

# **Design and Preconstruction Services for the Construction of a Visitor Deck at City Farm SLO**

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This paper will outline the process of designing and planning the construction of a visitor deck at City Farm of San Luis Obispo, which is a local non-profit. The deck was built for the purpose of providing an area for visitors to observe the agricultural land where City Farm educates the community on ecology, nutrition, and sustainable farming. The construction of the deck was completed by three fourth-year Construction Management majors: Lane Lagomarsino, Eric Cederstrom, and Brett Jones. Each project team member was responsible for their own aspect of the project planning and all members collaborated throughout the entire building process. While the deck itself was the most significant project deliverable, this paper will focus on the preconstruction deliverables completed by Lane Lagomarsino, which include the virtual design of the deck, the lumber cut sheet, and the project schedule. The preconstruction phase of the project began with preliminary design sketches which were later used to build a detailed Sketchup model of the deck. The completed design was used to create a cut sheet to build a lumber order and create a project budget. Lastly, the 6-month project schedule was formulated using Primavera P6 and was updated throughout the project.

**Key Words:** Preconstruction, Construction, Deck Construction, Lumber, Virtual Design

## **Introduction**

This project is located at City Farm SLO, which is a local non-profit that serves the San Luis Obispo community. City Farm leases several acres of agricultural land to small, independent, and local farmers. Their tenant farmers provide produce to local farmers' markets, restaurants, and school districts. City Farm also engages the community by offering volunteer opportunities on their farm and educating local youth by hosting field trips. City Farm reached out to the Cal Poly Construction Management department in search of students to build them a visitor deck. They had been looking for volunteers to build this project because they wanted a designated area for their visitors to view the geography of the surrounding area and observe the farming practices taking place. After deciding to take on this project, each of the three group members assumed the roles of Preconstruction Manager (Lane Lagomarsino), Project Manager (Eric Cederstrom), and Site Superintendent (Brett Jones).

## Design

### *Preliminary Design*

After visiting the project site and getting a verbal description of City Farm's vision for their visitor deck, the design process began with very basic sketches. To get an idea of exactly what they were envisioning, the project team drew up a couple options that would be feasible within the scope of a senior project. The City Farm representatives originally expressed the need for an 8' by 12' covered deck. A design that met that description was drawn up and a plan for how it would be constructed was discussed. The project team met with faculty advisors to get input on the means and methods of building the deck. It was concluded that the deck would need to be set on footings and raised off the ground since the building site has an uneven grade. This decision eliminated the need to do any earthwork and allowed for the project focus to be on the structure itself. The team was able to gather a general understanding of the material that would be needed for the deck once a rough design was drawn up. After referencing typical deck details and the corresponding standard tables, the sizing of the lumber was determined. The completion of these steps brought more detail into the design.

### *Virtual Design*

Once there was a rough design of the deck on paper, it was ready to be made into a digital model. This process was done using Sketchup, a 3D modeling software with architectural design capabilities. The first model was a much smaller rectangular shape and featured a slanted roof and built-in benches. Figure 1 below shows the first version of the deck model.



Figure 1. Rendering of Original Deck Design

City Farm reevaluated their needs after seeing the first model and responded with some changes to the design. Their final request was that the deck be a larger L-shape without a roof and without benches.

After several iterations of the design, the design shown below in Figures 2 and 3 was approved by City Farm.

