

Wellington Condominiums

Exton PA

Extraordinary Residences Exceptional Lifestyle



Design and Construction Team:

Owner: The Hankin Group

General Contractor: Wellington Commercial Construction

Construction Manager: Wellington Commercial Construction

Architects: Minno & Wasko Architects and Planner

Engineers: Liberty Engineering

General Scope:

Size: 147,069 S.F. 4 Story luxury condominiums w/ Parking Garage

Building Cost: \$18.1 million

Schedule: September 2005 thru May 2007

Project Delivery: CM @ Risk



Architecture:

- Designed in the tradition of grand estate homes
- Situated at Eagleview community town center
- 8 designs with a choice of décor being "traditional" or "contemporary"
- Designated areas for concerts, shopping, dining and fun
- Building surrounded by landscaped parks and native woods
- Stylish brick and cast stone exterior veneer
- Composite slate roof and membrane roof w/ copper eave drip edge



M.E.P. Systems:

- Fire protection system includes sprinklers, fire alarms and smoke detectors throughout each residence and public areas
- Building access communication system, telephone, cable and internet ready
- HVAC is an all air gas fired furnace supplying each condominium residence
- Main Electrical Distribution switch board is 1600 Amp, 3 phase, 120/208 V
- The main electrical distribution connects to 4 meter banks which are then broken down to each individual apartments

Construction and Structural:

- Being built in a very developed commercial neighborhood
- Geotech report indicated site had variance in quality of soils
- Installed permanent dewatering system before actual construction
- Delay in Permits and architectural approvals pushed façade construction to winter
- Foundation utilizes 18" strip and column footings w/ 5" slab on grade
- First floor makes use of a 12" heavily reinforced two way flat plate concrete slab
- Other floors use innovative Hambros Joist 3" slab on deck composite system



Wellington Features:

- 48 unique floor plans up to 2,300 S.F.
- Great views from large bay windows
- Hardwood floors in all living areas
- Polished Granite Countertops
- Elegant lobby entry





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A. Executive Summary

The Wellington Condominiums Project was investigated to identify areas of a project that are good candidates for further research in: alternative methods of construction, value engineering, and schedule compression. A proposal is put together to establish four main areas of research concerning industry and project specific issues.

A main theme that I would like introduce into the proposal is “Building for the Future.” As construction managers our future is about building tomorrow today. We have to understand that our basic responsibilities are in the actual construction and management of a building project. This is only a fraction of our responsibilities of what is more vital: the building of communication, trust, and respect with other people in the industry. Our future depends on building respect and taking team work and ethics to a new higher standard. With project delivery methods more frequently utilizing better team work arrangements like design-build, it is up to us whether or not the future of the building construction industry will respect that evolving philosophy.

The main body of research that will be conducted concerning the construction industry is: What are the decisions that industry members make in providing and utilizing new products? Who makes the decision to use a new product and when? What process of action can manufactures and suppliers do to promote new products? Who takes the responsibilities and risks? Can a process and procedure be created and implemented to help aid the construction industry?

These questions will be analyzed through a systematic process of research, interviews, and surveys with much industry feedback. An initial research will be conducted through published articles on the utilization of new products in the construction industry. Based off that research, interviews and surveys will be released to provide additional information as to what industry members feel is of concern to the introduction and utilization of new products. The information will be compiled and assessed to how to improve areas of greatest concern to the industry. A process and procedure will be established for an area of large concern for the construction industry as to how to improve the decisions that industry members make in providing and utilizing new products.

The “Hambros Joist Composite Deck System Analysis” builds off the main research as to take a project level perspective to determine whether or not this system was correctly selected for the Wellington Condominiums Project. Many problems have resulted because of this system and further research as to alternative methods and means will be examined. An acoustical breadth will be provided here to investigate the claims of the manufacture and supplier as stating: “The 2.5” deck slab of the Hambros Joist Composite



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Deck System measures up vary well to industry standards for minimal vibration and sound transfer.”

