Technical Report 3

November 16, 2011

Courtesy of RLPS Architects

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Masonic Village at Sewickley

Sewickley, PA

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Construction Option

Advisor: Craig Dubler

Executive Summary

Technical Report 3 contains further construction related details regarding Masonic Village at Sewickley. Topics of interest in this report contain constructability challenges, schedule acceleration scenarios, value engineering, critical industry issues, and problem identification analyses. Examination in many areas of the report involves insight from the project team and other industry professionals.

An interview with Project Manager Tony Grace helped explain several crucial issues involving development of the project. The greatest constructability challenges fall within the realm of site logistics, architectural design, and coordination with the prefabrication company. The site is not only located in a confined region but has further problems regarding vehicular access issues. Numerous protrusions and depressions along the building's façade makes masonry work difficult, which eventually gets put on hold due to a miscommunication with prefabricated balcony planks. Schedule acceleration scenarios involve increasing man power as well as the overall length of the work week. Nonetheless, this cannot be pursued until the structure has reached its watertight milestone due to continual weather difficulties. Value engineering on the project is virtually nonexistent. Only one idea has even been proposed and was immediately rejected by the owner. The owner has already built multiple buildings across their campuses similar in size and function. Experience and repetition has therefore eliminated the need for value engineering on this particular project. However, looking into ways of value engineer the amount of masonry on the job could provide a great reduction in project cost.

At the 20th annual PACE Roundtable meeting, industry professionals were consulted on various construction related issues. Two separate breakout sessions were held in which students attended one of three meetings for each session on different topics. The attended sessions included *Energy Management Services* and *Integrated Decisions for High Performance Retrofit Projects*. Each conference provided students with current industry issues and helped form ideas for research related studies.

Following the PACE Roundtable, problem identification and technical analyses were considered on an individual basis. The first topic of interest with Masonic Village at Sewickley is to find ways to speed up masonry construction. As a result, the current wall assembly will need to be altered and provides a good opportunity for a structural breadth. The second depth topic is to offer easier constructability by altering façade dimensions to better accommodate block construction. In changing the façade, it would also be useful to analyze thermal heat flow and conduct a mechanical breadth study regarding energy gains and losses.

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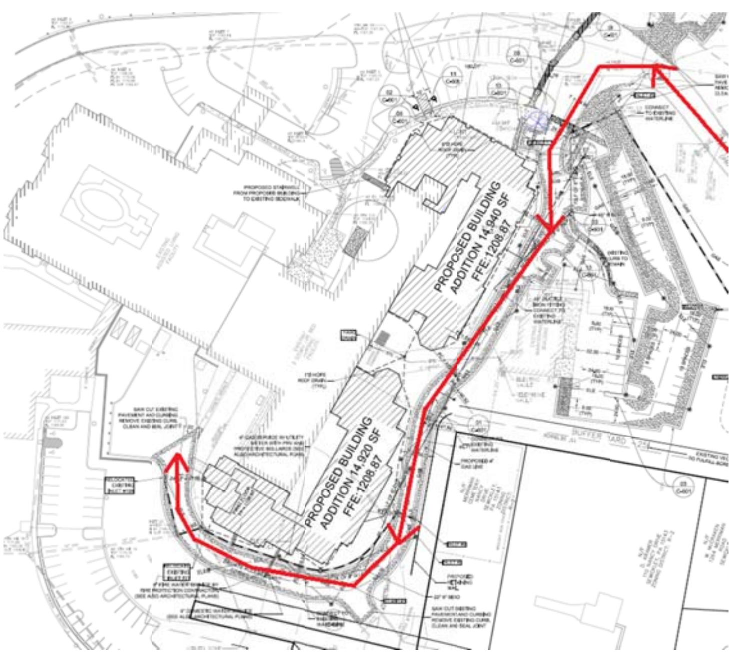
Constructability Challenges

Site Logistics:

One major challenge on the project is the configuration of the building itself. The structure contains two separate wings, each of which are located in an extremely constricted region of the owner's property. It is often problematic for various trades to function concurrently while trying to maintain materials and equipment within the confines of the site boundary. Congestion frequently leaves a cluttered site, in which subcontractors need to make a conscientious effort to try and avoid slowing each other down. Proper sequencing and positioning of trades by the project team is of absolute importance to the timely development of the facility.

To further complicate the logistics issue, there is only one available access road throughout the entire lifecycle of the project. The access road runs along the south wall and loops around to the west before it terminates as a dead end road. Therefore, every piece of machinery that drives down the path has to turn around and exit from the same gate in which it entered. If other large pieces of equipment happen to be functioning simultaneously and are blocking the road, each operator has to retreat sequentially such that the innermost machine has a clear path to exit before the others can reenter and continue working. Figure 1 displays a site layout map, illustrating not only the location of the access road but also the congested positioning of the two proposed additions.



