Landscape Storage Shed for Transitions-Mental Health Association

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The purpose of this paper is to outline the process of planning, designing, and constructing a storage shed for the non-profit organization, Transitions-Mental Health Association (T-MHA). This project was developed through a Cal Poly Construction Management course, CM 420, Service and Experiential Learning. The goal of this class is to gain experience through physical construction by building a service project for an organization or person who needs it. For this project, T-MHA asked that a storage chest be built for their landscaper who maintains the on-site garden. Due to multiple change orders by the owner, what was originally going to be a wooden chest blossomed into a large shed with a concrete foundation. The concrete foundation was completed for CM 420 and the shed was built and finished as a project-based senior project. The project took two months to complete and was built mostly off-site before being transported to the T-MHA site for finishing touches. The shed stands at 6 feet tall by 4 feet wide with a 2x4 frame, T1-11 siding, and a slanted, composite shingled roof. The shed contains all of the landscaper’s tools and will be on the T-MHA property for years to come.

Key Words: Shed, Storage, Landscape, Project-Based, Construction

Introduction

This project was completed for Transitions-Mental Health Association (T-MHA) which is a non-profit organization based in San Luis Obispo. Their mission is to promote wellness and recovery for people with mental illness through support and housing. They have multiple locations in San Luis Obispo including their Hope House location in downtown SLO which provides multiple different support groups including painting, cooking, and gardening. In January of 2022, the student was enrolled in CM 420, Service and Experiential Learning, and needed to find a non-profit to build a project for. It was then that the student was introduced to this organization through the student’s roommate who works for T-MHA, and she acquainted the student with the Hope House manager who described what construction projects were needed around the building. Initially, the manager explained that their on-site landscaper needed a small storage chest to store his tools. This was an ideal project for the class and was chosen. After many email exchanges, what was once a small chest developed into a large shed that also required a concrete foundation. After meeting with Professor
Phil Barlow, it was decided that the best course of action would be to pour the concrete foundation for CM 420 and finish the shed as a project-based senior project. The shed was built to be 6 feet tall by 4 feet wide and 2 feet deep.

**Preconstruction and the Concrete Foundation**

Once T-MHA and the student agreed on the design of the shed, planning began for how it would be built and what would be needed. A 2x4 frame with pressure-treated wood on the bottom plate that would connect directly with the foundation was decided on. For the siding, T1-11 was selected for its simplicity, durability, and affordability. A 1x2 decorative trim was selected to add a nice finish that would cover the T1-11 edges. Lastly, a slanted roof with composite shingles was decided on so that any rain or debris would wash away. This design would ensure that all of the landscaper’s tools would be stored safely and efficiently.

In regard to the concrete foundation, after visiting the site, a brick wall was discovered on-site that would be the ideal location for the foundation and shed since it would provide support. The area was cleared of any debris and the soil was compacted with a tamper before forming the foundation area with 2x6 boards. The slab dimensions were to be 4 feet wide by 2 ½ feet deep and 4” thick. After compacting the soil, gravel and sand was added to give the concrete an even and strong base. Pieces of rebar were drilled into the brick wall to give the foundation added strength and the rebar used was placed on top of dobies. Next, bags of 5000 PSI Quikrete were mixed and poured into the form. The last step for the slab was to install anchor bolts that would connect to the shed frame. The anchor bolts were placed an inch off from each side of the slab and included two in the front, one on each side, and one on the back.

**Construction**

**Framing**

The student decided the easiest procedure for the construction of the shed would be to build it off-site. Therefore, construction began for the shed in their garage at the end of April. Construction started with the frame and each piece was cut into size before assembling the frame together. Each corner of the shed was built as a two-stud corner on top of the pressure-treated bottom plate. The front of the shed had the door framed out and the back piece had a 2x4 placed directly in the middle of the wall for added support. For the shorter side walls, a piece of blocking was added into the middle to add support. The roof was a single top plate except for the front piece which was double-plated so it could add the slant to the roof. Reference Figure 1.