The third analysis targets where a majority of the delays and change orders to the project resulted. This is of great interest to the project team due to the tremendous amount of resources that had to be applied to correct the problem. Another area of concern is that the foundation system required a large amount of time and cost to the project which pushed back the façade construction to the winter months. The foundation’s design would be challenged by redesigning the system to a mat slab foundation. Many reasons as to why a mat slab foundation would be preferred are further detailed in the report. A structural breadth will take a deeper look as to whether or not a mat slab foundation system would be of greater value to the project.

The final analysis builds of the early delays that occurred on the construction of the foundation system. Since the schedule was pushed back, the façade construction would not begin until the winter months. This creates a need for the project team to think of alternative ways of constructing the building. The first floor consists of pre cast panels and follows with typical masonry construction up to the 4th floor. An analysis will be performed on the comparison between utilizing pre cast for the entire structure and rather than just for the first floor. Caution will be used when changing the building composition of the building façade by utilizing renders of the project. A full analysis and matrix system will be used to gain a full perspective on whether or not the entire façade should be pre cast.

B. Critical Issues Research

B.1 Introduction to Critical Issue

A critical issue that is to be pursued further in research is the decisions that industry members make in providing and utilizing new products. Who makes the decision to use a new product and when? What process of action can manufactures and suppliers do to promote new products? Who takes the responsibilities and risks? Can a process and procedure be created and implemented to help aid the construction industry? These questions are going to be researched and analyzed in the construction industry in hope of providing real solutions to real world problems.

It is a common notion that the construction industry is slow to adopting new products. As part of this research, we ask the question why? Why does it take the industry so long to adopt new products? In other industries products are adopted very quickly and efficiently but the construction industry tends to be very slow and hesitant.



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The theme of the report as to building respect in the industry goes much farther. “Building for the Future” and gaining respect with other industry members in communicating efficiently is a step towards a better working environment for all. Building respect will lead to building a brighter future for not only students but for everyone who works in and out of the construction industry.

One example that is to be further researched as to why the construction industry is hesitant to the adoption and utilization of new products is the Hambros Joist Composite Deck System. The Hambros Joist Composite Deck System is an innovative product to the construction industry. On a micro level, the Hambros Joist Composite Deck System on the Wellington Condominiums Project will be analyzed in a separate investigation by asking the question: ‘Was the Hambros Joist Composite Deck System a correct decision to be utilized on the Wellington Condominiums Project? Also where would this product be best utilized and the rational process for selecting this product?’ As part of the main research and analysis, this product and others will be compared and looked at on a global scale. The research goal is to define common problems that industry members are having in the adoption and utilization of new products. Issues such as: unions, local conditions, laws, regulations and codes, availability of product information, product logistics, and unfamiliarity with products are some of the common issues as to why products are not readily adopted. It is in the hope of this research to solve some common issues that could be readily fixed and help alleviate common problems that the construction industry is having in the adoption and utilization of new products.

B.2 Main Research and Analysis

B.2.1 Problem Identification

What are the decisions that industry members make in providing and utilizing new products? Who makes the decision to use a new product and when? What process of action can manufactures and suppliers do to promote new products? Who takes the responsibilities and risks? Can a process and procedure be created and implemented to help aid the construction industry?

As being from the manufacturing industry side for many years and now crossing over into the construction industry, it has always been of great interest to understand why the construction industry is slow in adopting and utilizing new products. With connections between industries, better research and understanding of how the supply chain management system works is of great business and economic interest.



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B.2.2 Proposed Solution

Many case studies have been researched through the implementation of new products in the construction industry. One product is the Hambros Joist Composite Deck System and its use in the construction industry. Much research has been done about products but very little as to improving the process of getting new and innovative solutions into the hands of the construction industry. Setting a path and a step by step procedure as to how to present and initiate new products in the construction industry is a key stepping stone towards improving the adaptation and utilization of new products. Also if a set path for manufacturers and suppliers are established better supply chain management and communication lines can be established. As the industries move towards more team work initiatives, the greater the need for set processes and communication lines. The sooner products can be presented to the construction industry members, the better they can make decisions and solve problems.