(**Figure 1:** Site Conditions) -Courtesy of RLPS, LTD.

To help eliminate overcrowding the entire site at once, the project team elected to begin construction on wing A several weeks prior to the initiation of wing B. Wing A is the addition located at the bottom of Figure 1, whereas wing B is located at the top. This sequencing permitted construction to begin at the back of the site and work its way to the front. Progression of work in this fashion helped utilize the site more efficiently, since it initially transformed the footprint of wing B into a viable space for workers to flow through. Figure 2 shows how work progressed from west to east along the length of the site. Another added advantage to the phasing of construction is that it offset the time in which large pieces of equipment were needed on site. On days in which cranes were required for wing B they were often not need for wing A. The implemented methodologies drastically improved the congested site conditions regarding the initial planning.

(**Figure 2:** Progression of Work Flow)   -Courtesy of Weber Murphy Fox, Inc.

Architectural Design:

The next largest constructability issue with Masonic Village at Sewickley is a result of the building's architectural design. Numerous protrusions and depressions along the structure's exterior façade creates an extremely labor intensive assembly for masonry workers. As phase 2 additions progressed, the project team quickly realized the layout of the building was simply not designed to be compatible with block construction. Dimensions between corners do not match up well with dimensions of standard CMU walls or brick veneer. A lot of time and cost has been associated with block modification needed to shave each unit down to its proper size. The project manager estimated there could have been a savings of almost $750,000 by simply laying out spaces to better accommodate the dimensions of masonry work. Figure 3 and 4 shows the irregular shape workers are faced with on the construction of the exterior façade.

In order to deal with this issue, the project team put in a request to the architect to physically alter certain measurements around the building's façade. No request was too drastic of an alteration and was commonly on the scale of a few inches. Change requests were just enough to avoid things such as having to cut each and every block all the way up every corner of the building. Other proposed changes in dimensions included minimal alterations to a few window opening sizes. The team determined the marginal benefit of a few minor modifications to certain sizes would be greater than leaving them as originally designed. To the benefit of the project team, the architect worked with them as much as they could to accommodate their requests. Although not every change was accepted, many of them did end up being employed and allowed for a better ease of constructability.

(**Figure 3:** Irregular Brickwork) -Courtesy of Weber Murphy Fox, Inc.

(**Figure 4:** Uneven Façade) -Courtesy of Weber Murphy Fox, Inc.

Prefabricated Balconies:

All elevated floor slabs used on the project are comprised of precast concrete planks. Each slab was prefabricated off site due to lack of storage space and trucked onto the job as needed. Upon arrival, a truck crane was used to lift the massive planks into position where they were grouted to load bearing masonry walls. Due to the nature of the building, precast planks are a very important part of the project schedule's critical path. The structure is erected by building one story of CMU walls, in which precast floor slabs are set on top of, and then repeated by adding another story of walls directly on top of the precast planks. Therefore, without the planks being put into position it is impossible to continue the structure upward. Figure 5 displays how the CMU walls rest on the precast slab below it.

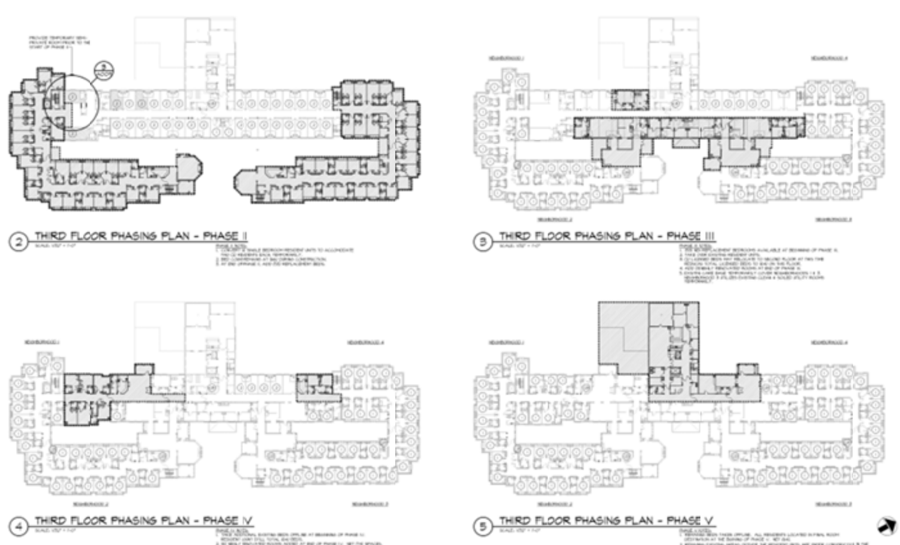
As each floor slab was lifted into position, everything seemed to be going smoothly. However, when it came time to set the prefabricated balcony slabs the project team noticed a huge issue. The slabs that had been delivered for wing A of the addition were actually the wing B balconies. Unfortunately, construction of wing B lagged wing A by several weeks, making the balconies on site virtually useless to the project team at that point in time. The mix up accounted for 3 weeks of delay due to the lead time necessary to prefabricate the correct set of balconies for wing A. After weeks of waiting, the project team was plagued with even more bad news. As wing A balconies were being loaded for delivery, they were informed that the crane had accidentally dropped one of the planks and broke it in half. A new balcony had to be cast, creating an even greater burden on the project's timely development.

