

AE 481W

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Courtesy of SCA

[Rydal Park Medical Center Addition]
[Rydal, Pennsylvania]

[TECHNICAL ASSIGNMENT 2]

[The following report presents a technical overview of the Rydal Park Medical Center Addition. Located within this assignment an in depth discussion of the addition which has been addressed through the exploration of the detailed project schedule, migration of the site through specific construction phases, analysis of the structural system and associated costs, and finally a brief dialogue regarding the general conditions estimate.]



RYDAL PARK MEDICAL CENTER ADDITION

PROJECT INFORMATION:

FUNCTION : INSTITUTIONAL CARE
BUILDING COST : \$26,590,000
SIZE : 142,862 SQUARE FEET
DATES OF CONSTRUCTION :
SEPT 09' - MARCH 11'
DELIVERY METHOD : CM @ RISK, DESIGN-
BID-BUILD W/ NEGOCIATED GMP

PROJECT TEAM:

OWNER : PRESBY'S INSPIRED LIFE
DEVELOPERS : GREENBRIER DEVELOPERS, INC.
ARCHITECT : STEWART-CONNERS PLLC
CONSTRUCTION MANAGER :
THE WHITING-TURNER CONTRACTING CO.
STRUCTURAL ENGINEER : WK DICKSON & CO.
MEP ENGINEER : MOORE ENGINEERING

ARCHITECTURE:

- AESTHETICS INTENDED TO INVOKE SENSE OF RESIDENTIAL COMMUNITY LIVING AT A LOCATION WHERE SENIORS MAY RECEIVE SKILLED ELDERLY NURSING CARE.
- 5 STORY STRUCTURE WILL INCLUDE:
 - TWO FLOORS OF PARKING GARAGE SPACE
 - TWO FLOORS OF SKILLED NURSING CARE
 - ONE FLOOR OF CRITICAL MEMORY SUPPORT
- FAÇADE WILL IMPLEMENT A STONE VENEER SYSTEM AND SPRAY APPLIED STUCCO AS WELL AS CURTAIN WINDOW WALL & PELLA WINDOWS TO MATCH THE EXISTING MEDICAL FACILITY

STRUCTURAL:

- FOUNDATION :
- HELICAL GEO-PIER STONE COLUMN FOUNDATION SYSTEM WILL PROVIDE SUPPORT UNDER SPREAD FOOTERS
- SUPERSTRUCTURE :
- POST-TENSION TWO-WAY CONCRETE SYSTEM
 - REINFORCED CONCRETE COLUMNS
 - REINFORCED MASONRY MASS SHEAR WALLS (GRAVITY SYSTEM), LOCATED MAINLY AT STAIRTOWERS, UTILIZED AS THE LATERAL SYSTEM
- ROOF STURCUTRE :
- NON-COMPOSITE ROOF DECK MAINLY SUPPORTED BY K-SERIES JOISTS AND SEVERL INTERMEDIATE WIDE FLANGE BEAMS BETWEEN COLUMNS

MEP SYSTEMS:

- FOUR PIPE AIR/WATER HVAC SYSTEM:
 - THREE FAN COIL UNITS (400 - 1200 CFM)
 - EIGHT AHU'S (630 - 3770 CFM)
 - FOUR ENERGY RECOVERY UNITS (FIRST FLOOR)
- BUILDING POWER SUPPLIED BY PECO:
 - 15 KW SWITCHGEAR TO STEPDOWN POWER
 - 208/120V 3 PHASE 4 WIRE WIRE SYSTEM
 - 350 KW EMERGENCY GENERATOR (FIRST FLOOR)
- COMBINATION DRY AND WET PIPE FIRE SUPPRESSION SYSTEM

CONCEPTUAL SKETCH



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Executive Summary

Presby's Inspired Life develops and manages continuing care communities that provide an opportunity for senior citizens to live their lives within a relaxing residential surrounding while retaining peace of mind that if any health emergency were to arise, assistance would be immediately available. This location, Rydal Park, is a continuing care retirement community where seniors begin living at homes that are cozy cottages and as their conditions progress (if any exist), they will eventually move into the medical facility at the center of the campus. This medical addition has finishes that closely resemble would be found within a luxury hotel, but with the added necessity of being equipped for medical emergencies.

Technical Assignment 2 digs deeper into specific portions of the Medical Center Addition. The first part of the research will focus on detailed planning through the development of a detailed schedule and the creation of several phase specific site plans. Along with the site plans, a construction sequence diagram will illustrate the flow and path of work throughout the construction phase. Following this detailed planning portion, an in depth cost analysis of the concrete structural system and general conditions will be addressed. The assignment will conclude with a summary of the 18th Annual PACE conference examining major current industry issues and which pertain to this project.

The project schedule, developed for the first technical assignment, was expanded upon to gain an improved understanding of the building sequence. A total of 143 activities have been developed for this five story structure. Notice to proceed was granted to the Whiting-Turner Contracting Co. on October 21st, 2009. Substantial completion must occur by the end of August 2011 to meet the contractual agreements signed with the owner.

Following the detailed planning portion, an analysis of the post tension concrete structural system as well as the general conditions estimate will examine all associated costs. The structural system analysis involves the footers, grade beams, SOG's, columns, shear walls, and elevated slabs which resulted with an estimated value of \$3,722,270. This value is approximately 18% below the actual submitted lump sum value received from the subcontractor. Reasons for this low estimate will be discussed at length due to the fact that this percentage of error is relatively high in comparison to the level of detail performed for the take off.

Upon completion of the general conditions estimate, the final costs came to \$2,712,245, with the weekly costs at \$34,772.37 for the 18 month duration of the project. This value is about 10% of the total project cost which appears to be within a reasonable cost range.

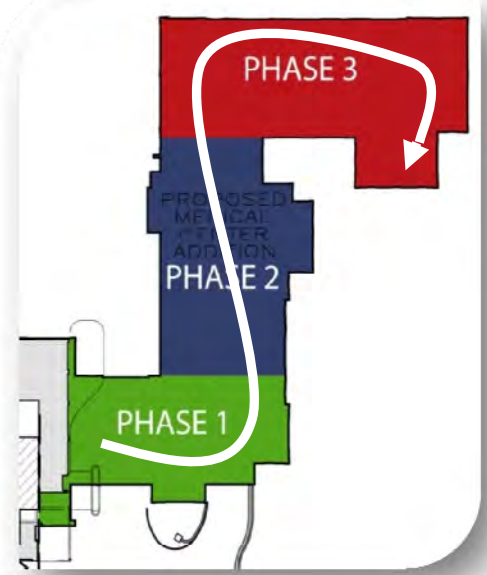
Detailed Project Schedule

Stewart-Conners Architects, who also designs many of Presby's Inspired Life's retirement communities, began designing this Medical Center Addition in February and March of 2008. As the schematic design phase started wrapping up, The Whiting-Turner Contracting Co. was hired in June 2008 for full preconstruction and construction management services. Due to the private nature of this project, the construction management services (at risk) were not put out for public bidding. From June 2008 to July 2009 it was unsure whether or not this project would see life as it went on hold twice, each time for a couple months. During July 2009, Whiting-Turner began increasing its effort to improve the success of the project eventually leading to the acceptance of a negotiated GMP on October 21st, 2009. Notice to proceed was given on this date and Whiting-Turner plans to be completely mobilized no later than mid-November '09. Currently, Whiting-Turner has bought-out site work, GeoPier foundations, concrete and MEP contractors. Achieving a watertight building is planned for the end of November '10 and substantial completion by the end of July '11. Meeting this deadline is crucial due to occupancy phasing requirements that have been dictated by the owner.

In order to properly interpret the detailed project schedule, several key features must be addressed. The construction phase of the schedule has been broken down into four major portions; substructure/subgrade, concrete structure, building enclosure, and interiors. In an attempt to remove confusion with relationships, most but not all, activities have been linked in a finish-start fashion. Within each major portion of construction, the work has been broken down by floors. It is also important to note that this 143 activity schedule was extrapolated from a basic 25 activity schedule. This presented challenges when developing appropriate durations for specific activities. Some items may look out of place, but there has been thought and reason behind each item's time location. Electrical equipment within the interiors phase is shown as being set during the structure phase. Since most mechanical and electrical equipment is bulky, large and expensive, it must be set while the floor above is open and easily accessible. Finally, one key feature to note regarding this schedule is that the MEP trades will be on site for the duration of the project. Between utility relocation, utility feeds and service, major equipment placement, MEP rough-in, and fixtures, the electrical and mechanical subcontractors will be performing work during each major construction phase.

Project Sequencing

In order to properly sequence this project, this construction flow diagram was developed. This flow was originally created for the concrete pour schedule, but was later decided that it also provides clear direction and general breakdown for each floor. Phase 1 was located because of its proximity to the existing medical facility. Once Phase 1 is completed on each floor, the rooms in the existing facility which have been closed due to the construction can be utilized once again. The owner has placed less emphasis on phases 2 and 3 since they don't impose the same issue or threat on the existing facility. Utilizing a three phased breakdown per floor will allow for high detailing when scheduling the concrete and building envelope subcontractors. Within each one of the four major construction phases, the schedule is broken down by floor. Breaking down the schedule into these four major



[Figure 01. Construction Flow]

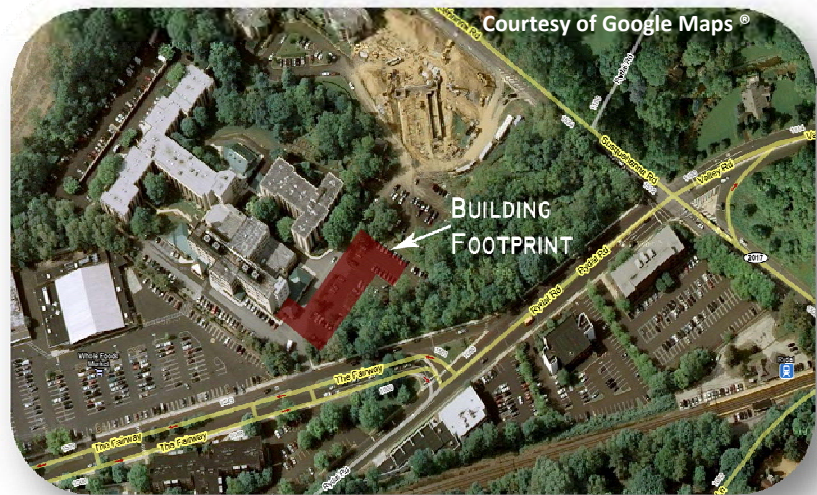
construction phases will allow Whiting-Turner to improve their understanding of each activity through keeping related tasks grouped.