B.2.3 Research Steps





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The procedure to investigating the decisions that industry members make in providing and utilizing new products are as followed:

1. Research on the current published problems that the construction industry is having with particular products? Investigate common supply chain management procedures and the processes for the selection and utilization of new products in the construction industry.
2. Analyze some recurring problems that the construction industry is having at this current time. Come up with some initial solutions and procedures to helping alleviate some common problems.
3. With all this information, create and refine surveys and interview questions for all members in the supply chain system of the construction industry as to gain perspective to the difficulties outlined in introducing and utilizing new products. What are some of the benefits and problems that the construction industry is having with the adopting and utilization of new products? (Unions, Regulations, Codes, Local conditions, etc.)
5. Collect enough surveys and interviews that outline 10 products that are of concern to the construction industry. Out of those 10 products, group them to similar issues of conflict. Select one area of greatest concern to the construction industry and analyze a process and procedure for improvement.

The sources of outside information that will be required to fulfill these research steps are as followed:

1. Information from supply chain managers in the manufacturing and construction industry through research and surveys.
2. Connections with owners and design professionals (in particular the Wellington Condominiums Project) on there input of a process of utilizing new products.
3. Research documents in the areas of engineering technologies and diffusion.

B.2.4 Expected Outcomes

The expected outcomes are to create a logical and systematic approach as to how the construction industry can improve the supply chain management of utilizing new products. The implementation of this process can be immediately utilized by any company and can be a way in improving the flow of ideas and communication between both industries. This process and procedure is the key to opening the door between industries and in hope of benefiting all parties involved.

I feel that all parties of the construction and manufacturing industry would benefit and have interest in the process and procedure of introducing and utilizing new products in the construction industry. Having a process that all industry members can follow may lead to having a more productive and respectful working environment.



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B.3 Data Collection Tool

A survey is created to gain an in depth knowledge as to what the industry members feel of why implementation and adoption of new products are very slow. Other questions as to how other companies proceed in introducing and utilizing new products in the construction industry will be asked and examined for improvement. This survey will be handed out to a range of people in many construction related areas as to gain a large perspective of the whole construction industry. Interviews will be conducted to ask similar questions outlined in the survey. The data collection survey is presented below for an initial possibly as to what questions could be asked.

See the Following Attached Page for Sample Survey

SAMPLE SURVEY

Architectural Engineering Thesis Research

What decisions do industry members make in providing and utilizing new products?

Target Audience: Manufacturing and Construction Industry Members, Owners, and Design Professionals.

Research Goal: To develop a systematic process for which construction industry members can follow when introducing and utilizing new products to the construction industry.

Please rate the following statements on a scale of 1 to 5, with 1 being strongly disagree and 5 being strongly agree.

Additional Comments are provided and highly recommended for further in depth analysis.

		Strongly Disagree				Strongly Agree
1.	The construction industry is slow and has difficulties in adopting and utilizing new products.	1	2	3	4	5

Comments on why the construction industry *is/is not* slow and has difficulties in adopting new products:

2.	There is a clear and direct process for new products to become available in the construction industry. Clear communication exists between the manufacturing and construction industry.	1	2	3	4	5
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Comments on there *is/is not* a clear and direct process for new products to be communicated efficiently between industries:

3.	There are minimal problems encountered with new products.	1	2	3	4	5
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Comments on there *is/is not* minimal problems encountered with new products. If problems exist with new products please name the product and what the problem is:

4.	There are many ways for which new products are to become available to the construction industry.	1	2	3	4	5
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Comments on there *are/are not* many ways for new products to become available:

5.	Team work in the supply chain is more prevalent now than before. If a problem dose arises with a new product, the problem can be easily fixed.	1	2	3	4	5
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Comments on team work *is/is not* more prevalent now than before and if a problem dose occur with a product then it can be easily fixed:

6.	Manufacturers and Suppliers are willing to take on the responsibilities and risks of promoting new products to the construction industry.	1	2	3	4	5
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Comments on manufacturers and suppliers *willing/not willing* to take responsibilities and risks:



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C. Core Investigation Areas

C.1 Introduction

Detailed analyses of technical building systems and construction methods have been selected and are proposed for future investigation. The three main problematic areas on the Wellington Condominiums Project are detailed in the following sections below.