(**Figure 5:** Precast Balcony) -Courtesy of Weber Murphy Fox, Inc.

In order to deal with an obstruction to the critical path, the project team did everything in their power to keep as much work flowing as possible. Although some portions of second floor CMU walls were able to begin, masonry workers were still limited in what they could accomplish. Furthermore, without being able to completely continue the structure upward there was very little that could be done to keep the project on pace. One of the best answers to the problem was to begin attaching brick veneer. The original schedule called for all three stories to be completed before attaching the brick façade. However, since work had been prohibited from continue upward and brick veneer was a necessary part of the watertight milestone, the project team decided it would be in their best interest for the veneer to chase the CMU blocks up the wall prior to total completion. This tactic permitted the team to regain some of their lost time and not take as big of a hit on the project schedule.

Schedule Acceleration Scenarios

The critical path for the project schedule contains numerous key activities throughout the construction process. Figure 6 shows the flow of work from phase 2 to phase 5. Starting with phase 1, the critical path moves from preliminary site work, to excavations, and onto pouring of foundations. Subgrade work includes caissons, grade beams, spread footings, and poured concrete walls. Phase 2 is where the majority of new construction takes place. The superstructure begins with the placement of 1st and 2nd floor slabs on grade, followed by 2nd floor CMU walls. Precast concrete planks are lifted onto the walls, where 3rd floor CMU walls are then positioned, and topped off with prefabricated wood trusses. Brick casing as well as windows and doors complete the watertight milestone and allow phase 2 interior fit outs to begin. Upon the conduction of several different inspections, which include food service, life safety, and nursing division, the critical path advances into phase 3. Phase 3 focuses on merely connecting the two additions back into the existing structure. The connecting segments of the building are both new construction and follow the exact same sequence of critical path events as conducted in phase 2. Phase 4 involves major renovations to the existing nursing facility due to the relocation of patient rooms. As the schedule advances, existing walls are demolished and reframed in different areas. MEP work is then redirected into newly built patient rooms, where finish work can proceed. As the critical path nears completion, the project advances into phase 5. Phase 5 involves light renovations to untouched regions of the existing building and is a very brief portion of the schedule. New finishes including GWB, painting, and flooring are the last major construction activities to be performed before the team completes its final punch list and close out.



(**Figure 6:** Phases 2-5) -Courtesy of RLPS, LTD.

Weather is undoubtedly the most significant risk to the Masonic Village at Sewickley completion date. Given the nature of the project, construction is practically put on hold when rain and other forms of severe weather impose their presence. Since the majority of the superstructure is comprised of CMU bearing walls, heavy rain creates a scenario in which masons cannot achieve joints of adequate quality. Thus, the critical path is stopped and construction cannot progress. Despite the risk of weather delays being accounted for in the original schedule, the project team has found themselves in need of much more time than was initially planned for due to a combination of misfortunes. According to Project Manager Tony Grace, December of 2010 has been noted as being the harshest winter on record to date in the Pittsburgh area. Furthermore, this brutal season was followed by relentless amounts of rain throughout the spring and summer of 2011. Weather alone has been the sole constituent of causing the project to become roughly two months behind schedule. Since weather is an obstacle that cannot be controlled, there is nothing the project team can do other than let nature run its course and try to regain lost time once they have reached their watertight milestone.

The possible solution to the current delay in schedule would be to increase the total number of labor hours devoted to the project after the additions are finally enclosed. Once the structure becomes watertight, weather is no longer a driving factor and the team’s biggest risk essentially becomes nonexistent. The CM at risk currently employs a 5 day, 40 hour work week. This could easily be increased to include evenings, weekends, or both. Utilizing around the clock work provides an opportunity for added hours to catch the project schedule back up to date with where it needs to be.

