The Preconstruction Work for the Shaded Structure at Growing Grounds

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When beginning a project, one must take vast consideration into the plan. For a construction project, this means considering how long the project will take, how much it will cost, what materials will be used, who will build it, where the money will come from, and who will utilize the space. This paper analyzes all this preconstruction work for a shaded structure at Growing Grounds. The Growing Grounds shared community space in San Luis Obispo, California, provides incredible resources and opportunities to the people in the area that struggle with mental health. Through horticulture, the volunteers must work hard to keep the many plants alive but can get easily tired in the hot San Luis Obispo sun. Designing a shaded structure that works for the many volunteers at Growing Grounds was an important part of this senior project. In addition to creating a design, the student completing this project was also in charge of doing a take-off, establishing a budget, and setting up a schedule. Through hard work and dedication, the preconstruction scope of work for the shaded structure at Growing Grounds was completed. This paper delineates the preconstruction plan to complete the shaded structure.

Key Words: Shaded Structure, Preconstruction, Design, Growing Grounds, Project Planning

Introduction

The conception of this project began with the introduction of Growing Grounds to the project manager, Grace Brekke, when a fellow construction management student was completing their senior project on the same site in 2018. The project manager of this project was able to volunteer there and saw how influential this organization was for the San Luis Obispo community. So, when the project manager was looking at what to do their physical project on for 2021 graduation, the first spot they checked was with Growing Grounds. The non-profit's unique approach to helping those with mental health problems heal was the main reason for choosing this entity. Through horticulture, community organization, gardening, and check-ins, almost everyone who can volunteer at Growing Grounds feels empowered and happy upon their leave. After discussing with the manager of the site what they desired, an architectural engineering student was quickly recruited for the project, and design began with full consideration of the needs expressed by the director of Growing Grounds. The purpose of this paper is to discuss the steps that were taken to complete the design for the project, then to complete the preconstruction scope of work required. The paper goes through all of the steps that were taken by the project manager and her team.

The Permit Process

Unfortunately, the design process took a little bit longer than expected and communication with the San Luis Obispo County Building Department remained stoic. Consequently, a permit was unable to be obtained in a quick manner that would have allowed the structure to get built by the end of June 2021. From January until March, there was back-and-forth communication with the City of San Luis Obispo (SLO) and the project manager. In March, the City of SLO disclosed to the project manager that the jurisdiction of Growing Grounds' land was under the County of San Luis Obispo. This meant that the pricing, negotiation, and permit process needed to consider different guidelines than originally thought. What formerly would have not required a permit for the structure to be built – since it was unattached to an already standing building, did not have any appliances, and was small enough - now required a $5,000 commercial building permit. Since the land is not a home, the shaded structure is commercial property, or open to the public, and therefore requires a substantially more expensive permit. The permit process could also take three to six months for the permit to be approved. After the project manager discussed with the County of San Luis Obispo about the difficulty and delays, they have caused to the project, the County informant told the project manager that the shaded structure's permit (if done correctly) could likely be expedited for construction to begin a bit sooner.

The Design

The project team was made up of a construction management student (project manager) and an architectural engineering student (designer). Once the architectural engineering student agreed to work on the project, the project manager immediately scheduled a meeting between the two of them and the director of Growing Grounds. Both the project manager (PM) and the designer were able to show some conceptual designs they had produced and ideas, like Figure 1, found online. The different design iterations were reviewed during the meeting with the owner and, after a few more meetings, all three parties agreed upon the final design.

Figure 1. Design Inspiration for Shaded Structure

After the first meeting, the PM and the designer split up responsibilities, leaving the design scope of work mostly up to the designer. The designer and the PM then had biweekly meetings with the

designer's subject matter expert (SME) in the architectural engineering department who gave critiques and adjustments to the design and suggestions about the construction process. These meetings proved to be helpful; however, the design was prolonged which pushed the construction process back. There were, unfortunately, a few issues with obtaining the permit too as different information was given to the designer than to the PM. Although the permit was not obtained, the design for the project pursued. Eventually, the design, as shown in Figure 2, was completed, and shared with the director of Growing Grounds. Construction is soon to start for the future project manager who will take over the project. In addition to having the design completed, the future PM will also be able to work off the preconstruction work including the quantity take-off, budget, and schedule.

