done. All the pieces produced for the festival were left up in the park for roughly 2-3 months. While building our project a local woman came by to chat with us was excited to have a place to bring her grandchildren within the park that wasn't just empty space. Our pavilion, and all the other projects, added interactive and exploritory spaces that caused people to pause and slow down within this linear park.

Through the years of school, design and concepts have been the extent to of which our work would proceed, aside from work terms within offices. Paper and found in the digital world was the end for many of our projects and implimentation of actually building them was never something that had to be pursued. This festival allowed me and my fellow teammates to design a project that we knew we would have to construct ourselves within a defined timeline. Design to build has issues that arise that you don't realize until you actually build something you design. Our design had to change slightly due to supplies, time constraints, tools, and lack of power supply at times. I was glad that we had created such a comprehensive design package, which we had with us while building, because we were able to refer back to drawings and make estimates for lengths and numbers pretty accurately.

If more design projects throughout the education process could be one to one build projects it would allow students to understand site, scale and process to a greater degree. Being fully immersed in a site for a week straight, 8am to 6pm every day, allowed us to understand the way light moved across the site, how people moved through and around the space. The design to build process was a great learning experience and will be something I will consider doing again.

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