If extending the hours of the work week is difficult to accomplish, another practical alternative would be to simply increase the amount of man power present in the 40 hours of time provided. Crews of various trades currently on the job are fairly small compared to the amount of work that needs to be completed. Increasing the size of their work force has the potential to be extremely advantageous to the schedule. As opposed to completing work in one wing and moving to the other, contractors could establish active crews in both wings at the same time. Thus creating and end result of doubling the output in half the anticipated time.

Although both scenarios fulfill their respective roles in advancing the schedule, there are certainly added costs associated with each of them. Whenever more laborers are brought onto the job site, the total cost of wages will increase significantly. It is the construction manager’s duty to keep these costs as low as possible. When employing a larger workforce, it is imperative to dictate how much and how often laborers are exposed to premium time versus typical wages. In order to keep costs low, it is valuable to employ more qualified laborers than having to pay overtime rates to a limited number of workers. If construction activity advances toward a longer work day, the project team may want to establish different shifts, in which different laborers work at different hours. The same principle would also hold true for weekend activity. The construction manager should mandate a maximum of 40 hours per week for each worker. Therefore, productivity on the project would drastically increase while simultaneously keeping overhead costs to a minimum.

Value Engineering

According to Project Manager Tony Grace, there was absolutely no need for value engineering on the Masonic Village at Sewickley project. Between previous building history and the time dedicated to actually planning the additions, years' worth of preparation and experience has been devoted to achieving an ideal structure on the first attempt. Masonic Villages of Pennsylvania is an organization that has been in business for over 130 years. Throughout the longevity of the company, the organization has established five separate campuses across the state of Pennsylvania. Although there are certainly subtle differences from campus to campus and building to building, each structure has generally maintained a common similarity in function and architectural design. The current additions and renovations to the existing nursing facility are nothing new to the organization. Therefore, the ultimate goal of the owner is to get things right on the first attempt and not expend additional time trying to find ways to value engineer their projects.

Masonic Villages of Pennsylvania is an owner that knows exactly what to expect from the construction process. The construction process is being overseen by a very experienced owner's representative. Every bid that was eventually awarded fell within the anticipated overall budget of the owner. Therefore, Masonic Villages of Pennsylvania was not forced to employ any sort of value engineering on the facility.

Throughout the life of the project, thus far only one value engineering idea has even been proposed to the owner. The proposal was issued from one of the project team's plumbing subcontractors. The idea was to change all subgrade plumbing lines from cast iron to PVC pipe. Nonetheless, the owner was not a proponent of the alteration and turned it down immediately. Masonic Village feels that since cast iron is a much more durable material than PVC, it should be the material utilized in the facility. They believe the marginal benefit of switching the type of pipe would not be greater than the marginal value. Therefore, it did not take much time for the organization to reject the first and only proposed value engineering idea.

Despite their history of resisting value engineering ideas, one concept that could have great benefit to the project is to value engineer the exterior masonry wall assemblies. Masonry is by far the most abundant and costly material used on site. Finding ways to maximize efficiency of use and minimize material waste would be an excellent concept to pursue. It would lower material costs for the owner as well as create a more environmentally sustainable form of construction.

Critical Industry Issues

The 20th annual PACE Roundtable meeting was held at the Penn Stater Conference Center Hotel in Innovation Park on November 8-9, 2011. The intent of the roundtable meeting is to provide AE students an opportunity for open discussions with industry professionals and faculty members. The event began with opening statements from Dr. Leicht, Dr. Anumba, and Dr. Messner each discussing critical information about PACE and the current industry. Following kick-off, two consecutive break-out sessions were held. Students were asked to attend one of the three meeting topics available during each session. Information obtained at the PACE roundtable on research topic ideas and key contact information can be viewed in **Appendix A**.

Break-out session 1 included the following topics:

1A. Energy Management Services

1B. Assembling/Procuring an Integrated Team

1C. BIM Services for the Owner – Role of the Design and Construction Professional

During session 1, I had the opportunity to be involved in the *Energy Management Services* discussion. The primary focus of energy management is to create efficiency in building operations. As professionals, it is our duty to understand where energy comes from and optimize its output. Nonetheless, this can often be a very challenging task to accomplish. One of the most notable impacts on energy management can often be the occupants themselves. If occupants are not buying into the concept of energy optimization, it can be very difficult to achieve the desired results. One of the best solutions to this problem is to pursue a top down management approach. As upper level management becomes involved, the trend gradually works itself down the chain of command. However, in some instances occupant behavior may be difficult to control. This scenario may call for a need to simplify the system of controls. Smart building systems operate based on how they are engineered to function and simplifies the amount of owner involvement. An example of such technology would be window shades that automatically raise and lower depending on the angle of the sun at a certain time. Although often very costly, it ensures designers that energy management will provide the owner with the intended outcomes.

