The Paso Robles Police Department has a shooting range located just outside the Paso Robles Airport. The range is a newer facility that is used for training by the Paso Robles Police, as well as departments from surrounding cities. The flagpole for the range, located at the top of the hill, was inaccessible due to the brush overgrowth, gopher holes, and uneven terrain. Thus, the department needed a new staircase to improve accessibility to the flagpole so the red flag can be flown while the shooting range is in use. With many neighboring facilities, such as the remote-control plane club, rocket engine testing facilities, the Links Golf Course, the Paso Robles Municipal Airport, and the bordering winery, it is important that the flag be flown at the appropriate times to maximize safety. The department requested wood stairs without handrails, starting from ground level up to the top of the hill. The final product consisted of about 30 feet of floating wood stairs that are 3.5’ wide. The stairs are held by 10 concrete footings, attached with a 4x4 post. At the top of the stairs, there is an extended landing to allow for proper access to the flagpole.

**Key Words:** Stairs, Accessibility, Police Department, Wood, Flagpole

**Background**

After taking CM 460 this last spring, I decided to pursue a project-based project. Throughout my years at Cal Poly, I have always enjoyed my lab classes that do physical builds, such as the residential and commercial labs. I also work at the CAED Support Shop, so building things is nothing new to me. Over the summer, I reached out to several nonprofits in hopes of finding a project that interested me. Dan Knight, my SME, sent out an email that he had a few projects in the area, so I reached out to him and set up a meeting. The next day, we met up with the Paso Robles Police at their shooting range facility to do a site walk and decide on a project. They gave me a choice between 4 different projects they needed done, but the stairs to the flagpole seemed the most urgent of the options. After deciding on the stairs project, I took some rough measurements so I could begin my research. A few weeks later, the design, budget, and schedule were set, and I was ready to get to work. Since I was doing such a large project on my own, I recruited my brother, who is also a Cal Poly student, to be my laborer for the construction process.
Process

Overview

Since this was my first time building stairs, I did plenty of research and watched multiple YouTube videos to plan out the building process. I ended up using these two videos to aid me during construction:
https://www.youtube.com/watch?v=vekkl_RP2xk
https://www.youtube.com/watch?v=zbcQRFBr8NI

Now that I knew what the final stair design looked like, I could get started on the estimate.

Estimate

An estimate was created based off material costs from Lowe’s, since they offer cheap material delivery to the site.

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>#9 3” Screws</td>
<td>1 Box</td>
<td>$49.98</td>
</tr>
<tr>
<td>2”x12”x12’ Pressure-Treated Lumber</td>
<td>5</td>
<td>$176.90</td>
</tr>
<tr>
<td>2”x12”x20’ Lumber</td>
<td>3</td>
<td>$160.98</td>
</tr>
<tr>
<td>4”x6”x12’ Pressure-Treated Timber</td>
<td>5</td>
<td>$217.40</td>
</tr>
<tr>
<td>Lag Screw</td>
<td>2 Packs</td>
<td>$31.96</td>
</tr>
<tr>
<td>2”x4”x8” Stud</td>
<td>3</td>
<td>$10.65</td>
</tr>
<tr>
<td>60 lb. Quikrete</td>
<td>40</td>
<td>$146.80</td>
</tr>
</tbody>
</table>

The estimate created was very rough, given that there were lots of unknowns due to the uneven terrain. Thus, a budget of $1,200 was decided upon to give room for change.

Scheduling

Since the shooting range is actively being used for training, scheduling build days was done through the officer assigned to oversee the stairs project, Ried Goekner. I would request build days, and he would schedule me on the range calendar to ensure there would be no conflicts between training and construction. Scheduling as we went worked out perfectly since the exact project duration was not set in stone.

Funding
The Paso Robles Police Department has funding specifically for the shooting range improvements, so they were able to provide all funding themselves. The budget was set at $1,200.

Construction

Day 1

The goal for the first day was to clear the area to take some rough measurements. I arrived on site around 8 A.M. to meet Officer Goekner. After signing a waiver, I was free to work. Using a rake, weed wacker, and shovel, I was able to clear the hill to get a better picture of the area. I took my measurements and headed out for the day to get started on the design.

Day 2

Over the next few weeks, I organized material delivery to the site. Since Lowe’s does not deliver on weekends, I had to organize missing some classes to be there for the delivery time. The delivery window was between 8 A.M. and 12 P.M. that following Thursday. Since the site is next to the airport, the whole area is gated off and has a gate code. Because of this, I had to sit by the entrance and wait for the delivery driver. He ended up arriving at 12:30 P.M., and I led him to the lay down area. The material delivery did not go as planned, as one of the stringers arrived partially cracked. Both the delivery driver and I took pictures of the cracked material to be sent to customer service in an attempt to replace the cracked stringer. Unfortunately I was not able to get a hold of customer service, so I adjusted the stair design to work with a shorter stringer to utilize the usable material.