C.2 Hambros Joist Composite Deck System ~ *Acoustical Breadth*



Figure 1: First Floor Hambros Joist Composite Deck System

C.2.1 Problem Statement

Is the Hambros Joist Composite Deck System a correct decision to be utilized on the Wellington Condominiums Project? Would a traditional composite deck system be a better alternative to the Wellington Condominiums Project? What type of construction project would best benefit from using the Hambros Joist Composite Deck System?

C.2.2 Proposed Solution

Analyze and compare the Hambros Joist Composite Deck System to other typical composite deck systems. The main breadth will look at the acoustical properties of both systems and see what system would be recommended through a design and constructability perspective. A further analysis in the structural and mechanical components of each system will also be considered. The acoustics is mostly of concern



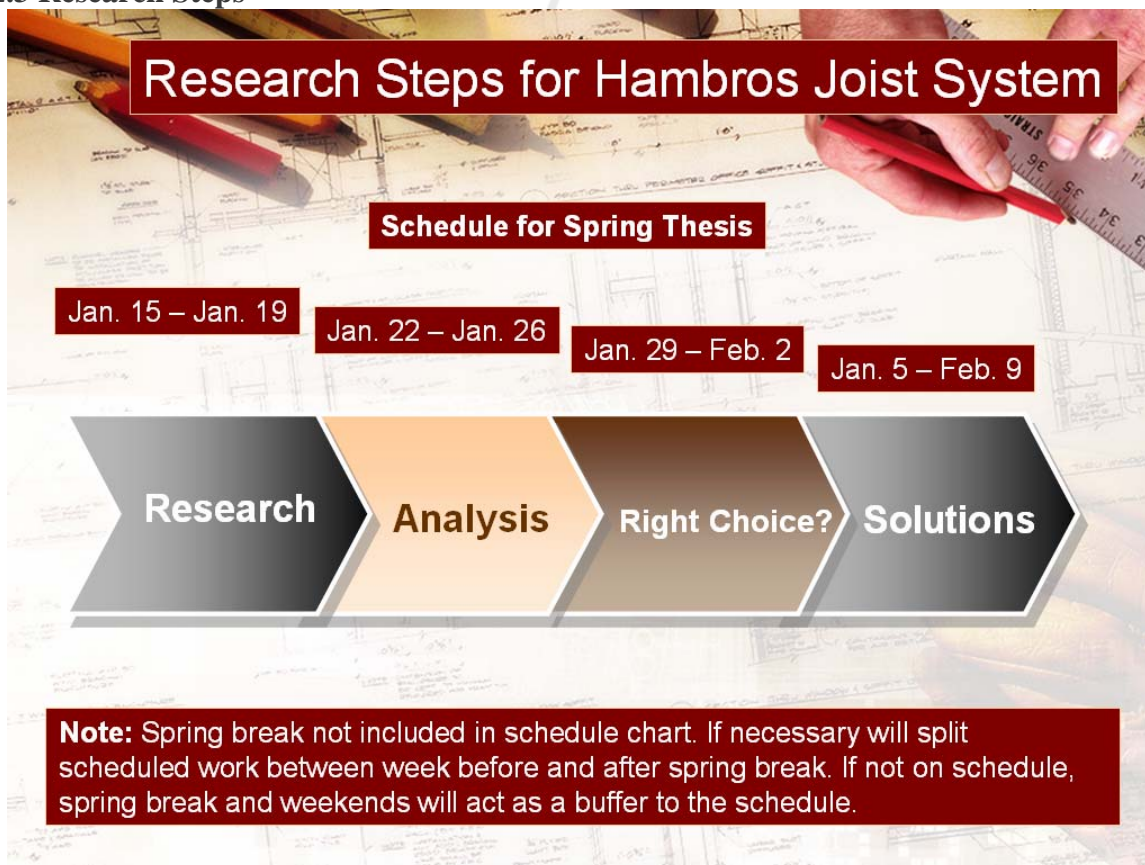
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due to the fact that the Hambros Joist Composite Deck System can be as thin as 2.5". Being that thin of a deck and having high end condominiums, the vibration and sound transfer between floors become of great interest and importance. Manufacturers and suppliers have promoted the fact that this system is excellent by industry standards for minimal vibration and sound transfer. It is up to this research to examine if this claim is true and if any parts of the system, i.e. the acoustical properties, are not as expected then recommendations would be provided to correct the problem.