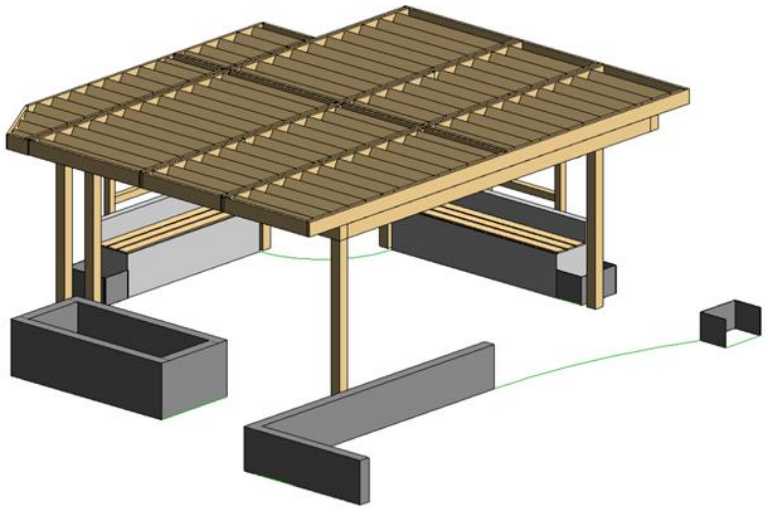


Figure 2. Final Shaded Structure Design

Pre-Construction

Quantity Take-Off

Upon the completion of the design, the PM started on the quantity take-off to determine the amount of materials needed for the project. Using Bluebeam, the project manager quantified the amount of each material needed for the shaded structure. From the truckload of concrete, Simpson embeds and bolts, amount of lumber needed, to the dimensions of the shaded cloth on top, the project manager was able to uncover it all. Working with Bluebeam was easy for the project manager, and their amounts were clear and made sense to other parties they consulted with to validate the amounts.

Making the Budget

This project is being completed entirely by volunteers, so the budget does not consider the cost of labor. Because of this major difference between other construction budgets, the project manager consulted with their SME. The SME suggested basing the pricing of materials off the Home Depot's website for listed materials. Utilizing the RS Means cost book, the Home Depot website, and Excel, a budget was created with all the components including the type of material, the amount, the type of unit the amount was in, the price listed, and the total (See Table 1). Using the quantities of materials obtained from the quantity take-off process, and RS Means costs data and formatting, an excel spreadsheet was created. The PM then went through every type of material to be used in the structure, found its cost on Home Depot's website, then converted the cost on Home Depot's website to align with the measurements found in the quantity take-off. They then used that base price, guaranteed that the number was in the same units as the take-off, then multiplied the quantity of the material by the price from Home Depot.

Table 1

Type	Unit	Unit Type	Cost/Unit	Total	
Building Permit	1	Ea.	5000	$	5,000.00
Materials					
Concrete	1	truck	150	$	150.00
6x6 Redwood Post	48	LF	10	$	480.00
6x10 Redwood Beam	92.653	LF	12	$	1,111.84
2x10 Slats	279.1136	LF	2.71	$	756.40
Double 2x10 panels	54.1396	LF	5.42	$	293.44
Simpson MPB66Z Post Base	6	Ea.	182.19	$	1,093.14
#4 Vertical Bars	63.5	LF	0.4395	$	27.91
16 Gauge Rebar Tie Wire	1	LF	5.47	$	5.47
Simpson H3 Tie	6	Ea.	0.75	$	4.50
Simpson CC66 Column Cap	6	Ea.	85.5	$	513.00
Simpson A 35 Clip	1	Bag	8.51	$	8.51
10d Toe Nails	1	Box	17.48	$	17.48
Shade Cloth	1	Ea.	250	$	250.00
Equipment Borrowed	1	Amount	0	$	-
Plants	20	Plants	0	$	-
Subtotal				$	9,711.68
Taxes				$	971.17
Total				$	10,682.85

Table 1. Budget Breakdown

In addition to material costs, soft costs were included in the overall estimate. As shown in Table 1, the cost of the permit is almost half of the overall project cost, which was obtained from consultations with the County of SLO's building department. The cost provided from the county was an estimate of what a shaded structure of its size would cost for a non-residential owner. Finally, a more general budget scope as shown in Table 2, was created in order to summarize the

varying costs the project will have to cover in addition to the detailed budget as shown in Table 1.

Table 2					
Cost of Building Permit				$	5,000.00
Cost of Concrete				$	150.00
Cost of Lumber				$	2,641.67
Cost of Hardware				$	1,920.01
Cost of Equipment				$	-
Subtotal				$	9,711.68
Taxes				$	971.17
Overall Project Cost				$	10,682.85

Table 2. Budget Scope

Creating the Schedule

Once the design of the shaded structure was completed, and the quantity take-off and budget were created, the PM created a project schedule using Microsoft Project. Several industry professionals were consulted when developing the schedule, which assumed a crew size of four people. The start date is based on the permit being submitted and when construction can begin based on it being acquired. The construction schedule then goes through all the necessary components in detail as to what will be expected of the four workers to be completed daily. Perhaps it will require a bit of overtime and additional workers to complete the scope of work, but the schedule is lenient on some of the ranges of days, so there should ultimately be enough time. The second biggest consideration that had to be made regarding the project's schedule was when the students could begin work and when they needed the project completed. One schedule constraint is a completion date of December 2021. See Figure 3 for schedule milestones and see Appendix E for the full schedule.