The Detailed Project Schedule is located within **Appendix A**.

Site Layout Plan

Due to the “addition” nature of this project, the building footprint is sitting on a site that was not originally designed or intended to accept a building. The site is currently a parking lot which is bounded by a grove of trees, Rydal Road, and The Fairway to the east. Along the south and west sides of the site are parking lots and existing buildings which may not be impacted by the construction in any form. Located at the north end of the site is a parking lot which will house parking for authorized construction personnel and the site trailers. For the safety of the community residents, the owner has decided to close all pedestrian walkways within the tree groves. The only nearby walkway

that is to remain open is the sidewalk along The Fairway and Rydal road. The only period that this walkway will be an issue is during the tree clearing phase. Since this is a retirement community, strict working hours of 7-5pm must be adhered to as to not disturb the patients in the medical facility or residents living in the apartments. For the duration of construction, overflow parking for authorized community residents will be relocated to the Whole Foods Lot, located directly in front of the south face of the existing medical facility.



[Figure 02. Aerial View of the Site]

General Conditions and Temporary Facilities

Most of the general conditions components that have been located on site will stay within in the same general region for the duration of the project. The delivery gate has been located at the south end of the site which will allow for quick and easy access to the loading dock and man hoist. Two regions have been selected for dumpsters, both of which are located with road access for ease of dumpster pickup. The main construction parking lot will provide space for a maximum of four contractor trailers. Trailers on site must be properly coordinated to ensure that each contractor has the required space to manage their specific work. If more space is required, interior-focused subcontractors will be allowed to set up within the completed parking garage space on the ground level. Toilets have been located within the parking lot, within close proximity to the site trailers. A temporary power shed, located at the southeast corner of the construction parking lot, will power the trailers.

Excavation Phase: Site Plan Summary

After the geotechnical reports indicated that the site soil mainly consisted of variable fill materials, as well as loose to medium dense residual soils, it was decided to utilize the suggested GeoPier foundations type. As an

added benefit, this foundation system requires a minimal amount of soil removal minimizing site excavation. Due to the fact that there is relatively no space on this campus to store excavated soil, this foundation type was a perfect match for the project needs. The excavation phase of this project will mainly consist of the asphalt parking lot demolition, GeoPier drilling, sediment and erosion control set-up, tree removal, and site grading. The region to the east of the site will provide the required space for the tower crane, soil storage, and as a lay down region after the tree grove has been cleared and graded. During this phase of construction, sediment and erosion controls will be extremely critical to ensure proper storm water pollution management.

Erection Phase: Site Plan Summary

During the first week of February 2010, the tower crane will be delivered and assembled on site and will begin placing concrete by the beginning of March. In order to properly reach each corner of the building, a swing radius of 180 feet is required. During this phase of construction, the newly cleared tree grove will provide a region for formwork lay down, staging, and storage trailers. The delivery gate has been located at an ideal position for the crane to easily fill the concrete bucket while maintaining operator visibility. The delivery gate location also provides an excellent queuing region for concrete trucks, given its location off of a main road. The crane will begin to wrap up its time on site as the window wall system, stone veneer, and EFIS are installed resulting with a watertight building by the end of November 2010.

Interiors Phase: Site Plan Summary

Once the crane is disassembled and removed, a man / material hoist will be built aiding in the movement of materials throughout the building. This hoist has been located directly next to the loading dock, allowing for quick and easy access to delivered items at the loading dock. Delivery trucks will be able to enter the site through the south entrance, drive through the parking garage, unload any materials, and exit through the north end of the site. This traffic route will eliminate time wasted through redirection and delivery driver confusion. The plan found within the appendix provides a clear description of the flow of work and where storage will be permitted.



[Figure 03. General Conditions and Temporary Facilities Plan]

Three Phase Specific Site Plans have been located in **Appendix B**

Detailed Structural System Estimate

Due to the fact that this structure is concrete, it was decided to perform the volume analysis through the study of the structural schedules with assistance from Excel. Since this structure has unique bays with varying slab thicknesses and column dimensions, utilizing the single bay method would contain a level of inconsistency and inaccuracy. The components that were taken off for this portion of the assignment included footers, grade beams, slabs on grade, columns, elevated slabs, elevated beams, shear walls, and stairwells. All five levels of this building are above ground, therefore no foundation or subgrade walls are found within this analysis. Basic measurements and quantity take offs were transferred into Excel spreadsheets and applied to the appropriate building component. These spreadsheets immediately calculated the desired cubic yards, tonnages, and formwork contact area for each major structural element. Without the use of an electronic spreadsheet tool, this estimate would not have been a viable option and would have required an extensive amount of work to complete.

Cavan Concrete® was the selected subcontractor for this project, winning the bid with a submitted lump sum value of \$4.61 million (this amount has been slightly rounded per request of WT and Cavan). This value equates to roughly \$28.97 per square foot. A total of eight contractors submitted bids for this contract with a price range varying from \$4.4 million to \$7.2 million.

The following table summarizes the quantities of concrete, rebar, formwork required to build this concrete structure.

Structural Component Summary			
Item Description	Concrete (CY)	Rebar (Tons)	Formwork (SFCA)
Footing	1408	59	6,431
Slab on Grade	566	N / A	638
Structural PT Slab	3525	159	134,457
Column	337	41	25,619
Grade Beam	143	5	2,142
Beam	63	4	3,018
Shear Walls / Stair Towers	672	60	15,280
	6714 CY	328 Tons	187,585 Tons

[Table 01. Structural System Quantity Take-Off Summary]

After applying these quantities to RS Mean’s 2009 data, an estimated value of \$3,774,382 (\$23.72 per sf) was derived. The table found on the next page provides a complete summary of this calculated estimate. Comparing this value to the actual lump sum value reveals that this analysis has a percentage of error of 18%. One potential source of this error could be Cavan’s knowledge of pricing post-tension projects. From this estimates point of view, many of the components were priced as just cast-in-place. Extra labor associated with constructing a post tension structure would be captured due to Cavan’s specialty insight and knowledge.

Another factor that could have resulted in high bids from contractors to Whiting-Turner was that the architect and structural released two significant drawing addenda during the bid period. Due to this, many contractors may have felt uneasy and unsure as to what new features would be added in future addenda. Contractors may have utilized higher contingencies in order to properly protect themselves.

Finally, it was felt that the discovered ratio of tons of steel to cubic yards of concrete was relatively low. Averaged throughout the entire building, this ratio was found to be approximately 4.88%. The component

that raised the most concern was the structural slab. The post tension slabs had a ratio of 1.98% compared to the columns at 12.2%. Due to this, when estimating the total tonnage of steel within the slabs, a ratio of 4% was utilized in an effort to account for any reinforcing that was possibly missed during multiple slab takeoffs.

The following table summarizes the estimated cost for the materials, labor, and equipment required to erect this structure. RS Means Cost Works 2009 data was utilized for this estimate. These cost units have been adjusted for Philadelphia. Ten percent waste factors were applied to the concrete and rebar value, and fifteen percent was applied to formwork. Waste factors have only been applied to material pricing only, labor or equipment has not been altered.

Detailed Estimate for Cost of the Post Tension Concrete System								
Item Description	Quantity	Unit	Bare Material	Bare Labor	Bare Equipment	Subtotal	Total O & P	Calculated O & P
Concrete								
Spread Footings (3000 psi)	1,408	CY	\$ 111.10	\$ 33.86	\$ 12.15	\$ 157.11	\$ 204.24	\$ 287,582.81
Grade Beams (5000 psi)	143	CY	\$ 122.10	\$ 12.41	\$ 4.56	\$ 139.07	\$ 180.78	\$ 25,911.76
Elevated Beams (5000 psi)	63	CY	\$ 122.10	\$ 36.36	\$ 13.15	\$ 171.61	\$ 223.09	\$ 14,004.85
Slab on Grade(4000 psi)	566	CY	\$ 116.60	\$ 17.36	\$ 8.25	\$ 142.21	\$ 184.87	\$ 104,701.21
Columns (5000 psi)	337	CY	\$ 122.10	\$ 45.36	\$ 22.00	\$ 189.46	\$ 246.30	\$ 83,002.43
Shear Walls / Stair Towers (5000 psi)	672	CY	\$ 122.10	\$ 27.86	\$ 13.75	\$ 163.71	\$ 212.82	\$ 143,068.92
Elevated Structural Slabs (5000 psi)	3,525	CY	\$ 122.10	\$ 22.86	\$ 10.90	\$ 155.86	\$ 202.62	\$ 714,314.53
						Subtotal Concrete: \$ 1,372,586.52		
Rebar								
Spread Footings	59	Tons	\$ 1,540.00	\$ 395.00	\$ -	\$ 1,935.00	\$ 2,175.00	\$ 128,325.00
Grade Beams / Elevated Beams	10	Tons	\$ 1,705.00	\$ 890.00	\$ -	\$ 2,595.00	\$ 3,150.00	\$ 31,500.00
Slab on Grade(WWF)	303	CSF	\$ 0.55	\$ 20.50	\$ -	\$ 21.05	\$ 31.58	\$ 9,562.51
Columns	42	Tons	\$ 1,705.00	\$ 950.00	\$ -	\$ 2,655.00	\$ 3,250.00	\$ 136,500.00
Shear Walls / Stair Towers	60	Tons	\$ 1,622.50	\$ 1,340.00	\$ -	\$ 2,962.50	\$ 3,400.00	\$ 204,000.00
Elevated Structural Slabs	159	Tons	\$ 1,815.00	\$ 490.00	\$ -	\$ 2,305.00	\$ 2,605.00	\$ 414,195.00
						Subtotal Rebar: \$ 924,082.51		
Formwork								
Spread Footings	6,431	SFCA	\$ 0.17	\$ 0.70	\$ 5.35	\$ 6.22	\$ 9.08	\$ 58,426.76
Grade Beams / Elevated Beams	5,161	SFCA	\$ 0.14	\$ 0.90	\$ 4.75	\$ 5.79	\$ 8.45	\$ 43,612.15
Slab on Grade	638	SFCA	\$ 0.13	\$ 1.35	\$ 3.25	\$ 4.73	\$ 6.90	\$ 4,405.35
Columns	25,619	SFCA	\$ 0.17	\$ 0.79	\$ 5.65	\$ 6.61	\$ 9.65	\$ 247,336.64
Shear Walls / Stair Towers	15,280	SFCA	\$ 0.14	\$ 0.78	\$ 4.73	\$ 5.65	\$ 8.25	\$ 126,001.37
Elevated Structural Slabs	134,457	SFCA	\$ 0.10	\$ 1.55	\$ 3.43	\$ 5.08	\$ 7.42	\$ 997,930.16
						Subtotal Formwork: \$ 1,477,712.42		
						Grand Total Estimate: \$ 3,774,381.46		

[Table 02. Detailed Structural Systems Cost Estimate]

Detailed tables showing how each quantity was developed can be located within **Appendix C**.

