Interdisciplinary Studio Pavilion [ISP] 2019

Gannon Van Sickle
California Polytechnic State University
San Luis Obispo, CA

An Interdisciplinary studio involves different knowledge disciplines who work together to achieve a common goal. This project engages this idea with three different majors. Our objective was to create a Pavilion to display wine history artifacts from the central coast. The project teams consist of architecture, construction management, and structural engineering majors. Each group was tasked with designing a portable pavilion that would achieve the desired objectives of the clients. At the end of the quarter the client will choose which project to be built. The roles of the different disciplines overlap, creating a project viewed at from many perspectives. This collaboration avoided clashes early on in the design and enabled an easier solution. As the construction management major in the group, the main input was in the logistics. We managed the constructability throughout the project, created an assembly package, tracked cost, and coordinated fabrication and transportation. The pavilion we designed is a HSS superstructure. This structure supports the form and display areas for the wine artifacts. No heavy equipment can be used for assembly and disassembly. Responding to that, we created a bolted assembly for the superstructure and a modular construction for the form. Were it not that this was an interdisciplinary studio, we would have not been able to design a project that responded to all the client's needs.

Key Words: Interdisciplinary, Pavilion, Assembly, Logistics, Coordination, Client

Background

The narrative of the WHP is a broad narrative of the viticulture environment: agriculture, land use, crop selection, the economic vitality of the county, and the relationships among the people who form the history of San Luis Obispo County. The purpose of the ISP 2019 project is to design a pavilion that will enable the public to experience a connection to that narrative. This studio will be an immersion in tectonic architecture. Tectonic architecture is defined as "the science or art of construction, both in relation to use and artistic design."

Process

The Interdisciplinary Studio Pavilion 2019 was structured as a competition between interdisciplinary teams of students to design a suitable pavilion for the Wine History Project of San Luis Obispo (the

"WHP"). Its curricula emphasized aesthetics; fabrication methods and techniques; ease of assembly, reassembly and transportability; and function.

Students were organized into eight interdisciplinary teams of architecture, architectural engineering and construction management students. Teams were tasked to produce conceptual designs, schematic designs, digital models, physical mock-ups, detailed drawings, structural calculations, detailed cost estimates and materials lists, description of fabrication techniques and methodologies, fabrication labor estimates, interconnection details, and assembly and disassembly manuals. At completion of the course, students presented their work, including scaled mockup models. WHP representatives selected the design (or designs) of one or more teams. This design (or designs) will survive to the build phase of the project. The build phase is outside of the scope of this senior project.

The ISP goals and objectives are listed in Table 1.

Table 1

ISP Goals and Objectives

Goal	Description of Goal	Description of Objectives
1	Incorporate WHP values into the design, demonstrated by achieving the listed objectives.	a) establish a set of 3 to 5 value propositions through interviews with the WHP; b) gain WHP approval of these proposed value propositions; and c) demonstrate how the design addresses each value proposition.
2	Achieve an integrated design through interdisciplinary teaming, demonstrated by achieving the listed objectives.	a) establish team protocols for interdisciplinary participation; b) measure the team's adherence to those protocols; c) establish a list of design elements that required interdisciplinary participation in their design; and d) explain the interdisciplinary characteristics of each of those design elements.
3	Connect the user to the design and the design to the site, demonstrated by achieving the listed objectives.	a) establish a suitable scale that enables users to connect with the pavilion through the exhibits mounted therein; b) express the defining narrative that connects the pavilion to the site; and c) explain the specific features of the pavilion that advance that narrative
4	Facilitate the user experience, demonstrated by achieving the listed objectives.	a) identify one or more elements of the user experience, and b) demonstrate how the pavilion facilitates those experiences.
5	Incorporate tectonic portability into the design, demonstrated by achieving	a) establish joinery of elements that enable easy knockdown and reassembly of the pavilion; b) specify durable connections that with withstand

the listed objectives:	numerous knockdown/reassembly cycles; c) assure that all hardware is weather-resistant, (the use of non-corrosive metals and/or compatible metals is encouraged); and d) amalgamate all connections into the architectural aesthetic.