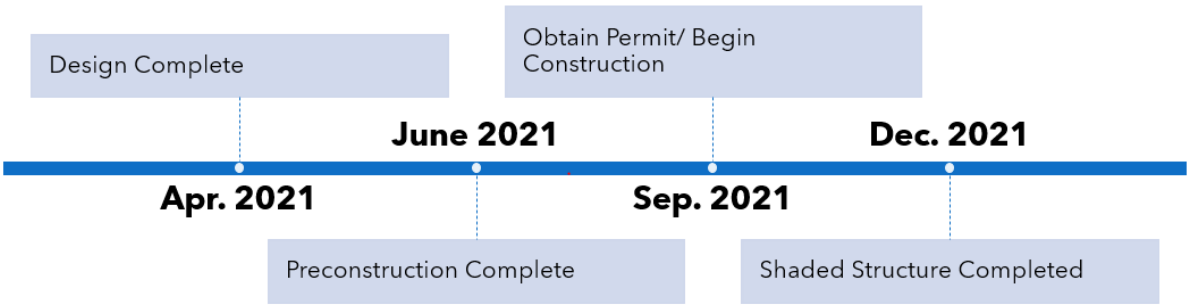


Figure 3. Project Milestones

Environmental Considerations

When this project was first being conceptualized by the PM and the director of Growing Grounds, they wanted to consider how the structure blended into the natural and built environment. Sustainability and the environmental impact of the shaded structure were important considerations for all stakeholders. The use of the site was to be communal, with a low carbon footprint from the material selection and where the materials came from. So, the project manager attempted to design a shaded structure that blends with the community space while continuing to allow wildlife to thrive. The shaded structure during construction will also utilize locally sourced, refurbished material for the lumber which will also help to reduce the amount of carbon emitted and waste produced from the project. Taking the natural and built environment into thought is vital to people that work in the building industry. Similarly, sustainability is something that the PM and the director of Growing Grounds both heavily value, so hopefully upon the scope of construction work being completed, these values will be upheld and shown through the materials and construction process.

Lessons Learned

As the project manager of this project, I learned so much about what it means to be a part of and invested in the pre-construction work of a project. For most of my life and all my internships, I have invested my time into the physical construction process. It is thrilling to be around, and I learned so much about what it means to build through those experiences; however, I have never truly known about the work that preconstruction covers. Working with a designer can be difficult, time-consuming, and did not move as fast as I would have liked. In the future I should take more responsibility about telling them how quickly we need the design in order to obtain our building permit. However, I am glad this project worked out the way it did. It would have been a bit too much pressure for me if I had also expected to build the shaded structure, in addition to personal matters I was dealing with in the last quarter of college.

In addition to the pace of the design process, I also learned about how slow the permit process can be. The communication that one should expect when working with the County Building and Permit entity can be slow and time-consuming. The biggest lesson I learned is that I cannot expect things to automatically work out in this industry just because I want them to. I must hold myself accountable, I must check up on the status of others, and I must make sure that there is enough money. I am looking forward to seeing how the team that will take over this project will do. Hopefully, I will be able to attend a couple of volunteer work parties so that I too can say that I designed, performed the preconstruction planning for, and built this shaded structure for Growing Grounds.

Conclusion

In conclusion, the preconstruction scope of work for the shaded structure for Growing Grounds was a success. The design was collaboratively produced with the owner, the designer, and the project manager. The project manager completed the quantity take-off, the budget, and the schedule. And, lastly, a future candidate was selected that will complete the construction scope of work as their senior project this fall. The impact of this project will be a safe, peaceful shaded space for volunteers at Growing Grounds to appreciate. There were many lessons learned along the way including the amount of time it takes to complete a project of this size and what the necessary steps are to starting construction. Now the project will be passed onto a rising fourth year who will work with the architectural engineering student and clubs to complete the construction scope of work. By doing the preconstruction work for this project, the new project manager and the designer will be able to focus all their energy on building the shaded structure in an efficient and costly way for Growing Grounds.

"Appendix A"