**Siding**

The siding was the most exciting part of building the shed because this was when the shed started looking like an actual shed with walls. Each piece of siding was cut with a circular saw and assembled with 1 ½” screws. The back piece was cut first as this was the largest piece and therefore the easiest to cut and assemble. Next, two pieces were cut for the front and space was left for the door to be placed. The space above the door and below the roof was left without siding for the time being as this piece would need to be placed after the door was installed. This was to ensure that the siding would match up aesthetically. Lastly, the two side pieces were cut and installed. Each piece was cut to its highest point before scoring each side with a pencil to get a perfect slanted cut. Once all four sides were cut and assembled, the roof was cut and measured and used a basic piece of ½” plywood. A ½” overhang
was left on each side of the roof so the decorative trim would be flush with the roof. Reference Figures 2 and 3.

The Door

Constructing the door of this project was the most difficult part of the entire project. The door had to line up well enough with the rest of the shed so that there would be no gaps, but still have the room to open completely. Construction for the door began by building the frame of the door out of 2x4s. Each piece of the 2x4 frame was laid flat with the 3 ½” side facing the ground. When screwing the frame together, each screw was sunk to make sure that no screw would be sticking out and disrupting the flow of the door. After building the frame and making sure it fit perfectly in the door, the siding was measured and cut to size. The last part of the door needed was the hinges. 4” hinges were used and located about a foot above and below the ends of the door. The frame was routed out so the hinges could sit flush. The hinges were placed on the door before screwing them into the frame. Reference Figure 4.

Trim

The decorative trim was the easiest part of construction on this project. Each piece of 1x2 trim was selected based on how straight it was and if it was an aesthetically pleasing piece. Each piece was measured out and cut with a coping saw. The trim was installed around the roof first because these pieces would be flush with the roof and be the easiest to install. Then the student measured from the bottom of the trim to the bottom of the shed to get the exact dimensions for the vertical pieces. Next, all of the trim for the front and back of the shed was installed. The side pieces needed extra attention since they would have to be cut at a slant. Each side piece was cut to its highest point before scoring and cutting it to the correct angle. Each piece of siding was attached with three to four screws depending on its length.

Weatherproofing

After speaking with T-MHA, the student decided to weatherproof the shed with an exterior clear wood sealer. The reason for this was because T-MHA decided that when the shed was completed, they would create a new painting support group where they will design and paint the shed themselves. This made the project easier as the student did not have to worry about finding a stain color T-MHA liked and ensuring the stain was painted on in an aesthetically pleasing way. Rather than apply this sealer on-site, it was applied to each piece off-site for easier application. Reference Figure 5.

Anchor Bolt Problem

After the shed was finished off-site, the student decided to cut holes in the bottom plate for the anchor bolts. Exact measurements of the anchor bolts were taken on-site, however, when these locations were measured out on the frame, they did not fit. When the anchor bolts were originally installed, they were placed too close to the edges of the slab as the installed siding was not considered in the fact that it would add to the size of the shed. These anchor bolts would not be able to fit on the shed. Instead of having to rent or buy an angle grinder, a cut-off blade mandrel was used. This is a tool that can be inserted into a power drill and have a small metal cut-off disc attached. While cutting each anchor bolt took lots of time and energy, each anchor bolt was able to be cut down to the slab and the problem was resolved. Reference Figures 6 and 7.
Transporting to the T-MHA Site

To make the shed easier to transport, two solutions were decided on. The first was to wait until the shed was in place to build the roof since composite shingles can get extremely heavy. The second was to take off the siding on the side pieces since they could be reattached after and it would make the shed lighter to move. Using a friend’s truck and the strength of multiple people, the shed was transported smoothly to the site. Once the shed was on the foundation, Z-flashing was installed on the bottom plates of the side pieces before reinstalling the side pieces onto the shed. Reference Figure 8.

The Slab Problem

Once the shed was landed on the concrete foundation, it did not fit. Similar to the anchor bolt problem, the extra size the decorative trim siding would add was not taken into account. Therefore, the trim that ran into the brick wall on the back was cut off and the shed was scooted back as close to the brick wall as possible. This led to the shed fitting perfectly on the slab. Reference Figures 9 and 10.