C.2.3 Research Steps



1. Learn in more detail how the project team selected the use of the Hambros Joist Composite Deck System. What are the initial advantages and disadvantages of this system on the Wellington Condominiums Project? (Areas of interest for this analysis are: formwork and joist construction, rebar placement, and concrete deck pours.)
2. Perform an acoustical analysis to determine if the Hambros Joist Composite Deck System performs up to typical composite systems. Also consider the structural and mechanical components of each system.



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3. Compare and contrast each system and come up with a logical rationale as to decide if the Hambros Joist Composite Deck System was the correct choice for this project.
4. If areas of the Hambros Joist Composite Deck System are seen to cause problems what can be done to improve the system during the construction phase.
5. Make recommendations as to where this system would be best utilized for a given project. Identify some key areas that a project team must focus on when deciding to use this product. Also develop a process or procedure for when to decide between traditional composite deck systems versus a Hambros Joist Composite Deck System.

C.2.4 Expected Outcomes

The outcome expected through this research is that the Hambros Joist Composite Deck System has its advantages; but it might not be what is suitable for the Wellington Condominiums Project. The Hambros Joist Composite Deck System is a new product that has been a problem for the project team during construction. Issues have risen to the surface and questions have been proposed about whether or not this system fits well with the Wellington Condominiums Project. Delays and on site problems have occurred and many feel that what was to be gained in time and money is being lost. It is through this research to create a logical and systematic approach as to see if this system was the correct decision to be utilized on this project. If there are problems with the system then what can be done by the project team during construction to correct those problems.

This research would be of great interest to the owner because when utilizing new products there is a fair amount of risk. Being that this project owner is a developer, risk management is a very important part of deciding what products are to be utilized on a project. By minimizing the risks for the owner and laying out a clear process and procedure for whether or not this system is best for the project is one way of ensuring a project's success.



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C.3 Foundation Redesign ~ *Structural Breadth*



Figure 2: Foundation Excavation

C.3.1 Problem Statement

With poor subsurface conditions prevalent, can the foundation system be redesigned to possibly reduce cost and time spent without interfering with architect or owner needs?

This problem was identified through the geotechnical reports, change orders, and project manager interviews. A lot of money, time, and energy were spent by the project team having to deal with poor subsurface conditions. An analysis communicating some potential solutions is one study of great interest to many on the Wellington Condominiums Project.

C.3.2 Proposed Solution

A possible solution to the Wellington Condominiums Project is for a structural redesign of the foundation system. A structural breadth will be utilized in the analysis of the comparison between the current and proposed systems. The current foundation system makes use of single slab column footings and will be challenged through the redesign of a mat slab foundation. A mat slab foundation system is proposed and will be researched to do the following possibilities:

1. Save time and money by not having to excavate as deep in rock material.
2. If footing depth can be decreased possible savings in the dewatering system could happen.