Further discussions on energy management lead to topics of project delivery and specialization of skills. Industry professionals at the roundtable session stated that their company bids jobs solely through the idea of performance-based contracting. This type of delivery requires measurement and verification of a building's performance and can be used as justifiable evidence to the owner that the contractor has met their needs. Testing can be conducted by a 3rd party agency or in-house, whichever is more desirable to the owner.

The final subject of session 1 regards energy management in relation to retrofitting existing structures. Some states are beginning to mandate performance requirements as buildings undergo renovations. This is a very important matter for project teams to monitor closely, as it can easily be misinterpreted. Some regulations seem to have a sense of ambiguity in their goals, making it difficult to understand what minimum requirements need to be achieved. For instance, what does it mean to have a 15% energy reduction? Is that in relation to its previous efficiency or other similar buildings throughout the nation? Ambiguity in legislature may lead to the need for energy audits. Audits provide information about the building's current state and provide an estimate as to what certain upgrades are capable of achieving. Such documents can prove to be extremely useful in energy oriented projects.

As part of integrating session 1 into Masonic Village at Sewickley, a couple research topics seemingly relate to the project. The idea of energy management, particularly related to the building's large resident room windows, should be studied to determine how much heat energy is gained or lost through the glass. Studies may involve the implementation of automated window shades or be as simple as simply reducing the overall dimensions of the windows themselves. Finding the optimum area of glazing has the potential to provide a huge kick back to the owner in energy savings. Given that Masonic Village at Sewickley also has 44,000 SF of renovation work, retrofitting the existing MEP system would also be a good topic of study. Understanding the difference between initial system cost and operational cost may provide a completely different perception of how an owner chooses to approach a project. A quick return on their investment may persuade them to incur a higher initial cost. Research in these areas allow for a better understanding of energy management and optimization.

Break-out session 2 consisted of the following choices:

2A. Learning Systems for Training Sustainable Workforce

2B. Integrated Decisions for High Performance Retrofit Projects

2C. Strategies and Opportunities for Taking BIM into the Field

Given that much of Masonic Village at Sewickley involves renovating the existing nursing facility, I chose to attend *Integrated Decisions for High Performance Retrofit Projects* for break-out session 2. In order for integrated decision making to be supported, a lot of different variables might be considered. Trades need to collaborate during front end planning of the project. Knowing the responsibility and scope of work for each subcontractor plays a critical role in reducing costly change orders. It is also important to understand that a complete remodel has a much different impact on integrated decisions than an adaptive reuse. Circumstances are more complex in situations where existing systems are being partially salvaged. This is due to the fact that it requires more precise knowledge of exactly how to incorporate new materials with existing components. In the case of partially conserving certain systems, a project team may need to address costs incurred from having to maintain specific systems. Integrated decisions on retrofit projects need to be clear as to who bears each of these expenses.

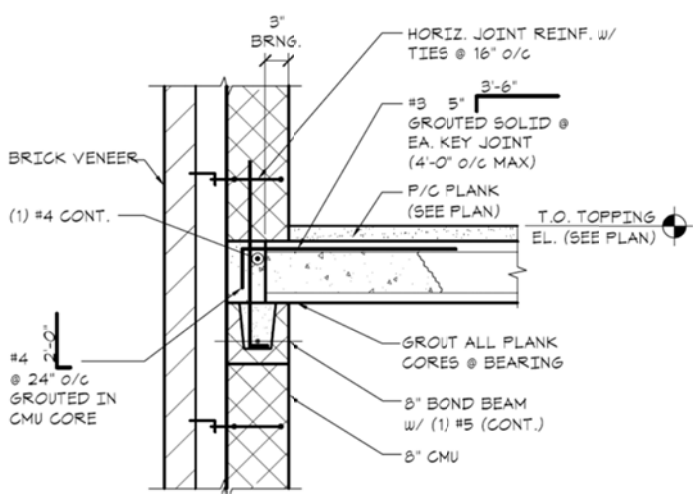
In situations where the architect is the sole designer of a retrofit, it is not uncommon to see a large differentiation in bids on bid day. Most discrepancies are due to the fact that there is no integration of design during development. One contractor may discover a way to drastically reduce a certain cost and thus obtain a competitive advantage amongst other bidders. Integration of design would likely make everyone aware of potential cost reductions, which may ultimately produce an even lower bid than having just one contractor aware of the savings. One technique used to achieve high performance is assembling trades into clusters. A cluster is a group of trades that form common building assemblies, which provides better insight on how each one needs to work together. Such integration also gets the owner onboard early and helps communicate exactly what is expected. Nonetheless, integrated design still has its drawbacks. One of the most significant problems is that no one entity is officially designated to lead the process. Everyone is equally expected to contribute the best information they have available to them. In order to be successful a project needs to acquire the necessary talent and maintain a positive attitude.

