Mercy Medical Center
Replacement Clinical Tower
Baltimore, Maryland

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Proposal

Mercy

In care of the sick, great tenderness above all things.
- Catherine McAuley, Founder, Sisters of Mercy

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Executive Summary

The Mercy medical Center has been analyzed to establish means for potential value engineering, schedule reduction and alternative building options. In this proposal four areas of research will be discussed, along with their relation with the analysis topics.

The critical research topic being analyzed is the role of women in the construction industry. The research pertains to determining why there are so few women in the construction industry, and ways to create interest in the construction industry. Through the use of a survey, given to both women in the construction field and those hiring in the construction field, a better perspective on the industry can be established, which will allow for a solution to be reached when recruiting women engineers.

My technical research problems focus on the site of the building with respect to the overall congestion of the site as well as the onsite ventilation. The level of congestion of the site can have a drastic effect on the delivery of site materials as well as the ease of the construction process. Due to the fact the hospital is being built on a site where there are adjacent buildings, the analysis will include the projects effect on those facilities as well. The end result will be a chart which establishes various levels of site congestion based on prior sites, with each level corresponding to possible solutions to the site congestion.

Onsite ventilation is also a very important topic for medical facilities, especially since there are established hospital buildings around the new site. This poses the problem of cross-contamination from construction. Identifying the main causes of potential contamination is a major aspect of my analysis. These causes will then be used to make an effective list of ways to minimize contamination. All research tools will be obtained from ICRA. The last topic refers to the use of a drilled shaft foundation system, versus a mat foundation system. The analysis will involve researching the positive and negatives of each system, looking at both schedule and cost.

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Critical Industry Topic

Women in the construction Industry

The construction industry is one of the largest workforces in the Nation. Approximately 240,000 construction positions are filled each year. The field of construction over the past years has had an increase in the number of women in the industry. Although the numbers are increasing, there is still a shortage of women in the industry. This could be due to the lack of appeal of the construction industry, the fact that it is a male dominated industry, or that the construction industry isn't typically seen as an area where females flourish. As the issue of labor shortages continues to affect the industry more and more companies are looking to hire females.

Problem Identification

What are ways more women be recruited for the construction industry? How can women be retained in the construction industry? Why is the construction industry seen as unappealing to women? How can companies benefit from hiring female employees?

Proposed Solution

Educating women about the industry and the opportunities available can foster new ideas about the construction industry. Doing so can increase the number of women interested. Providing peer-to-peer support through mentoring opportunities, will establish a relationship between those already within the industry and those considering entering the industry. Creating programs for entry-level female engineers, such as apprenticeships will give them a more stable environment when starting out. Each engineer would have a female mentor, for a particular time frame. The mentor would serve as a liaison between them and the established industry members.

Research Steps

1. Analyzing the trend of women in the construction industry over the past 10 years.
2. Identifying possible reasons for the trend.
    a. Educational reasons
    b. Job market
    c. Career goals
3. Consulting both women and industry members about ways to increase the number women the industry. Also asking them about the incentives they use to attract female employees.
4. Interviewing women in the construction industry about their experience within the industry.
    a. What incentives were provided when first starting out in the work force?
    b. What incentives are provided to them now?

Outside Information Required

Opinions from individuals within the industry will be required.