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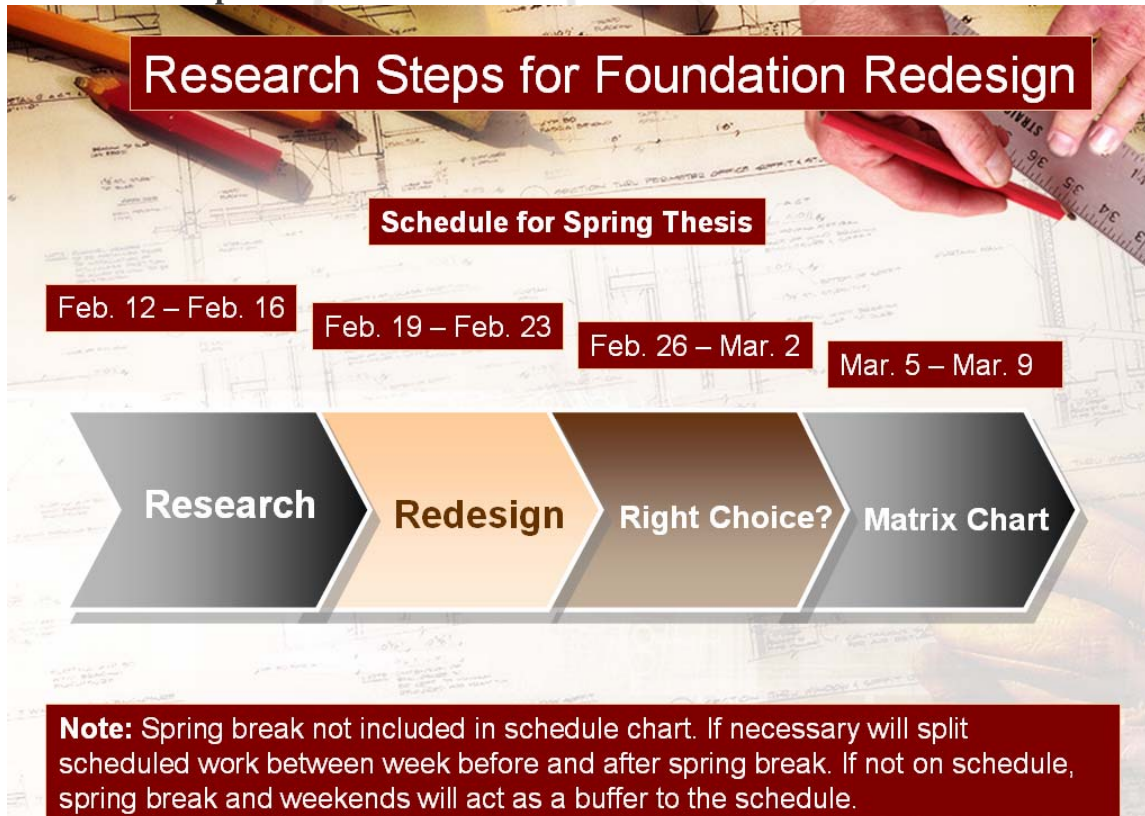
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- Using a mat slab could reduce the strength needed for foundation concrete and also if designed correctly act as a slab on grade. This could potentially save time and cost to the project.

C.3.3 Research Steps



The procedure to investigating if a mat slab foundation system would be more viable than a traditional single slab column footing is as followed:

- Learn in more detail and have available the single slab column footing's estimate, schedule, design documentation, specifications, and methods of construction.
- Redesign the foundation system utilizing a mat slab foundation. Figure out how much material, cost, and time would be spent to construct.
- Compare the two systems and create a matrix chart based on the owner requirements of which system overall is better for the project.
- (Optional) The matrix chart could be given to other project team members to see what their opinion is on the system and see how everyone's responses compare.



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C.3.4 Expected Outcomes

The mat slab foundation system at first seems to be an ironic system to select rather than pouring single slab column footings. When looking at the following items: cost and time spent to rock excavate by rock hammering, putting in a extensive permanent dewatering system and support equipment, weeks of delays that would push back the façade construction to the winter months, and the structural engineer specifying the use of 6,000 PSI concrete for footings. Once you look at all those variables the cost and ease of simply pouring the entire slab may be a better alternative. Until the analysis is completed there is no fast way of determining whether this is a better alternative. Also the analysis can be swayed either way by the owner's input of the foundation system based on a matrix chart. This matrix chart could be given to different project team members and see if there are any differences in how people think on the value engineering analysis. It would be worthwhile to investigate this to see the current industry outlook and whether or not industry members have a building respect for one another.

