
TECH #3: ALTERNATIVE METHODS & RESEARCH

Executive Summary

The following technical assignment summarizes the discussion in two of the dialogue sessions at the annual PACE roundtable. 40 industry members and 30 undergraduate and graduate students got together for simultaneous discussions on four topics: integrated design management, frontiers for innovation, healthcare facility design and delivery, and team building. Each topic had two discussion sessions. The sessions summarized in this report are both of the healthcare dialogues. Some of the issues discussed were the headaches for contractors in healthcare construction, infection control methods, steps necessary for successfully delivered projects, and planning issues that can beneficially affect project cost.

In this technical assignment is an identification of a critical issue that will be researched. A problem statement and research goals have been developed, and a data collection tool has been created.

Also, in this technical assignment is an identification of several problematic features of the project. Each problem falls under the category of a value engineering analysis, a constructability review, or a schedule reduction/acceleration.

The final section of the technical assignment is the technical analysis methods. Three technical analyses are presented with descriptions on how the analyses will be performed. Additionally, presented is a matrix showing how I plan to distribute my effort in the spring among the technical analyses and the research issue.

CRITICAL INDUSTRY ISSUES

Session 1: Healthcare Facility Design and Delivery 1

The topic of the first discussion on healthcare was Barriers to High Performance Healthcare Facility Delivery. The first question tackled was: what are the top 5 headaches for contractors in healthcare construction? One of the first issues raised was that hospitals

are rarely built from scratch. Most hospitals are steadily growing, with additions and wings being added on every couple of decades. This creates a problem when the new construction has to interface with construction sometimes decades old. Another huge headache is the fact that the owner of a healthcare facility is never one individual. The “owner” usually consists of some combination of the board of directors, head nurses, facilities management, maintenance, and head doctors, just to name a few. The problem this creates is that each person wants to have a say in the hospital design, creating delays during the design process. Additionally, during the construction phase issues arise because of communication problems between the contractor and all of the “owners”. The project manager has to waste a lot of time informing all the parties of the construction activities that are occurring. To combat this, industry members stressed the importance of setting communication protocols during preconstruction. With proper protocols set up, time will not be wasted by the construction manager contacting multiple individuals whenever there are utilities to be interrupted, or a problem arises during construction. The second topic discussed was the impact of project delivery and contracting practices on healthcare construction. One industry member highlighted a successful project in which the construction manager hired a design/build MEP subcontractor, and this was an effective method. The prevailing attitude was that the owners in the healthcare industry need to be better educated on more progressive delivery methods such as design/build. CM at risk is the prevailing method, and the construction is exceedingly change order driven. The general consensus among the industry members was that a program manager is needed during the early study and schematic design phase, however during construction the program manager can become a burden slowing the communication process down. The last topic discussed was the impact of infection risk control. Industry members highlighted several of the methods employed on their projects. Some of these methods included temporary partitions, negative air machines, sticky mats at ingress/egress points, not storing duct on the floor, and using a different temporary duct rather than the permanent duct. Everyone agreed that preconstruction is essential in establishing an infection control plan. Life safety plans are one area that can get overlooked. It is essential that these are updated so that hospital employees or patients do not go into the construction area during an

emergency evacuation. Another problem facing the contractor is the infection potential from material deliveries to the site.

What surprised me about the discussion was that so few industry members were in attendance at the session. The healthcare industry is a somewhat large sector of the construction market and I expected more of the industry members to be there at the discussion. When I approached one industry member about this he said that the healthcare industry is more of a niche market and either you are in it or you are not. Despite this, I still expected more people to be there. One issue that might be applied to my project is the infection control procedures. With my project being a renovation of an existing wing, this is especially pertinent. Of all the subjects discussed, this is the topic that most interests me. Some of the key contacts I met were Jim Faust of HSC and Dan Flickinger of Alexander. Both are involved in healthcare projects, Jim from a project executive level and Dan from a project manager level.