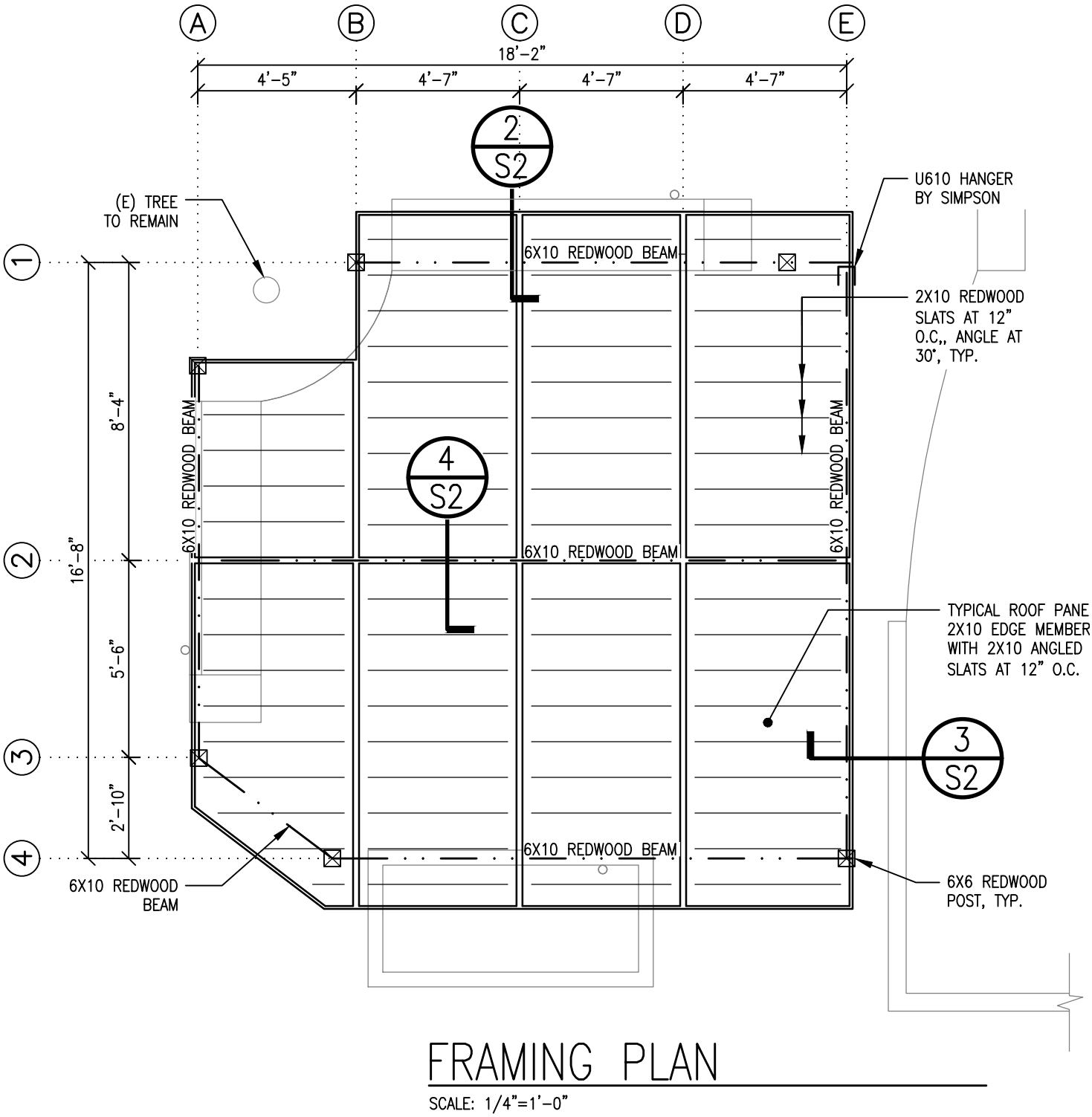
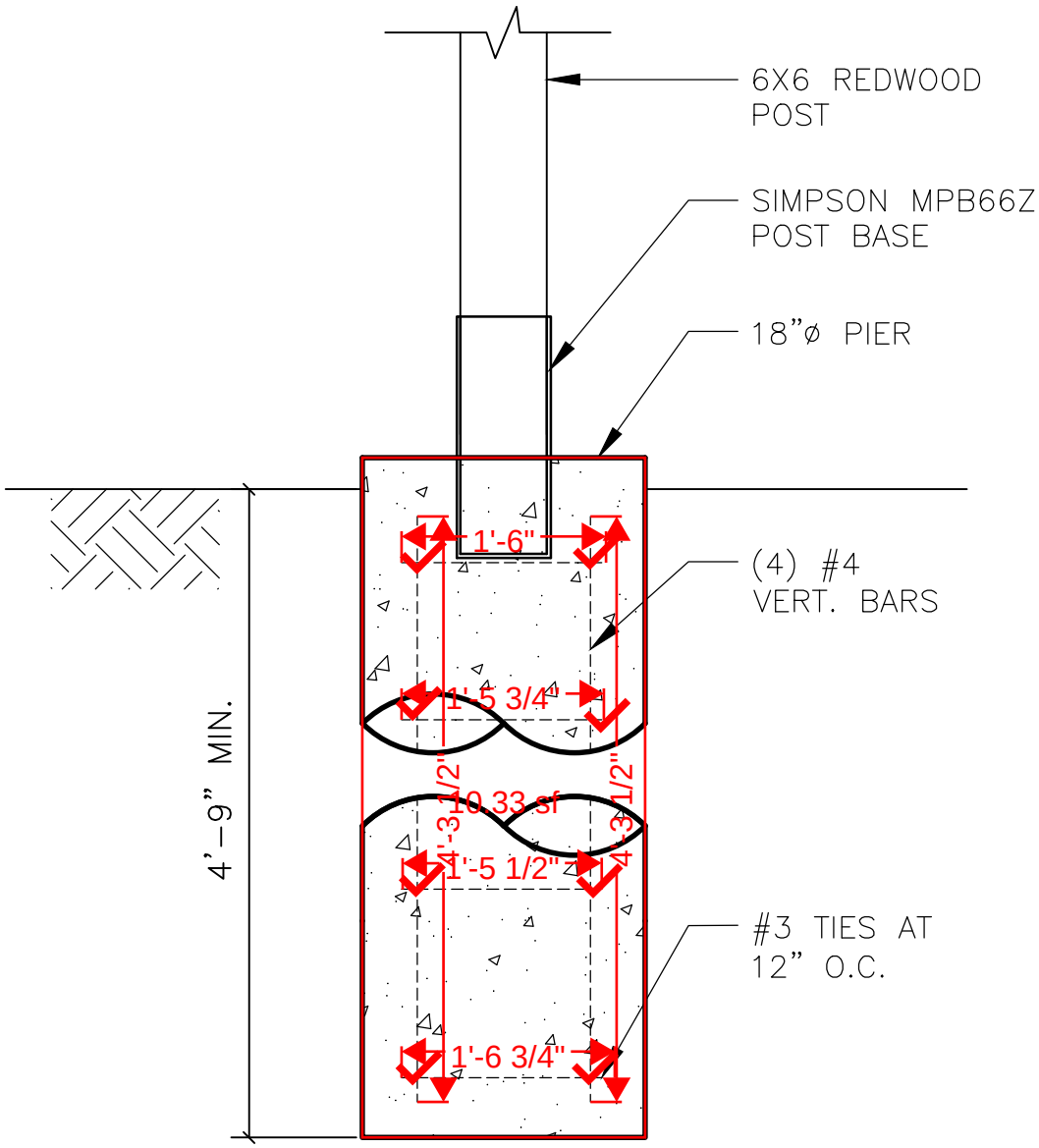