As from the questions, it is clear that anyone on the project team would be interested in the research presented here. Architects would be interested in the analysis if any changes in the design or composition of the building were made. The engineer and contractor would be interested as to see if the footing requirements can be decreased and provide more value to the constructability of the project. The owner would be interested if the alternative design could save time or even cost to the project without having to alter major building systems and components.



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C.4 Façade Integration



Figure 3: CIP Formwork for Balconies

C.4.1 Problem Statement

With many early problems and delays on the project, is there a way to construct the building façade, in the winter months of 2006, in a more productive manner? Can this be done without ruining the architectural style and vision of the owner and architect design?

This was one of the first things that was looked at and asked to the project manager when analyzing the project schedule. The schedule at first was not this way but with early delays it has pushed back façade construction to the winter months.

C.4.2 Proposed Solution

At first glance the answer to this is ‘Yes we can change the building façade!’ But caution must be in place when wanting to change the architectural style of the building façade. The proposed solution would be to introduce a façade integration of exterior components. This will be done through the use of pre cast throughout the entire façade rather than on the first floor. The first floor mainly consists of pre cast that have to be situated with a crane. Following the construction of the pre cast, the rest of the floors utilize traditional brick masonry construction. One of the major reasons why exterior masonry construction can not start is the formwork in place for the cantilevered cast-in-place condominium balconies. These balconies require a great deal of time to pour and form. After the fourth floor balconies are poured, they must wait to be at strength before the scaffolding is removed.



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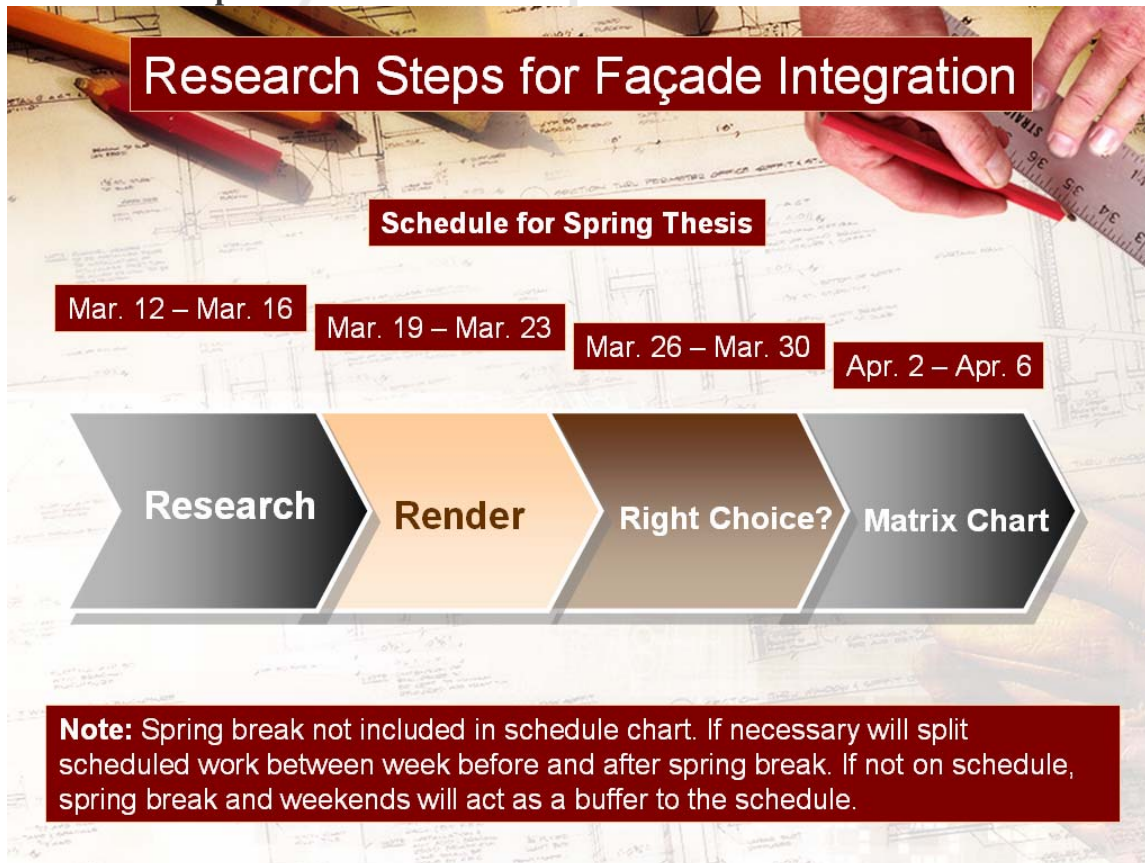
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This creates huge logistical issues and delays in constructing the façade. If the system components can be preassembled whether they are the balconies or façade, cost and time could be saved on the project.

