# Technical Assignment #3

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## Executive Summary

**Critical Industry Issues:**

This section offers a look into the topics discussed at the PACE Roundtable. The critical issue identified from these discussions is the current and future impacts of the cost of energy on the decisions made in building construction.

**Critical Issues Research Method**:

The impact of energy costs on new building construction will be investigated for a variety of building systems affecting a buildings consumption of energy. Value engineering options will be created that will reduce the impact of energy costs by building a more efficient building with minimal impact on budget constraints.

**Problem Identification:**

Analysis 1:

Applying to Two Liberty Center all applicable value engineering options developed in the research portion of this assignment and reviewing all of the impacts that those options will have.

Analysis 2:

Re-sequencing the construction of the pre-cast concrete façade for Two Liberty Center. This analysis will review the schedule impacts of the re-sequencing as well as the constructability of this process and the site logistics involved.

# Critical Industry Issues

**First Session Summary**: Mechanical and Electrical Building Systems

This session began with a very structured plan. The group was begun by compiling a list of recent trends in mechanical and electrical building systems. Once a list of trends had been finalized, each trend was analyzed to identify any issues related to that trend. The basic concept behind the session was to see where mechanical and electrical building systems are going, and what challenges will the trades face in following these trends.

The discussion started out by identifying the most prevalent trends in MEP construction. Members of the industry identified a significant increase in the amount of prefabrication used in all disciplines of MEP construction, as well as a change in the methods used to install theses systems, such as flanged pipe connections. The group then brought up the effects of the rising energy costs. Many decisions about MEP systems a building are being driven by the cost of energy and the projected future costs of any system considered. These same decisions about building systems are also being affected by the changing standards, specifically ASHRAE standards for new construction. The final issue on the list was the increasing need for specialty consultants for high-tech systems being used in many new buildings.

As the discussion moved on, the group began to discuss the issues that are arising due to the increased use of prefabricated system components. One of the most important issues to come up was the need for a more completed design before the sections can be assembled. Prefabricated sections do not allow for much correction after installation without additional cost, therefore the systems must be designed and coordinated before the fabrication can begin. After these sections are fabricated, there is an issue of transporting the large pieces to the building and then coordinating the access into the building. More logistical planning may be required to prevent setbacks due to limited building access for delivery of prefab sections.

The newer materials being used in the industry did not raise as much concern among the group as the prefabrication trend, but there were a few items mentioned that should be taken into consideration. These newer materials and methods do not have the

same long term track record that more traditional materials and methods have. There is also an issue in gaining acceptance from the architecture and engineering communities.

Increasing costs of fuel and other costs related to energy are changing the way that decisions are made about MEP systems for buildings. An issue brought up regarding this trend is the need for up-front capital by the builder because of the most likely additional initial costs. These more efficient systems can also be more complicated and reliant on a proper installation, so the need for better commissioning and verification programs is becoming evident. All of the issues revolving around the instability in energy costs are making the selection process for building systems a much more financially driven process.

The next discussion analyzed the impacts of the changing design standards for MEP construction. These changes are causing designers to focus on outdoor air requirements and experiment with adjusting these quantities. More complex controls are also becoming necessary to operate the systems and control all of the variables being adjusted. When designing these systems, and considering the changing design standards, the project team should focus on adopting these systems and designs at an earlier stage in the project and following through with the decision.

Discussing the newer technologies being introduced into MEP construction and the need for specialty consultants led to the identification of many different issues. These technologies are changing very fast, and there needs to be planning for the future of the systems installed and an effort to standardize the infrastructure supporting the systems. The rapid development of technologies causes excessive late changes on projects, but this could hopefully be avoided through the early planning for the future expansion of these systems.

The issues identified in this session can become very useful tools for the planning and management of MEP construction. There are many complexities within the MEP trades, and there is little room for additional complexity. Discussion groups, such as this one, could be utilized more frequently in the industry to assist in the successful planning of MEP systems for new construction.

