FirstFruits Farm Tractor Shed

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Preconstruction lays the foundation for the overall outcome of a construction project. This project phase includes a detailed schedule, outlines the scope of work, and provides an overall estimate for the project. Devoting a sufficient amount of time and effort into the preconstruction phase is crucial. Preconstruction is an important component of what makes the entirety of a construction project successful. Preconstruction work also includes finding funders to cover the costs of material. Preconstruction and the construction for a tractor shed were completed for FirstFruits Farm in San Luis Obispo. The construction portion of this project relied on the successful completion of the preconstruction phase. Ensuring everything during that phase had been sufficiently complete, construction could take place with ease. Providing a well-constructed tractor shed for the farm is an important part of maintaining the farm’s equipment, as it was crucial to ensure it would withstand wear and tear over the years. This paper will include the steps it took from confirming the project to completing the shed for occupancy. An in-depth analysis on the process of construction is provided, as well as the lessons learned from completing the overall process of a construction project from start to finish.

Key Words: FirstFruits Farm, Tractor Shed, Preconstruction, Construction, Lessons Learned

Background

FirstFruits Farm is a non-profit organization located in San Luis Obispo, California. Their mission is to organically farm fruits and vegetables to give to the community that are experiencing food insecurity in the area. Currently, they are producing about 78 lbs of a variety of fruits and are looking for a new vegetable field that is coming very soon. They focus on teamwork as everyone who works on the farm are volunteers willing to put in extra work in order to make this farm successful for its community. There are many different teams on the farm and each one has a team leader where they contribute to a certain part of the farm’s operations. The three pillars of operation are Planting Hope, Growing Generosity, and Honoring Dignity. It is evident that these pillars hold true to every worker on the farm as they work out of the goodness of their hearts.

How the Project Came About

A few years ago, another senior project team constructed a large shed at the front of the farm. This shed stores all of the farm’s tools and supplies and is located at the very front of the farm. Although this shed serves great purpose to the farm, they were in need of another shed that will keep a seed
feeder out of the outdoor elements. Before Covid 19, the farm had a savings account for the purpose of constructing this shed, but when the pandemic hit, the allotment of money had to be repurposed towards face masks, hand sanitizer, etc.

FirstFruits Farm already had the contacts of the Construction Management Department at Cal Poly and reached out seeking for another senior project team to make the seed feeder shed. The department sent an email to all senior students in need of a senior project. This was a great opportunity to be able to construct a larger scale project, while giving back to the community. This shed not only helps a local non-profit organization, but also will indirectly help the community of food insecurity in the area.

The two students had been in contact with the Special Projects Captain, Fred Kessler. Fred provided the plans previously designed for the shed and discussed logistics with him to make sure there would be no interference with the farm's work during construction.

**Preconstruction**

In order to get the project executed, the preconstruction process took place as soon as the proposal had been approved. The first step was to obtain the drawings that FirstFruits Farm had already designed and use these to put together an estimate of all material needed.

The estimate was very detailed and helped facilitate the process when receiving a quote from Hayward Lumber. When performing the estimate, the pricing posted online from Home Depot was helpful to get a general idea of how much the project would cost. This estimated pricing was something that was presented to the funders, as they requested an outline of all the project costs.

**Funding**

Following the presentation of the estimate to the funders, they could only supply funds for a portion of the project unfortunately and there was still a large remaining balance. The next step was to search for funders that could help with the remaining balance. The students looked out for funders for a couple of weeks, but there were no grants available. After explaining the situation to the farm, they told us that they were willing to pay the remaining balance to allow this project to move forward. Once the students were able to secure the total amount of funding, materials were ordered immediately. Lumber and plywood were purchased from Hayward Lumber; Galvanized bolts, washers, nuts and post caps were purchased from Home Depot.

While the funding issue was getting resolved, a construction schedule had been made but not finalized until the hard start date could be inputted based on the delivery date of the material. Once the delivery date was official, the schedule was updated and accurate to real time. It was at this moment that they finally provided Mr. Kessler with a date of completion for this project.

**Delivery**

Lumber was delivered by Hayward the day after the order was placed. This helped ensure the students stayed on schedule and provided additional days of float for other activities in the schedule. Hayward delivered ⅝” CDX for the roof sheathing instead of the OSB they had planned for. Although it was an inconvenience, it did not cause any delays because placing the roof sheathing was one of the last activities on the schedule. They focused on the wall framing and installation of roof rafters first, two activities on the critical path. As the walls and rafters were being built, they were able to exchange the sheets of CDX to OSB.
On the day of delivery, the truck was unable to off-load where the “shed” was located. In turn, Kiana had to use a skid steer on site to transfer and organize the material closer to the site for easier accessibility. The space on the perimeter of the farm was very reduced and made the transportation of the material a little more difficult. On one side, there were crops and on the other was the perimeter chain link fence; There was about a maximum of 8”-12” of space on the side of each tire. This is shown in the two figures below, the highlighted section is where the shed will be located.

