AEI Student Design Competition: Texas Tech Sports Performance Facility

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The AEI Student Competition is an annual event that pushes students in the disciplines of engineering and construction management to collaborate and demonstrate creative solutions to the challenges presented. This year, the competition is focused on the new Texas Tech Sports Performance Sports Facility located in Lubbock, Texas, where they tore down the existing building and are in the process of completing the new facility. Instead of recreating the plans given, we designed a brand new building to meet the project requirements, which included a $48 million budget and a 34-month construction duration. As the Construction Manager for the project, I primarily used DProfiler to design and budget the project. The construction submittals are as follows: Site Specific Safety Plan, Site Logistics, Jurisdictional Requirements, Project Delivery Method, Project Phasing, Critical Path Schedule, and Uniformat Level 1, 2, and 3 estimates, Value Engineering and Sustainability, Constructability Challenges, and Life Cycle Cost Justifications.

Key Words: Student Competition, AEI, Bridging, Texas Tech, Construction, Collaboration

Introduction

This project originated from the Architectural Engineering Institute (AEI), which is a subsidiary of the American Society of Civil Engineers (ASCE). Each year, they host the AEI Student Design Competition, which brings students of different disciplines together to overcome challenges. The emphases of the competition are "the development and integration of innovative and original solutions to the competitions design challenges, collaboration, and peer review, all of which are critical to building design and competition. Each year, AEI chooses a different and current project that will act as the focal point for all competition challenges. This year, the competition is based on the complete design of the new Texas Tech Sports Performance Facility that is currently under construction. The AEI provides all participants with complete building information, which includes all plans and specifications needed to complete their area of the competition. Although this competition is based from the engineering side of the industry, this competition provides an excellent chance for students to work with their future industry members, which is something that most curriculums in college do not have a chance to offer. Most programs are only focused on teaching what their respective majors will be doing in industry, so competitions like the AEI Student Design Competition provide a rare opportunity for interaction between architects, engineers and construction managers.

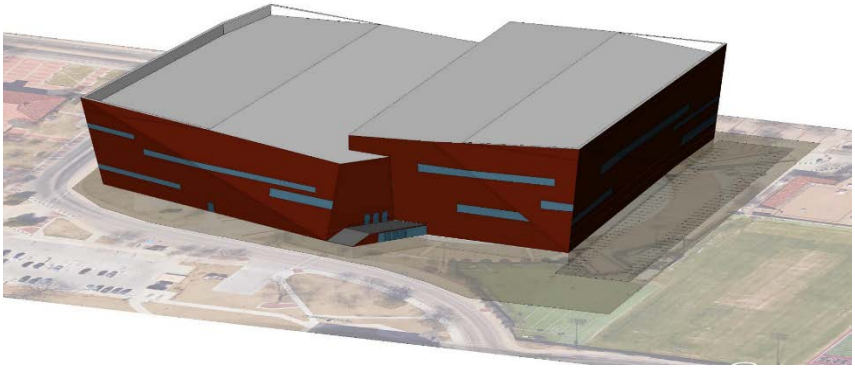
Where It All Started

I was first introduced to the AEI Student Design Competition here at Cal Poly, specifically while I was taking CM 415. This class which is known as Integrated Project Delivery, is taught by Greg Starzyk. This class was not his traditional curriculum as the eight of us Construction Management students soon figured out on the first day. Because the class was four days a week, normally we would be specifically with Greg, however this time around, we were going to be in the room next door with a mixture of architectural engineers and architects. From the first day, we were split into five teams, with two teams only having one CM student. I was paired with fellow classman Jason Angerer, who was also a graduating senior. We were randomly put into teams of two architects and two architectural engineers for the purpose of the class. Our two architects were Baptiste Boget, a French exchange student and Zackary Anderson, a fifth year. The two architectural engineers were both fifth year students, Patrick

Brutzman and Guillermo Davila-Bernardez. As this was all of our first times working directly with students from different majors, getting used to each other and the new dynamic was something that took some getting used to. Compared to other groups however, we quickly came together and were easily able to bounce ideas off each other on what we needed to do to complete the pieces of the project required for the class. They say that in construction you will meet many different types of personalities, but you will always find that the same types of personalities will be in a specific type of field. I must say that could not be truer. At times things were a little difficult, whether it was issues with the design, structural systems or the building program as a whole, but we were all able to make sacrifices on every end to make sure that our design was seamless.

The Process

As mentioned above, the project initially started in CM 415 with Greg Starzyk when we were to complete a list of objectives based on the AEI Student Design Competition. Originally, for the purpose of the competition, the design that these objectives were to be based off was the current design for the new Texas Tech Sports Performance Facility in Lubbock, TX. The competition program required us to use this design in order to complete the submittals listed on the competition program. However, for the purpose of the class, all three teachers, which were representative of each major, decided that we would get much more out of the class by designing a brand new building based on the parameters given in the competition program. The new facility was a multi-purpose facility whose main features were a full-length track and field and a shortened practice football field, which were both required items in the program. For 10 weeks, we worked specifically on the design, structural systems, schedule and budget for the project. Although both the budget and schedule ceilings were already prescribed by the competition program, there was a lot more freedom of expression when we decided on what the form of the building took and what variation of structural systems we used. For the purpose of the construction submittals that I was required to submit for the competition, all of my work was completed based on the new design that was created last quarter in CM 415, which was approved by the faculty. Because this was a creation by architects, architectural engineers and construction managers, this was a much more worthwhile design to do the submittals for, especially because this was something that I was passionate about because I had so much input in what it became. For the construction submittals specifically, these included items that every construction manager will probably have to do at some point in their career. Being able to have exposure to it and have my hand at working with budgets, schedules, safety programs and site logistics was an excellent experience to undertake before my graduation.



