

Technical Assignment #3
Alternative Methods and Research

Devin Learn

Construction Management

Dr. Messner

Lancaster General Hospital 5th & 6th Floor Fit-Out, Cardiac Elevator

Lancaster, Pennsylvania

11/21/06

Technical Assignment 3

A. Executive Summary	1
B. Critical Industry Issues	2-4
C. Critical Issues Research Method	4-6
D. Problem Identification.....	7-8
E. Technical Analysis Methods.....	8-9
F. Weight Matrix	9

A. Executive Summary:

This technical assignment contains the summary of critical industry issues discussed in the 15th annual PACE roundtable held on October 12, 2006. The roundtable consisted of three different discussion sessions each containing 3-4 sub groups. The topics of these discussion sessions summarized range from start-up, operating and maintenance to education and workforce issues for BIM and building respect with owners and operators. These sessions helped to gain insight into issues that are present in the construction industry currently as well as to establish contacts with industry personnel that will be assisting in the research aspects of this report.

Also included in this technical assignment is an identification of a critical issue that will be research. The critical issue identified in this section of the report is the commissioning of fit-out type projects focusing on healthcare/hospital facilities. A problem statement, research goals and data collection tool have been developed to complete the research of this issue.

The third section of this report identifies three problem areas specific to the project being studied at depth in the previous technical assignments which is the 5th and 6th floor fit-out and cardiac elevator addition to the Lancaster General Hospital, Lancaster PA.

In the final section of this technical assignment are the technical analysis methods. Three technical analyses are described and include the steps that are required to complete the analysis for each.

Additional material presented includes the weight matrix that illustrates how my effort will be distributed in the spring semester among the three technical analyses and issues research.

B. Critical Industry Issues:**Session 1: Building Systems Challenges****1D – Start-up, Operations and Maintenance**

This session focused on O&M, commissioning and warranty issues. Discussions began with common reasons for call-backs and maintenance problems, some of the most common reasons stated had to do with temperature and humidity issues. Most of the topics were related to MEP systems because industry members present were from Southland Industries. Commissioning was at the base of most of the discussions which was a good thing for me because it is something that I was interested in learning more about. Types of building and use can impact the effectiveness of commissioning. We also discussed some of the pros and cons of having a 3rd party, GC or In-House commissioning agent. Some of the operations and maintenance issues covered were the importance of training personnel, bringing them in as early as possible in the design and construction of the building so they can learn and have an input in the systems. Some characteristics of institutional vs. developer projects, such as institutions often have full-time O&M personnel that are already on staff and can be more easily be brought in at the beginning of the project however developers usually don't hire their O&M personnel until the end of the project. This session was very informative and gave me some ideas for some research possibilities that I will expand upon later.

Session 2: Building Information Modeling Technology**2B – Education and Workforce Issues for BIM**

This session focused on the possible uses and challenges of BIM. Throughout the discussion we learned that there can be many different forms of BIM and many companies are already using systems that could be considered BIM organizations at least in simple formats. Some of the possible uses that were identified are its use in pre-construction in the owner presentation as a selling point to help people that are not able to see drawings in a 3D format in their head. It is important to specify the uses and intent for BIM early in a project and establish everyone's expectations and responsibilities to make it possible. As far

as field use goes technical limitations are going to be a major challenge to overcome and could require substantial training and technology investment to occur. Everyone on the project team needs to be on board from the architect producing 3D drawings to the contractors having the technology and knowledge to put the models together.

Session 3: Building Respect

3A- with Owners and Operators

Most of this discussion was based on ways to build and maintain the respect and a relationship with the owner. The basis for respect is trust and it is important to build this trust as early as possible and to be careful not to do anything to break this trust between the owner and the contractor. Some ways to build trust is through communication with the owner and the contractor and not just talking about the good things that are happening but keep them up to date on the problems that may be occurring. If there are problems or bad news to be delivered always have a plan on how to work toward a solution. Walking through the project with the end user early in the project can help eliminate problems and make sure that they are happy with the progress and the spaces that they will be occupying. Some ways to lose the respect of the owner is to hide problems or try to sneak things by them such as change orders or construction issues. If a good relationship is created early in the project and is carried through to completion the project will more successful and can lead to repeat business with the owner.

Some of the issues that came up during this meeting gave me ideas for what I could research as part of my thesis project. One of these issues is commissioning which I plan to research in the form of effectiveness and importance in a fit-out type project in an existing shell space. My thesis building as a hospital with intensive MEP systems that have strict requirements so I think that commissioning may produce a better end product.

The key contacts that I made were with Jim Foust of HSC, John of OPP and Teresa from Pentagon Renovations. Jim Foust and HSC specialize in hospital and educational construction so he has a wealth of knowledge in the type of projects that I am researching. John from OPP at Penn State has been working on

commissioning and is providing me with information and research of commissioning on campus. Teresa from Pentagon Renovations knows a lot about the owners perspective and will be able to help me with information about how to best produce a mutual feeling of satisfaction between the contractor and owner for a successful project.

C. Critical Issues Research Method:

Problem Statement:

More and more owners are starting to look more at the long term operating expenses of their buildings over the initial cost of construction. This has lead to an increase in commissioning and green building ideas being incorporated into the construction process. Commissioning is a way to ensure that the building systems are designed, set up and functioning in an efficient manner.