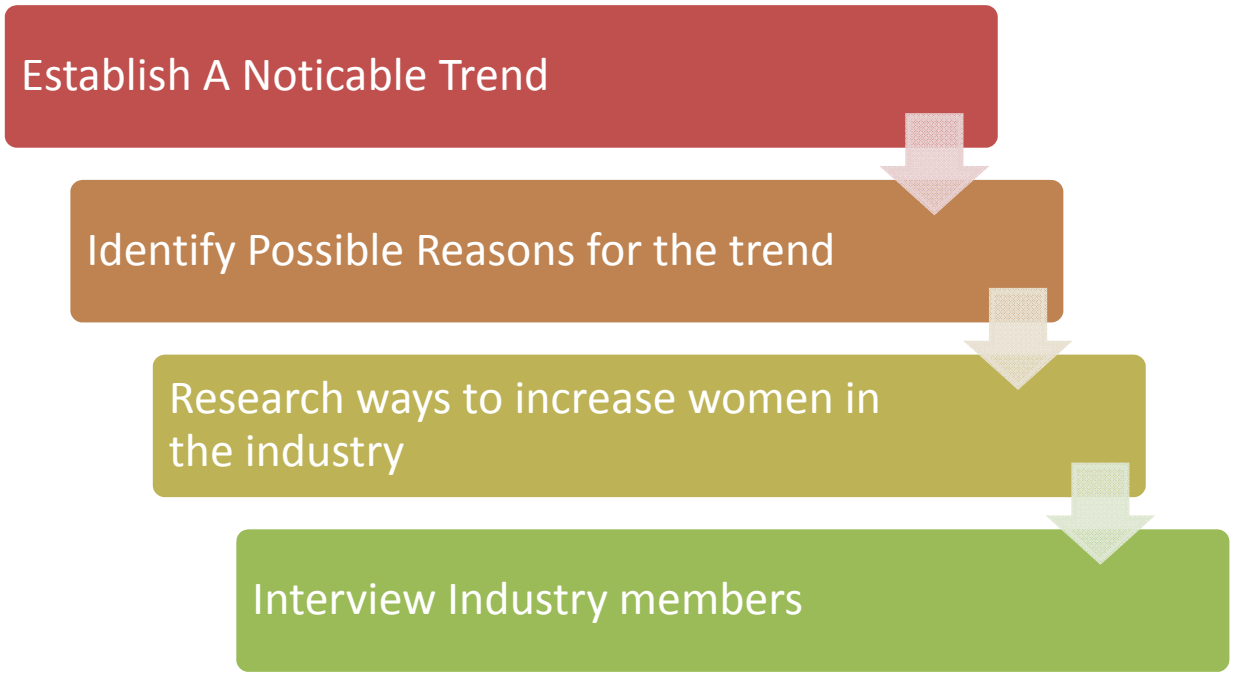

Figure 1.a. Research Process

Data Collection Tool

A survey will be used to establish a better understanding of the issue of women in the construction industry. The target audience will be women in the construction industry and those hiring women for entry-level positions. The survey will ask the same questions for both groups, and the data collected from the surveys will be analyzed both separately and as a whole.

Questions

Questions For Women on Construction:

1. **What difficulties did you face as a female, when first starting out in the industry?**
2. **Were you involved in any mentorship programs upon hiring? If so did they help you?**
3. **What advice do you have for women considering entering the construction industry?**
4. **Do you have any suggestions on ways of improving the industry for women?**

Questions for Those Hiring Women:

1. **How has your company sought to increase the number of women in the construction industry?**
2. **Do you feel it is necessary to use programs such as mentors, and apprenticeships to keep women retained in the construction field?**
3. **How do you feel the construction industry has changed with respect to hiring women?**

4. **What advice do you have for women entering the construction industry?**

Technical Problem Analysis

Problem 1: Effective Air circulation within the hospital environment

Due to the fact that hospital already has operating facilities surrounding the proposed site, it is very important to maintain a level of active circulation in and around the site area for patients and pedestrians. Cross contamination from outside air and debris can cause the mechanical systems of the existing buildings to be less effective in filtering.

Problem Identification

How can cross contamination be reduced or eliminated? What are the major causes of cross contamination? What codes or laws are in place concerning construction and debris from the site? Do all parties of the construction process examine the possibility of cross contamination? In what ways can the construction process be affected by potential cross-contamination?

Proposed Solution

Onsite temporary ventilation systems could be provided to reduce the level of dangerous particles being circulated in the hospital setting. The system would allow for pedestrians and patients to freely enter adjacent buildings as well as provide onsite workers better air quality. The site should also be re-analyzed for evasive ways to reduce cross-contamination.

Research Steps

1. Using the ICRA matrix, the type of construction project will be identified.
2. Using table 2.b, the patient risk will be identified as low risk, medium risk, high risk or highest risk.
3. Using the matrix table 2.c, the medical center will be matched accordingly with a particular group.
4. Using table 2.d the steps necessary to reduce the infection risk will be identified.
5. After the steps are identified, a comprehensive list of feasible solutions will be constructed.

All tables mentioned are located in Appendix 1.

