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**Technical Assignment 3**  
**Construction Project Management**  
**Apartment Complex**  
**Anytown, USA**

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## **A Executive Summary**

This document is intended to outline the issues I plan to research during the spring semester. On this report, many aspect from both, the construction industry and my project, were analyzed. There is a summary of the critical issues discussed at the PACE roundtable. There is also a more in depth analysis of one of those critical issues. Lastly, there is an analysis of the potential issues that I plan to research for the second part of my thesis.

At this year's PACE roundtable, three issues that the construction industry is facing were discussed. Prefabrication, BIM, and workforce development were the three issues discussed. All of the topics discussed were really interesting and very helpful. After the PACE roundtable I decided to look deeper into prefabrication. I wanted, and still want, to do more research on this topic because I may decide to do my thesis proposal on prefabrication. Another topic that was really interesting to me was the workforce development. After a while, the discussion on workforce development took many different paths. One of them was the fact that most of the workers are Spanish speakers. On my few years of experience on the construction industry I have notice that the language barrier has become a problem. Therefore In this report, there is an analysis on this topic as well.

The PACE roundtable discussion, as well as my research on those topic have narrowed my proposal options. After identifying many problems that my project had, I decided to research three of them. Prefabrication, changing the material for the interior framing, and changing the floor system are the three topics I plan to research. I narrowed my options to these three topics because I believe that those three topics have the most potential to improve the project. I plan to study these three topics in more depth to determine which of them I will peruse on the spring semester as my final thesis proposal.

## **B. Critical Industry Issues**

### **Topic: Prefabrication**

The Construction process is a very long and complex process. Many steps of this process could be done simultaneously with prefabrication. Prefabrication is a very efficient way of doing all the parts separately and then putting them together. At the PACE roundtable, prefabrication was discussed. It was surprising to me how even though everyone had so many good things to say about prefabrication it is still very rare in the business. There are not many projects that use prefabrication as the main method of construction. I think that in the future, prefabrication will be used in every project. However, at this point it seems to me that the industry is not ready to make prefabrication the preferred method. There are still many unknowns and problems to solve. People are just discovering the benefits of prefabrication. The industry still needs to adapt to prefabrication in order to maximize its benefits. Moreover, prefabrication does not work for every project. A large site for staging the prefabricated materials is needed. Prefabrication will not work on projects where space is limited.

The goal is to start implementing prefabrication into every project in order to better understand its benefits. As we implement prefabrication more and more, we will get more familiarized with it. Better methods and many solutions to prefabrication will emerge. Most certainly, prefabrication will shorten schedules and therefore will decrease cost. Listening to what people said on the PACE roundtable made me realize that prefabrication will become very shortly a big factor in construction. The time spent working on the jobsite is very valuable. By doing some building parts outside the site, you can maximize the productivity and finish the project earlier. It is obvious that many other problems will emerge with prefabrication. Architects and engineers will have to work together even harder to avoid any design mistakes. It is true that if prefabrication becomes the main methods for construction, more planning more preconstruction and more coordination will be needed. However, due to the great benefits that prefabrication offers, it is worth giving it a try.

Unluckily, on my thesis project prefabrication could not play a very big role. Due to the reduced space in Washington DC, and the congested site, there is not enough space to lay down a lot of material on the jobsite. Moreover, the structural system of the project is a hybrid. There are many different components that are part of the structural system. Cast in place concrete, precast concrete, steel, metal framing, and wood framing are the main components of the structure. Prefabrication works better on structures that are repetitive. However, if the façade of the building could be prefabricated, then the schedule could be reduced. I plan to study in more depth what kind of impact would a prefabricated façade have on the budget and schedule.

## **Topic: Building Information Modeling**

The second session of the morning focused on Building Information Modeling (BIM). As I was reading some reviews from last year's PACE roundtable, I realized that the industry is changing its view towards BIM. I read that last year there were many industry members arguing that BIM should not be implemented. The general consent was that people did not feel comfortable with BIM. This year, I felt that the general thought about BIM changed completely. Industry members were completely in favor of using BIM and they were encouraging the students as well as other industry members to get familiarized with BIM. From what I perceived, industry members were talking as if they were sure that BIM will be an important factor in the future. I was convinced that BIM will be used in the near future more often. Moreover, I am now convinced that BIM will change many things and it will change the way construction is done.

The ability of BIM to identify system conflicts is the greatest benefit of BIM. By avoiding conflicts, you could reduce the schedule and the cost due to the avoidance of construction delays. All of these opportunities could form a whole new branch of the industry. Firms could simply look at drawings and schedules and coordinate the entire project on a BIM model. Imagine how much time and money could be saved by avoiding conflicts on the jobsite. Imagine how much money could be saved by avoiding change orders caused by conflicts that could have been avoided with BIM. Resolving conflicts on the jobsite can take several days. With BIM, conflicts can be resolved by just using the computer mouse. BIM will benefit everyone. Owners will save money, and the relationship between architects, contractors, and subcontractors will be much better because they will be working in a "free conflict environment".