**Second Session Summary**: Model Development and Responsibilities

Discussion during this session was very focused on gaining an understanding of Building Information Modeling and the steps necessary to begin implementing these models. As a group, there was very little initial understanding of these models, but the few knowledgeable people in the room helped to explain these systems and identify a few of the key issues surrounding them.

These models can become very useful tools for project planning and construction management. One of the first steps to integrating this tool into the industry is to make a transition from designing in two dimensions to designing in three. The design professionals would need to be trained in newer software and break away from the comfort of their current methods. Once the designers have made a switch to three dimensional designs, the addition of building information modeling to these designs is not difficult.

As a group, there was significant concern for the ability to successfully make the necessary changes in current methods in order to adopt BIM's. The general consensus was that there will need to be a pioneer in the industry to take on the costs and break into these new practices. Government agencies could be the perfect group to lead the industry into the next generation in building design, project planning and development, and construction management. Building Information Modeling has a place in the industry, but the challenge will be in adopting these new practices.

**Third Session Summary:** Building Respect with Specialty Contractors

This final session began by outlining the meaning of mutual respect. Mutual respect is most clearly defined as: Treating others the way you would like to be treated. Respect among professionals can be developed through a few simple practices. The way to start building respect is to earn the respect of the people around you through performance, quality of work, and being knowledgeable. To build respect, maintain respect, and lose respect all revolve around honesty. There is no faster way to lose the respect of somebody then being caught in a lie.

The discussion later took a more focused look at the relationships within a project, and the roles that the specialty contractors play in those relationships. Success in the

specialty contractor community is strongly based on the relationships that are built between the various contractors and whoever their contracts are with. These relationships can dictate the success of any job and provide opportunities for future work with the same project teams. Between the contractors, respect and relationships are built not only through interacting personalities but through the respect for each others work and a lack of harmful competition between trades. Often times the trades can build a bond by uniting against the general contractor, but this can be dangerous for a project environment if it becomes a rebellion.

The group went on to discuss the role that the procurement can play in building respect within the industry. Procurement sets the stage for a project and can dictate the types of relationships that will result from that project. The relationships with the specialty contractors will carry over into the construction phases of a project and lead to a more friendly and productive environment. These contractors put forth a significant amount of effort in the quotes that they provide, and they deserve respect for that effort.

Finally we discussed the role of the close-out process in building respect in the construction community. Successful jobs should be celebrated and outstanding performance on those jobs should be rewarded. As little as a phone call or letter to a contractor, thanking them for their efforts can establish a respect that can lead to more successful projects in the future.

The construction industry within a geographic area can be very tight knit, and respecting each other within those communities is crucial to the success of the companies involved. We as individuals need to remember that each person we work with on a project has a common goal, and respecting each other can help all parties to reach that common goal. If this industry is to continue its growth and success, then the members of the industry should learn to treat each other as comrades rather than opponents.

**Project Relevant Industry Issues:**

As an office building with space for lease, one of the most relevant issues is the decision making for MEP systems based on the costs of energy. From a development perception, it is difficult to make decisions that affect the first cost and lifecycle costs of the building. The developer may not be interested in the lifecycle costs of the building

directly, but they must consider whether the types of decisions they make will have an impact on marketing the property to potential tenants. There should be a middle ground for the amount of money put in the upfront costs versus the lifecycle savings. Value engineering ideas that may improve efficiency without additional cost would be very helpful for a developer in this situation.

**Industry Contacts:**

From the PACE Round Table seminar, I found a contact from the general contractor on my thesis building that may prove to be helpful for my research. He is a project executive from Clark Construction and was involved in the preconstruction process of Two Liberty Center. Since he was involved in the preconstruction on my building, he will be able to help me gain an understanding of the decisions that were made regarding MEP systems, and what the driving factors were behind those decisions. He can further help me identify the balance of upfront costs versus lifecycle costs and the attention that was paid to building an efficient building.

