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## Reflective Essay: Architectural Structures I

After completing Architectural Structures I, I have gained a better understanding of building structures and how they are designed. Throughout the class, I went from struggling with vector additions to breezing through beam designs. The following is an analysis of my progress in this class and an assessment of what I will carry forth in my career.

From the start, we began learning concepts of structures that were new and challenging. We also took a "pre-quiz" that challenged our math and problem solving background. I found that I did not do as well as I had thought I would. I learned immediately that this was a class that stressed accuracy and precision. It made me realize that we would need to use all resources available to us, and not just our memories. At the beginning of the semester, we learned the foundations of structure design and how to interpret forces mathematically and graphically. I learned that every structure has forces acting upon it, and they will either cause the body to move or to deform. Forces can be internal (stresses) or external, such as wind. Structure members can either be in tension (pulled) or compressed (pushed). One concept that we learned was that in order to find the resultant force on a point of a structure, you must add the  $x$  forces together and the  $y$  forces together. I struggled with this idea, since I had learned different methods in my physics class. As you can see in Figure 1, I had difficulty with this task. However, my future quizzes and assignments required this simple concept, and I was able to master it. It is now second nature to me. Another idea I struggled with was moments. I was unsure when to use them and when not to use them. In the first quiz, I used a moment equation when I was not supposed to. I now know when it is appropriate to use moments. When a force causes a rotation or a tendency to rotate about a point, it causes a moment.

I have also significantly improved my structures skills by taking this course. Before beginning a problem, I make sure to provide equilibrium equations and solve for any unknown forces in the structure. When an object is in equilibrium, it is not moving. Therefore, the sum of the forces of  $x$  and the sum of the forces of  $y$ , and the sum of moments will all equal zero. If they did not equal zero, then the structural member would be in motion. At first I was unsure how to create free body diagrams and assign forces to points; however, after solving numerous homework problems, I now do this with ease. I also felt that at times, it was unnecessary to draw free body diagrams. As you can see in Figure 2, I did not draw a free body diagram, which caused confusion when setting up my equilibrium equations. However, in Figure 3, one can see that I had successfully created a free body diagram. I also interpreted the diagram and wrote out the equilibrium equations, which I had also struggled with previously. The free body diagram will help to establish forces that are unknown. As the class progressed, I was able to learn other skills. I learned how to create shear and moment diagrams in order to calculate stresses on a beam. I also learned how to design beams by determining maximum allowable stresses and loads. We used charts to determine information about steel and wooden beams, such as area, depth, thickness of steel web, and inertia. I believe that I can now design simple beams and ensure that they will support all loads and resist stresses such as bending and bearing. I can also find the stress applied on bolted and welded connections and determine if the connection will support the beam.

This class has sparked interest in me to find solutions to problems I cannot immediately solve. I believe that with the foundations I have learned from this class I can look at any design situation and find an efficient and effective way to solve the problem. There were many homework problems that I did not understand right away. However, when I would come up with the incorrect answer, I was eager to know where I had gone wrong. I feel that now I can take a real structural member and determine the forces acting on it, its shear and moment values, its deflection, and any other descriptive values that are associated with it. In the latter part of the class, we learned how to design beams. This involved a great amount of problem solving. For example, in Figure 4, pg. 10, we were to design a W10x beam that would support the loads given. I first calculated the required parameters of the beam to compare with the actual values of the beam. After trying the W10x12 beam, I found that the actual section modulus ( $S$ ) value was less than the required  $S$  value, which means the beam was no good. I then had to move to a W10x14 beam and test its values. I then found that the actual areas and  $S$  values exceeded the required values, and the deflection of the beam was less than the allowable deflection, making the beam acceptable. Had the deflection of the beam exceeded the allowable deflection, a new beam would have to be chosen.

Finally, I have developed as a better learner throughout this class. The homework problems were always challenging, which helped me to test my limits. Nothing was easy, and therefore I found myself asking many questions and inquiring about many ideas and principles. I often wonder why something happens even if I have solved the problem mathematically. I also found that I learn best with a group. Each member of the group brings new ideas that help solve problems. I discovered I had weakness in immediately understanding concepts, but my strength of perseverance and determination helped get me through the assignments. I found that making diagrams was difficult for me because I usually see things in my head. However, these problems were much more complicated than anything I was used to, so I made the adjustment to drawing everything out on paper. This helped eliminate careless errors I would have made otherwise.