Day 3

That Saturday was the first day of construction. My laborer and I headed up to Paso Robles around 8 A.M. to meet Officer Goekner on site. Officer Goekner rented a two-person auger for the weekend to help dig the post holes. After discussing the operation of the auger and ensuring we had enough gas on hand, he left us to start digging. We began by building the frame of the lower stairs. Using the dimensions of the frame, we were able to mark where the four corner holes would be. Next, we began digging the holes with the auger. The holes ended up being way harder to dig than expected because of the concrete-like soil. We used a combination of the auger, post-hole digger, mallet and chisel, and soaking the hole with water. Once we got the four holes to 1.5-2’ deep, we put the lower stair frame back in its place on the hill. We cut 4’ tall 4x4 posts and set those in the holes. We squared and leveled each post, as well as the frame, then tied it all together using screws. After all posts were tied in, we double checked each one before preparing to pour the concrete. We mixed and poured all four holes with quickrete and left it to dry overnight.

Day 4

The concrete was dry the next morning, so we moved on to cutting the stringers. Before moving anything, I marked a line where the post was level with the stringer and marked where the middle posts should go in the soil (didn’t dig the middle holes the day before because we ran out of daylight). We removed the frame from the posts and disassembled the frame. Using the line drawn, I drew out the stairs with a slope of 11:5, then cut it all out with a circular saw. I used the first stringer to trace the stairs outline onto the second stringer, ensuring they would be exactly the same. While I was cutting the stairs, my laborer worked on digging the two middle holes for the lower stairs that we didn’t dig the day before. Before continuing with the bottom stairs and cluttering the hill with
materials, we needed to get the upper stairs started. We built the frame for the upper stairs, and used it to mark where the 6 holes would be. We dug the 6 holes, placed the frame, and set the posts. After the posts and frame were square and level, we poured the concrete for the upper stairs. Now that the upper stairs concrete was drying, we could focus our efforts for the remainder of the day on the lower stairs. Using the line marked on the stringer from earlier, we releveled and squared the stringers before tying them into the posts with 2 4” lag screws each. Now that the stringers were set, we could get started on cutting the steps. Since the posts were sticking about 2-3’ out of the ground, we could only put the stairs on that were not going to overhang a post. We cut stairs 36” wide and screwed them all in with an even overhang on each side. Once all steps were set, we placed the middle 2 posts, squared and leveled, and tied them into the stringers with lag screws. We poured the concrete for the middle 2 posts, then headed out for the day.

Day 5

Now that the upper stairs concrete was dry, we removed the frame after marking where the post meets the stringer. I repeated the same process as before, drawing out the stairs and cutting them out with a circular saw. I then traced the stairs onto the second stringer and cut it out. We set the stringers on the posts, squared and leveled, with lag screws. We cut out the steps and screwed in all that weren’t overhanging a post.

Day 6

One of my classes got cancelled, so I headed out to Paso to work for a few hours. I first put the weed barrier down under the upper and lower stairs. I used 4” long nails with washers so the nails would not rip through the weed barrier. After securing it to the ground, I moved on to cut more steps in preparation for my next work day.

Day 7

The first thing I did was cut off the posts with a chainsaw, so they sat level with the steps. We set the remaining steps that overhung the posts. Because I wanted to cover the top of the posts that were cut off, these remaining steps were cut at 42” wide. Now that the upper and lower stairs were nearly complete, we moved on to the middle landing. We began by digging an extra post hole in line with the outer post of the lower stairs. After the hole was dug, we attached the extra post and the outside post of the lower stairs with a 2x6. Before screwing in the bottom step of the upper stairs, we hung a 4x4 joist under the step, level with the top step of the lower stairs. Now that the post and joist were set, we put down the weed barrier under the landing before placing the landing boards on top. We measured and cut the boards for the landing, then tied them into the 2x6 on the outer edge and on top of the joist on the inner edge. Now that the landing was complete, we poured the concrete for the post and left it to sit overnight.

Day 8

At this point we were putting on the final touches. We started by creating a cantilever system for the top landing using extra material. We then cut and attached the extra 2 boards for the landing. Next, we stained and sealed the stringers to match the steps. After applying 2 coats, we let it dry while we did some site clean-up. I took pictures of the final product and headed out.
Conclusion

Emily Andres, a Construction Management student at Cal Poly, completed a project to build stairs for flagpole access at the Paso Robles Police Department shooting range. The previous accessway to the flagpole was compromised by overgrowth, gopher holes, and uneven terrain. Emily designed, estimated, coordinated, and constructed a set of stairs that would be safe for all users of the shooting range facility to utilize. The project was beneficial to Emily, as it allowed her to showcase her carpentry skills, as well as her planning and management skills. This project would not have been completed without the support from the Paso Robles Police Department and the advising from Dan Knight.