United Methodist Children Center Drain Project

Andy Abdelnour
California Polytechnic State University
San Luis Obispo, California

The United Methodist Children Center in San Luis Obispo is a preschool for young children in our community. Some of these students are the children of Cal Poly faculty and staff. The previous drain was not draining water properly and was uneven with bumps and dips that became a hazard for the children. Children would trip, fall, and hurt themselves on the drain. A team of two Cal Poly Construction Management students Ethan Lin and Andy Abdelnour worked together to estimate, design, coordinate, demolish, and construct a new section of the drain that would be safe for the students. The roles were divided on the project with both members working on aspects of the preconstruction and construction phases. Ethan did the estimate, owner communications, schedule, and safety plan. Andy drew the schematic sketch, organized material shipments, and coordinated with Cal Portland for the concrete truck. Both students contributed significantly to the completion of the construction aspect of the project. The construction included the demolition of the existing drain, formwork, rebar layout, dowel drilling, pouring concrete, and finishing the concrete. The project was successful in not only removing the tripping hazards but also improving the water flow of the drain. Now the space is safe for the children to walk on.

Key Words: Concrete, Demolition, Drain, Curb, Trip Hazards

Background

In the spring of my junior year I took CM 460, which is Senior Project Methodology, and learning about senior projects led me to wanting to do a physical project-based project. Through the experience I have received through Cal Poly and the opportunities provided through internships, I have realized that concrete is a strong point in my knowledge. I have worked as a Carpenter’s Apprentice with Swinerton Self-Perform Concrete and a Project Engineer for Largo Concrete. Ethan Lin, my project partner, came to me with the idea to do a project that gives back to the community, while enriching our knowledge and applying our experience. Our SME, Dan Knight, suggested fixing a concrete drain at the United Methodist Children Center, where one of his children tripped and contracted a head injury. I was really excited to hear that we had the opportunity to do a concrete project for the Children Center because the project checked every box for me and was right up my alley. Since this was originally Ethan’s project, he then called Liz to ask about the project and if they were interested in us re-building it for them. Ethan then walked the site with Liz taking pictures and identifying the existing trip hazards. Ethan realized that the demolition alone for this project is going to be huge part and that it may not be a solo project, and that’s when he reached out to me to work together. Ethan and I are both signed to work full-time with Largo Concrete, and he thought it would be a very beneficial experience for us to run a small-scale concrete project.

Process

Overview

In order to tackle this project, Ethan and I thought the best strategy would be to play to our strengths. Since I have field experience as a carpenter I took on the Superintendent role, while Ethan’s multiple summers as a Project Engineer intern and organizational management skills made him well suited to take on the Project Manager role. This helped us run a smooth jobsite because there was nothing unaccounted for, we knew our responsibilities and helped each other when needed.
Estimate

The first step of estimating the drain and curb project was to visit the site with a tape measure and field book to get the dimensions. We saw that we were dealing with a 30’ drain and curb, 30” wide, with the drain being 4”-6” thick, and the curb being 6”x8”. With that information I was able to create a schematic design with reinforcement plans and section cuts to submit to UMCC for review. In my schematic design I upped the reinforcement to three longitudinal bars, two in the slab one in the curb, and latitudinal bars dowelled into the existing slab 4” @ 2’ O.C. From there Ethan and I made an excel sheet to track all costs of material. For the rebar estimate it was a simple lineal footage multiplied by the number of bars, the only challenge was that we could only buy 20’ rebar. The concrete estimate was also just a volume calculation adding the drain and curb multiplied by a waste factor. The rest of the material and equipment was based off of what we could get from the CM department. We were able to exclude many tools from our estimate because the tools in SST, such as a chipping gun, rotary hammer, plyers, angle grinder, skill saw, shovels, wheelbarrow, trowels drill bits, and stakes. The biggest thing that needed to be rented for us to complete the project was a 30lb Hilti Mini-Breaker to demolish the existing drain and curb. Other than that, the last piece of equipment needed to complete the project was a bon tool to bend rebar. For our formwork estimate we decided to keep it simple and use stakes to hold up 8’ 2x8’s to form it up on one side with the other side earth formed. The final thing we included in the estimate was one box of duplex nails.