![Figure 1: Site Map](image1.png) ![Figure 2: Enlarged Site Map](image2.png)

**Construction**

Although all the material was on site now, they were still not able to commence construction. This was because the concrete footings and column brackets were set by a volunteer at the farm prior to the commencement of the work, the priority was to ensure that these were level and square prior to cutting any columns and lumber to the dimensions outlined on the plans. A transit level was used to check the elevation of each bracket and utilized string lines to see if they were aligned and squared. As expected, these brackets were not level nor square and therefore the columns and wall panels would need some field adjustments.

The transit level was used to determine the elevation of each bracket, and with these measurements determined how much was needed to cut from the 4”x4”x8’ posts to ensure the beams sat level on the posts. After cutting the five posts to their specific length, wood stakes were used to brace the posts before bolting them into the brackets. Once all posts were plumb and aligned, the students lifted and placed the beams over the columns with the assistance of volunteers, as they were heavy and difficult to handle. As anticipated, the weight of these beams would slightly move the posts, and therefore they checked for plumb once again before taking measurements for the walls.

As soon as all posts and beams were secured, the students began to frame the walls according to the 16” o.c. outlined in the plans. They decided to frame the wall in the back first, so it could be used as structural support for the roof rafters that were cut and placed shortly after. When finished nailing the rafters, they were able to start framing the walls on the sides. After all walls were framed and nailed onto the posts, they could finally add the lower row of CDX siding for the wall. The students did not want to add both rows at this moment because they wanted to ensure the siding would go all the way up to the roof rafters and sheathing before cutting any material. The roof sheathing did not take long to nail because of the use of a nail gun. Finally, they were able to cut the remaining wall siding and
nail it to the framed walls. This step was a little tedious because it was a sloped piece and required special cuts for the beams on both sides.

Upon completion of construction, they met with Mr. Kessler to do a final walk-through and ensure the final product was built according to that agreed with in the proposed plans. Because the students completed the project ahead of schedule, they were planning to use the remaining days to fix any issues, but fortunately the final product fulfilled his expectations.

**Deliverables**

The deliverables completed for this project, specifically relating to the preconstruction work included: an estimate, schedule, and scope.

**Scope**

FirstFruits Farm
Tractor Shed: Scope of Work

General Items
- Furnish and install all of the following in accordance with provided plan set

Materials
- Students will obtain all materials and have them delivered to the farm
- Materials include:
  - (5) 4x4-08 DF
  - (2) 4x6-10 DF
  - (1) 4x10-20 DF
  - (1) 4x60-12 DF
  - (1) 4x6-20 DF
  - (9) ½ 4x8 CDX Plywood
  - (10) 4x8 OSB Plywood
  - (32) 2x4-08 DF
  - (10) 2x6-16 DF
  - (8) Simpson H2.5A Hurricane Tie
  - (25) LUS26 Shear Hanger
  - (3) 2x4-16 DF
  - (3 boxes) 3½ 16D Nails
  - (2 boxes) 2-½ 8D Nails

Installation and Execution
- Students will safely and diligently install all material items above in accordance to plan set

Cleaning
- Students will clean the site once construction has ceased
- Any materials not used will be returned and credited back to the farm
### Schedule

<table>
<thead>
<tr>
<th>Task Description</th>
<th>Start Date</th>
<th>End Date</th>
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<td>3-8Mar22</td>
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<td>SF1 Demo</td>
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<tr>
<td>SF1 Draw</td>
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<tr>
<td>SF2 Draw</td>
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<td>3-28Mar22</td>
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<tr>
<td>SF2 Demo</td>
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### Estimate

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<th>Length</th>
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<tr>
<td></td>
<td>Posts</td>
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<tr>
<td>2</td>
<td>4x4 Posts</td>
<td>8'</td>
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<td>3</td>
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Lessons Learned

Having the opportunity to be a part of the project had been a great experience, as the two students were able to learn a lot throughout the duration of this spring quarter. These lessons ranged from preconstruction work to procurement and construction. During the preconstruction phase of this project, all of the deliverables and planning worked out fairly smoothly. Luckily, the farm had already designed the plans for how they wanted the shed to be constructed. Being given those plans, they were able to complete an estimate and schedule right away. A lesson learned from this phase was the importance of constant communication. Because the price of lumber and other building materials increased substantially in recent months, the funders were unable to pay for the whole project, something they had agreed to initially. This event set back the preconstruction phase by about three weeks. From this, they learned that being proactive in communication and ensuring the funders understand exactly what a project this size costs could have mitigated this issue.

