Final Proposal

Depth and Breadth

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

Lancaster, Pennsylvania

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Revised Final Proposal

A. Executive Summary:

This report contains four analyses conducted on the 5th and 6th Floor Fit-Out projects as well as the Cardiac Elevator Addition to the Lancaster General Hospital, Lancaster PA. Included in each analysis is the problem statement, the goal of the research, methods/tools used and the expected outcome.

Commissioning

The emphasis of this report will be on the first section which contains the research of the effectiveness of commissioning of fit-out type projects. The further focus of this topic will be in the healthcare/hospital construction field. This analysis will attempt to determine the effectiveness of commissioning of fit-out type projects were new and existing MEP systems are utilized and to assist design professional and construction companies to deliver a successful project.

ICRA

The second section of this report contains an analysis including breadth of MEP systems used on projects requiring Infection Control Risk Assessment procedures. In the section such issues as completing tie in to existing systems through ICRA partitions without compromising the protection provided by the partitions. Systems that work the best in these situations will be identified through this research.

Pre-Cast Vs. Cast-In-Place Elevator Shaft

The third section of this report contains my second breadth analysis into the structural system used for the cardiac elevator addition. The current structural system utilizes a steel frame with cast in place concrete on composite metal decking. The system that is proposed in this section is a pre cast floor system to reduce the over all schedule and the duration that the tower crane being on site.

Weight Matrix

The weight matrix attached to this report shows the distribution of how I plan to apply my effort to the analyses proposed in this report during the spring semester.

B. Commissioning of Fit-Out Projects: (Research)

Problem

The 5th and 6th floor fit-out project at the Lancaster General Hospital will incorporate the NTICU on the 5th floor and the ICU on the 6th floor. Both of these spaces will make use of new and existing MEP systems. This will require the coordination between the new and the old units that I believe would benefit from commissioning practices. Since these projects take place inside a healthcare facility there are strict regulations on there functions and servicing of the space.

More and more owners are starting to look 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.

Goal

The goal of the proposed research would be to determine the effectiveness of commissioning on a fit-out type construction project when the space will include 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 to 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 even more important. Commissioning may also help reduce the life-cycle costs of these spaces for the not-for-profit hospital.

Method

1. Review existing literature on commissioning focusing on healthcare facilities.
2. Identify individuals that are involved in the decision process for commissioning.
3. Interview individuals identified above to determine the key aspects of the decision making process as well as the common uses of commissioning in healthcare facilities.
4. Summarize data collected from the interviews in a matrix to identify decision and benefit factors in the commissioning process.
5. Additional information required for this research will come from the mechanical design professionals for this project to determine what effects if any the new and existing units have on each other.

Tools

The tools used to complete this research will be the interviews conducted with owners to determine their feelings on the benefits of commissioning within their facilities, design professionals to determine their thoughts about the advantages of commissioning and how it effects their design as well as contractors to determine what advantages they feel come from the commissioning process in their projects. These interviews will be conducted across this range in order to get the perspective of everyone involved in the commissioning process.

Expected Outcome

The expected outcome of this research will be to have created a decision matrix that will help all parties involved in the decision process for commissioning to determine how extensively it will be used in their project. Some determining project features may include size, MEP requirements, new vs. existing systems, maintenance staff training and project delivery method.

C. Infection Control Risk Assessment: Including Mech. (Breadth)

Problem

Infection Control Risk Assessment (ICRA) 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 as well as take the research a step further and include a breadth study looking specifically at MEP systems that are used on projects that require ICRA procedures. 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.

Goal

The goal of this research will be to identify MEP systems that make the transition from occupied sections into the construction zone through ICRA partitions focusing on connections and dampers used at the partition to separate the two spaces during construction and during normal operation in the post construction phase. There is a wide variety of requirements for ICRA partitions including fire ratings, smoke ratings and negative air pressure ratings. Each of these types have different specifications as far as construction but this research will hope to make the requirements for the MEP systems running through the plenum space above the partition easier to determine ensuring that the proper connections and dampers are put into place.

Method

1. Review literature on infection control risk assessment and requirements for healthcare/hospital facilities.
2. Review literature from the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) inspection process.
3. Interview design professionals to determine how they determine damper and connection requirements for projects that require ICRA partitions.

4. Compile the information into a list format that will be broken down into the different partition requirements specifying connection and damper types for each assembly type.
5. Perform analysis on this project to identify appropriate design.

Tools

Tools used for this research will include:

- Joint Commission of Accreditation of Healthcare Organizations website www.jcaho.org
- HPAC Engineering website www.hpac.com
- Penn State Architectural Engineering Faculty.
- Interviews with design professionals.

Expected Outcome

The expected outcome of this research will be to develop a list of different partition requirements specifying connection and damper types for each assembly type. This will assist design professionals and contractors in selecting equipment to be used in the construction of ICRA partitions as well as reduce the schedule and cost by eliminating rework by allowing proper connections to be put in place during original construction of partition rather than removing part of the partition in order to install proper connections and dampers.

D. Pre-Cast Vs. Cast-In-Place Elevator Shaft: Including Str. (Breadth)

Problem

The cardiac elevator addition to the Lancaster General Hospital, Lancaster, PA is being constructed to serve the fit-out spaces of the 5^{th} and 6^{th} floor. The current structural system calls for a steel frame with cast in place concrete over composite metal deck. The system that is proposed in this section keeps the structural steel frame but replaces the cast in place concrete with a pre cast concrete system to reduce the overall schedule and cost by shortening the duration of the tower crane on the project. This analysis will include a constructability review to address the extremely condensed site for the elevator

addition and to address the air intake vents for the hospital being located directly adjacent to the site.

Goal

The goal of this research is to identify the benefits on this project of switching concrete systems from cast in place to pre cast to the schedule and costs of the project. This will result in minor changes to the steel framing system to incorporate the alternate connections required for the pre cast panels however these changes will not result in any additional costs for the steel package as the need for metal decking will be eliminated.

Method

- Identify required changes to steel framing system.
- Identify benefits of a pre cast system over slab on metal deck.
- Identify possible suppliers in the region for the pre cast planks and their availability.
- Identify changes to schedule, complete a cost analysis and resources.
- Discuss reasons for the cast in place design with architect and contractor to determine if there is an advantage to cast in place over pre cast.

Tools

- Penn State Architectural Engineering Structural Faculty
- Structural Option Students
- Architect and Contractor Personnel
- Pre cast manufacturers in the Lancaster Area

Expected Outcome

The expected outcome of this analysis is that there will be an advantage in schedule and cost in switching the structural system from cast in place to pre cast concrete floor section in the elevator shaft. This will be completed through structural analyses and interviews with the architect and contractors for the project.

E. Weight Matrix

This weight shows the distribution of how I plan to apply my effort to the analyses proposed in this report during the spring semester.

Description	Research	Value Eng.	Const. Rev.	Sched. Red.	Total
Commissioning	15%	10%	5%		30%
ICRA	15%	5%	5%	10%	35%
Pre cast vs. Cast in place		10%	15%	10%	35%
Total	30%	25%	25%	20%	100%