Figure. 6 Framing Plan

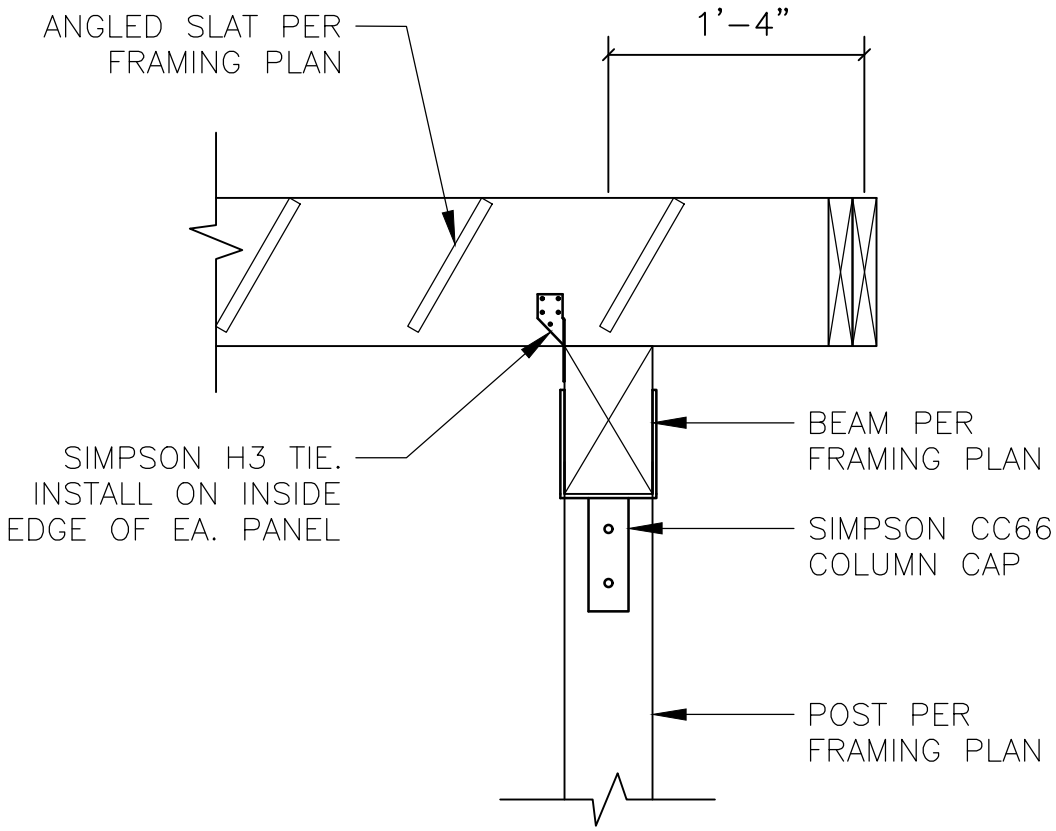
"Appendix B"



1 / S2	TYPICAL POST FOOTING SCALE: 1"=1'-0"