Outside Information Required

Basic information concerning both the OSHA requirements for site ventilation as well as OSHA requirements for hospital ventilation. The ICRA will mainly be used to provide a clear relationship between

Problem 2:Congested Site Analysis

A critical issue in the construction industry is the efficient layout of the construction site. This is

particularly on a congested site such as the mercy medical center located in Baltimore city, Maryland. The site poses many potential problems with the delivery of materials, as well as crane location. Another problem is parking spaces for the onsite workers as well as storage space onsite. Keeping the overall circulation of the downtown area is essential to have a smooth construction process as well as keeping adjacent buildings and customers content. The downtown Baltimore area provides multiple obstacles for the contractor. Establishing an efficient layout for all aspects of the building is a very challenging. The building is within existing conditions and is in the place of the demolished parking garage.

Problem Identification

How can site congestion be minimized without sacrificing the efficiency of surrounding buildings and transportation? In what ways can disputes between the contractor and the adjacent building owners be reduced? What ways can on site transportation be applied to create a union between the existing roadways and the new construction layout? In what ways the can pedestrian access be made safer, and more efficient? The construction site is one of the major components of the building process. Establishing a good site can reduce on site prices as well as make operation on site and adjacent to the site efficient. Researching the layouts of congested site plans as well as looking at the renovations of hospitals with respect to the transport of pedestrians and patients in the building and around the building.

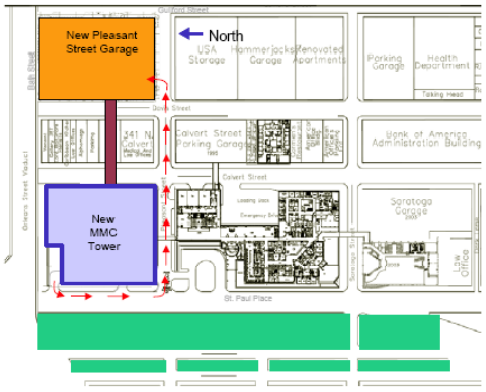

Figure 2.a Site Layout

Proposed solution

Providing guidelines for site congestion. Each level of congestion will have designated regulations. These regulations will be based on previous site plans.

Research Steps

1. Identifying similar site plans and areas and look at all problems and issues faced during those problems.
2. Analyze the various problems with the different levels of congestion

3. Creating different codes for each level of congestion and applying it to real life situations.
4. Creating ways to reduce the amount of danger on site, and the amount of congestion on site
5. Applying the techniques to the mercy medical center to create a better construction site.

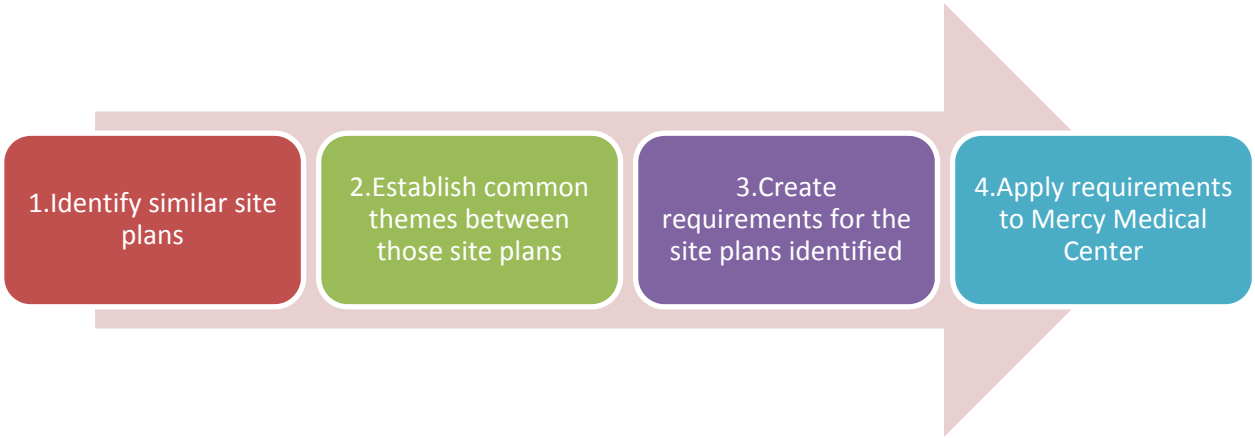

Figure 3.a. Research Process

Outside Information Required

1. Information concerning adjacent buildings and how they are affected by the construction process.

2. Vehicle and pedestrian circulation through downtown Baltimore city, Maryland.

Expected Outcomes

The expected outcome will be a scaled chart with different levels of site congestion. The chart will show the conditions for each site condition and will have a breakdown of the steps that are needed to create a better site plan. The table below is a preview of how the finished product will look.