Deliverables

Through initial conversations, the project set out to mirror the core values of the wine history project and the goal of collecting, preserving, and sharing San Luis Obispo's local wine and food history. To do this, the project sets out to be a storyteller, attempting to reflect the diverse and rich narrative of not only the area as a whole but the unique histories present. The projects set out to reflect these narratives through an adaptable modular structure that can expand, contract, and be rear-ranged to fit the needs of the exhibit, but also change the experience of the pavilion to enhance the educational experience passively. The modularity is based of the biomimicry of the soldier ant. They have the ability to use function specific ants to join together around a queen to create bridges, rafts, and bivouacs. The pavilion reflects this through the different functions. The forms act as the ants coming together to create different shapes for the necessary situation at hand. For example, there are areas of the form that are entirely encased in polycarbonate to protect visitors from weather elements. The display walls purpose is to provide a place to display the artifacts while also protecting them. The walls are designed to be water proof and direct water away from the artifacts. The superstructure is the backbone of the pavilion. Its purpose is to support the rest of the pavilion so that the different elements can perform their intended purpose. The team really focused on the overall function of the pavilion as one unit. This played into the deliverable as the construction management major in the group. Our role was really focused on the logistics and checking up on the constructability of the design ideas. This often caused the team to go back to the board and start the design from a new perspective. Other then the collaborative team deliverables, the construction manager in the group had individual tasks as well. We had to create fabrication drawings for each aspect and the different modules. This included one for the form, superstructure, and wall assembly. We worked on material selection that would be affordable but also achieve the necessary purpose needed. The construction manager also had to create a detailed estimate and schedule that effected the client's choice for the pavilion they selected in the end. After going through fabrication details we created transportation and installation diagrams. This created a full package, so the client could really see the project from all perspectives and make the most educated decision. The client was also able to see the vision of the pavilion from a full-scale model we built. We worked around the clock for a week to build the model. We were then tested with transportability and assembly, as we put the model together at the show location. The clients then had the day to collaborate and review the design and make their final decision.

Pavilion Progress Pictures

The following pictures display the progress of design. It will show how much our design was changed throughout the quarter

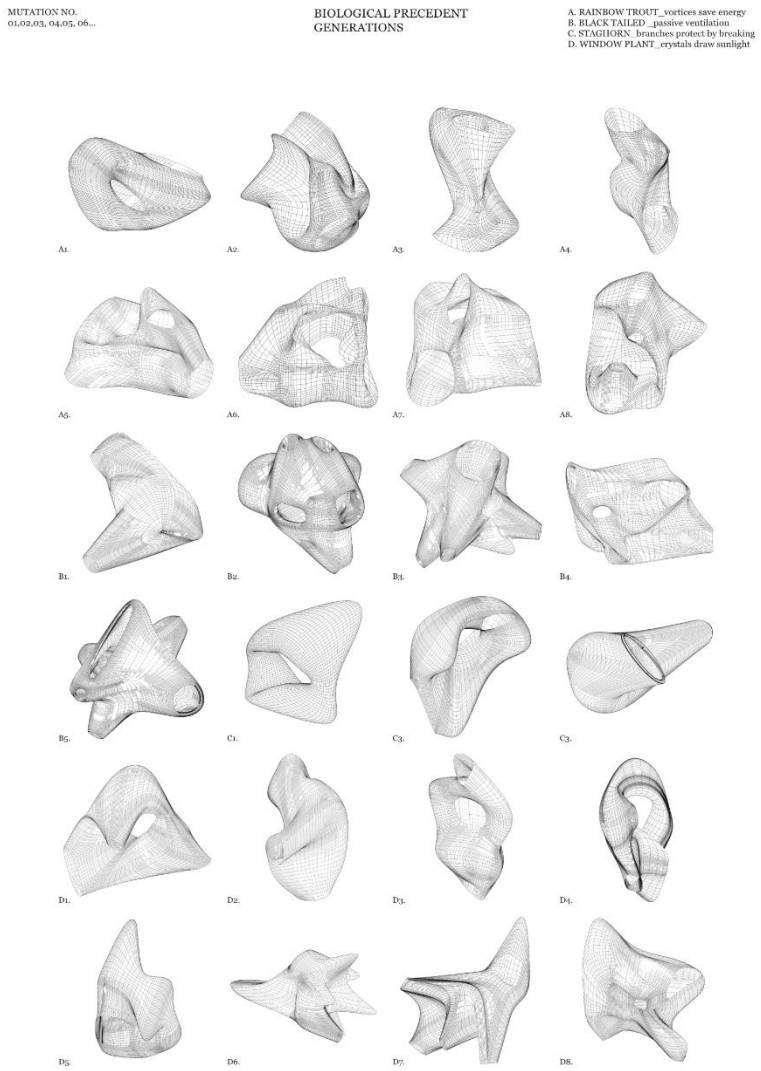

Figure 1: These renderings represent the initial biomimicry ideas for the pavilion. This was done during the first week of the quarter. They are very pre

