DG Pathway for City Farm SLO

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City Farm SLO is a local 501(c)(3) non-profit organization whose mission is to empower the next generation to live healthier, more prosperous lives through sustainable agriculture and farm-based education. Located in San Luis Obispo on the outskirts of San Luis Ranch, City Farm SLO’s latest project known as “A Garden for All” aims to create a fully accessible garden that can serve all the students in the community they serve. A key part of this project is the pathway connecting the various garden elements which were previously not accessible to wheelchairs and susceptible to water damage and flooding during rain events. This pathway was to be 5 feet wide, bordered by pressure treated two by six boards, with three inches of decomposed granite over three inches of road base. The execution of this part of the project proved to be a challenge, taking both more time and funding to complete than originally planned. However, through diligent effort and a considerable amount of manual labor, the project was still delivered ahead of schedule and under budget. This was accomplished largely through the support and donations of the community combined with a dedicated student and the occasional hard-working volunteer.

Key Words: Pathway, Decomposed Granite, Accessibility, Construction

How Project Came About

This project was one of a group of improvements that City Farm SLO aimed to complete over the spring of 2023. Together, these improvements would be known as the non-profit’s “Garden for All”, an functional garden and learning built with the purpose of being accessible to all members of the community regardless of ability level. Included in the garden for all were the forementioned pathways, a mobile classroom, wheelchair accessible garden beds, a shade structure, and other minor functionality improvements to the garden. Leading up to the spring, the non-profit developed rough plans for each of the improvements and began fundraising for the materials needed. In the Fall of 2022, an email was sent to the class of rising seniors in the Construction Management program notifying students of the opportunity to complete one of the improvements as a part of their senior project. After reaching out to the non-profit and scheduling an initial planning meeting I decided that my skills would be best used on the DG pathways, and I planned to use the opportunity to complete my senior project. After an initial back and forth with the non-profit, the projects were all roughly scheduled to be completed sometime in the spring before City Farm SLO’s annual fundraiser where they would be showcasing the new “Garden for All”. The farm and non-profit itself has been expanding where it sits on the corner of the San Luis Ranch space where the mission is both to promote sustainable farming practices and educate the next generation in these practices. They lease space to local tenant farmers and manage both their area of agriculture and educational space with a small fulltime staff and a community of volunteers. Their mission revolves around school field trips to their educational space where students can see how a sustainable farm operates. The food that they produce on their farm is collected in farm boxes and available to the community to support their mission. This round of improvements was essential to their mission because it would allow them to serve both students and community members that rely on wheelchair accessible pathways and wheelchair accessible tables which the farm did not previously have.
**Project Goals**

The goal of this project was to provide a durable and lasting means of access to the various areas that make up the organization’s garden space. These spaces included a pergola, a group of raised garden beds, a covered green house, a sheep pen, as well as garden beds adjacent to the path. In all the path needed to span over three hundred and fifty feet with multiple intersections and corners. The path was designed to be level with the ground with base material extending six inches underground to ensure that it would be durable enough to outlast the two by six twenty-year rated pressure treated wood boarders. With this design, the inevitable rotting of the underground wood should not render the path useless. Instead, once the wood rotted away, the stabilized six inches of base material would remain intact and would continue to serve as a compact pathway for the foreseeable future. This design was proposed by the non-profit and was thoroughly discussed to ensure that usage and longevity requirements were met. In these early discussions additional challenges were addressed such as stormwater drainage and constructability. It was decided that the non-profit would take this opportunity to install two small culverts to address the drainage, and the schedule would need to be adjusted to account for the lack of earth moving equipment access to the areas where the pathway would be installed. After that a deadline for pathway completion was given, a procurement plan put in place, and a rough schedule was outlined. In the following months the necessary materials were acquired, the construction schedule drawn up, and the build itself was executed in just over two weeks. Through this process, many lessons were learned while still turning over a finished product that would serve its purpose for years to come.