Session 2 also provided ideas on potential thesis research ideas. Phase 4 of Masonic Village at Sewickley is a complete remodel whereas phase 5 is only a partial renovation. One study that resulted from the roundtable would be to compare the difference in performance between the two. It would be interesting to find out how much of an impact adaptive reuses actually have on performance. The second research idea to come out of the discussion focuses on the advantage of integrated decisions. This study would attempt to compare the type of issues commonly overlooked by an individual designer, but tend to be taken advantage of when integration is involved. Such research may better quantify advantages of integration and justify its use on a project.

Problem Identification and Technical Analysis

Masonry Acceleration:

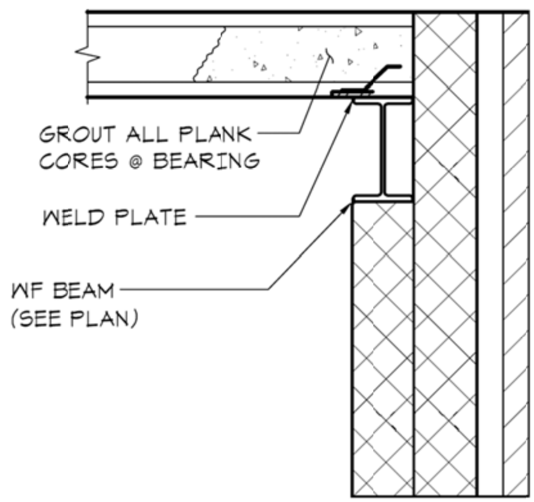
It is clear that amount of masonry utilized in Masonic Village at Sewickley is undoubtedly one of the most critical factors driving the project's schedule. Keeping on pace with masonry work is a key concern of construction. Allowing work to be delayed could ultimately lead to a failure of the expected completion date. Finding innovative ways to speed up the erection of masonry alone could lead to weeks' worth of progress in the overall schedule. Such improvements in work flow might be the best answer to regaining lost time in other similar buildings as well. Figure 7 is a connection detail that displays how the nursing facility is currently being constructed. One floor of masonry bearing walls is built, precast concrete plank is set on top, and another story of masonry walls is then added. The construction depth topic of interest would be to study scenarios of fast tracking masonry construction. Since precast slabs must be put in place before masonry work can continue upward, removing them from this sequence would eliminate their role as a member of the critical path. The wall system would effectively be balloon framed as opposed to platform framed. Alterations to the current process would permit masons to completely erect wall assemblies without having to suffer delays caused by precast crews. The current sequencing on the project is done by developing one floor of CMU walls, applying a moisture barrier, adding brick veneer, and then repeating the process for the next floor. The newly proposed sequencing would not only save time due to precast elements but also permit masons to devote their attention to completely assembling one type of block system before switching to the other. This sequencing creates an easier flow of work for masons. Studying potential methods to accelerate masonry construction provides huge advances to the schedule on this particular project.



(**Figure 7:** Connection Detail) -Courtesy of RLPS, LTD.

Precast Plank Supports:

In the event of transforming the building into a balloon framed structure in order to enhance the schedule, precast planks will need to be supported and connected in a different fashion. Design modifications provide an opportunity to explore building structural changes as a breadth study. Since precast slabs will no longer be an integral part of the wall system, steel wide flanges would be the most effective way to provide the necessary support. Masonry pilasters are currently located at regular intervals along the exterior wall. Steel wide flanges that span from pilaster to pilaster can be used as the primary means of supporting the planks. Each plank will need to have weld plates mounted on them when as they are fabricated. Once they are set, the plates will be welded to the wide flanges to create the connection. Figure 8 shows a section through a pilaster demonstrating how the new floor system will function without disrupting the fast tracked masonry work flow.



(**Figure 8:** Modified Support System)

NOTE: Figure 8 was modified from its original form and is not a detail available in architectural documents.

- Unmodified versions of **Figure 8** are courtesy of RLPS, LTD.