Scheduling

After the estimate of quantities and prices our next goal was to create a schedule to keep us on track. Ethan and I were out of element on this because it’s really hard to project your production with so many variables. We decided the best idea was to perform all the work over a three-day weekend just in case anything went wrong. Ethan hopped on touch plan to build a schedule with milestones to keep us focused on the daily tasks at hand. With all the demolition needed, Ethan and I “broke ground” Friday afternoon, after all children went home. We also scheduled to complete all demolition and hauling by the end of the day Saturday, and all slab pad prep, rebar tying, and formwork setting by Sunday to be ready for the pour Monday. Other things that were an aspect of scheduling were material deliveries and equipment rentals. We scheduled to rent the Mini-Breaker from 2:00 pm Friday to 7:00 pm Saturday, which meant we had to finish all demolition by then. Not only that but the only Home Depot that had it was in Lompoc, so we had to have in on the road back to Lompoc by 5:40 pm. The last little bit of scheduling that we had to do on this job was a material delivery to the jobsite because we had no way of getting 20’ rebar to the site. I originally scheduled the delivery for Friday at 5:00 pm, but after not being able to get ahold of anyone at Home Depot, I received a call that the material would be delivered Saturday morning.

Funding

We secured funding for our senior project from the United Methodist Church and a few other small donations. Ethan talked to Liz was able to get our estimate and schedule approved and funded. One of the donations we received was from CalPortland. I am the captain of the ASC Concrete Solutions team and we meet with CalPortland construction annually to prepare for the Region 6 & 7 Competition, so I reached out to David VanMuyden to see if CalPortland could help us out. David offered to donate half of the total price of concrete, which was a huge help because concrete was our highest material cost. The other donation we received was from Paul’s Concrete Pumping, Paul let us use one of his trailer pumps for two hours.
Construction

Day 1

My day started at 1:00 pm as I headed down to Lompoc to get the Hilti Mini-Breaker. On my way up I stopped at White Cap in Santa Maria to pick up a bon tool. I got to the site at about 2:15 and assessed what we needed to do and get prior to starting work. The first thing we did was headed to SST to grab a few materials and lights for all the work needing to be done Friday. All the children left at around 4:00 pm and that’s when we officially started demolition. We plugged in the lights and Mini-Breakers to get as much done as we could before it got too dark, and safety was a concern. Ethan and I were quickly informed with the rigor of demolishing reinforced concrete, as we had to rotate turns on the Mini-Breaker. Before demolition we had no clue that the drain was reinforced with a wire mesh, which made it exponentially more difficult to demolish. After about two hours of doing demo work we realized the bit on the Mini-Breaker was more for breaking up rocks, and we made the switch to the slab breaking bit. We started working more efficiently after this but still were not able to produce at the estimated production rates we set for ourselves. We realized the complexity of the project and how long it was going to take, this led us to decide that it wasn’t realistic to complete the full drain beyond the tripping hazard and that the fence would need to be embedded in the concrete. We called our SME Dan Knight, and the first thing he brought up was if it fixed the tripping hazards, which it did but not the entire 70’ drain. Dan gave us the ok as long as we pour Monday and solve all the issues of tripping hazards.

Day 2

With all the work Ethan and I had on our hands, we thought it would be best to start bright and early. We arrived at the site at 7:00 AM, put our PPE on, and got right to work. While one of us was on the Mini-Breaker, the other was creating a pile of demolished concrete to prepare for haul. While chipping we started to get fed up with the sharp wire mesh coming out of the concrete, so we decided to use the angle grinder to remove the pointy edges to make our lives easier. Once we got close to the ending point of demolition, I put a concrete diamond blade on the angle grinder and made a cut in the drain and curb to identify where to stop. At around 10:00 AM we completed all demolition and started to go on our haul route. We had to tediously separate the wire mesh from the concrete and then wheelbarrow the load uphill to the truck to be disposed of. We threw all the big pieces on a tarp in the bed with the finer pieces in buckets. Ethan and I went on this haul route probably 20 or more times.

On one of our trips, we ran into Construction Management first-year Sam McClintock, who offered to assist us with our project if we needed a couple extra hands. We took him back to the site with us, got him some PPE, and put him right to work. With all of us working we started to increase our productivity on the jobsite. I was cutting rebar with the angle grinder, then passing it to Ethan and Sam to bend it and put it on a dobie. We used a rotary hammer to drill holes for the rebar dowels to sit in. At the end of the day before we left we did some jobsite housekeeping as we swept up all the dust and fines, stowed all equipment away in a locked classroom, and wet the drain pad to compact and prep the soil. We also wanted to advocate that a clean site is a safe site.