The Program

The construction industry is very much driven by computer-based programs that allow us to design, budget and schedule a project, essentially telling a complex story. The main program that I used for this project was BeckTech's DProfiler, which was a program introduced in CM 415 and taught directly by Greg. Although I had access to a Revit model, creating the new design in DProfiler was of utmost importance because of the value in its costing database. To describe DProfiler as straightforward would be a bit of a stretch, and it didn't help that some of our building facades included inclined walls, parapet walls, and multi-directional roofs, so modeling the building required much time and effort. But what made DProfiler so important was that we could create and designate different aspects of the model, which would then designate a price for that particular material, or a certain type of slab. The biggest problem that I ran into was the DProfiler, and this specific costing database was only tailor-made for pricing office

buildings, not complex and abstract sports performance facilities. So when the model was complete and all materials and room types were designated, it auto-populated the square footage of many different features of the building, some of which would make no sense for a sports performance facility, like 170,000 SF of drywall for a building that was primarily steel and concrete. So the big task was to go through each line item and either remove it completely, adjust the amount, or replace it with the correct system. This in itself was a large task, and gave me a closer look at what would be needed to make sure this building was a realistic representation of what we designed. When it was all said and done, the building was priced out at $52 million, which was $4 million above the competition's mandated budget ceiling. However, we took that with a grain of salt as the real building whose plans and specifications the competition required participants to use was actually at around $150 million. This made us feel much better about using our own design, as it seemed much more of a realistic expectation. An important thing that Greg taught me was that it's not smart or realistic to force a price for a design, which is what this competition was asking us to do. The competition then required that the total time from design to Certificate of Occupancy (CoO) would have to be 34 months, so that required methodical thinking on how each task and milestone would need to be done in order to make sure we could stay within that time frame. This is where Greg suggested that using a Bridging delivery method would be the most efficient way to structure the building program. When it came to the rest of the submittals, it all came back to why we designed the model the way we did, so I used my knowledge of the building plan to complete the rest of the submittals, which included site-specific safety measures, constructability challenges, site logistics, jurisdictional requirements and life cycle costs. The process just involved me using what I learned in our CM program to make smart, educated decisions to get the job done.

Deliverables

As I have mentioned many times, the competition required a list of submittals based on which area you were planning to compete in. Most of the submittals required for the competition were challenging, though some were definitely much more time consuming, including the budget and the schedule. Last quarter in CM 415 provided me with a solid backbone to work from to be able to complete these submittals, and for the first time in my young professional career, this was something that I was incredibly passionate about and proud of the work that I put in to make this happen. Although I know this project will not ever see an owner's desk, it was nice to be a part of the process which I learned so much about. Below is my list of deliverables for the competition program:

1. Site Specific Safety Program,
2. Constructability Challenges,
3. Site Logistics,
4. Jurisdictional Requirements,
5. Project Phasing,
6. Project Specific Delivery Method,
7. Critical Path Schedule,
8. Uniformat Level 1, Level 2, Level 3 estimates,
9. Life-Cycle Cost Justifications,
10. Value Engineering and Sustainability.

Lessons Learned

The biggest lesson that I learned while completing this project was that completing these submittals was much more difficult than anticipated, namely because most companies have a template of some sort to work from. During my internships, I never was asked to develop a site safety plan, or think about how the project would need to be phased to be completed efficiently and on-time. When we are hired on at a construction company, many of these practices and policies are already well grounded in the company and established, so all you would need to do is tailor these practices to a specific project. Creating a site-specific safety program from scratch took a lot more thought on what would need to be addressed. Another difficult step I had to take was utilizing DProfiler as the main means for a lot of my building information. This model was very hard to create and work with because the program did things in a different way than most BIM programs like Revit or CAD do. The information it provided was invaluable however, as it wasn't just a pretty picture for me to look at. I also learned that having input from construction professionals can definitely push you in the right direction, as many of these submittals would have been much harder if I was just working on them by myself. Not being afraid to ask questions really helped me along the way, because as a student and soon to be project engineer, I'm not going to know everything right away, but being willing to learn and absorb information is valuable and makes you a more rounded person and construction professional.

New Knowledge

From working through this project, I can definitely attest to and promote working with other students in different majors and disciplines. As construction managers, we will be directly working with engineers and architects in many of the projects that we will be on, so starting that exposure early would be invaluable. The beginnings of this project started with me being paired with another construction manager as well as architects and architectural engineers. This was something completely new to all of us, but I felt that it was very important to learn how different disciplines think and act. It created a realistic environment of what it will be like to work with these professionals in the future, and be able to see the other side of construction in the aesthetic and structural design. Compromise was something that we all had to learn in order to make the relationship work, especially when so many different types of personalities and thought-processes were clashing. That being said, promoting more inter-disciplinary work, whether it's through a competition or a class embedded into the curriculum is something I would highly recommend to not only the CM department, but also to the College of Architecture and Environmental Design. At some point we will all be working together so putting us together will make everyone much more well-rounded as construction professionals when they go into their respective fields.