Façade Dimensioning:

The irregular shape of the building façade has proven to be an extremely problematic and costly feature to the project team. Since measurements do not match up well with dimensions commonly used for masonry construction, the site generates enormous amounts of waste. Cutting blocks to fit proper dimensions not only adds cost in material waste but also in labor and manpower. Making minor adjustments to wall dimensions has the potential to generate unprecedented cost savings. The intent of this construction depth study is to optimize savings for the owner by making minor alterations to façade dimensions. Three critical research components include manpower, time, and material waste. A reduction of cost in these three areas is what ultimately generates the opportunity for anticipated savings. Since far fewer blocks are expected to be cut, equivalent work-in-place manpower is expected to be reduced. Crews will no longer require added workers to cut irregularly shaped blocks. Largely removing this part of the erection process initiates a ripple effect. When masons encounter unconventional block sizes, it takes more time and effort to produce an assembly than it otherwise would in a “line” formation. Taking advantage of façade dimensioning can provide a scenario that continually maintains such a rhythm. Time is money in the construction industry and should be treated intelligently when budgeting for a project. The ripple effect in savings further continues by allowing less material to go to waste. The cost of wasted material adds up rapidly on this particular project, given the majority of its superstructure is comprised of block construction. It is crucial to minimize waste not only from a cost standpoint but also from an environmental point of view as well. The results of this study will provide insight to future designers as to a simple technique in reducing project costs.

Surface Area of Glazing:

One distinguished feature of the project is the use of significantly large windows. Windows in most resident rooms are commonly in the range of 5’ x 5’. As part of making alterations to building dimensions for better accommodation of masonry construction, it may also be advantageous to adjust the dimensions of window sizes. Since the majority of windows in the additions are south-facing it may cause occupants to be overwhelmed with light, especially during parts of the year when the sun is low in the sky. Reducing sizes will not only provide a more pleasant level of light but also lead to potential energy savings’. Glass serves as a very poor insulator and causes considerable amounts of energy to be lost. Less glazing area ultimately allows less energy to be lost. The idea of this breadth study is to optimize window sizes in relation to energy losses, light levels, and dimensions of block construction. Since the windows are primarily south-facing, there may be an opportunity to take advantage of solar heat gain. Nonetheless, if light levels remain overwhelming it may cause occupants to close their shades and prevent the system from taking advantage of natural heat gains. Further research in optimizing all three areas will need to be conducted and prioritized accordingly.

- A copy of the research proposal presentation can be viewed in **Appendix B.**

Appendix A

PACE Roundtable

Student Name:_________Jason Drake___________

Session #1

Topic:_____**Energy Management Services**______________________________

Research Ideas:

(1) Energy study through systematic controls (i.e. automated window shades)

(2) Retrofitting existing buildings and studying the savings between system cost and operating cost

Session #2

Topic:__**Integrated Decisions for High Performance Retrofit Projects**____

Research Ideas:

(1) Difference in performances between a partial renovation and a full gut

(2) Focus on issues that were overlooked by doing things individually as opposed to different designs that could have been achieved through integration

Industry Panel: Differentiation in a Down Economy

Research Ideas:

(1) Try to find new approaches in the way companies respond to the economy as it changes

(2) Implement new technologies, such as BIM, to provide a leg up in the market

Industry Member Discussion

Key Feedback:

Which research topic is most relevant to industry? What is the scope of the topic?

Energy Management -	Using window size, orientation, and shading to conserve a building's energy consumption
Retrofitting -	Mandating performance, energy audits, and system vs. operational cost
Building Controls -	Education facility management and metrics of existing building

Suggested Resources:

What industry contacts are needed? Is the information available?