I am sure that my thesis project would benefit from BIM. I think that every project would benefit from BIM. This computer program will change the industry in a good way. The industry will move forward with BIM. It is true that the Industry is still uneducated and unsure of BIM and its capabilities. However, In the near future, BIM will play a key role in the construction process. I would not be surprised if in a couple of years BIM becomes a requirement for every project, every company, and even school programs.

## **Topic: Workforce Development**

The construction workforce's image has been deteriorating throughout the years. Today, a predominant percentage of construction workers are immigrants. The problem with illegal immigrants has been an issue that has affected the construction industry. There is a reason why children always want to be football players, astronauts, etc. There is a reason why young college students want to be engineers, businessman, etc. There is a reason why very few people want to be construction workers these days. That reason is image. Children as well as college students want to be successful, wealthy, and happy. It seems to me that the image of a construction worker does not portrait success, or wealth.

Owners do not care about the workforce image; they just want to build buildings. Owners just care about budget. That is the reason why there are so many construction workers that are immigrants. The fact is that immigrants are seen by the industry as cheap labor. Money is the main factor driving the construction industry. It seems to me that, for the industry, it is more important to have cheap labor rather than improve the industry's image.

This image problem has brought some other issues that the industry is dealing with now. The truth is that most of the current construction workers that are immigrants do not know how to speak English. The real problem begins at this point. Communication is a key factor in the success of a project. If you cannot communicate with the workers, then everything turns out to be more complicated. Communication is very important for the progress of the project. If there is not good communication, there is a big chance that the project turns out to be a problematic project.

After attending the PACE roundtable I realize that there are various solutions to this problem. One would be to teach Spanish to engineers, superintendents and foreman. Another solution would be to teach English to construction workers. Another solution, which I think is the less probable, would be to change the workforce's image in order to attract more people to the industry.

## **C Critical Issues Research Method**

Construction has been constantly changing throughout the years. The Construction industry's image has been changing as well. Buildings have been evolving, and the way they are built has been changing as well. Construction methods, equipment, materials are just few things that are constantly changing in the construction industry. Another thing that change and it seems that it will continue to go on is the fact that a large percentage of the construction workers are Spanish speakers.

It is hard to say exactly why is the construction manpower predominantly Latin-American people. Some people say that the construction industry's image has been deteriorating throughout the years making the construction worker job to be an undesirable job. Some people say that immigrants can be cheap labor and having foreigner manpower can lower the budget of a project. My personal belief is that there is a large percentage of Latin-American workers due to the combination of many factors that will be analyzed later in this section. However, the real problem is that those Latin-American workers are Spanish speakers who do not know how to speak English. The other side of the problem is that most of the project engineers, construction managers, and superintendents do not know how to speak Spanish. This creates a big problem to the industry since there is a problem with communication.

One thing that I have learned through my short experience in construction is that without good communication things cannot be properly done. Without good communication, it is impossible for a project to be completed without conflicts. On my previous two internships, which were in Washington DC, I realized that having workers that do not speak English was a problem. Even a simple task, such as telling a worker to do something, was hard. Communication between the engineering staff and the workers is essential. The language barrier between these parties is creating a problem for the entire construction industry.

I am from Venezuela, and therefore I know Spanish. During my two internships in Washington DC I realized the advantage that I had over my coworkers just because I knew Spanish. I am sure that if we could eliminate the language barrier, projects would run smoother. I plan to study in more depth the effect of the language barrier on the construction process. My goal is to determine how much is this language barrier hurting the industry. I think that if we give this problem the attention it needs, we can find a solution. Giving Spanish classes to the management staff, or giving English classes to construction workers could be an easy solution to the problem. This is a problem that concerns the entire construction industry. If we could eliminate the language barrier, the entire industry would be benefited.

In order to conduct my research on this topic, I plan to do several things. I plan to get more familiarized on the subject by reviewing literature on this subject matter. I also plan to interview construction workers as well as people on the management side to see what their thoughts on this problem are. My goal is to determine if this language barrier is really affecting the industry.

The Format of my survey is shown below.

Name	
Position	
Do you feel that the language barrier is a problem	
How does the language barrier affected you	
Do you think the industry should pay more attention to this issue	
What do you think could be a solution to this problem	



## **D. Problem Identification**

**This part of my research discusses the unforeseen problems that have appeared or could appear during the construction of Apartment Complex. The solutions for each of these problems are very different. Some of the solutions will have to come from the designer, others solutions may come from just better planning. Here are some problematic features on this project that I plan to analyze later in my proposal.**

### **Safety**

The building footprint is very close to the outside perimeter of the entire jobsite. This is very dangerous since there might be things that could fall from the building directly to the street. In Elm Street there is a protected pedestrian path. However Bethesda Avenue and Arlington road have no protection at all. Maybe having debris netting would make the site safer. By just installing some debris netting to protect pedestrians and automobiles from things that could fall from the building, accidents could be eliminated.