General Conditions Estimate

Whiting-Turner has broken up the general conditions estimate into nine sections: mobilization and temporary field office, small tools and equipment, project management and supervision, travel and lodging, plans / permits / postage, special requirements, testing and inspections, site requirements, and building access. The value submitted within the GMP for Division 01 came to \$2,666,500 or approximately \$31,370.60 in weekly costs. In comparison to the entire GMP, the general conditions equate to approximately 10% of the total project cost. This general conditions estimate was designed for approximately 18-20 months worth of on-site, at risk, construction management services.

One outcome of the negotiated GMP between Whiting-Turner and Presby's Inspired Life was that the owner decided to pick up several general condition items. By doing this, WT was able to slightly reduce their general conditions estimate. Items that a medical setting would usually need during construction such as HEPA-VACS and ventilation machines, Presby's agreed to supply. Other items such a temporary utility services to all trailers, testing & inspections, building permits, and basic office supplies will also all be purchased and managed by the owner.

After further inspection of the general conditions estimate, it was discovered that the majority of the costs come from the project management and supervision staff. This project will require a staff of eight people to run efficiently, which is about 65% of the total general conditions value. Of these eight people, the senior project manager will be billed as part-time, due to his multiple active projects.

General Conditions Estimate Value	
Description	Value
Mobilization and Temporary Field Office	\$ 45,075.00
Small Tools and Equipment	\$ 4,150.00
Project Management and Supervision	\$ 1,733,800.00
Travel and Lodging	\$ 45,050.00
Plans, Permits, and Postage	\$ 42,000.00
Special Requirements	\$ 47,050.00
Testing and Inspections	\$ 12,500.00
Site Requiements	\$ 631,870.00
Building Access	\$ 105,000.00
Grand Total General Conditions	\$ 2,666,495.00

[Table 03. General Conditions Summary]

The entire General Condition Estimate can be found with **Appendix D**.

PACE Roundtable Summary: “Creating Opportunities”

Currently, the construction industry is facing difficult economic times requiring all of its members to develop innovative approaches to foster a successful come-back. The 18th Annual Partnership for Achieving Construction Excellence meeting has been the perfect environment to develop approaches for these critical problems. During this year’s PACE roundtable conference, more than 30 industry representatives and construction management professors met with students to develop key issues facing the construction field. Several discussions were held regarding energy usage in the building industry, BIM execution & planning, and business networking. Each of these topics generated potential research possibilities for CM students.

Conference Format and Topics

During this year’s PACE conference, three distinct discussions were held where industry members could explain their views about construction while receiving students input. The first discussion introduced a panel of five industry leaders who shared their thoughts regarding the state of the industry. Considering that many students will be entering the workforce next May, this was extremely helpful and interesting. Most members of this panel agreed that healthcare and government work are the two market sectors that will continue to thrive through this economic period. The next portion of the PACE conference broke out in sessions which set up a problem identification and solution development period. This broke out into three separate rooms focusing on energy, BIM execution & planning, or business networking. Finally, this conference concluded with a panel of students providing their point of view regarding the patterns that have emerged from the current generation’s use of blending technology and communication.

Business Networking: Expanding Circles and Creating Opportunities.

Improving the communication process as well as collaborative techniques is essential to this “social industry”. The Business Networking: Expanding Circles, and Creating Opportunities breakout session provided a chance for students to listen to experienced industry leaders. Each representative had unique point of views regarding how they establish and maintain their network circles.

Starting off this session was a dialogue regarding the shift in industry delivery methods. Reasons for this shift were agreed upon as resulting with improved benefits for owners through collaborative negotiated GMPs. The conversation shifted to Joint ventures, which presented unexpected outcomes. Business leaders discussed their joint venture experiences and the successes they had with it. It was surprising to hear how companies who compete against each other on a day to day basis where able to set aside differences and work together. Several people suggested joining up with a competitor, especially during this economy, to improve their resumes, expand geographically or enter other market sectors.

Another topic that resonated was the importance of general contractor’s ability to get close or pair up with architects and designers. Bevan Mace (Balfour Beatty) sketched a diagram showing that architects need to focus their efforts within the schematic design phase, and leave more of the standard design components to the GC/CM and technical designers. In doing this, energy is not wasted through constant redesigns between the architect and designers. This also lets architects focus on the pure aesthetics and primary architectural appearance of the building, which is where they achieve their primary satisfaction. Also GC’s can benefit from meeting new clients and owners through architects and designers.

Finally the concluding portion of this breakout session was focused on integrated project delivery (IPD). Each player involved with building design and construction process needs to learn how to integrate their efforts to improve the quality of the delivered product. Analyzing the means through which a building is delivered is another key component to creating a successful integrated delivery. As this session developed, it became clear that everyone did not have a similar definition for IPD. Someone quoted that integrated project delivery is basically “a successful design-build” project. This statement reflects that design-build projects can exist that are less efficient than design-bid-build given the latter has excellent collaboration and integration. The fact that IPD had such a weak industry definition was the most surprising element of this breakout session. IPD should be a required component of design and construction due to its ability to improve efficiency, cut waste, maintain a constant communication circle and advance the quality of a building.

Finally, one of the best quotes heard during this session was to “chase clients, not projects”. This is a phrase that is directly in line with the theme of this breakout. As general contractors harness the notion that construction is a “social industry”, keeping a steady flow of business and revenue must be managed through a company’s client base, rather than focused project hunting.

The following table is a list of contacts who were met during the PACE activities held on October 14th and 15th. The dinner and lunch periods fostered a great environment to relax and converse about general construction matters. A great deal of feedback was given regarding thesis research and assignments.

Contacts Name	Company	Email Address
Michael G. Pittsman	James G. Davis Construction Corp.	mpittsman@davisconstruction.com
James Salvino	Clark Construction Group	james.salvino@clarkconstructon.com
Michael Barnhart	Forrester Construction Company	mbarnhart@forresterconstruction.com
Bevan Mace	Balfour Beatty Construction	bmace@balfourbeattyus.com
Charles Tomasco	Truland Systems Corporation	ctomasco@truland.com

Thesis Relevant Topics

After observing and absorbing each industry member’s comments, several topics resonated for potential thesis research during next semester. First, the fact that integrated project delivery has such a weak definition must be addressed. With the technology and resources available in today’s world, it is unacceptable that this industry doesn’t implement proven collaboration techniques more often. This is definitely a major issue with the project team for Rydal Park. The project team is disconnected given that the owner is from Pennsylvania, the developer is from Texas, the architect is from North Carolina and the interior designer is from Tennessee. Adding to this geographical difficulty, each entity believes that their agenda superseded that of the others.

Another striking issue was the use of joint ventures not necessarily as GC-GC but GC-Architect. If general contractors and architects started teaming up more often, they could affect the level of competition and force the industry to utilize collaboration and integration.

Topics from the BIM and energy sessions could also pertain to future research but have limited relevance to this Medical Center. Both LEED and BIM have not been implemented within the design process, but considering the project’s young stage, performing the right form of analysis could have a huge impact on the final delivery process.

[APPENDIX A]

Detailed Project Schedule

ID	Task Name	Duration	Start	Finish	2008																								2009																								2010																								2011																								2012																							
					4th Quart						1st Quart						2nd Quart						3rd Quart						4th Quart						1st Quart						2nd Quart						3rd Quart						4th Quart						1st Quart						2nd Quart						3rd Quart						4th Quart						1st Quart						2nd																																			
					End	eginnin	Middle	End	eginnin	Middle	End	eginnin	Middle	End	eginnin	Middle	End	eginnin	Middle	End	eginnin	Middle	End	eginnin	Middle	End	eginnin	Middle	End	eginnin	Middle	End	eginnin	Middle	End	eginnin	Middle	End	eginnin	Middle	End	eginnin	Middle	End	eginnin	Middle	End	eginnin	Middle	End	eginnin	Middle																																																																								
1	Pre-Construction	468 days	Fri 2/1/08	Tue 11/17/09	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
2	Design and Planning Phase	432 days	Fri 2/1/08	Mon 9/28/09	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
3	Construction Manager Hired	0 days	Mon 6/2/08	Mon 6/2/08	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
4	Estimating and GMP Completion	311 days	Mon 6/2/08	Mon 8/10/09	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
5	Finance Closing	41 days	Fri 8/21/09	Fri 10/16/09	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
6	Notice to Proceed	0 days	Wed 10/21/09	Wed 10/21/09	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
7	Subcontractor Procurement	20 days	Wed 10/21/09	Tue 11/17/09	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
8	Sitework, Stone Columns, Concrete, MEP	20 days	Wed 10/21/09	Tue 11/17/09	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
9	Submittals / Shop Drawings	86 days	Mon 10/26/09	Mon 2/22/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
10	PT Concrete Shop Drawings	40 days	Mon 10/26/09	Fri 12/18/09	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
11	GeoPeir Foundation Shop Drawings	16 days	Mon 10/26/09	Mon 11/16/09	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
12	Mechanical Equipment	42 days	Tue 11/3/09	Wed 12/30/09	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
13	Electrical Equipment	47 days	Tue 11/3/09	Wed 1/6/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
14	Elevator Shop Drawings	32 days	Mon 1/4/10	Tue 2/16/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
15	Glazing and Storefront Shops	36 days	Mon 1/4/10	Mon 2/22/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
16	Site / Civil Preparation	80 days	Wed 11/4/09	Wed 2/24/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
17	Mobilize / Setup Site Office	11 days	Wed 11/4/09	Wed 11/18/09	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
18	Sediment & Erosion Controls	10 days	Mon 11/9/09	Fri 11/20/09	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
19	Relocate Utilities / Site Prep	20 days	Mon 11/16/09	Fri 12/11/09	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
20	Clear Tree Grove	5 days	Tue 11/24/09	Mon 11/30/09	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
21	Site Demolition (Asphalt Lot)	18 days	Wed 11/25/09	Fri 12/18/09	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
22	Grade Site	8 days	Mon 12/21/09	Wed 12/30/09	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
23	Assemble Tower Crane	5 days	Wed 2/17/10	Wed 2/24/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
24	Construction	467 days	Mon 12/14/09	Tue 9/27/11	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
25	Substructure / Subgrade	40 days	Mon 12/14/09	Fri 2/5/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
26	Drill GeoPeir Holes	10 days	Mon 12/14/09	Fri 12/25/09	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
27	Place/Pack GeoPeir Aggregate	10 days	Mon 12/28/09	Fri 1/8/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
28	FRP Structural Footings	10 days	Mon 1/4/10	Fri 1/15/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
29	Verify Locations for NEW Site Utilities	5 days	Mon 1/18/10	Fri 1/22/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
30	Place / Install NEW Site Utilities	10 days	Mon 1/25/10	Fri 2/5/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
31	PT Concrete Structure	173 days	Wed 2/3/10	Fri 10/1/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
32	FRP Slab on Grade	15 days	Wed 2/3/10	Tue 2/23/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
33	Concrete Columns - Ground Floor	13 days	Wed 2/24/10	Fri 3/12/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
34	Place Shoring for First Floor Slab	5 days	Mon 3/15/10	Fri 3/19/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
35	Concrete Slab / Columns - First Floor	24 days	Mon 3/22/10	Thu 4/22/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
36	Place Shoring for Second Floor Slab	5 days	Fri 4/23/10	Thu 4/29/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
37	Concrete Slab / Columns - Second Floor	24 days	Fri 4/30/10	Wed 6/2/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
38	Pull First Floor Reshoring @ Ground Floor	3 days	Wed 6/2/10	Fri 6/4/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
39	Place Shoring for Third Floor Slab	5 days	Mon 6/7/10	Fri 6/11/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
40	Concrete Slab / Columns - Third Floor	24 days	Mon 6/14/10	Thu 7/15/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
41	Pull Second Floor Reshoring @ First Floor	3 days	Tue 7/13/10	Thu 7/15/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
42	Place Shoring for Fourth Floor	5 days	Fri 7/16/10	Thu 7/22/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
43	Concrete Slab / Columns - Fourth Floor	20 days	Fri 7/23/10	Thu 8/19/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
44	Erect Structural Steel	17 days	Fri 8/20/10	Mon 9/13/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
45	Pull Third Floor Reshoring @ Second Floor	3 days	Wed 8/25/10	Fri 8/27/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
46	Pull Fourth Floor Reshoring @ Third Floor	3 days	Wed 9/29/10	Fri 10/1/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
47	Building Enclosure / Envelope	163 days	Mon 5/17/10	Wed 12/29/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
48	Exterior CMU Framing & Stone Veneer - Ground	17 days	Mon 5/17/10	Tue 6/8/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
49	Exterior CMU Framing & Stone Veneer - First	17 days	Wed 6/9/10	Thu 7/1/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
50	Standing Seam Roof (Above Bay Windows)	7 days	Wed 6/23/10	Thu 7/1/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
51	Fiber Glass Aluminum Windows	5 days	Fri 7/2/10	Thu 7/8/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
52	Exterior CMU Framing & Stucco EFIS - Second	17 days	Fri 7/9/10	Mon 8/2/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
53	Window Wall System - Second Floor	8 days	Tue 8/3/10	Thu 8/12/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							
54	Fiber Glass Aluminum Windows	12 days	Tue 8/3/10	Wed 8/18/10	[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																								[Gantt Bar]																							