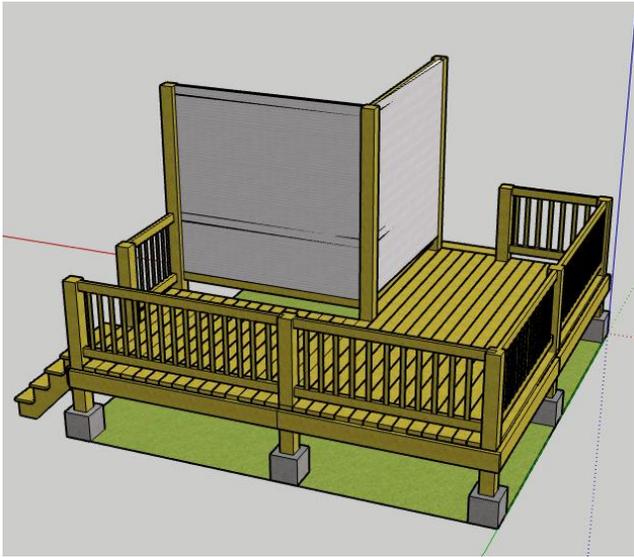


Figure 2. Rendering of Final Deck Design

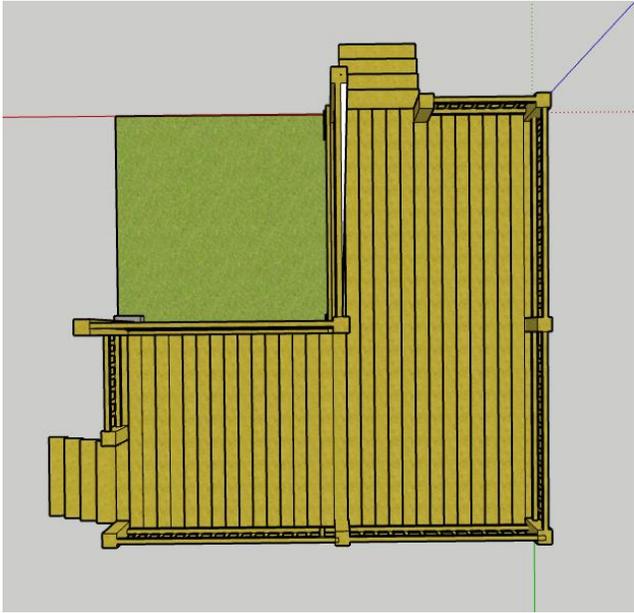


Figure 3. Plan View Rendering of Final Deck Design

The final iteration of the deck design is set on seven concrete footings, each 10" wide. The 6x6 posts sit on top of the footings and were cut to the proper height once placed. The 2x8 outer joists tie into the 6x6 posts and are doubled for reinforcement on the ends where the 2x8 inner joists are hung. The deck has two stairs each with three treads leading up to the deck. The decking is composed of 2x6 deck boards. The entire perimeter of the deck has a railing approximately 40" above the finished deck. The two back sides feature higher posts for City Farm to later install a privacy wind screen. The long sides of the deck are 16' and the short sides are 8', which makes for a total footprint of 192 square feet. Figure 4 below calls out each of the members and dimensions that were mentioned.

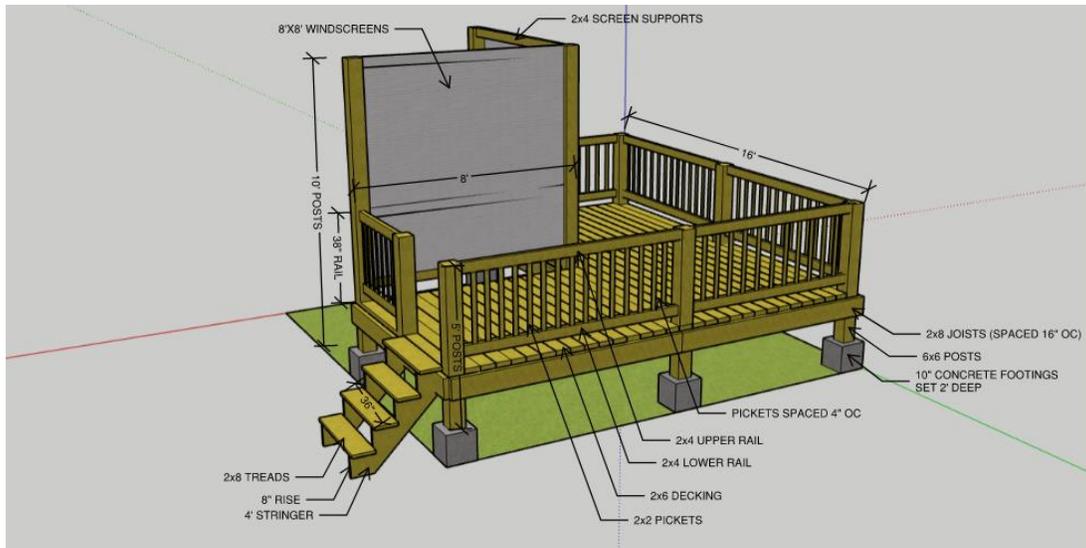


Figure 4. Digital Model with Member Callouts

With the digital model complete and City Farm satisfied with the design, the project team proceeded to the estimating and procurement phase.