**What Process did the Student Go Through**

**Funding**

Funding this project was one of the most challenging aspects of the project delivery. Preliminary estimates for all the materials and equipment needed to complete the pathway alone were in the range of $6,000 to $7,000. The non-profit had set aside a budget for the completion of their spring improvements, but it was not enough to cover the cost of contracting it outright or even to cover the cost of materials alone. By soliciting material donations and securing additional funds through a CMAC grant I was able to bring the cost of the project down to $2,000 which was well within the budget set aside for the DG pathways. Cal Portland donated seventy tons of base and DG leaving only the cost of trucking for that material. The eight hundred linear feet of two by six pressure treated wood was donated by Prime Electric and delivered directly to the site for free. The equipment rentals were donated by San Luis Obispo United Rentals at no cost and were a key component to meeting the completion schedule. The only remaining costs were the gopher wire, metal stakes, miscellaneous fasteners, and trucking costs.

**DG Pathway Planning**

The pathway was designed to be long lasting and solid enough for wheelchairs to easily roll over the surface. The farm has also had a consistent gopher problem underneath previously installed DG pads. To solve these issues and meet these requirements the design included a total of six inches of material compacted over a continuous layer of galvanized gopher wire that was stapled to the insides of the two by six pressure treated wooden border. Large eighteen-inch metal stakes were used every five feet to hold the border in place. The pressure treated wood was specified to be in twenty-foot lengths to keep the sides of the path as straight as possible. The next largest design challenge was determining the slope of the path to match existing grade while still having as few slope changes in the path as possible. Low points in the path also needed to be avoided so that rainwater would not pool in any spot along the path. During the design phase a simple survey was conducted with stringline and a large bubble level to determine where water would flow over a path of continuous grade. The survey confirmed that water would not pool anywhere on the path but there were two areas where storm water would need to cross the path to drain out of the farm area. In these two areas small culverts were placed to drain any excessive runoff. The layout of the path was designed by the non-profit to access as many locations on the farm as possible while still covering as small of a footprint as possible. It was decided that in the higher traffic areas the path would be fifty-four inches wide, lower traffic areas would be forty-eight inches wide, and the space along the sheep pen where there is the least amount of room would only be forty inches wide.
Figure 1. Plan View

Figure 2. Cross Section of Pathway

Figure 3. Estimate
The first step in the construction of the pathway was laying out the string lines for the path and marking the outline for excavation. Six inches of soil were to be removed to make room for the two by six and six inches of material that would be compacted into the pathway. Extra material had been ordered to account for the eventuality that we would dig closer to seven or eight inches. This was because digging less than six inches was not an option because it wouldn’t allow room for the two by six boards to sit flush with the existing ground level. Ordering extra material then allowed us to excavate with a six-inch-wide bucket, mounted on a track steer bobcat. The day of excavation was postponed due to weather which left the local native soil, which was rich with clay, in an unworkable state for days. After initial excavation the next step was to re-establish string lines where the wood borders of the path were to be and begin staking in the twenty foot two by sixes every five feet. While the boarders were installed, they were checked for levelness, straightness and ensured to be sitting plumb. To compensate for the inevitable movement that would happen during compaction, the dimensions of the path were measured from outside of the board to outside of the opposite board. Once filled and compacted the measurement was close to spanning from inside of the board to inside of the board as each one had moved slightly due to the weight of material that they were holding back. Before placing and compacting material, the borders were checked one final time to be straight, level, plumb, and parallel. The last step before filling the path with the material was to staple in place the galvanized gopher wire, ensuring that there was sufficient overlap where needed to maintain complete coverage. Filling was done with the same track steer bobcat with a sixty-inch bucket; however, this equipment could no longer access the entire path due to the wooden borders being in place and much of the path being right up against planted beds and other structures on the farm. This meant that only approximately eighty of the three hundred and fifty feet of pathway could be filled by machinery and the rest needed to be filled by hand. Neary a full week was spent wheel barrowing the material from the stockpiles to the pathway where it was eventually compacted in two lifts. One of base and one of decomposed granite. Sides of the border where extra material had been removed to allow for installation were backfilled and compacted by hand while the path itself was compacted with a vibratory plate compactor that the farm owned. The final compaction took place half a week before the deadline of April twenty third.
Figure 6. Excavation