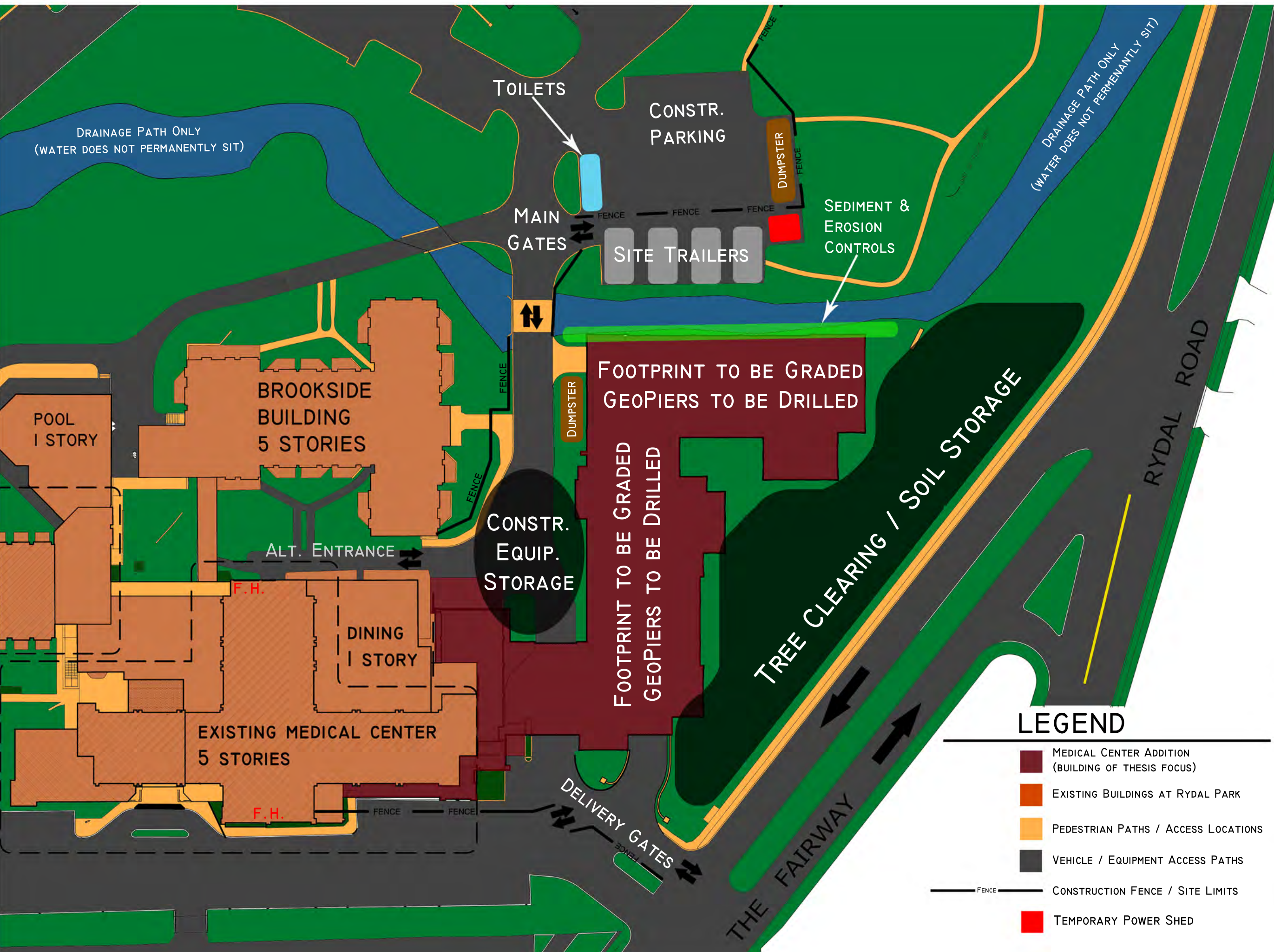
Project: Detailed Project Schedule 2
Date: Wed 10/28/09

Task: [Blue Bar] Progress: [Grey Bar] Summary: [Grey Bar] External Tasks: [Grey Bar] Deadline: [Green Arrow]

Split: [Dotted Bar] Milestone: [Diamond] Project Summary: [Grey Bar] External Milestone: [Diamond]

[APPENDIX B]

Construction Phase Specific Site Plans



**RYDAL PARK CONTINUING CARE RETIREMENT
COMMUNITY : MEDICAL CENTER ADDITION
RYDAL, PENNSYLVANIA
SPECIFIC CONSTRUCTION PHASE: EXCAVATION PLAN**

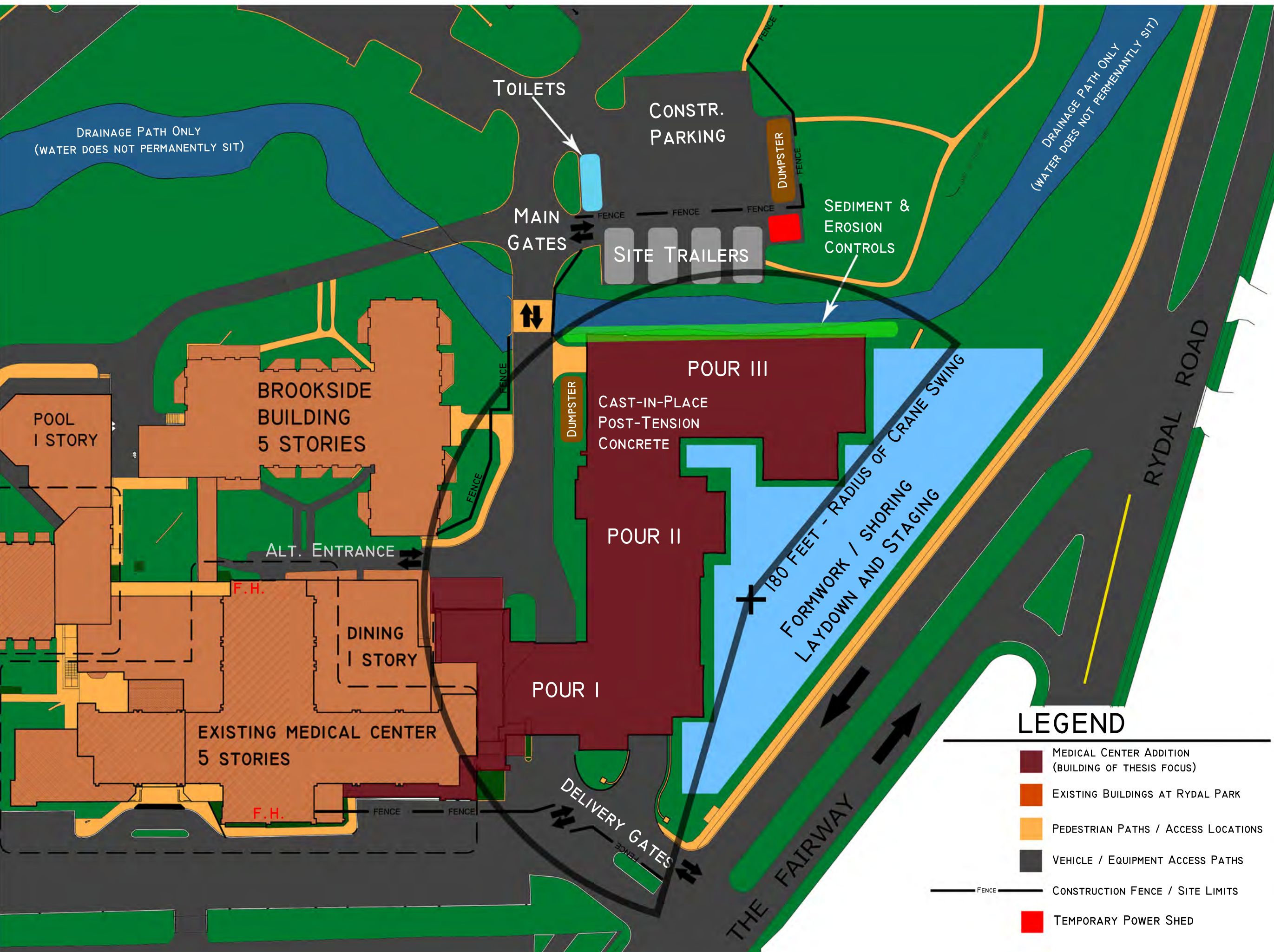
DRAWN BY:
MATT DABROWSKI
DATE:
10/28/2009