Research Goal:

The goal of the critical issues research is to determine the effectiveness of commissioning on a fit-out type construction project when the space will utilize both new and existing equipment. Specifically the effect on units that will now be serving expanded zones due to the fit out. As well as the effect of the new units on existing zones within the previously occupied section of the hospital adjacent to the fit-out. This will require information on the design of the new units as well as load information from existing units. Due to the strict regulations on outside air and air change per hour for healthcare facilities proper sizing and balancing of units is required. This information will hopefully allow the mechanical designer and general contractor deliver a successful project for the hospital that will safely and effectively serve their patients and staff. Since the fit-out space for this project will be occupied by the nero-truama intensive care and intensive care units of the hospital were some of the most severely injured patients will be located a safe and healthy environment is that much more important. Commissioning may also help reduce the life-cycle costs of these spaces for the not-for-profit hospital.

Research steps:

- Review existing literature on commissioning focusing on healthcare facilities.
- Develop a data collection tool to gather information from industry professionals on commissioning and mechanical system design.
- Identify individuals that are involved in the decision process for commissioning.
- Identify individuals that are directly involved in the commissioning process.
- Distribute the data collection tool in the form of a survey to the individuals identified above.
- Upon return of the data collection survey summarize the results in matrix form to identify decision and benefit factors in the commissioning process.
- Other information required for this research will come from mechanical design professionals for this project to determine what effects if and the new and existing units have on each other.

Data Collection Tool:

The following is a draft of the data collection tool that will be sent to the individuals identified above in order to accumulate information for research purposes on commissioning of fit-out type projects.

My name is Devin Learn, I am a 5th year student in architectural engineering at The Pennsylvania State University. I am doing research on the effectiveness of commissioning in fit-out type projects focusing on healthcare/hospital facilities. The goal on my research is to identify the benefits and decision factors for commissioning in these types of projects which will be organized into matrix form.

Please identify your self, your company as well as your position in the company and fill in the survey to the best of your ability.

Name:

Company:

Position:

Benefits	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
Decision Factors	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	

Please email this survey back to me at dcl146@psu.edu

Or contact me at 814-441-9654 for other response options.

D. Problem Identification:**Constructability:**

There are some constructability issues with the cardiac elevator addition at Lancaster General Hospital. None of these issues are insurmountable however I feel that given more time than was available in the actual project schedule to investigate the possibility of different methods some schedule and cost savings may be possible. One of the constructability issues is simply getting equipment in to and out of the constricted site of the cardiac elevator with the only access to the site coming from a parking garage on the ground floor with limited



Figure 1 – Site access from garage

floor to ceiling height of approx. ten and a half feet. This access point is shown here in Figure 1. Another issue on this project is the fact that the outside air intakes for this wing of the hospital are located directly adjacent to the construction site. The air intakes can be seen here in Figure 2. This causes a problem for any operation that creates any type of fumes,



Figure 2 – Air Intakes

exhaust or excessive dust. One such occurrence is during excavation what is to be done with the exhaust from the excavator once you have managed to get the excavator into the tight space. These issues and others add to the already complex task of successfully completing a construction project in or around a functioning healthcare facility. There is also an emergency exit from a stairwell that enters into the site that must be preserved.

Commissioning:

As part of my project I would like to take a look at the advantages and disadvantages of commissioning in a fit-out project. I intend to look at whether it

is as advantageous in this application as it is in base building type projects. One of the areas within this project that I would be most interested in is how the existing building systems are affected by the addition loads placed on them by the newly occupied spaces. Also how the new equipment may affect the load on the existing equipment and if these two issues if present would benefit from implicating a commissioning procedure.

ICRA:

Infection Control Risk Assessment is a very important part of working in healthcare facilities and other sensitive areas. I would like to continue the previous research into this area with respect to sequencing and cost analysis. If this requirement is not identified in budget and scheduling of the project it can have a serious negative impact on successfully completing the project. ICRA is a multifaceted approach to creating a healthy and safe atmosphere for the occupants of a healthcare facility.

E. Technical Analysis Methods:**Analysis #1: Commissioning**

This technical analysis will look at the effectiveness of commissioning on fit-out type construction projects focusing on healthcare/hospital facilities. In order to conduct this research the following steps should be used.

- Review existing literature on commissioning of healthcare/hospital facilities.
- Determine benefits and decision making process of commissioning.
- Catalog research information into decision making matrix.

Analysis #2: Infection Control Risk Assessment

This technical analysis will look at the importance of infection control risk assessment focusing on sequencing and schedule reduction. In order to conduct this research the following steps should be used.

- Review literature on infection control risk assessment and requirements for healthcare/hospital facilities.

- Determine locations and types of assemblies that will be used to satisfy these requirements.
- Identify sequence of work that will require the least amount of rework or movement of these assemblies to complete the project with the least amount of risk.

Analysis #3: Constructability

This technical analysis will look at the constructability issues of the cardiac elevator addition in an isolated site within the hospital complex. In order to conduct this research the following steps should be used.

- Identify constructability issues for the cardiac elevator addition.
- Research alternate methods of construction.

F. Weight Matrix:

Description	Research	Value Eng.	Const. Rev.	Sched. Red.	Total
Commissioning	15	10			25
ICRA	15			10	25
Constructability			20	10	30
Issues Research	20				20
Total	50	10	20	20	100%