Figure 7. Rough-In
Figure 8. Border and Wire Complete

Figure 9. Compaction
Deliverables

The final deliverable of this project was three hundred and fifty-five linear feet of decomposed granite pathway. It was built out of seventy tons of compacted material, both road base and the decomposed granite itself, eight hundred linear feet of pressure treated two by six lumber, four hundred linear feet of galvanized gopher wire, one hundred and sixty metal stakes, and was primarily built by hand. In all the project took over 200 person hours to complete. This hard work was well worth it for a project that will serve the community for decades. Even after the twenty-year lifespan of the pressure treated wood, the depth and compaction reached by the pathway will ensure that it will remain intact for the foreseeable future. The scale of the project is apparent even from satellite imagery. On google earth the high contrasting pathway stands out and is clearly visible even though the image was captured before the pathway was fully complete, see figure 12 for reference. However, the larger and more lasting impact that this project makes is within the community. Prior to the completion of this path, those who wished to visit the garden with the rest of their class but were bound to a wheelchair simply couldn’t. One student expressed her thankfulness and joy with me at finally being able to join her class and get all the way back to the sheep pen where she could never go before. This project was able to help the non-profit achieve their goal of educating the next generation regardless of their ability level to navigate the garden and learning space. The pathway itself that was created is a point of pride for the garden. Its sturdy beauty invites visitors into the space where the previously unsteady ground and mud deterred many visitors. Finally, the work that was done has taught me the value of serving my community and is an experience that I will not soon forget.

Figure 9. Finished Path

Figure 10. Google Earth Imagery
Lessons Learned During the Process

The goals of this project were to complete a pathway of high quality with a limited budget, all without having previously built a path of similar construction or scale before. The initial challenges were related to securing funding and managing expectations with the non-profit. While I was happy to donate my time and expertise, it was difficult to raise enough funds alone to cover the cost of this project with their original design intent. What I learned was that from a constructor’s point of view, means and methods have a significant impact on the cost of a project. In this case the non-profit wanted to specify exactly how the pathway was to be built but was not originally able to afford the budgeted total cost of such a project. Luckily, I was able to lower the cost of materials by soliciting enough donations to make the project affordable for the non-profit. The actual construction of the project taught many lessons. The first of which was in the estimating of time and materials. Material waste of the fill due to transportation and inaccurate excavation consumed all the excess material that I had ordered. After completion of the project almost no excess material remained despite ordering ten cubic yards of extra base and DG. These additional factors to compaction loss were great take aways from a project like this. Scheduling this project was another challenge that required substantial room for error. Despite allocating nearly two extra weeks to my initial prediction of a singular week, I finished with only a few days of the deadline. Multiple factors led to this including weather delays, constructability changes, volunteer availability, and the simple fact that I do not build things as fast as I would like to. However, despite these challenges, enough time was set aside for the project to meet its original deadline without sacrificing cost or quality. The opportunity to serve my community in such an impactful way while learning about the construction industry and the challenges it faces was invaluable. The lessons I learned in the process of completing this project and the skills I’ve built will help me start my career and stay with me for years to come. I have also gotten the opportunity to meet and serve a community dedicated to a mission that I believe in and that I’ve helped them succeed in. The path that I built will make a tangible difference in the lives of countless children and community members who can now experience the education that City Farm SLO offers on their farm. I cannot thank the sponsors of this project enough for their support enough. The expertise and advice shared with me in the Construction Management department was critical to the success of this project. I could not have done this without the support of so many helping hands in and around the department and the community.
Photos of the Project

Figure 11. Finished Path
Figure 12. Finished Path

Figure 13. Finished Path