Example	Congestion Level	Conditions	Ways to Improve
	Low Congestion		
	Moderate Congestion		
	High Congestion		

Table 3.b. Site Congestion Table

Problem 3:Structural System Analysis

The use of drilled shaft foundations are primarily used for buildings where a deep foundation is required , due to high axial loads. The idea of using a mat foundation instead of a drilled shaft foundation could

provide savings in cost as well as the schedule. A mat foundation will require a large amount of reinforcing, but could provide multiple benefits in the process.

Problem Identification

Analyzing ways to reduce the schedule of the project, as well as provide some cost savings.

Proposed Solution

Applying the Mat foundation system to the Mercy Medical Center can effectively reduce the project schedule, and offer potential co

Research Steps

1. Identify the various pros and cons of using a mat foundation versus a drilled shaft foundation .
2. Create a proposed schedule using the mat foundation, and compare the new schedule to the previous schedule.
3. Design the mat foundation of the Mercy Medical Center.

Outside Information required

The information required will be analyses of both systems, as well as their prospective histories within the construction industry.

Expected Outcome

An effective method to reduce the schedule of the project as well as provide potential cost savings. The method will be shown through the use of comparison tables as well as a new project schedule and project cost analysis.

Weight Matrix

The weight matrix is a breakdown of how my research of the topics will be completed. The Primary focus will be placed on the research aspect of my topics.

Description	Research	Value Eng.	Const. Rev	Sched. Red	Total
Critical Research Topic	30%				30%
Site Congestion	15%			15%	30%
Hospital Ventilation	20%	5%	5%		30%
Foundation Analysis				10%	10%
	65%	5%	5%	25%	100%

Table 4.a. Weight Matrix

Appendix 1:ICRA Matrix Tables

Step One:
Using the following table, *identify* the Type of Construction Project Activity (Type A-D)

TYPE A	**Inspection and Non-Invasive Activities.** Includes, but is not limited to: ▪ removal of ceiling tiles for visual inspection only, e.g., limited to 1 tile per 50 square feet ▪ painting (but not sanding) ▪ wallcovering, electrical trim work, minor plumbing, and activities which do not generate dust or require cutting of walls or access to ceilings other than for visual inspection.
TYPE B	**Small scale, short duration activities which create minimal dust** Includes, but is not limited to: ▪ installation of telephone and computer cabling ▪ access to chase spaces ▪ cutting of walls or ceiling where dust migration can be controlled.
TYPE C	**Work that generates a moderate to high level of dust or requires demolition or removal of any fixed building components or assemblies** Includes, but is not limited to: ▪ sanding of walls for painting or wall covering ▪ removal of floorcoverings, ceiling tiles and casework ▪ new wall construction ▪ minor duct work or electrical work above ceilings ▪ major cabling activities ▪ any activity which cannot be completed within a single workshift.
TYPE D	**Major demolition and construction projects** Includes, but is not limited to: ▪ activities which require consecutive work shifts ▪ requires heavy demolition or removal of a complete cabling system ▪ new construction.

Table 5.a. Project Activity

Step Two:
Using the following table, ***identify*** **the Patient Risk Groups** that will be affected.
If more than one risk group will be affected, select the higher risk group:

Low Risk	Medium Risk	High Risk	Highest Risk
▪ Office areas	▪ Cardiology ▪ Echocardiography ▪ Endoscopy ▪ Nuclear Medicine ▪ Physical Therapy ▪ Radiology/MRI ▪ Respiratory Therapy	▪ CCU ▪ Emergency Room ▪ Labor & Delivery ▪ Laboratories (specimen) ▪ Newborn Nursery ▪ Outpatient Surgery ▪ Pediatrics ▪ Pharmacy ▪ Post Anesthesia Care Unit ▪ Surgical Units	▪ Any area caring for immunocompromised patients ▪ Burn Unit ▪ Cardiac Cath Lab ▪ Central Sterile Supply ▪ Intensive Care Units ▪ Medical Unit ▪ Negative pressure isolation rooms ▪ Oncology ▪ Operating rooms including C-section rooms

Table 5.b. Patient Risk

IC Matrix - Class of Precautions: Construction Project by Patient Risk

	Construction Project Type			
Patient Risk Group	**TYPE A**	**TYPE B**	**TYPE C**	**TYPE D**
LOW Risk Group	I	II	II	III/IV
MEDIUM Risk Group	I	II	III	IV
HIGH Risk Group	I	II	III/IV	IV
HIGHEST Risk Group	II	III/IV	III/IV	IV

Note: Infection Control approval will be required when the Construction Activity and Risk Level indicate that **Class III** or **Class IV** control procedures are necessary.