Another lesson learned was to keep the client aware of the situation. The initial thought process was to figure out where they could get an extra funder quickly, without possibly disappointing the client. In the efforts to keep a positive relationship with the client, they were unsuccessful in securing another funder with an effort that took about three weeks. All of the grants had already been used and being about week 6 of the quarter, there were no opportunities left to quickly secure funding. Kiana ended up writing an email to the client informing them of the situation and why there was no progress being made. The client wrote back offering to cover the remaining balance of the materials, which was ultimately what allowed construction to get started. They did not expect the farm to offer to cover the balance, and they were extremely grateful for their contribution. They learned that being open in communication with the client as soon as they experienced the funding issue would have saved the project a lot of time. The efforts were with good intentions, trying not to disappoint the client, but they realized that keeping them in the loop can make things much easier down the line.

Once preconstruction had been completed and the materials had been ordered, they learned about the importance of always verifying materials upon arrival to ensure that nothing is missing or incorrect. If they had not taken the step to check the delivery, then they would have not realized that they received CDX instead of OSB for the roof of the shed. Making this realization too late would have caused more delays in the schedule and could have potentially caused us not to meet the deadline proposed to the client.

One of the most important lessons learned from performing this project was to check all pre-existing conditions thoroughly. This would include the concrete footings and column brackets that had already been installed for this project. These had been installed prior to us connecting with the farm and securing this project. Once they had checked the layout and dimensions, they discovered that the bracket heights were not concurrent with the plans and they were not level as well. If it had not been checked prior to cutting the posts, the beam sitting on top of the posts and the roof would not be level.

This project was a great experience and the students are extremely grateful to have gotten the opportunity to be part of all the steps of a typical construction project from start to finish. The students have learned a lot and will take these lessons upon graduation and working in the industry.

Connections to Curriculum

The entirety of this project directly ties to the Construction Management curriculum. In the required lab courses, estimates are always part of a project. The courses that required a large estimate included Residential Construction (CM 214), Commercial Construction (CM 313), and Integrated Project Delivery (CM 450). Using old templates from courses, the students were able to come up with a very
accurate and concise estimate that both the funders and sales manager at Hayward Lumber could follow.

Scheduling this project used skills that had been learned in Advanced Scheduling (CM 422). In this course, the students would be given various scenarios on a jobsite and would have to make a schedule using Primavera P6 to accurately reflect the scenario’s timeline. Sequencing activities is very important for a project to be properly managed, making sure all materials and personnel are on site, ready for the scheduled activity.

Various scopes of work had been written in Commercial Construction (CM 313) for a very large hospital project. Knowledge of formatting the scope of work was applied from the curriculum in that course. As well as what a scope of work should include and how thorough the scope should be to ensure every part of the project is accounted for with clear written expectations.

The construction and building portion of this project used a lot of the techniques in carpentry learned in the Residential Construction course. The students had learned how to use various tools like speed squares, chalk lines, tape measures, and power tools. Determining the order of operations was also a topic in this course that the students applied to the shed, which helped for scheduling and planning.

**Conclusion**

Overall, this project was a success despite all its challenges. The authors exceeded the owner’s expectations with the final product and they were pleased with the relationships formed with the farm. To ensure the students kept a good relationship with the farm they made sure to keep the project on schedule. The initial estimate was very accurate and there were a few pieces of leftover material that had been accounted for in the estimate for emergencies. This material will be returned and credited back to the farm. This project was a great experience and the students are grateful that they were able to contribute to the improvement of the farm and the community in San Luis Obispo. This project was a perfect reflection of the four years spent in the Construction Management program here at Cal Poly, which will most definitely be carried into the future careers in the construction industry. Below are photos taken throughout the duration of construction.

**Appendix: Photos**

![Figure 3: Roof Rafters and Rear Fall Framed](image1)

![Figure 4: Side View of Figure 3](image2)
Figure 5: Temporary Braces
Figure 6: Walls Framed
Figure 7: Plywood Installation
Figure 8: Roof OSB Installation
Figure 8: Rear View, Plywood Installation Complete

Figure 9: Angled View of Figure 8

Figure 10: Completed Tractor Shed