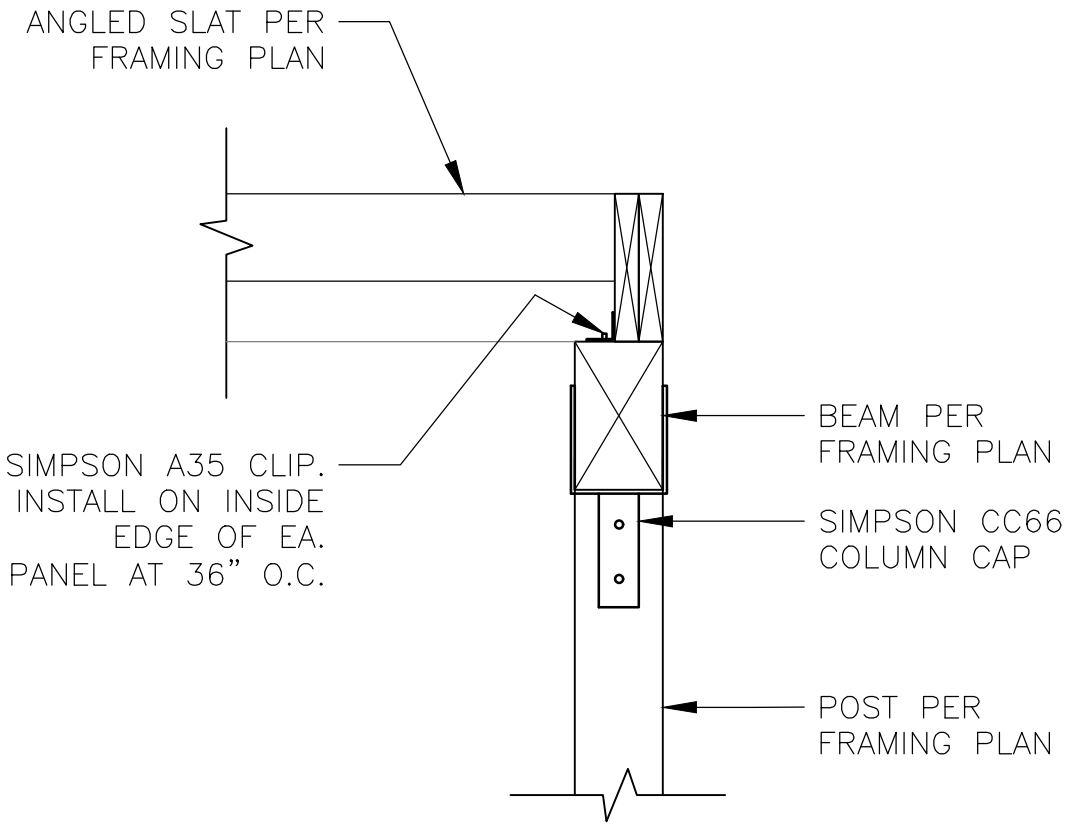
Figure. 7 Typical Post Footing

"Appendix C"



2 / S2	TYPICAL EAVE– PARALLEL SLAT CONDITION SCALE: 1"=1'–0"

