

# Senior Design Team Member Reflection

CIVE 4043 – Senior Design  
Honors Version  
Joshua Wood

ABET requires that students demonstrate “(5) an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.”

The following reflection essay is a discussion of my experience in CIVE 4043 Senior Design in light of the above ABET requirement. It contains an overview of our project, my personal strengths and weaknesses, my experience with my team, my opinions about our project, and final thoughts regarding the course.

My team, consisting of Sidney Shellhammer, Ryan Hollenbeck, and Will West, was tasked with converting an abandoned hospital in Pawnee, Oklahoma, into a community center. We collected data in the form of surveys, pictures, and interviews with the town’s Mayor, Alice Cottle. Through those conversations, we learned what our design goals were, and that our final product would have to be usable in grant applications and campaigns to raise support for the conversion. Our design goals were, in short, to use the existing structure and land to provide senior care, childcare, student meeting space, space for the Pawnee Nation to meet and coordinate, Red Cross staging room, a gym, library, cafeteria, walking track, playground, splash pad, storm shelter, and community garden. All of this had to be done while minimizing structural damage and including areas for community memorials and murals.

In the pursuit of these goals, my primary work involved developing a BIM model in Autodesk Revit. Our project had a lot of separate moving parts, and the model helped us keep track of those parts, as well as design around them by quickly giving us reliable spatial dimensions. It also allowed us to quickly mockup ideas and assess their quality. This model was developed based on land surveys taken by Sidney, as well as blueprints provided by Mayor Cottle, and aerial photography donated by Universal Surveying and Mapping. It was used alongside a third-party program, Enscape, to generate professional renderings of the newly revised structure and site. The intent of these media pieces was to be used with promotional materials and grant applications. I created the model, as well as the rendered photos and videos. Unless specified in the Appendices section of our report, all interior models – like the hallway railing and walking trail solar lights – were developed from scratch by me.

## Missing Preparation and Training

This project would have been more straightforward if I had known ahead of time that small towns may have spotty record keeping practices. Coming from Oklahoma City, I'm used to large bureaucracies dedicated to preserving information. My team and I constructed a plan of action regarding the structural analysis and interior design of the building, much of which was rendered irrelevant when we had to reorient after the mayor told us she could not provide the structural plans we needed to do that design. Had we anticipated this issue ahead of time, we might have constructed a plan B sooner than we eventually did, or not spent so much time planning for something that, in retrospect, was very at risk of being rendered obsolete by simple issues during its initial steps.

While it will be discussed in some detail later, I was not prepared to be asked to combine lots of small, moving parts together into a larger narrative, rather than submitting a large project

wholly within a single subject area. I had the training necessary to reach specific design requirements seen in my past classes, but it was difficult to then combine a multitude of those parts into something easily digestible for a non-engineer, such as the Mayor of Pawnee.

Regarding the contributions of course instructors, the instructors reminded my team of the value of not overcomplicating a problem. As an example: one detail my team was stuck on for some time was the design of the center's storm shelter. Originally, we wanted to use the existing basement, but were worried about the cost of reinforcing it. Dr. Delatte told us that it was probably safe to assume that a fallout shelter above a floodplain would resist a tornado, and we incorporated that fact into our decision-making process. Such basic engineering judgement was a valuable asset that I believe all of my team members honed as we made decisions on which of the myriad facets of the project we would focus on.

In addition to the storm shelter considerations, Dr. Delatte also helped us design our new use cases for the hospital by reminding us that anywhere in the building, being a hospital, was probably designed for higher-than-average loads to accommodate equipment and beds.

Our project involved significant amount of synthesizing small details. A large part of the reason that we devoted so much time to modeling work and graphical presentation was because our work involved a very broad range of relatively shallow topics. Unlike some other groups, we were rarely required to “get into the weeds” on any one topic. The classes I was required to take prepared me well for going on deep dives into very specific topics: structural analysis, concrete design, etc. I did not have a substantial grasp on how to tie disparate topics together. As such, my team had to figure out during the project how to take a parking lot design, a slab design, interior demolition plans, and land survey results, among other things, and weave them together into a

cohesive narrative. We created that narrative successfully, but it would have been easier if we had had prior training.

In addition to the previous items, my team lacked expertise on site design concerns like parking lots and walking trails – we had to do significant research on how to design even basic versions of both. We spent a significant amount of time learning what factors we needed to consider, and how we had to use said factors in design. If our classes had taught us how to do basic site design, this would have been a smoother process.

## The Team as a Whole

I would work again with this exact team on another project. Coming into the semester, I already knew and had a rapport with 2 of my 3 teammates (Sidney and Will). I knew how they worked and trusted them to take the project as seriously as I did. My third teammate, Ryan, was a friend of friends, and they all had high praise for his work ethic and drive. All of this meant that my team was able to quickly come to an understanding of where we were, where we should go, and how we might get there.