LEGEND

- MEDICAL CENTER ADDITION (BUILDING OF THESIS FOCUS)
- EXISTING BUILDINGS AT RYDAL PARK
- PEDESTRIAN PATHS / ACCESS LOCATIONS
- VEHICLE / EQUIPMENT ACCESS PATHS
- CONSTRUCTION FENCE / SITE LIMITS
- TEMPORARY POWER SHED

1 OVERALL CAMPUS PLAN
SCALE: N.T.S.

PLAN NORTH



**RYDAL PARK CONTINUING CARE RETIREMENT
COMMUNITY : MEDICAL CENTER ADDITION**

RYDAL, PENNSYLVANIA

SPECIFIC CONSTRUCTION PHASE: ERECTION PLAN

DRAWN BY:
MATT DABROWSKI

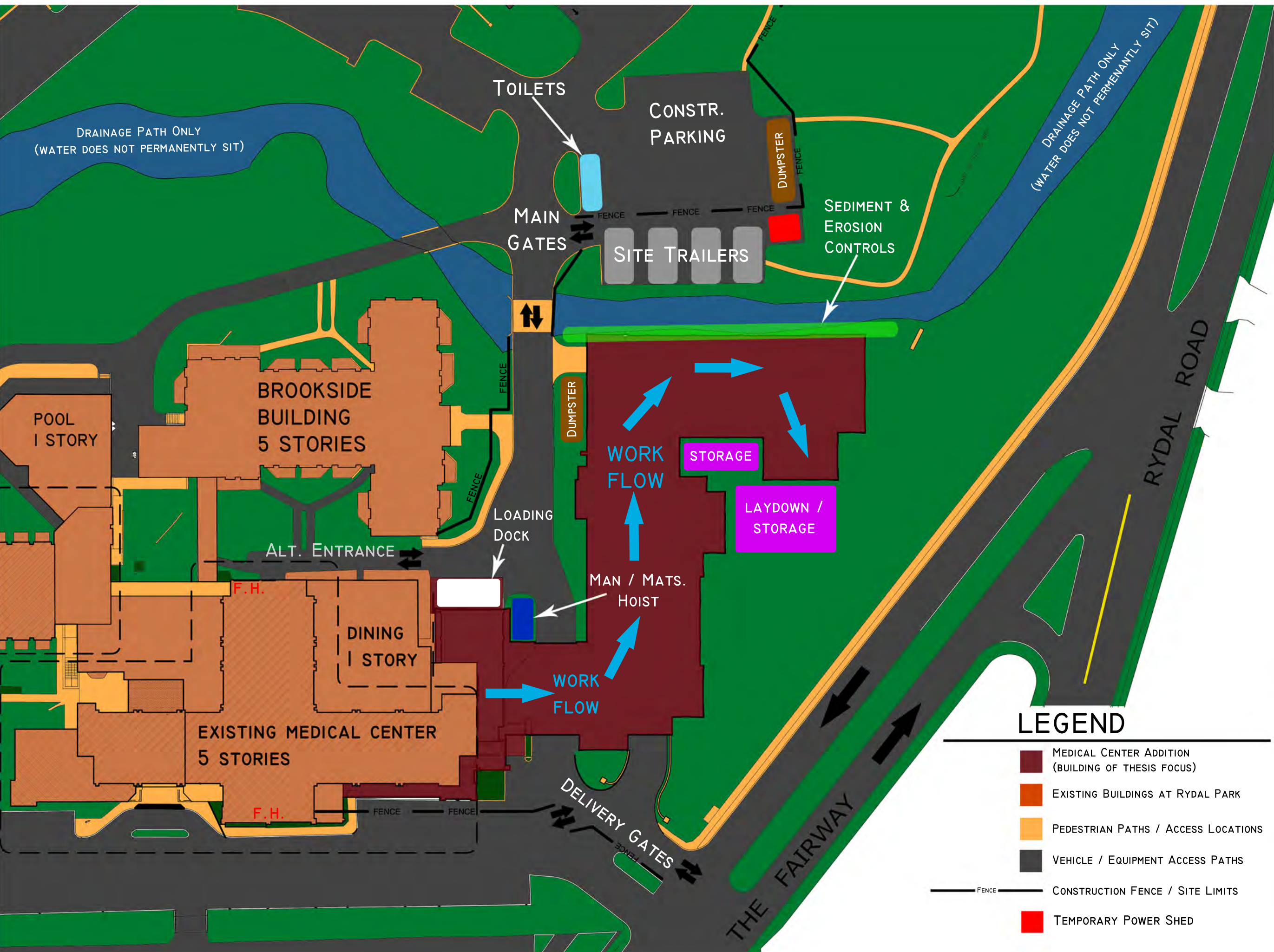
DATE:
10/28/2009

LEGEND

- MEDICAL CENTER ADDITION (BUILDING OF THESIS FOCUS)
- EXISTING BUILDINGS AT RYDAL PARK
- PEDESTRIAN PATHS / ACCESS LOCATIONS
- VEHICLE / EQUIPMENT ACCESS PATHS
- CONSTRUCTION FENCE / SITE LIMITS
- TEMPORARY POWER SHED

1 OVERALL CAMPUS PLAN
SCALE: N.T.S.

PLAN NORTH



**RYDAL PARK CONTINUING CARE RETIREMENT
COMMUNITY : MEDICAL CENTER ADDITION**

RYDAL, PENNSYLVANIA

SPECIFIC CONSTRUCTION PHASE: INTERIORS PLAN

DRAWN BY:
MATT DABROWSKI

DATE:
10/28/2009

LEGEND

- MEDICAL CENTER ADDITION (BUILDING OF THESIS FOCUS)
- EXISTING BUILDINGS AT RYDAL PARK
- PEDESTRIAN PATHS / ACCESS LOCATIONS
- VEHICLE / EQUIPMENT ACCESS PATHS
- CONSTRUCTION FENCE / SITE LIMITS
- TEMPORARY POWER SHED

1 OVERALL CAMPUS PLAN
SCALE: N.T.S.

PLAN NORTH

[APPENDIX C]

Detailed Post Tension Concrete Structural Estimate

Footing (Concrete and Rebar) Take-off

Mark	Quantity	Depth (ft)	Size (ft)		Top Reinforcing				Bot. Reinforcing				CY per EA	Total CY	
					Short	Long	Bar #	lbs.	Short	Long	Bar #	lbs.			
F1	13	1.00	5.0	x	5.0	N/A		N/A		8	8	5	83	0.93	12.04
F2	5	1.00	6.0	x	6.0	N/A		N/A		7	7	5	88	1.33	6.67
F3	6	1.00	7.0	x	7.0	N/A		N/A		7	7	6	147	1.81	10.89
F4	8	1.33	8.0	x	8.0	N/A		N/A		8	8	6	192	3.16	25.28
F5	7	1.67	9.0	x	9.0	N/A		N/A		9	9	6	243	5.00	35.00
F6	2	1.67	10.0	x	10.0	N/A		N/A		10	10	7	409	6.17	12.35
F7	10	2.00	11.0	x	11.0	N/A		N/A		11	11	7	495	8.96	89.63
F8	1	2.00	12.0	x	12.0	N/A		N/A		14	14	7	687	10.67	10.67
F9	8	2.33	13.0	x	13.0	N/A		N/A		11	11	8	764	14.60	116.84
F10	3	2.33	14.0	x	14.0	N/A		N/A		13	13	8	972	16.94	50.81
F11	2	2.67	15.0	x	15.0	N/A		N/A		15	15	8	1202	22.22	44.44
F12	4	2.67	16.0	x	16.0	N/A		N/A		17	17	8	1452	25.28	101.14
F13	1	3.00	17.0	x	17.0	N/A		N/A		18	18	8	1634	32.11	32.11
F14	1	3.00	19.0	x	19.0	N/A		N/A		17	17	9	2196	40.11	40.11
F15 - 1	1	2.67	20.0	x	29.0	24	35	8	3976	40	29	8	4366	57.28	57.28
F15 - 2	1	2.67	15.0	x	30.7	18	37	8	3744	52	22	8	3838	45.51	45.51
F15 - 3	1	2.67	22.0	x	26.8	26	32	8	3858	76	32	8	6715	58.30	58.30
F16 - 1	1	3.00	22.0	x	38.3	26	46	8	6259	26	32	8	4793	93.70	93.70
F16 - 2	1	3.00	16.0	x	52.6	19	63	8	9679	19	23	8	4055	93.48	93.48
F16 - 3	1	3.00	32.1	x	36.7	39	44	8	7610	39	46	8	7828	130.79	130.79
F16 - 4	1	3.00	31.0	x	42.9	37	52	8	8980	37	45	8	8194	147.82	147.82
F16 - 5	1	3.00	15.0	x	30.5	18	37	8	3701	18	22	8	2480	50.83	50.83
F16 - 6	1	3.00	30.5	x	42.0	37	50	8	8632	37	44	8	7906	142.33	142.33
80		Footers						56440 lbs.				60740 lbs.		1408 CY	
								28 Tons				30 Tons			

Footing Formwork Takeoff

Mark	Quantity	Depth (ft)	Size (ft)			Totals
F1	13	1.00	5.0	x	5.0	140.00
F2	5	1.00	6.0	x	6.0	72.00
F3	6	1.00	7.0	x	7.0	98.00
F4	8	1.33	8.0	x	8.0	192.00
F5	7	1.67	9.0	x	9.0	240.00
F6	2	1.67	10.0	x	10.0	100.00
F7	10	2.00	11.0	x	11.0	484.00
F8	1	2.00	12.0	x	12.0	96.00
F9	8	2.33	13.0	x	13.0	546.00
F10	3	2.33	14.0	x	14.0	261.33
F11	2	2.67	15.0	x	15.0	240.00
F12	4	2.67	16.0	x	16.0	426.67
F13	1	3.00	17.0	x	17.0	204.00
F14	1	3.00	19.0	x	19.0	228.00
F15 - 1	1	2.67	20.0	x	29.0	261.33
F15 - 2	1	2.67	15.0	x	30.7	243.83
F15 - 3	1	2.67	22.0	x	26.8	260.44
F16 - 1	1	3.00	22.0	x	38.3	362.00
F16 - 2	1	3.00	16.0	x	52.6	411.50
F16 - 3	1	3.00	32.1	x	36.7	412.62
F16 - 4	1	3.00	31.0	x	42.9	443.50
F16 - 5	1	3.00	15.0	x	30.5	273.00
F16 - 6	1	3.00	30.5	x	42.0	435.00
						6431.23 SFCA