Installing New Anchor Bolts

Since the previous anchor bolts had to be cut off, new ones had to be found to attach the shed to the foundation. ½” wide by 5 ½” deep expansion anchors were decided on. Two anchor bolts were to be placed on the back wall of the shed and one on each side of the shed. Two different ½” drill bits, one for wood and one for concrete drilling were used to drill the holes into the bottom plate and concrete foundation. While drilling through the wood was easy, drilling into the concrete was much more difficult because extra-strength Quikrete was used for the foundation. After many minutes of drilling, each hole was drilled to the proper depth and the anchor bolts could be installed. Each bolt was placed into its hole and hammered in before being secured with a washer and bolt. At this point, the shed was installed and standing strong. The only part of the project left was the roof. Reference Figure 11.

The Roof

Preparations for construction of the roof began off-site. The dimensions of the roof were taken on-site and the composite shingles were cut to the proper size. A step ladder was brought to the site along with the shingles, building paper, and flashing. Construction began by clearing the roof of debris and prepping the site. The, the building paper was cut to the size of the roof and attached with roofing staples. The next step for the roof was to install the metal drip edge. The piece that would be sitting at the front of the shed was cut first, however, when cutting the drip edge, an incorrect cut was made and the piece would not be able to be placed properly. A new piece of drip edge was used and this time it was cut and installed correctly. The incorrectly cut drip edge was able to be reused for the back piece of drip edge. With the building paper and drip edge complete, the only thing left to do was place the shingles. Starting from the back, each piece of shingle was placed and since more than one piece was needed for each row, each row switched off which side had the shorter shingle so that a nice overlap was created. Roofing nails were used to secure each shingle and the last piece of shingle was cut to size. With the shingles finally installed, the shed was complete. Construction for the shed finished in late May. Reference Figures 12 – 16.

Lessons Learned
Communication and Change Orders

There were many lessons learned during this project. However, the biggest lesson learned was that owner change orders can happen and throw a project for a loop as it did for this project. In January, the student had no idea that agreeing to build a small storage chest would become a large shed and senior project. It is important to make sure that the contractor and the owner are on the exact same page about what is to be built and what exactly the owner wants.

Measure Twice, Cut Once

There were many times during the construction of this project that the student had to make runs to hardware stores from incorrectly cutting a piece or damaging it. Therefore, it is important to double-check that everything is measured out correctly before cutting it because once something is cut, it cannot be uncut.

This lesson also applies to making sure that when something is being built or installed, everything has been thought out about what will be added to the project. If the student had thought through the anchor bolts being in the correct location, time and money would have been saved by not having to cut them down and reinstall new ones. On a real job, something like this could cause a drastic delay to the schedule and increase costs. In addition, this lesson applies to the shed initially being too large for the foundation before cutting down the trim. While a simple solution was able to be found for this problem, on a large job a solution might not easily present itself.

Construction Labor is Hard!

Due to the student’s experience as a carpenter’s apprentice, the student understood that a physical project-based project would not be easy. This project was another gentle reminder that construction is not for the faint of heart. Not only is the planning, scheduling, and estimating for a project difficult, the physical construction is even harder. Doing physical labor under the sun gives a person an understanding of what the carpenters and laborers on a project site do every day. It makes a person have the utmost respect for them and their work.

Conclusion

Overall, this project was successful. Although the project had its fair share of challenges and obstacles, the shed was effectively designed and built over a two-month period from April to May 2022. Many valuable lessons and skills were learned on this project since the student was able to gain preconstruction and construction experience. Being able to wear the hats of both the office and field side of construction was an unforgettable experience and a great education. The student was grateful for the opportunity to have a hands-on project where their carpenter skills could be tested and improved. Cal Poly’s Learn by Doing motto was practiced to its full extent for this senior project.

Appendix - Photos
Figure 1. Frame of the Shed

Figures 2 and 3. Siding on Front of Shed
Figure 8. Shed Transported to Site

Figure 9 and 10. Trim Cut to Fit Brick Wall
Figure 11. New Anchor Bolts Installed

Figure 12. Roof Prepped

Figure 13. Building Paper and Drip Edge
Figure 14. Roofing Completed

Figure 15 and 16. Completed Shed