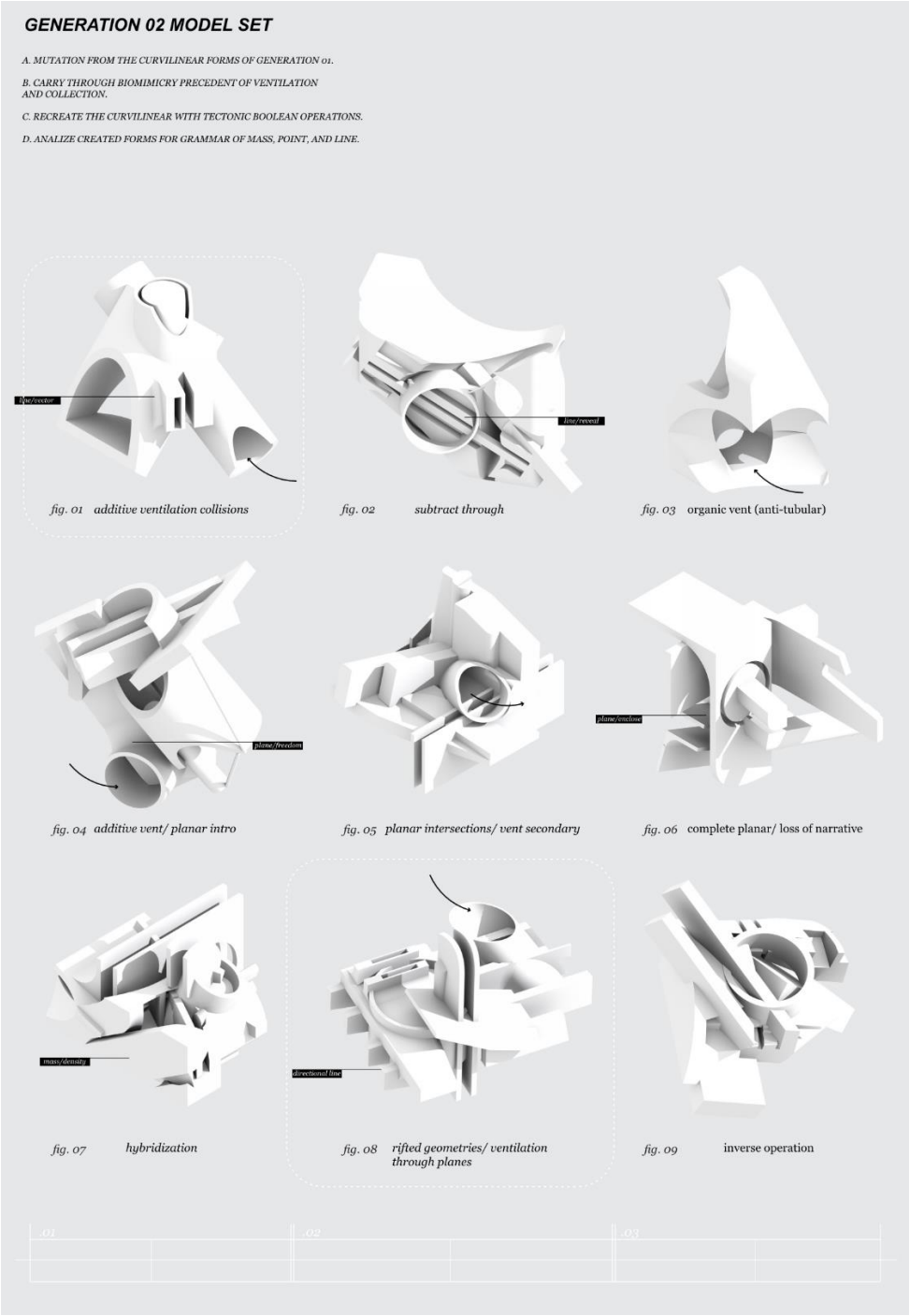

Figure 2: This rendering represents the first design forms. These shapes inspired the architects to go with a large massing design. The