Session 2: Healthcare Facility Design and Delivery 2

The topic of the second discussion on healthcare was Enabling Processes in Healthcare Design and Construction. The first issued looked at was the critical design and construction steps necessary for successful project delivery. One important step is to get input from the end user and maintenance staff. Design input is essential to minimize changes that could happen during construction. Another important step is to make sure the owners understand what is going into the facility. One way to achieve this is to make sure they look at samples and other similar facilities, or three dimensional models so they can better visualize the spaces and materials. For a successfully delivered project there must be clear communication channels. In order to facilitate the project, construction managers need to educate themselves on healthcare equipment and relevant issues associated with them. The biggest key to a successful project was having a happy owner at the end. The next topic discussed was planning issues that can beneficially affect project cost. One of the areas we talked about was getting construction input during the design phase. It definitely adds value to have a construction manager involved during design to avoid change orders later. Another issue was educating the owner and developing good estimates. The owner needs to understand any potential risks associated with the project.

Additionally, early development of good estimates, with as much detail as possible, is essential for the owner to better understand the budget. Also, realistic budgets will ensure that the owner does not get their hopes up. Planning for the project complexity is vital to controlling costs. With the complex nature of hospitals and healthcare facilities it is imperative that the project team is experienced and able to handle stringent quality control. A final opportunity to affect the project cost is in the selection of subcontractors. A bad subcontractor can ruin a project, so it is key to make sure that the best subcontractors are selected for the job. Subcontractors with preexisting relationships with the construction manager or owner can be very useful when it comes to communication and cooperation. The last topic covered was whether the construction manager should become involved in project funding or facility operations, especially for non-profit healthcare owners. The biggest hurdle in this potential scenario is that there is a lot of risk for the construction manager. The healthcare owner needs to have some sort of income stream or needs to have land or some sort of equity that they can “trade” for a new facility. However, the construction manager can get involved in project funding by introducing the owner to developers and assembling good estimates for the owner to get a more precise idea of funding needs. The issue is that many hospitals are so close to bankruptcy, with very little cash flow, that it is a big risk for the construction manager to invest too much money early in the project if the owner cannot pay up in the end.

The thing that surprised me the most was how the industry members highlighted how uneducated the healthcare owners were. How a lot of effort was needed to make sure that the owner understood what they were getting. None of the topics discussed in the session are particularly applicable to my project, because my project is a small renovation and addition. However I think the discussion on communication is beneficial because that is something important to my project, and all projects regardless of size. The topic that I am most interested in is the idea of having contractor input during design, and how that is possible with a traditional delivery method. Due to the small size of the discussion again, I did not make anymore key contacts. Jim Faust and Dan Flickinger were both there again.

CRITICAL ISSUES RESEARCH METHOD

Problem Statement

Each year several thousand people die in hospitals from infection due to poor construction standards. Infection control is so much more important in healthcare construction than in any other type of construction because the patients in a hospital have suppressed immune systems which cannot fight infection risks introduced during construction.

Research Goal

The goal of the critical issue research is to develop a checklist/matrix of the most common infection control issues, how to best control each infection risk, and the anticipated schedule/cost/sequencing impact of controlling that infection risk. The main audience of the research will be the general contractors and construction managers who participate in the construction of healthcare facilities. Another audience is the owners and program managers of healthcare facilities. The research will be beneficial to the hospital facility general contractors and construction managers in establishing plans to control infection risks. The research will make sure that there are no risks that are unaccounted for by the GC or CM. The contractor can better plan for how to properly control the infection risk as well as determine the impact of controlling that risk on the project. The hospital owners and program managers will benefit by having a guide that they can follow when determining the infection control specification on their project. Utilizing the results of the research they can be sure that the constructed facility is as free from infection risks as possible. Ultimately the patients in the healthcare facilities will benefit from having hospitals with diminished infection risks.

Research Steps

- Review existing literature on controlling infection risks in healthcare construction.

- Develop a data collection tool for gathering information from industry professionals regarding infection control issues that have occurred on their projects.
- Identify the individuals that are in charge of the healthcare construction division within several general contractors or construction managers.
- Identify the individuals in charge of construction within the hospital ownership.
- Send the data collection tool in the form of a survey out to all of the individuals targeted.
- Upon receiving responses from the industry members, summarize the results in the form of a checklist/matrix of all the infection control issues identified.
- The only outside information needed for the research is contact information of all the industry members that need to be contacted.