Slab on Grade Take Off (Concrete) - Ground Floor

Mark	Area (sf)	Thickness (in)	CY
SOG1	2936.8	6	54.4
SOG2	1296.4	4	16.0
SOG3	22258.1	6	412.2
SOG4	802.7	4	9.9
SOG5	2991.1	8	73.9
30285.1			566 CY

Formwork

Mark	Perimeter (sf)
SOG1	108.4
SOG2	48.0
SOG3	298.4
SOG4	37.8
SOG5	145.8
638.4 SFCA	

1st Floor - Concrete

Area (sf)	Thickness (in.)	CY
964.2	8	23.8
2593	10	80.0
2578.1	8	63.7
18862.71	9.5	553.1
1719.16	10	53.1
3386.54	12.5	130.7
1055.22	9.5	30.9
1046.55	9.5	30.7
32205.48		965.9

2-4 Floors - Concrete

Area (sf)	Thickness (in.)	CY
964.2	8	23.8
2593	10	80.0
2578.1	8	63.7
18862.71	8	465.7
1719.16	10	53.1
3386.54	11	115.0
1055.22	8	26.1
1046.55	8	25.8
32205.48		853.2 CY

1-4 Floors - Formwork

Area (sf)	Thickness (in.)	Perimeter	SFCA
964.2	8	124.2	1047.00
2593	10	203.7	2762.74
2578.1	8	203.1	2713.50
18862.71	9.5	549.4	19297.63
1719.16	10	165.9	1857.37
3386.54	12.5	232.8	3629.01
1055.22	9.5	129.9	1158.09
1046.55	9.5	129.4	1148.99
32205.48			33614.33 SFCA

Floors 2-4: 2559.52 CY

Total SFCA Formwork: 134457 SFCA

Total Concrete in Slabs: **3525.4** CY

Total Steel in Slabs: **158.64** Tons

Reinforcing Ratio - 800 SF - 19.75 CY Concrete

Designation	Bar Size	Length (ft)	Distance (ft)	Spacing (in.)	Quantity	Tons	Volume
H (Hook)	4	9.333	14.5	12	15	0.04676	0.19444
Tendon	N / A	27.6	N / A		3	0.02766	0.11500
Tendon	N / A	29	N / A		2	0.01937	0.08056
10T	5	5.333	29	6	10	0.02781	0.11481
Bx21'@24"	4	21	27.6	24	14	0.09820	0.40833
10T	5	5.666	27.6	6	10	0.02955	0.12198
10T	5	9	29	6	10	0.04694	0.19375
B@24"	4	18	29	24	15	0.09018	0.37500

Steel : Concrete Ratio **0.01972** ~ 2% Total Steel in Slabs: **158.64** Tons

Grade Beams											
Mark	Area (sf)	Depth (ft)	Volume (ft ³)	Rebar - Parallel with Beam				Rebar - Perpendicular with Beam			
				Quantity	Bar #	Length	Lbs.	Quantity	Bar #	Width	Lbs.
GB-1	258.93	1.00	258.93	5	5	90.50	471.96	181	5	3.00	566.35
GB-2	242.73	1.00	242.73	3	5	74.25	232.33				
GB-3	26.02	1.00	26.02	3	5	10.75	33.64	8	5	2.33	19.62
GB-4	30.75	1.00	30.75	3	5	13.18	41.24	10	5	2.33	24.05
GB-5	55.80	1.67	93.00	12	6	9.30	167.62	28	6	6.00	251.43
GB-6	82.33	1.17	96.06	5	5	19.00	99.09	38	5	4.33	171.75
GB-7	692.16	1.17	807.52	7	6	98.88	1039.62	198	6	7.00	2079.25
GB-8	100.64	1.00	100.64	2	5	50.32	104.97	50	5	2.00	104.97
GB-9	26.67	1.00	26.67	2	5	13.33	27.81	13	5	2.00	27.81
GB-10	34.41	1.00	34.41	3	5	14.75	46.15	11	5	2.33	26.92
GB-11	54.67	1.17	63.78	6	5	10.25	64.14	10	5	5.33	57.02
GB-12	28.44	1.00	28.44	2	5	21.33	44.50	21	5	1.33	29.67
GB-13	109.07	1.00	109.07	3	5	46.75	146.28	35	5	2.33	85.32
GB-14	31.50	1.00	31.50	2	5	15.75	32.85	12	5	2.00	24.64
GB-15	121.64	1.00	121.64	2	5	30.41	63.44	30	5	4.00	126.87
GB-16	48.00	1.00	48.00	3	6	16.00	72.10	8	5	3.00	25.03
GB-17	62.25	1.00	62.25	3	6	20.75	93.50	10	5	3.00	32.46
GB-18	150.80	1.00	150.80	2	5	75.40	157.28	57	5	2.00	117.96
GB-19	153.39	1.00	153.39	3	5	65.75	205.73	49	5	2.33	119.99
GB-20	242.67	1.17	283.11	6	5	45.50	284.74	91	5	5.33	506.20
GB-21	736.00	1.17	858.66	6	5	138.00	863.60	276	5	5.33	1535.29
GB-22	120.86	1.00	120.86	2	5	60.43	126.06	60	5	2.00	126.06
GB-23	45.00	1.00	45.00	5	5	15.00	78.23	30	5	3.00	93.87
GB-24	76.66	1.00	76.66	2	5	57.50	119.95	43	5	1.33	59.97

Total Concrete: **143.33** CY 4616.83 lbs 6212.50 lbs

Total Steel: **5.4** Tons

Formwork

181.00
148.50
21.50
26.36
31.00
44.33
230.72
100.64
26.67
29.50
23.92
42.67
93.50
31.50
60.82
32.00
41.50
150.80
131.50
106.17
322.00
120.86
30.00
115.00

2142.45 SFCA

Grade Beams											
Mark	Depth (ft)	Volume (ft ³)	Rebar - Parallel with Beam				Rebar - Perpendicular with Beam				
			Quantity	Bar #	Length	Lbs.	Quantity	Bar #	Bar Length	Beam Width	Lbs.
B-1	2.67	113.75	8	8	32.00	683.52	32	3	7.99934	1.33	96.25
B-2	4.00	168.47	8	9	31.67	861.33	32	4	10.66	1.33	222.79
B-3	2.67	113.78	8	6	32.00	384.00	32	3	8.00006	1.33	96.26
B-4	2.67	113.78	8	6	32.00	384.00	32	3	8.00006	1.33	96.26
B-5	5.00	232.50	15	10	31.00	990.30	31	4	13	1.50	265.98
B-6	5.00	232.50	15	10	31.00	990.30	31	4	13	1.50	265.98
B-7	2.50	37.50	4	8	15.00	160.20	15	3	9.5	1.00	53.58
B-8	2.67	113.78	8	6	32.00	384.00	32	3	8.00006	1.33	96.26
B-9	2.67	113.78	8	6	32.00	384.00	32	3	8.00006	1.33	96.26
B-10	2.67	113.78	8	6	32.00	384.00	32	3	8.00006	1.33	96.26
B-11	2.67	113.78	8	6	32.00	384.00	32	3	8.00006	1.33	96.26
B-12	2.67	113.78	8	6	32.00	384.00	32	3	8.00006	1.33	96.26
B-13	2.67	113.78	8	6	32.00	384.00	32	3	8.00006	1.33	96.26

62.78 CY 6757.64 lbs 1674.64 lbs

4.2 Tons

Formwork

213.32
295.45
213.34
213.34
356.50
356.50
90.00
213.34
213.34
213.34
213.34
213.34
213.34
213.34

3018.46 SFCA

Column Concrete and Formwork

Mark	Quantity	First Floor Size (in)	Second Floor Size (in)	Third Floor Size (in)	Fourth Floor Size (in)	Roof Size (in)	CY per EA	Total CY	Formwork	
									EA	Total
C2	1	12 x 24					0.99	0.99	79.80	79.80
C3	30	12 x 24	12 x 24	12 x 24	12 x 24		3.55	106.53	287.60	8628.12
C4	6	16 x 24	16 x 24	12 x 24	12 x 24		4.21	25.25	305.34	1832.02
C5	4	16 x 24	16 x 24	12 x 24	12 x 24		4.21	16.83	305.34	1221.35
C6	1	18 x 24	18 x 24	12 x 24	12 x 24		4.54	4.54	314.20	314.20
C7	0	18 x 24	18 x 24	12 x 24	12 x 24	12 x 24	5.22	0.00	369.45	0.00
C8	2	20 x 24	20 x 24	12 x 24	12 x 24		4.86	9.73	323.07	646.14
C9	0	16 x 24	16 x 24	12 x 24	12 x 24		4.21	0.00	305.34	0.00
C10	13	12 x 24	12 x 24	12 x 24	12 x 24		3.55	46.16	287.60	3738.85
C11	3	12 x 24	12 x 24	12 x 24	12 x 24	12 x 24	4.23	12.70	342.85	1028.56
C12	3	12 x 24	12 x 24	12 x 24	12 x 24	12 x 24	4.23	12.70	342.85	1028.56
C13	3	16 x 24	16 x 24	12 x 24	12 x 24		4.21	12.62	305.34	916.01
C14	1	14 x 24	14 x 24	14 x 24	14 x 24		4.14	4.14	303.58	303.58
C15	6	16 x 24	16 x 24	16 x 24	16 x 24	12 x 24	5.42	32.50	374.81	2248.86
C16	2	16 x 24	16 x 24	16 x 24	16 x 24		4.73	9.47	319.56	639.12
C17	1	16 x 24	16 x 24	12 x 24	12 x 24		4.21	4.21	305.34	305.34
C18	2	16 x 28					1.53	3.07	97.53	195.07
C19	2	12 x 53	12 x 24	12 x 24	12 x 24		4.74	9.48	351.89	703.77
C20	8	16 x 24	16 x 24				2.63	21.02	177.33	1418.67
C21	1	12 x 27	12 x 27	12 x 27	12 x 27	12 x 27	4.76	4.76	371.42	371.42
	89							337 CY		25619 SFCA