As is to be expected, our project contained many unexpected developments. My team weathered all of these surprises well, and never had an issue reorienting itself. At no point during this semester did I have doubts about my teammates' abilities or intentions, and I am very happy with the project we created. Reflecting on this semester, I find myself sad that I won't get to work with Sidney, Ryan, and Will again. My standards have been set very high by them.

During the project, I was more of a follower than a leader, though that classification requires some significant explanation. At the outset, my team decided that we would not create a leadership hierarchy to manage the project. Because we all trusted each other to move towards

our goals effectively, we decided instead to operate under a unanimous consent system. Instead of nominating a leader to direct us, we ensured that everybody held the same end goal, and that we would each do the work of orienting ourselves towards that goal with respect to our strengths. This meant that we had periodic meetings to ensure we were pointed in the same direction, and where we surveyed our current workloads to make sure that, assuming all of us diligently completed said work, we would all be satisfied with the outcome.

With all that in mind, I was a follower on the team. I followed the unanimous decision toward a shared goal, and I did my best to help us reach that goal while playing to my strengths. There were a multitude of instances where my help was needed interpreting survey data, helping design a parking lot, or helping design our new entrance slabs. I never questioned my need to assist, even if it took away from what I was trying to do at the moment.

Any other team I worked with would have involved people I did not have prior exposure to. I thus would have taken more time to build trust and knowledge of my team members' strengths and weaknesses, which would have taken away from valuable design time.

Had I different, less familiar teammates, I might have tried to steer my team into a more traditional management plan involving clearly defined leadership roles and separation of responsibilities in order to quickly get to work. I might have been unwilling to take risks, such as putting lots of work toward the long-term goal of building a BIM model to manage information, as I would be afraid of unexpected interpersonal team developments that might render that work wasted. I was confident in my teammates enough that I was willing to take risks by putting large amounts of time toward something unusual.

## My Performance on the Team

Over the course of this project, I learned what my previous mentors and professors meant when they called me a “quick learner”. Much of what I did for this project was wholly or partially new to me. My assisting in interpreting survey data used new tools, such as Autodesk Civil 3D, and my work creating our BIM model on Revit almost exclusively used concepts and tools that I had never heard of before using them on this very project. When I am interested in a topic, I am capable of mastering it very quickly, and using it for the benefit of my team.

However, while I am capable of quickly learning, and I am used to trusting my teammates on long-term projects, sometimes I go too quickly into the “trusting” stage, without checking to see if my teammates are on the same page as me. Early on, when I decided to commit lots of time to modeling, I poorly explained why I was doing it, and I assumed other people were both aware of why I was spending so much time on it, and in agreement that it was a good idea. After I explained myself, this issue was resolved. However, it was only resolved quickly because my other teammates were forward enough to bring this issue up early on. In the future, I should not rely solely on the responsibility of my teammates to correct my mistakes.

## Weathering Obstacles

Our contact, while being able to provide lots of useful initial information, was not able to provide the more detailed information that we eventually sought. When we asked for floor plans, Mayor Cottle quickly found and sent us detailed blueprints for the building. When we asked for structural plans showing column and beam layouts, we did not get what we needed. Record keeping issues by the City of Pawnee meant that those plans were essentially lost from our standpoint, or at least would have required more effort to find than the City was able to provide

on my team's behalf. This resulted in a substantial shift in my team's design priorities, as we lacked the information needed to do the detailed interior analysis and design work we were originally planning to do.

With this obstacle in mind, my team did a fantastic job of managing workload and accountability. At no point did we have to sit down and address issues getting work done, and all of our smaller meetings to reorient around outside obstacles went without argument. For the entire semester, my team was able to maintain a shared goal. We were also able to maintain trust that every other member was diligently working towards that goal productively. When we were suddenly unable to perform the internal structural design work we thought would make up the bulk of the project, we relatively seamlessly transitioned to site design. We learned how to develop parking lots and walking trails, and we took another survey, this time more detailed and focused explicitly on site development.

This push into site design came with its own surprises. When we realized we needed a more detailed survey than our first pass provided, Sidney knew that the traditional Philly rod and total station would not be viable tools. However, our GPS total station lacked a charger, so I reached out to local businesses asking if we could use their charging equipment. Not only did one of those businesses – Boundaries, A Land Surveying Company – allow us to borrow a charger, but a separate business – Universal Surveying and Mapping – offered to take an ultra-high-definition aerial photograph for us to use in conjunction with the survey. None of this would have happened had we not reached out to local figures to ask for help.