## Project Planning

### *Lumber Cut Sheet*

The virtual design included all the necessary members for the deck structure, so it was able to be used to create a cut sheet of the necessary lumber. The cut sheet was intended to create an outline of the lumber order that would later be used to estimate the total cost of the project. This materials list was limited to lumber because it was part of Brett and Eric's role to determine which hardware was required for the connections of each member. Figure 5 displays the table that was created to identify the length, thickness, and width of each member, as well as the required quantity of each cut. The table also includes important notes about how the members tie into one another and what cuts are necessary. All this information was used by Eric to formulate the project estimate and obtain a quote from the lumber yard.

Member	Length	Thickness	Width	Quantity	Notes
Posts	16'	6"	6"	2	Cut to finished privacy screen height once in place
Posts	8'	6"	6"	2	Cut to finished railing height once in place
Corner Bracing	8'	6"	6"	1	Cut to fit diagonally on vulnerable corner
Outer Joists	16'	2"	8"	5	Two each bolted together on sides where joists will hang
Outer Joists	8'	2"	8"	3	Two each bolted together on sides where joists will hang
Inner Joists	8'	2"	8"	17	Hung with joist hanger and respective hardware
Railing Top	10'	2"	6"	4	Mitered end cut for 45 degree seam
Railing Top	18'	2"	6"	2	Mitered end cut for 45 degree seam
Railing Inner	10'	2"	4"	16	Toe-screw into posts
Railing Pickets	8'	2"	2"	55	Cut to railing height, diagonal end cut for aesthetic
Deck Boards	10'	2"	6"	18	Install full length and cut once in place
Deck Boards	18'	2"	6"	18	Install full length and cut once in place

Figure 5. Cut Sheet

### *Project Schedule*

An integral part of planning this project was creating the project schedule. The project schedule was generated using Primavera P6 scheduling software. The work breakdown structure for the project is divided into five different phases: Planning, Preconstruction, Procurement, Construction, and Post-Construction. The schedule also highlights milestones for Proposal Approved, Funding Acquired, and Construction Complete. Creating this schedule allowed the team members to visualize the amount of time that could be dedicated to each phase of the project. Since all members of the team are also full-time students, the work could only be done a couple days per week and a few hours at a time. Due to these limitations, the preconstruction phase lasted from January to April. Procurement activities began in April and the actual Construction Process took place between mid-April and the end of May. The full project schedule as completed is shown in Appendix A at the end of this document.

### **Lessons Learned**

While the most significant challenges of this project arose during the construction phase, there were a few challenges that came with the preconstruction of the project. It was difficult to create a design that perfectly matched City Farm's vision since we were communicating mostly over email. It would have been beneficial to have more meetings in-person with City Farm so that there could have been a more immediate discussion with design changes made on paper. By communicating via email, the design feedback was delayed and ended up adding more time to the schedule. Additionally, creating a new design on Sketchup required starting almost from scratch each time a major change was made. Taking a different approach to the collaborative design process would have made for a more efficient workflow. Something else that was challenging was creating a cut sheet that would be perfectly accurate. For example, the original lumber order called for 8' and 16' deck boards. The boards later had to be exchanged for longer ones so they would cover the thickness of the outer joists and create a clean, finished look. The cut sheet was modified to include 10' and 18' boards instead. Several similar issues arose and could have been avoided by further review of the design and cut sheet with an experienced builder.

### **Future Projects**

City Farm has not expressed the need for any specific projects at this time, but they are always making upgrades to their farm. Several other Construction Management students have completed