Figure. 8 Typical Eave - Parallel Slat Condition

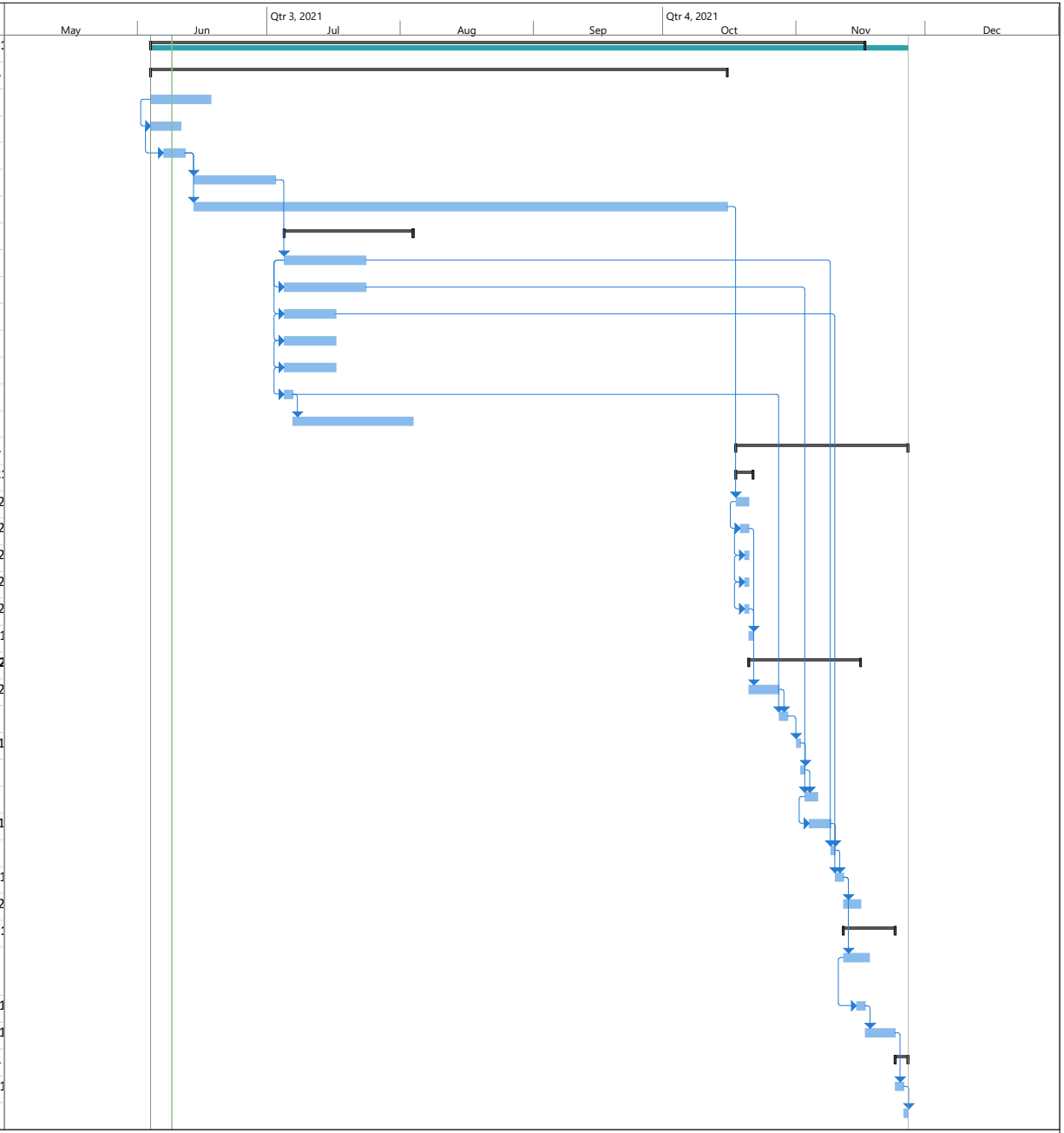


3 / S2	TYPICAL EAVE– PERP. SLAT CONDITION SCALE: 1"=1'–0"

Figure. 9 Typical Eave - Perpendicular Slat Condition

"Appendix D"