C.4.3 Research Steps



1. Learn in more detail about the integration of façade components through the use of pre cast or preassemblies in fabrication shops.
2. See if there are feasible ways of constructing building facades in the winter months. Look at research papers if available through ASCE databases. Talk to industry pre casting companies on alternatives for the given situation.
3. If pre cast is the main alternative, a rendering should be created to show the owner that there are little if any differences to the architectural style and vision to the project.
4. Do a cost, schedule, and methods of construction comparison analysis of the building façade options.



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5. (Optional) Do a matrix chart with all project participants to gain a sense of what is important to them on the project when it comes to façade composition and construction.

C.4.4 Expected Outcomes

The expected outcome for the façade analysis is very clear before doing the investigation. Pre cast could save you time and cost in labor and equipment. During the winter months this becomes greater due to the loss of expected productivity during this time period. With the addition of not being able to start constructing the building façade due to the scaffolding in place for the cast-in-place balconies; there is a great demand for alternative means and methods of construction. Pre cast is one way of solving this but further research should be conducted to see if there are other methods of constructing building facades during the winter months. The architectural style of the project would have to be rendered to see if the exterior has changed in dramatic or subtle ways. This is one of the first research steps because if the exterior façade changes architecturally, most likely the owner or architect is not going to approve of the changes. But if a rendering can show that minimal changes would occur and substantial cost and schedule savings would result then this could be a good alternative.

The owner, architect and contractor would have the greatest interest in the façade composition and construction. Each have their own reasons for how this should be done. A further option could be employed to research how an owner, architect, and contractor think about façade construction. The main theme of building trust and respect come about to how do project team members see each other. Does the owner respect and trust the contractor to constructing a façade that is of great style and vision? There are many more questions that can be answered from this and to determine how respect and trust is at the current time in the construction industry.



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D. Weight Matrix

D.1 Introduction

A weight matrix was created to show how effort will be distributed with the different analyses presented in the attached report. For a breakdown of each analysis presented see the weight matrix chart below.

D.2 Weight Matrix Chart

Description	Research	Value Eng.	Const. Rev.	Sched. Red.	Total	Breadth
Critical Issues Research	25%				25%	0%
Analysis 1 Hambros Joist System		10%	15%		25%	60% (30% V.E. & 30% C.R.)
Analysis 2 Foundation Redesign		10%	10%	5%	25%	40% (20% V.E. & 20% C.R.)
Analysis 3 Façade Integration		10%	5%	10%	25%	0%
Total	25%	30%	30%	15%	100%	100%

D.3 Brief Analysis

From the graph, 25% of the time will be dedicated towards research. Value Engineering, Constructability Reviews, and Schedule Reduction are allotted respectively: 30%, 30%, and 15%. The breadth topics will be covered in Analysis 1 and 2. A bulk of the time spent will be in Value Engineering and Constructability Reviews of the topics presented.