Data Collection Tool

The following is a draft of the data collection tool that will be sent out to all of the industry members identified, either in an email or as a webpage format in which participants could submit their answers through on a website:

My name is Abe Vogel. I am a 5th year Architectural Engineering student at Penn State. I am doing research on controlling infection risks during the construction of healthcare/hospital facilities. The goal of my research is to develop a checklist/matrix of the most common infection control issues, how to best control each infection risk, and the anticipated schedule/cost/sequencing impact of controlling that infection risk.

Please identify your self, your company, and your position within your company, and fill in the matrix with as many infection control issues that you have encountered during the construction of a hospital/healthcare facility. One example is shown in the matrix.

Name:

Title:

Company:

Infection Risk	How was it controlled?	Schedule/Cost/Sequencing Impact
Dust introduced by workers entering the work area	Having sticky mats at the entrance to the facility once the building is enclosed	Cost incurred from purchasing the sticky mats

Please email this back to me at ajv139@psu.edu

Or fax to this number: 814-863-4789

Or send to this address: Abe Vogel
602 Torrey Lane, Apt. 2
Boalsburg, PA 16827

PROBLEM IDENTIFICATION

Value Engineering Analysis

- Pre-cast brick veneer façade vs. hand laid masonry. Nitterhouse Concrete Products presented a façade in which there is thin brick veneer integral with the pre-cast concrete wall. Issues may arise because the addition needs to appear the same visually as the existing facility.
- Utilization of different flooring or illumination systems.

Constructability Review

- Interface of new elevated slabs with existing hospital slabs. The new slabs have to interface with the existing slabs built in the 1950s.
- Interface between existing hospital and new construction, with respect to infection control. It is imperative that no dust or particulate enters the existing hospital from the construction. Proper barriers are necessary to ensure this.

Schedule Reduction/Acceleration Proposal

- Pre-cast plank vs. cast in place elevated slabs. Pre-cast planks will not require any casting time, as it can be done off site.
- Pre-cast brick veneer façade vs. laid masonry. Pre-cast façade will greatly accelerate the schedule because the casting is done off site; the only time needed is for erection.
- Elimination of program manager. The program manager under contract with the hospital is fulfilling a similar role to the construction manager now that program requirements and design development are over.
- Alternate roofing system. Roofing is scheduled to take a month on a ten month project, a small savings here is readily apparent in the overall schedule.

TECHINICAL ANALYSIS METHODS

Analysis 1: Precast Brick Veneer Façade

This technical analysis will consist of analyzing the value added from using a precast brick veneer façade instead of a mason laid brick façade. To develop this analysis the following steps should take place:

- Identify a precast brick façade manufacturer.
- Determine feasibility of using a precast brick façade knowing the constraints of the project.
- Consult with a structural option faculty to determine structural requirements of the façade in order to erect it.
- Determine the schedule impact of using a precast brick façade and a precast concrete structural system.
- Determine the cost impact of using a precast brick façade and a precast concrete structural system.
- Determine the cost savings on general conditions due to schedule reduction.

Analysis 2: Precast Concrete Structural System

This technical analysis will consist of analyzing the utilization of a precast concrete structural system instead of a cast-in-place concrete system. To develop this analysis the following steps should take place:

- Consult with a structural option faculty to design a precast concrete structural system.
- Determine impact of using precast members to the site layout plan.
- Determine impact of using precast members to the crane selection.

Analysis 3: Infection Control Risk Assessment

This technical analysis will look at the interface between existing hospital and new construction, with respect to infection control. To develop this analysis the following steps should take place:

- Review literature on Infection Control Risk Assessment
- Determine type of Infection Control Risk Assessment to perform
- Perform Infection Control Risk Assessment

Weight Matrix

The following matrix illustrates how I plan to distribute my effort among the different analyses I propose for the spring:

Description	Research	Value Eng.	Const. Rev.	Sched. Red.	Total
Precast Veneer		10%	10%	10%	30%
Precast Structure		5%	10%	5%	20%
ICRA	20%				20%
Issues Research	30%				30%
Total	50%	15%	20%	15%	100%