Column Rebar – Ground Floor

Mark	Quantity	Ground Floor Size (in)	Vert Reinf			Horizontal Reinforcing				Totals
			Quan	Bar Size	Lbs.	Spacing	Tie Size	Quan	Lbs.	
C2	1	12 x 24	6	9	288.5	12	3	14	31.58	320.0
C3	30	12 x 24	4	8	4530.5	12	3	14	947.5	5478.0
C4	6	16 x 24	4	9	1153.8	12	3	14	210.6	1364.4
C5	4	16 x 24	8	10	1947.0	12	3	14	140.4	2087.4
C6	1	18 x 24	10	10	608.4	12	3	14	36.85	645.3
C7	0	18 x 24	8	8		12	3	14		
C8	2	20 x 24	12	10	1460.3	12	4	14	77.21	1537.5
C9	0	16 x 24	10	10		12	3	14		
C10	13	12 x 24	6	9	3749.9	12	3	14	410.6	4160.5
C11	3	12 x 24	4	8	453.0	12	3	14	94.75	547.8
C12	3	12 x 24	6	9	865.4	12	3	14	94.75	960.1
C13	3	16 x 24	8	10	1460.3	12	3	14	105.3	1565.5
C14	1	14 x 24	8	8	302.0	12	3	14	33.34	335.4
C15	6	16 x 24	6	10	2190.4	9	3	14	210.6	2401.0
C16	2	16 x 24	10	10	1216.9	9	3	14	70.19	1287.1
C17	1	16 x 24	6	8	226.5	12	3	14	35.09	261.6
C18	2	16 x 28								
C19	2	12 x 53	8	8	604.1	12	3	14	114.1	718.1
C20	8	16 x 24	4	5	471.9	16	3	14	280.7	752.7
C21	1	12 x 27	4	8	151.0	12	3	14	34.22	185.2

12.3 Tons

Column Rebar – First Floor

Mark	Quantity	First Floor Size (in)			Vert Reinf			Horizontal Reinforcing				
					Quan	Bar Size	Lbs.	Spacing	Tie Size	Quan	Lbs.	
C2	1											
C3	30	12	x	24	4	8	4485.6	12	3	14	947.5	
C4	6	16	x	24	4	9	1142.4	12	3	14	210.6	
C5	4	16	x	24	8	10	1927.7	12	3	14	140.4	
C6	1	18	x	24	10	10	602.4	12	3	14	36.85	
C7	0	18	x	24	8	8		12	3	14		
C8	2	20	x	24	12	10	1445.8	12	4	14	77.21	
C9	0	16	x	24	10	10		12	3	14		
C10	13	12	x	24	6	9	3712.8	12	3	14	410.6	
C11	3	12	x	24	4	8	448.6	12	3	14	94.75	
C12	3	12	x	24	6	9	856.8	12	3	14	94.75	
C13	3	16	x	24	8	10	1445.8	12	3	14	105.3	
C14	1	14	x	24	8	8	299.0	12	3	14	33.34	
C15	6	16	x	24	6	10	2168.7	9	3	14	210.6	
C16	2	16	x	24	10	10	1204.8	9	3	14	70.19	
C17	1	16	x	24	6	8	224.3	12	3	14	35.09	
C18	2											
C19	2	12	x	24	4	8	299.0	12	3	14	63.17	
C20	8	16	x	24	4	5	467.3	16	3	14	280.7	
C21	1	12	x	27	4	8	149.5	12	3	14	34.22	

Totals
5433.1
1353.0
2068.1
639.3
1523.0
4123.4
543.3
951.6
1551.1
332.4
2379.3
1275.0
259.4
362.2
748.0
183.7

11.9 Tons

Column Rebar – Second Floor

Mark	Quantity	Second Floor Size (in)			Vert Reinf			Horizontal Reinforcing				
					Quan	Bar Size	Lbs.	Spacing	Tie Size	Quan	Lbs.	
C2	1											
C3	30	12	x	24	4	8	3630.1	12	3	11	744.5	
C4	6	12	x	24	4	8	726.0	12	3	11	148.9	
C5	4	12	x	24	4	8	484.0	12	3	11	99.26	
C6	1	12	x	24	10	8	302.5	12	3	11	24.82	
C7	0	12	x	24	6	9		12	3	11		
C8	2	12	x	24	6	9	462.3	12	4	11	49.63	
C9	0	12	x	24	6	9		12	3	11		
C10	13	12	x	24	6	9	3004.7	12	3	11	322.6	
C11	3	12	x	24	4	8	363.0	12	3	11	74.45	
C12	3	12	x	24	6	9	693.4	12	3	11	74.45	
C13	3	12	x	24	6	9	693.4	12	3	11	74.45	
C14	1	14	x	24	8	8	242.0	12	3	11	26.19	
C15	6	16	x	24	6	10	1755.1	9	3	11	165.4	
C16	2	16	x	24	10	8	605.0	9	3	11	55.15	
C17	1	12	x	24	6	8	181.5	12	3	11	24.82	
C18	2											
C19	2	12	x	24	4	8	242.0	12	3	11	49.63	
C20	8										0	
C21	1	12	x	27	4	8	121.0	12	3	11	26.88	

Totals
4374.6
874.9
583.3
327.3
511.9
3327.3
437.5
767.8
767.8
268.2
1920.5
660.2
206.3
291.6
147.9

7.7 Tons

Column Rebar – Third Floor

Mark	Quantity	Third Floor Size (in)	Vert Reinf			Horizontal Reinforcing			
			Quan	Bar Size	Lbs.	Spacing	Tie Size	Quan	Lbs.
C2	1								
C3	30	12 x 24	4	8	3630.1	12	3	11	744.5
C4	6	12 x 24	4	8	726.0	12	3	11	148.9
C5	4	12 x 24	4	8	484.0	12	3	11	99.26
C6	1	12 x 24	10	8	302.5	12	3	11	24.82
C7	0	12 x 24	6	9		12	3	11	
C8	2	12 x 24	6	9	462.3	12	4	11	49.63
C9	0	12 x 24	6	9		12	3	11	
C10	13	12 x 24	6	9	3004.7	12	3	11	322.6
C11	3	12 x 24	4	8	363.0	12	3	11	74.45
C12	3	12 x 24	6	9	693.4	12	3	11	74.45
C13	3	12 x 24	6	9	693.4	12	3	11	74.45
C14	1	14 x 24	8	8	242.0	12	3	11	26.19
C15	6	16 x 24	6	10	1755.1	9	3	11	165.4
C16	2	16 x 24	10	8	605.0	9	3	11	55.15
C17	1	12 x 24	6	8	181.5	12	3	11	24.82
C18	2								
C19	2	12 x 24	4	8	242.0	12	3	11	49.63
C20	8								0
C21	1	12 x 27	4	8	121.0	12	3	11	26.88

Totals
4374.6
874.9
583.3
327.3
511.9
3327.3
437.5
767.8
767.8
268.2
1920.5
660.2
206.3
291.6
147.9

7.7 Tons

Column Rebar – Fourth Floor

Mark	Quantity	Fourth Floor Size (in)	Vert Reinf			Horizontal Reinforcing			
			Quan	Bar Size	Lbs.	Spacing	Tie Size	Quan	Lbs.
C2	1								
C3	30								
C4	6								
C5	4								
C6	1								
C7	0	12 x 24	6	9	231.1	12	3	11	41.36
C8	2								
C9	0								
C10	13								
C11	3	12 x 24	4	8	363.0	12	3	11	24.82
C12	3	12 x 24	6	9	693.4	12	3	11	28.95
C13	3								
C14	1								
C15	6	12 x 24	6	10	1755.1	9	3	11	28.95
C16	2								
C17	1								
C18	2								
C19	2								
C20	8								
C21	1	12 x 27	4	8	121.0	12	3	11	26.88

Totals
387.8
722.3
1784.1
147.9

1.5 Tons

Total in all Floors: **41.16** Tons

Shear Wall 1 (20' - 6" Wide)															
20.5	Concrete			Steel (Each Face)				Miscellaneous - Opening Steel							
	Thickness (in)	Height (ft)	CY	Vertical	lbs.	Horizontal	lbs.	Vertical	lbs.	Horizontal	lbs.				
Ground	14	14.1354	12.52	62	10	3741	38	6	1161	8	10	486.6	8	10	705.69
First	14	14	12.40	62	10	3705	37	6	1150	8	10	481.94	8	10	705.69
Second	10	11.333	7.17	62	8	1861	23	5	485						
Thrid	10	11.333	7.17	62	8	1861	23	5	485						
Fourth	10	11.333	7.17	62	8	1861	23	5	485						
			46.43			13030			3764			968.53			1411.4

Formwork

546.57
541.33
445.76
445.76
445.76

Shear Wall 2 (14' - 6" Wide)															
14.5	Concrete			Steel (Each Face)				Miscellaneous - Opening Steel							
	Thickness (in)	Height (ft)	CY	Vertical	lbs.	Horizontal	lbs.	Vertical	lbs.	Horizontal	lbs.				
Ground	14	14.1354	8.86	44	10	2646	38	6	821	8	10	486.6	8	10	499.15
First	14	14	8.77	44	10	2621	37	6	813	8	10	481.94	8	10	499.15
Second	10	11.333	5.07	44	8	1316	23	5	343	8	6	136.18	8	6	174.23
Thrid	10	11.333	5.07	44	8	1316	23	5	343	8	6	136.18	8	6	174.23
Fourth	10	11.333	5.07	44	8	1316	23	5	343	8	6	136.18	8	6	174.23
			32.84			9216			2662			1377.1			1521

Formwork

376.94
373.33
309.77
309.77
309.77

Shear Wall 3 (22' - 6" Wide)															
22.5	Concrete			Steel (Each Face)				Miscellaneous - Opening Steel							
	Thickness (in)	Height (ft)	CY	Vertical	lbs.	Horizontal	lbs.	Vertical	lbs.	Horizontal	lbs.				
Ground	10	14.1354	9.82	45	5	663	28	5	663	8	5	117.95	8	5	187.74
First															
Second															
Thrid															
Fourth															
			9.82			663			663			117.95			187.74

Formwork

612.53
0.00
0.00
0.00
0.00

Shear Wall 4 (22' - 6" Wide)															
22.5	Concrete			Steel (Each Face)				Miscellaneous - Opening Steel							
	Thickness (in)	Height (ft)	CY	Vertical	lbs.	Horizontal	lbs.	Vertical	lbs.	Horizontal	lbs.				
Ground	10	14.1354	9.82	68	6	1433	28	5	663	8	5	117.95	8	5	187.74
First	10	14	9.72	68	6	1420	28	5	657	8	5	116.82	8	5	187.74
Second	10	11.333	7.87	68	5	798	23	5	532						
Thrid	10	11.333	7.87	68	5	798	23	5	532						
Fourth	10	11.333	4.02	35	5	408	23	5	532						
			39.30			4857			2916			234.76			375.48