## Critical Issues Research Method

**Problem Statement**:

During the PACE Roundtable, there was a discussion during one of the sessions about the effect that energy costs, and the unpredictability of those costs, on the decisions that owners are making about building efficiency. Initial savings on construction costs through cheaper and less efficient systems are having a greater impact on the life costs of that building. Owners need to be presented with options to produce a more efficient and more responsible building that can meet their budget needs.

**Research Goal:**

To produce a variety of Value Engineering options for building owners, that can produce life cost savings and minimize the impact of energy costs with no impact, or a minimal impact on the budget of the project.

**Research Method:**

The following steps will be taken to develop the Value Engineering options stated in the Research Goal:

- Research and analyze the current energy market, and review predictions for the future of energy costs
- Identify the most critical building systems with the greatest impact on life costs through energy savings
- Research and identify the most typical option for the systems identified
- Research current options for more efficient alternatives to the systems identified above.
- Interview representatives from some of the leading suppliers of these types of building systems to identify new technologies being introduced
- Analyze the life cost savings of these systems based on the predicted future of energy costs and compared to the more traditional system
- Analyze the impact on initial costs based on total impact of that system on the design of the building
- Analyze potential impacts on construction schedules based on lead times and installation times.
- Assemble a list of the system alternatives with life cost savings, initial cost impacts and schedule impacts identified.

**Research Product:**

The final list of system alternatives will be a chart outlining all impacts that the system will have on the initial costs, life costs, construction schedule, and building operation and functionality. This list will become a helpful tool during Value Engineering to present a building owner with the options they have to produce a more efficient and more responsible building.

# Problem Identification

**Analysis 1: Application of value engineering options identified in the research portion**

To apply and analyze all of the potential value engineering ideas that will be developed in the research section of this assignment. The owner of Two Liberty Center is a developer so there is a concern for upfront costs, but they also have an interest in a quality and responsible design. This owner would be an ideal beneficiary of the outcome of these value engineering options.

**Analysis 2: Re-sequencing of the Façade construction**

The pre-cast concrete façade is currently scheduled to be erected one face at a time. This prevents the window installer from starting until the pre-cast panels are complete since the windows are installed by floor. Using the tower crane and installing the panels around the perimeter by floor will accelerate the schedule. With the phased completion and occupancy by floor, the ability to perform interior work earlier is critical.

# Technical Analysis Methods

**Analysis 1: Application of value engineering options identified in the research portion**

The technical analysis method for this option will involve a wide variety of value engineering applications including many different building systems. The implementation of these value engineering options into Two Liberty Center will offer the opportunity for extensive constructability reviews in many different technical areas of the building design. An investigation into the total impacts of these value engineering options will include, but not be limited to, a schedule impact review and proposal for acceleration or justification for a schedule extension.

**Analysis 2: Re-sequencing of the Façade construction**

This area of the technical analyses will offer a unique opportunity to investigate not only a significant scheduling impact but to closely evaluate the total impact on the constructability of this pre-cast concrete exterior wall system. This analysis will extend into the site logistics of erecting a pre-cast panel façade in a highly trafficked urban setting and explore the many options for coordinating this process. The schedule impact portion of this analysis will also extend into the greater impact on the project with a look at the impact on the phased fit-out turnover and how that will benefit the owner.

# Weight Matrix

| Description | Research | VE | CR | SR | Total |
|---|---|---|---|---|---|
| Analysis 1: Application of value engineering options from research | X | 15% | 7.5% | 7.5% | **30%** |
| Analysis 2: Re-sequencing of façade construction | X | X | 5% | 5% | **10%** |
| Issues Research: Value Engineering for a more responsible building | 30% | 20% | 5% | 5% | **60%** |
| **Total** | **30%** | **35%** | **17.5%** | **17.5%** | **100%** |