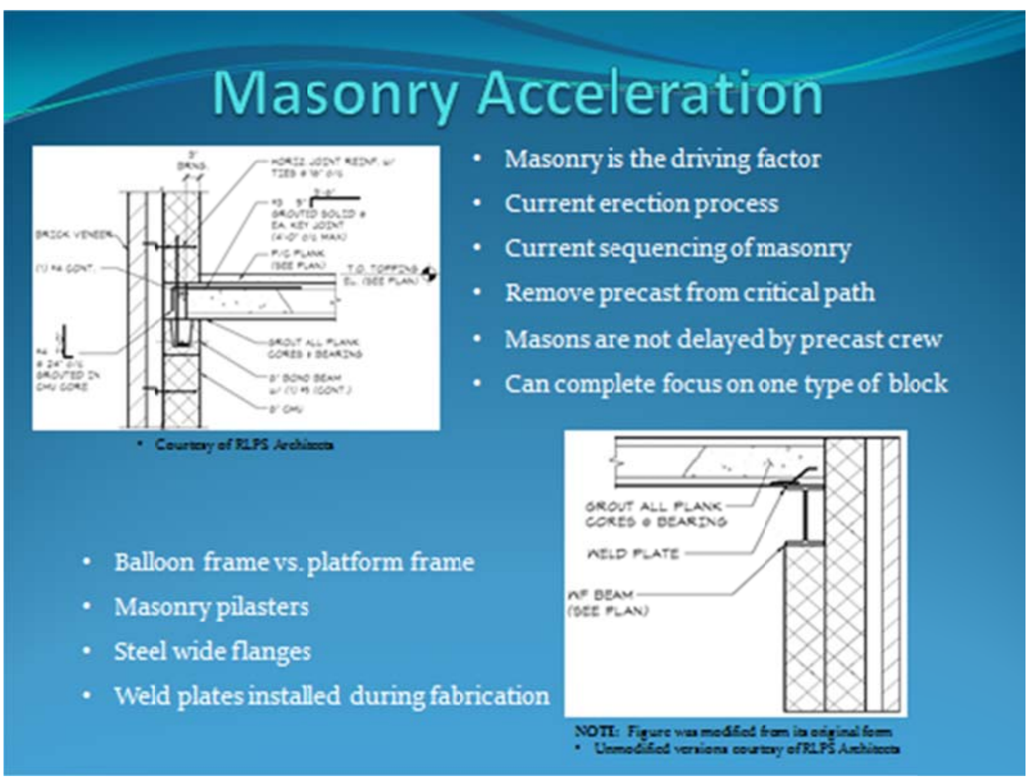
1.) Sonali Kumar - Info on energy in healthcare
207 Eng. Unit B

2.) Dan Kerr, PE - Info on energy management
Director of Energy Services
dankerr@mcclureco.com

Appendix B

Research Proposal Presentation

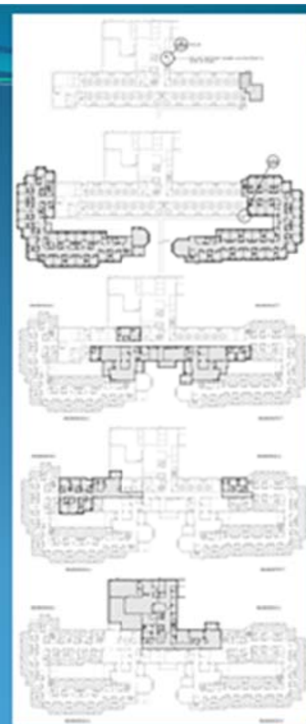

Masonic Village at Sewickley
Courtesy of: Reese, Lower, Patrick, & Scott, LTD.
MASONIC VILLAGE
SEWICKLEY
Owner : Masonic Villages of Pennsylvania
Location: Sewickley, PA
Building Type: Nursing Facility
Project Cost: $22.8 Million
Height: 3 Story
Occupancy: 128 Beds
New Construction: 66,455 SF
Renovation Work: 40,000 SF
Construction Dates: 9/13/10 – 9/27/12
Courtesy of RLPS Architects


Masonry Acceleration
• Masonry is the driving factor
• Current erection process
• Current sequencing of masonry
• Remove precast from critical path
• Masons are not delayed by precast crew
• Can complete focus on one type of block
• Courtesy of RLPS Architects
• Balloon frame vs. platform frame
• Masonry pilasters
• Steel wide flanges
• Weld plates installed during fabrication
GROUT ALL PLANK CORES @ BEARING
WELD PLATE
WF BEAM (SEE PLAN)
NOTE: Figure was modified from its original form
• Unmodified versions courtesy of RLPS Architects

Sequencing

- Alternative sequencing
- Site constraints
- Better flow of construction
- More convenient laydown area
- Relocation of resident rooms

• Courtesy of RLPS Architects



• Courtesy of RLPS Architects

Façade Dimensioning

- Irregular shape façade
- Avoid cutting blocks
- Opportunity for cost savings
- Research savings in:
  - Manpower
  - Material Waste
  - Time
- Energy losses
- Overwhelming amount of light
- Optimize with block dimensions
- Cost savings

• Courtesy of Weber Murphy Fox

• Courtesy of Weber Murphy Fox


Safety Analysis
OSHA regulations
Resident safety
Noise pollution
Construction dust
Adequate egress
Employee safety
Entrance/Exit from parking lot
Interior safety during renovations
Worker safety
Construction lifts
Proper protection
Tool box talks
Courtesy of MVS