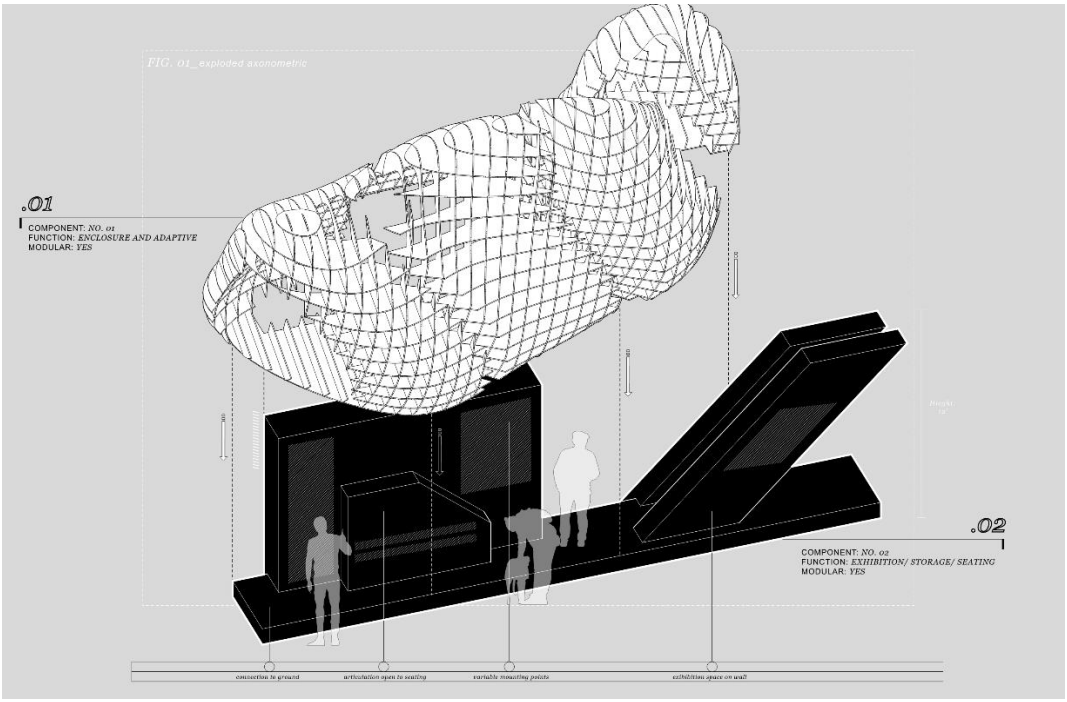

Figure 3: This diagram shows the waffle design and the display massing. After going with this design for a while, we had to go back to the drawing board because this was next to impossible to build with the criteria we had.

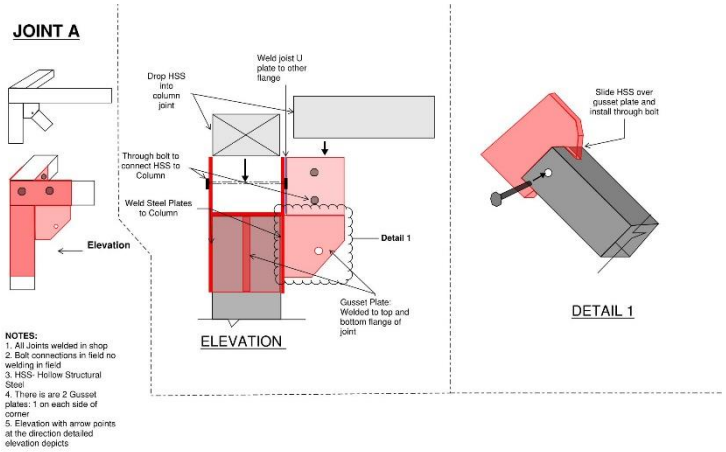

Figure 4: This assembly drawing represents our thought on constructability of the pavilion. It gave us the ability to design the project, knowing we had a way of supporting the artistic aspects of the pavilion.

Figure 5: This is the team's final design intention. The black members are the added HSS superstructure to support the forms and wall. The form is built with ¾" steel tubing with polycarbonate paneling. The walls are wood framed with thermoplastic waterproofing

Lessons Learned

Overall this project taught me many lessons, and gave me a lot to take away. It was the first time working in an interdisciplinary studio, but I thought it was a really efficient and productive way to do a project like this. One of the first lessons learned is really focusing on time management. We only had 3 months to create this whole project, and during the whole process we were pushed for time. The group did a great job of creating schedules and making deliverable by certain dates, but at times I felt like we did not focus our time in the right area. We got carried away with the forms and design intentions instead of stepping back and looking at what the clients really wanted. There were check boxes that the clients had for us, and I think that we should have checked them in a simpler way. We needed to create a better balance between the check boxes and design. We were able to make the pavilion buildable, but there was to much complication. For example, the 1 full scale model of one form took around 70 hours to make. There are 13 of these forms, so the timing on these would be very long. There are also compound angles and very complex connections for the forms. If we simplified the forms I think I would have helped cut down the cost and made for easier fabrication. We did realize the complexity of this project, but building the scale model really put it into perspective. We did not have time to go back and change anything at that point. Another valuable lesson was in working with students from other disciplines. This project gave me insight into what their majors are about and how different we all think. I really enjoyed my group and I think we worked really well together. The architects in the group were extremely creative and I loved how passionate they were. However, I feel like I should have done a better job at controlling the constructability. I did not want to take away any creativity, but if we had more time we should have simplified it. Overall, I do not have any regrets with this project. Our team worked well together and we created an amazing design.