Day 3

We decided to get up and at ‘em again and started at 7:00 AM, but since we were working at a Church on a Sunday we couldn’t operate any power tools from 8:00-11:00 AM. Our plans for the day included excavation, drain pad prep, and setting formwork. Since we couldn’t use any power tools we did a neat excavation of the drain pad near the corner, we also thought it would be a great idea to use the sandbox tools to clean everything out of the footing, especially the dust from dowel drilling.

To set the formwork we used three 8’ pieces of 2x8 lumber supported by stakes. The first thing we did to set the formwork was we set a string line to establish a level and flush curb face. Our strategy to set the boards was to nail
the boards to the stakes with two duplex nails, then using a double jack to hit the stakes flush with the string line, and finally toe-nailing the 2x8’s together. We repeated this for all the boards until we reached the desired curb face. To support the stakes, we created turnbuckles by nailing a nail to the back board and tying tie wire between the nail and stake and twisting a nail to put tension on the wire. This helped us reinforce the forms and control the amount of tension we put on the wire.

For the next few hours, we used the chipping hammer with an excavation bit to clean up the corner of the drain pad. We used a shovel to move our spoils in a bucket for disposal. After all excavation was completed we started placing our rebar. We placed our longitudinal and latitudinal bars in the dowels and used tie wire to connect them at every intersection. We also placed dowels throughout the drain to get the rebar above the pad. Tying rebar was very tedious as we had a bunch of intersections to tie, and none of us had experience doing it.

**Day 4**

Since we had a three-day weekend due to the Presidents Day holiday, and we arrived at the site at 7:00 AM. We did some last-minute pour preparation and finished up rebar tying before Cal Portland showed up at 9:00 AM. We got Paul’s Concrete Pumping Inc, to sponsor a pump for us to use, and Cal Portland to sponsor half of all concrete costs. Our friend Henry Miller and SME Dan Knight showed up at 8:30 AM to help with the last ties and pad preparation. Right before the concrete arrived I had to run to Home Depot to get curb and curb face trowels. We set up a plastic sheet around the building to prevent any concrete from getting on the walls. We then lined up the swail on the screed board and cut it out of plywood to finish the concrete drain.

When Paul got to the site we had to set up the pump and layout about 60’ of hose. Since the parking lot was at the top of the hill we had to run hose from where the pump was to the actual drain. After the pump was all set Cal Portland showed up right on time in a ready-mix truck. Lucky enough for us Paul manned the hose and was able to fill the forms and drain perfectly. We also had Paul fill us up a wheelbarrow with concrete that we could use to fill the holes from pulling the stakes. Once we filled the forms then we used the screed board and mags to float the concrete. After we had the concrete the way we wanted it we played the waiting game for the concrete to set. Once the concrete set to the desired workability we removed the turnbuckles to float the top of the curb.

Once the top was finished we pulled the stakes and forms out. When the stakes come out we edged the curb, finished the face, and leveled it out. We then were using wire brushes and scrapers to clean the concrete around the drain. Henry and Dan did a great job leading the team of finishers, coaching us through how to finish the drain. We then used the concrete in the wheelbarrow to patch all the holes from stakes and even out the drain. Once the concrete was hard enough we tested the flow line with a little bit of water and if flowed perfectly. We then applied a broom finish to the drain and curb to maximize traction and minimize trips, slips, and falls. Once the pour and finishing was completed we washed all the tools, used a blower on the concrete, and took down the plastic wrap. A few weeks later, Ethan and I added quickcrete to finish the transition from the existing walkway to the new drain to smooth out any remaining trip hazards.

**Conclusion**

Andy Abdelnour and Ethan Lin, two Cal Poly Construction Management students, worked together on a project to reconstruct a drain at the United Methodist Children Center in San Luis Obispo. The previous drain was causing tripping hazards for the children and not draining water properly. Abdelnour and Lin estimated, designed, coordinated, demolished, and constructed a new section of the drain that would be safe for the children. The construction included the demolition of the existing drain, formwork, rebar layout, dowel drilling, pouring concrete, and finishing the concrete. Both students contributed significantly to the completion of the project. The project was successful in removing tripping hazards and improving water flow, making the area safe for the children to walk on.
The project was also beneficial for Abdelnour and Lin, as it allowed them to apply their knowledge and experience in concrete, and run a small-scale concrete project. This project cannot have gotten done without the help of Cal Portland, Paul’s Concrete Pumping Inc, Henry Miller, Dan Knight, and Sam McClintock.