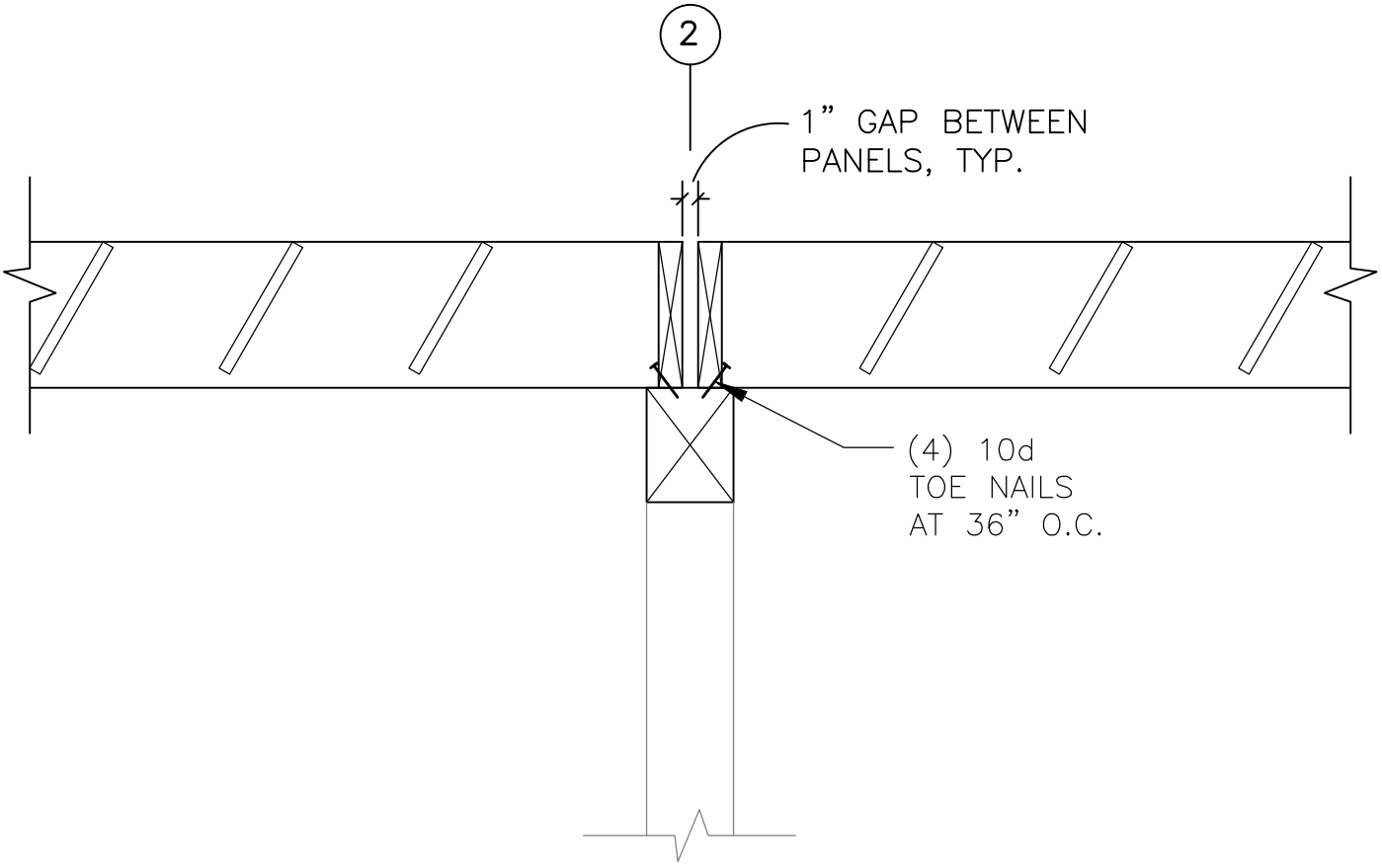
ID	Task Mode	Task Name	Duration	Start	Finish
1		**Senior Project**	**118 days?**	**Fri 6/4/21**	**Tue 11/16/21**
2		**Preconstruction**	**96 days**	**Fri 6/4/21**	**Fri 10/15/21**
3		Design	10 days	Fri 6/4/21	Thu 6/17/21
4		Budget	5 days	Fri 6/4/21	Thu 6/10/21
5		Schedule	5 days	Mon 6/7/21	Fri 6/11/21
6		Contact Donors	15 days	Mon 6/14/21	Fri 7/2/21
7		Apply for Permit	90 days	Mon 6/14/21	Fri 10/15/21
8		**Order**	**22 days**	**Mon 7/5/21**	**Tue 8/3/21**
9		Order Concrete	15 days	Mon 7/5/21	Fri 7/23/21
10		Order Rebar	15 days	Mon 7/5/21	Fri 7/23/21
11		Order Posts	10 days	Mon 7/5/21	Fri 7/16/21
12		Order Beams	10 days	Mon 7/5/21	Fri 7/16/21
13		Order Slats	10 days	Mon 7/5/21	Fri 7/16/21
14		Order Embeds, Bolts, Screws	2 days	Mon 7/5/21	Tue 7/6/21
15		Order Shade Cloth	20 days	Wed 7/7/21	Tue 8/3/21
16		**Construction**	**30 days**	**Mon 10/18/2**	**Fri 11/26/21**
17		**Prepare Site**	**4 days**	**Mon 10/18/2**	**Thu 10/21/2**
18		Clean Up Area	3 days	Mon 10/18/2	Wed 10/20/2
19		Layout Posts Placements	2 days	Tue 10/19/21	Wed 10/20/2
20		Layout Delivery Placements	1 day	Wed 10/20/2	Wed 10/20/2
21		Layout Coverage for deliveries	1 day	Wed 10/20/2	Wed 10/20/2
22		Layout Equipment Storage	1 day	Wed 10/20/2	Wed 10/20/2
23		Bring Equipment to Site	1 day	Thu 10/21/21	Thu 10/21/21
24		**Posts**	**18 days**	**Thu 10/21/2**	**Mon 11/15/2**
25		Dig down for post placement 1,2, &3	5 days	Thu 10/21/21	Wed 10/27/2
26		Put embeds in posts	2 days	Thu 10/28/21	Fri 10/29/21
27		Formwork Posts 1,2,3	1 day	Mon 11/1/21	Mon 11/1/21
28		Formwork Posts 4, 5, 6	1 day	Tue 11/2/21	Tue 11/2/21
29		Rebar Posts 1,2,3	3 days	Wed 11/3/21	Fri 11/5/21
30		Rebar Posts 4, 5, 6	3 days	Thu 11/4/21	Mon 11/8/21
31		Pour Concrete for Post Base	1 day	Tue 11/9/21	Tue 11/9/21
32		Install Posts 1, 2, 3	2 days	Wed 11/10/2	Thu 11/11/21
33		Install Posts 4, 5, 6	2 days	Fri 11/12/21	Mon 11/15/2
34		**Vertical**	**8 days**	**Fri 11/12/21**	**Tue 11/23/2**
35		Install Simpson Bolts and Cross Beams around Perimeter	4 days	Fri 11/12/21	Wed 11/17/21
36		Install Top Plates around perimeter	2 days	Mon 11/15/2	Tue 11/16/21
37		Install Joists	5 days	Wed 11/17/2	Tue 11/23/21
38		**Final Touches**	**3 days**	**Wed 11/24/2**	**Fri 11/26/21**
39		Oil the Wood	2 days	Wed 11/24/2	Thu 11/25/21
40		Place Plants	1 day	Fri 11/26/21	Fri 11/26/21



Project: Senior Project Schedule
Date: Wed 6/9/21

Task
Split
Milestone
Summary
Project Summary
Inactive Task
Inactive Milestone
Inactive Summary
Manual Task
Duration-only
Manual Summary Rollup
Manual Summary
Start-only
Finish-only
External Tasks
External Milestone
Deadline
Progress
Manual Progress

"Appendix E"



4 S2	FRAMING AT GRIDLINE – (2) SCALE: 1"=1'–0"

Figure 10. Framing at Gridline