Table 5.c. Class of Precautions

Description of Required Infection Control Precautions by Class

	During Construction Project	Upon Completion of Project
CLASS I	1. Execute work by methods to minimize raising dust from construction operations. 2. Immediately replace a ceiling tile displaced for visual inspection	1. Clean work area upon completion of task.
CLASS II	1. Provide active means to prevent airborne dust from dispersing into atmosphere. 2. Water mist work surfaces to control dust while cutting. 3. Seal unused doors with duct tape. 4. Block off and seal air vents. 5. Place dust mat at entrance and exit of work area 6. Remove or isolate HVAC system in areas where work is being performed.	1. Wipe work surfaces with disinfectant. 2. Contain construction waste before transport in tightly covered containers. 3. Wet mop and/or vacuum with HEPA filtered vacuum before leaving work area. 4. Upon completion, restore HVAC system where work was performed.
CLASS III	1. Remove or Isolate HVAC system in area where work is being done to prevent contamination of duct system. 2. Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins. 3. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units. 4. Contain construction waste before transport in tightly covered containers. 5. Cover transport receptacles or carts. Tape covering unless solid lid.	1. Do not remove barriers from work area until completed project is inspected by the owner's Safety Department and Infection Control Department and thoroughly cleaned by the owner's Environmental Services Department. 2. Remove barrier materials carefully to minimize spreading of dirt and debris associated with construction. 3. Vacuum work area with HEPA filtered vacuums. 4. Wet mop area with disinfectant. 5. Upon completion, restore HVAC system where work was performed.
CLASS IV	1. Isolate HVAC system in area where work is being done to prevent contamination of duct system. 2. Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins. 3. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units. 4. Seal holes, pipes, conduits, and punctures. 5. Construct anteroom and require all personnel to pass through this room so they can be vacuumed using a HEPA vacuum cleaner before leaving work site or they can wear cloth or paper coveralls that are removed each time they leave work site. 6. All personnel entering work site are required to wear shoe covers. Shoe covers must be changed each time the worker exits the work area. 7. Do not remove barriers from work area until completed project is inspected by the owner's Safety Department and Infection Control Department and thoroughly cleaned by the owner's Environmental Services Dept	1. Remove barrier material carefully to minimize spreading of dirt and debris associated with construction. 2. Contain construction waste before transport in tightly covered containers. 3. Cover transport receptacles or carts. Tape covering unless solid lid 4. Vacuum work area with HEPA filtered vacuums. 5. Wet mop area with disinfectant. 6. Upon completion, restore HVAC system where work was performed.

Table 5.d Control Precautions

Appendix 2: Breadth Topics

Breadth 1: Mechanical System

Due to the fact that hospital already has operating facilities surrounding the proposed site, it is very important to maintain a level of active circulation in and around the site area for patients and pedestrians. Cross contamination from outside air and debris can cause the mechanical systems of the existing buildings to be less effective in filtering. The research will explore possible ways to reduce cross-contamination, and increase the amount of ventilation onsite. Possible solutions include the installation of temporary on-site ventilation systems as well as more evasive ways of reducing contamination.

Breadth 2: Foundation Analysis

The use of a drilled shaft foundation is primarily used for buildings where a deep foundation is required, due to high axial loads being applied. The idea of using a mat foundation instead of a drilled shaft foundation could provide savings in cost as well as reduce the schedule. The research will focus on the various positives and negatives of using a mat foundation instead of a drill shaft foundation.

Appendix 3: Timetable

Timetable December 2007- April 2008	
12/27/07-01/12/08	Conduct Research Concerning Women in Construction
1/14/08-1/25/08	Interviewing Process for women in construction
12/27/07-1/12/08	Begin research on site congestion analysis
2/02/08-2/24/08	Establish the solutions
2/25/08-3/08/08	Begin Analysis of cross-contamination
3/16/08	Finalize mechanical components
2/25/08-3/08/08	Begin foundation analysis
3/16/08	Design of new foundation completed
3/22/08-4/10/08	Review all Analyses
4/14/08	Presentations

Table 6.a. Timetable