### **Access roads**

Access to the site is limited. It is hard for trucks to deliver materials. Some trucks deliver materials directly from the street because it really hard for them to get in the jobsite. Washington DC is a very congested area, and the traffic does not help. One solution to this problem could be to use Festival Street, which is a street that is on the middle of the building. That way trucks could easily travel from Bethesda Avenue to Elm Street, and deliver materials from inside the jobsite.

### **Too many components for the structural system**

The structural system on this project is a combination of many systems. The structural system has concrete, precast concrete, wood, and even steel. The problem of having many different components in one system is that many trades have to work on the same structure. When many trades work together, most likely there will be conflicts. With many trades, there is the need of extra coordination to avoid conflicts. Maybe by simplifying the structure, conflicts could be avoided, and the schedule could be reduced. BIM could be another solution for this project. BIM could eliminate any conflicts that may appear during construction.

### **Wood studs Vs Metal studs**

The interior framing on this project is done with wood studs. I was surprised when I saw a project in Washington DC being built with wood. My first thought was that wood is a material that is hard to work with. However, after asking people on the project, I realized that wood is a

very cheap and workable material. Wood studs are cheap, and they are installed quickly. However, I think that in the long run, wood is not a very good option. Wood is not a durable material, which means that the building will deteriorate in the long run much faster. I think that using metal studs for the interior framing could be more beneficial even though it will probably be more expensive. However, I see this idea as a value engineering idea. Even though metal studs would increase the cost of the project, they will increase the value of the building as well.

### **Prefabrication**

Due to the large perimeter of the building, the apartment complex façade is very large. Since there is a large façade, there will be a lot of brick installation needed. I thought that prefabricating the brick for the façade could accelerate the schedule significantly. I plan to study how the prefabrication of the façade will impact the schedule. I will also study how a prefabricated façade would impact the other systems.

### **Workforce development (Language barrier)**

In Washington DC the percentage of Spanish speaker workers is very large. Communication, due to the language barrier, could be a problem. By eliminating this language barrier, conflicts, and misunderstandings could be avoided. A project without conflicts and misunderstandings tends to run smoother.

## **E. Technical Analysis Methods**

### **Analysis 1: Prefabricated Brick Façade**

On a project that has a big façade; it is worth studying how a prefabricated façade would affect the project. The use of pre-cast brick façade panels rather than hand laid brick could reduce the schedule significantly. In order to research this issue, I plan to analyze the following project aspects that could be affected by a prefabricated facade:

- Schedule
- Cost
- Design (connection details)
- Maintenance requirements
- Resource allocation
- Safety

With this analysis, I plan to identify any potential problem or concern that may appear. With a prefabricated façade there are many issues that could appear such as, crane usage conflicts, or site congestion. I plan to analyze this issue in more depth in order to eliminate any possible conflicts, and maximize the advantages of a prefabricated façade.

### **Analysis 2: Metal framing Vs Wood framing**

In this project, all the interior framing was done with wood studs. It is still not clear to me why the architect choose to use wood for the interior framing. I believe that wood was used in this project due to its low cost. However, I think that it is worth studying how the project would be affected if metal studs had been used instead. Metal studs would certainly increase the cost of the project, but they would also increase the value of the building. Metal studs are more resistant and more durable. Therefore, replacing wood framing for metal framing would increase the value of the building and would benefit the building in the long run. In order to research this issue, I plan to analyze the following project aspects that could be affected by using metal framing:

- Schedule
- Cost
- Maintenance
- Value of metal studs (durability, resistance)
- Safety
- Labor

Changing the framing material could affect many aspects. I plan to study how cost and schedule will be affected. I also plan to study how this change will affect the construction process and the trade's scope of works. Furthermore, I plan to study how much value would metal studs give to the project. Ultimately, my goal is to determine if the added value is worth the extra money.

### **Analysis 3: Composite metal deck Vs Wood joist floor system**

Currently, the flooring system consists of a slab on grade and slab on deck up to the second floor. The remaining floors consist on a wood joist floor system. I believe that the metal deck system could be installed faster, and it would be more durable in the long run. I plan to study the effects on the project by changing the floor system. I plan to analyze the following project aspects that could be affected by using a composite metal deck instead of the actual floor system:

- Schedule
- Cost
- Maintenance
- Value of metal deck system (durability, resistance)
- Safety
- Labor

Changing the floor system to a metal deck system could affect many aspects. I plan to study how cost and schedule will be affected. I also plan to study how this change will affect the construction process and the trade's scope of works. Furthermore, I plan to study how much value would be added to the project by using a metal deck system. This system might be more expensive, but it may increase the value of the building and accelerate the schedule.

## **F. Weight Matrix**

Description	Research	Value Eng.	Const. Rev.	Schedule Red.	Total
Prefabrication of the façade	15		5	20	40
Composite Metal deck Vs Wood joist floor system		15	15	5	35
Wood studs Vs Metal studs		15	10		25
Total	15	30	30	25	100%