Sidney, Will, and Ryan helped give me a team experience where I never had to worry about interpersonal issues interfering with our work. For the entire semester, they have been patient and diligent, and never ready to give up when the project got busy or difficult. I have

been very conscious of the fact that this is a luxury, and I have appreciated it very much. I hope to find this dynamic very soon elsewhere.

## Final Thoughts

As a result of this project, I am confident in my ability to function effectively on a design team and learn on the job. I had to do lots of self-teaching this semester, be it about designing parking lots, or learning the intricacies of Autodesk Revit. I am measurably more capable of learning new concepts quickly than I was in January.

Being involved with OKState Rowing for 4 years, and being its president for 2 years, I am used to working with a group, trusting them, and working towards long-term goals. However, my experience with Rowing has not necessarily been applicable to class work; in class, my teammates were assigned to me, and they *did not have a choice* in being there. Rowing does not have this issue. As such, some lackluster past experiences did not give me hope that senior design would be a paradigm shift in my feelings toward group projects. These low expectations turned out to be unfounded, though. My team was hyper-effective, and my ideas of what a team might deliver have been expanded. Previously, project groups have been something I was forced to work within. My design group allowed me to see the team as a valuable asset, not a feature of the environment that, at best, did not get in the way of progress. This expanded view of a team allows me to see much more potential in large projects.

While I am proud of my team's work and consider this the most enjoyable project I have ever participated in during the completion of my degree, there were some areas that I wish we had had more time to develop, namely our model's topography, its depictions of our outside amenities, and our work with the History Department.

Our walking trail maps are based on surveys taken by Sidney, and we believe them to be the best options for their intended use. The horizontal curves are accurately mapped and reliable for dimensioning the path. That said, I wanted to provide precise vertical curves and slope values for the trail. The intent was to use the elevation values from Sidney's GPS survey to make an accurate rendering of the topography, but an issue during the survey resulted in incorrect elevation values that weren't useful. As such, the land elevation in the model used a combination of publicly available geospatial data and estimated values based on our site visits. The planar locations of all site items are true to life, but their elevations are not. I personally regret not being able to go back and get a precise topography to render walking trail information on.

Further regarding the model, I did not have time to render the splash pad and garden, as I had wanted to at the outset. Because of this, I view the model that our pictures and videos come from as slightly incomplete, though I acknowledge that it is a serviceable starting point for the community to use in promoting the conversion project.

Our work with the history department was valuable. Their team uncovered documents that shed light on original use cases, ages of various portions, and what stresses the building has been subject to over time. They designed an entire memorial wall using data we supplied about space requirements and general aesthetics. All of this will be in the final report and model. Despite all this, our two teams rarely interacted outside of a few meetings over the course of the semester. Had we interacted more, we might have been able to incorporate more of their work into our promotional materials and presentations early on, rather than giving it passing mention. Opportunities for better collaboration existed between the two teams and were missed.

Compared to the other projects I have completed during my degree, this was the first one that I felt deeply invested in. I found intellectual enjoyment in tasks like designing a steel

structure, but the Pawnee Hospital project was the first time I felt that I could make a real difference by using skills I was good at and enjoyed practicing. On multiple occasions this semester, I took time out of my day to do extra work helping clean up design documents or making sure our media renderings for the community were up to a very high standard. I was personally driven to do well on this project in a way I have not been in the past.

I believe that I found so much purpose in my work on this project because, in polishing our model and making images and videos for the City of Pawnee to use, I was, in a way, teaching. My past teachers have told me that they expect me to end up in a classroom someday, and it is true that my excitement to make our model came from an excitement to show Mayor Cottle and others what we have been doing, and to break it down into digestible chunks that could be taught. I find great enjoyment in teaching people this way, and I had an unexpected chance to realize that enjoyment on this project. I will remember for a long time how easy it was to speak at the Senior Expo, and how I wished I had had more time to sit with interested people and explain what my team had achieved up to that point.

As a whole, I found CIVE 4043 very valuable. Over the course of my degree, the nitty-gritty of designing beams or roadway super elevations has never appealed to me, and I was at a loss for what I might use my degree for that I found enjoyable. I also had not had a team project experience that left me aware of what good teams are capable of. Because of the CIVE 4043 course, I learned what talented teams can accomplish, and I found that my passions lie in BIM modeling. My work on this project got me a job with a startup firm in New York doing very similar tasks, and I credit the Civil school and CIVE 4043 for making me seek out work like what I am now employed doing.

Over the course of this project, I learned a tremendous amount about Autodesk Revit, and far more than I expected to about Microsoft Word and Teams. I also learned what I'm personally capable of accomplishing on a team when I trust my teammates. I view the class as a culmination of the last 4 years of learning to manage projects, make long-term goals, and work with others. I will be keeping my experiences in the class close to me for quite a while after I graduate, and I am a better engineer for having taken it.