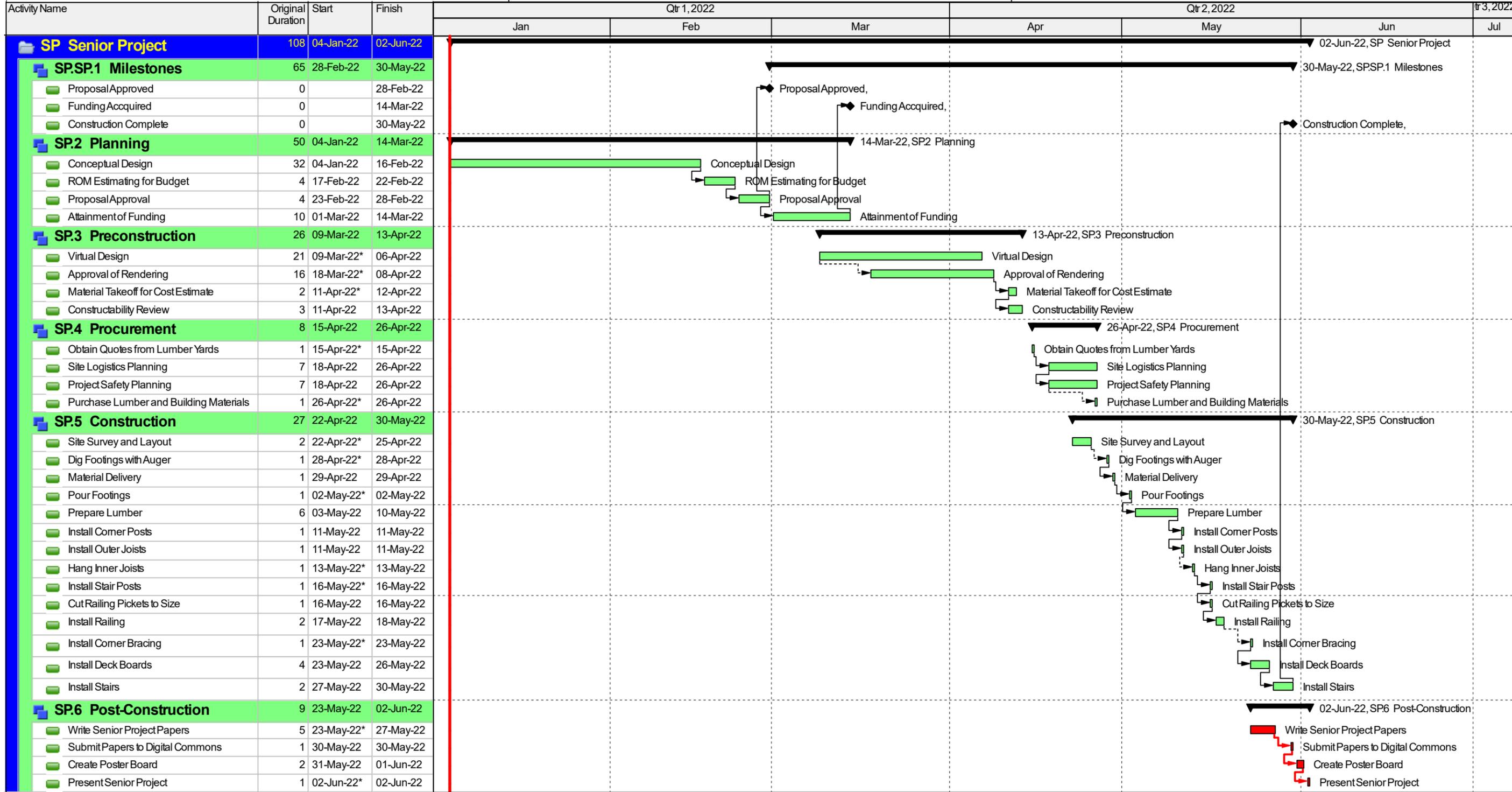
senior projects at City Farm and have greatly improved the functionality and aesthetic of their property. For inquiries about future senior projects at City Farm, students should contact Steven Marx (steven@cityfarmslo.org) and Shane Lovell (shane@cityfarmslo.org).

## **Conclusion**

This project was a culmination of the many skills emphasized in the curriculum for Construction Management education. The process of creating the virtual design, sizing the necessary lumber, and building a project schedule provided an opportunity to apply key concepts and learn from mistakes along the way. The structure of the project team imitated that of a real-world construction project. Taking on individual project roles while also working together made for a collaborative team dynamic and a communicative relationship with the end user of the project. The people of City Farm were extremely grateful that this deck was provided to them. They have expressed that it will make a lasting impact on their operations at the farm. The City Farm Visitor Deck will provide a space for visitors to observe the admirable work being done there for years to come.

## **Appendix A**

### *Project Schedule*



█ Actual Level of Effort    █ Remaining Work    ◆ Milestone  
█ Actual Work    █ Critical Remaining Work    ▶ summary