Formwork

612.53
606.67
491.10
491.10
491.10

Shear Wall 5 (19' - 0" Wide)															
19.0	Concrete			Steel (Each Face)				Miscellaneous - Openings							
	Thickness (in)	Height (ft)	CY	Vertical	lbs.	Horizontal	lbs.	Vertical	lbs.	Horizontal	lbs.				
Ground	10	14.1354	8.29	57	6	1210	38	5	747						
First	10	14	8.21	57	6	1199	37	5	740						
Second	10	11.333	6.65	57	5	674	23	5	449						
Thrid	10	11.333	6.65	57	5	674	23	5	449						
Fourth	10	11.333	6.65	57	5	674	23	5	449						
			36.44			4431			2834						

Formwork

513.59
508.67
411.77
411.77
411.77

Shear Wall 6 (22' - 4" Wide)													
22.3	Concrete			Rebar (Each Face)						Miscellaneous - Openings			
	Thickness (in)	Height (ft)	CY	Vertical	lbs.	Horizontal	lbs.	Vertical		Horizontal			
Ground	10	14.1354	9.74	45	5	659	28	5	659				
First	10	14	9.65	45	5	652	28	5	652				
Second	10	11.333	7.81	45	5	528	23	5	528				
Thrid	10	11.333	7.81	45	5	528	23	5	528				
Fourth	10	11.333	7.81	45	5	528	23	5	528				
			42.83			2895			2895				

Formwork
607.82
602.00
487.32
487.32
487.32

Shear Wall 7 (10' - 10" Wide)													
10.8	Concrete			Rebar (Each Face)						Miscellaneous - Openings			
	Thickness (in)	Height (ft)	CY	Vertical	lbs.	Horizontal	lbs.	Vertical		Horizontal			
Ground	10	14.14	4.73	22	5	319	28	5	319				
First	10	14.00	4.68	22	5	316	28	5	316				
Second	10	11.33	3.79	22	5	256	23	5	256				
Thrid	10	11.33	3.79	22	5	256	23	5	256				
Fourth	10	11.33	3.79	22	5	256	23	5	256				
			20.78			1404			1404				

Formwork
282.71
280.00
226.66
226.66
226.66

Shear Wall 8 (14' - 6" Wide)													
14.5	Concrete			Rebar (Each Face)						Miscellaneous - Openings			
	Thickness (in)	Height (ft)	CY	Vertical	lbs.	Horizontal	lbs.	Vertical		Horizontal			
Ground	10	14.14	6.33	29	5	428	28	5	428				
First	10	14.00	6.27	29	5	423	28	5	423				
Second	10	11.33	5.07	29	5	343	23	5	343				
Thrid	10	11.33	5.07	29	5	343	23	5	343				
Fourth	10	11.33	5.07	29	5	343	23	5	343				
			27.81			1879			1879				

Formwork
386.37
382.67
309.77
309.77
309.77

Total Concrete: 256 CY 38375 lbs. 19019 lbs. 2698.3 lbs. 3495.6 lbs. 15280.15 SFCA

Total Steel: 31.794 Tons

Elevator Tower South Wall (16' - 8" Wide)																
16.67	Concrete			Steel (Each Face)						Miscellaneous - Opening Steel						
	Thickness (in)	Height (ft)	CY	Vertical	lbs.	Horizontal	lbs.	Vertical	lbs.	Horizontal	lbs.					
Ground	10	14.1354	7.27	33	5	491	28	5	491	8	5	117.95	8	5	139.07	
First	10	14	7.20	33	5	487	28	5	487	8	5	116.82	8	5	139.07	
Second	10	11.333	5.83	33	5	394	23	5	394	8	5	94.56	8	5	139.07	
Thrid	10	11.333	5.83	33	5	394	23	5	394	8	5	94.56	8	5	139.07	
Fourth	10	11.333	5.83	33	5	394	23	5	394	8	5	94.56	8	5	139.07	
			31.96				2160				2160			518.45	695.33	

Formwork

447.62
443.33
358.88
358.88
358.88

Elevator Tower West Wall (11' - 2.5" Wide)															
11.21	Concrete			Steel (Each Face)						Miscellaneous - Opening Steel					
	Thickness (in)	Height (ft)	CY	Vertical	lbs.	Horizontal	lbs.	Vertical	lbs.	Horizontal	lbs.				
Ground	10	14.1354	4.89	22	5	330	28	5	330						
First	10	14	4.84	22	5	327	28	5	327						
Second	10	11.333	3.92	22	5	265	23	5	265						
Thrid	10	11.333	3.92	22	5	265	23	5	265						
Fourth	10	11.333	3.92	22	5	265	23	5	265						
			21.49				1453				1453				

Formwork

293.31
290.50
235.16
235.16
235.16

Elevator Tower East Wall (12' - 5.25" Wide)															
12.44	Concrete			Steel (Each Face)						Miscellaneous - Opening Steel					
	Thickness (in)	Height (ft)	CY	Vertical	lbs.	Horizontal	lbs.	Vertical	lbs.	Horizontal	lbs.				
Ground	10	14.1354	5.43	25	5	367	28	5	367						
First	10	14	5.37	25	5	363	28	5	363						
Second	10	11.333	4.35	25	5	294	23	5	294						
Thrid	10	11.333	4.35	25	5	294	23	5	294						
Fourth	10	11.333	4.35	25	5	294	23	5	294						
			23.85				1612				1612				

Formwork

328.06
324.92
263.02
263.02
263.02

Elevator Tower North Wall (16' - 8" Wide)																
16.67	Concrete			Steel (Each Face)						Miscellaneous - Opening Steel						
	Thickness (in)	Height (ft)	CY	Vertical	lbs.	Horizontal	lbs.	Vertical	lbs.	Horizontal	lbs.					
Ground	10	14.1354	7.27	33	5	491	28	5	491	16	5	235.89	8	5	139.07	
First	10	14	7.20	33	5	487	28	5	487	16	5	233.63	8	5	139.07	
Second	10	11.333	5.83	33	5	394	23	5	394	16	5	189.13	8	5	139.07	
Thrid	10	11.333	5.83	33	5	394	23	5	394	16	5	189.13	8	5	139.07	
Fourth	10	11.333	5.83	33	5	394	23	5	394	16	5	189.13	8	5	139.07	
			31.96				2160				2160			1036.90	695.33	

Formwork

447.62
443.33
358.88
358.88
358.88

Stair Tower NO. 1 South Wall (23' - 0" Wide)																	
23.00	Concrete			Steel (Each Face)						Miscellaneous - Opening Steel							
	Thickness (in)	Height (ft)	CY	Vertical	lbs.	Horizontal	lbs.	Vertical	lbs.	Horizontal	lbs.						
Ground	12	14.1354	12.04	46	5	678	28	5	678	8	5	117.95	8	5	191.91		
First	12	14	11.93	46	5	672	28	5	672	8	5	116.82	8	5	191.91		
Second	12	11.333	9.65	46	5	544	23	5	544								
Thrid	12	11.333	9.65	46	5	544	23	5	544								
Fourth	12	11.333	9.65	46	5	544	23	5	544								
			52.93				2981				2981			234.76			383.82

Formwork

621.96
616.00
498.65
498.65
498.65

Stair Tower NO. 1 West Wall (11' - 0" Wide)																	
11.00	Concrete			Steel (Each Face)						Miscellaneous - Opening Steel							
	Thickness (in)	Height (ft)	CY	Vertical	lbs.	Horizontal	lbs.	Vertical	lbs.	Horizontal	lbs.						
Ground	12	14.1354	5.76	22	5	324	28	5	324	8	5	117.95					
First	12	14	5.70	22	5	321	28	5	321	8	5	116.82					
Second	12	11.333	4.62	22	5	260	23	5	260	8	5	94.56	8	5	91.78		
Thrid	12	11.333	4.62	22	5	260	23	5	260	8	5	94.56	8	5	91.78		
Fourth	12	11.333	4.62	22	5	260	23	5	260	8	5	94.56	8	5	91.78		
			25.31				1426				1426			518.45			275.35

Formwork

282.71
280.00
226.66
226.66
226.66

Stair Tower NO. 1 North Wall (23' - 0" Wide)																	
23.00	Concrete			Steel (Each Face)						Miscellaneous - Opening Steel							
	Thickness (in)	Height (ft)	CY	Vertical	lbs.	Horizontal	lbs.	Vertical	lbs.	Horizontal	lbs.						
Ground	12	14.1354	12.04	46	5	678	28	5	678								
First	12	14	11.93	46	5	672	28	5	672								
Second	12	11.333	9.65	46	5	544	23	5	544								
Thrid	12	11.333	9.65	46	5	544	23	5	544								
Fourth	12	11.333	9.65	46	5	544	23	5	544								
			52.93				2981				2981						

Formwork

621.96
616.00
498.65
498.65
498.65

Stair Tower NO. 1 East Wall (11' - 0" Wide)																	
11.00	Concrete			Steel (Each Face)						Miscellaneous - Opening Steel							
	Thickness (in)	Height (ft)	CY	Vertical	lbs.	Horizontal	lbs.	Vertical	lbs.	Horizontal	lbs.						
Ground	12	14.1354	5.76	22	5	324	28	5	324								
First	12	14	5.70	22	5	321	28	5	321								
Second	12	11.333	4.62	22	5	260	23	5	260	8	5	94.56	8	5	91.78		
Thrid	12	11.333	4.62	22	5	260	23	5	260	8	5	94.56	8	5	91.78		
Fourth	12	11.333	4.62	22	5	260	23	5	260	8	5	94.56	8	5	91.78		
			25.31				1426				1426			283.69			275.35

Formwork

282.71
280.00
226.66
226.66
226.66

Stair Tower NO. 2 West Wall (22' - 0" Wide)													
22.00	Concrete			Steel (Each Face)						Miscellaneous - Opening Steel			
	Thickness (in)	Height (ft)	CY	Vertical	lbs.	Horizontal	lbs.	Vertical	lbs.	Horizontal	lbs.		
Ground	12	14.1354	11.52	44	5 649	28	5 649	8	5 117.95	8	5 183.57		
First	12	14	11.41	44	5 642	28	5 642	8	5 116.82	8	5 183.57		
Second	12	11.333	9.23	44	5 520	23	5 520						
Thrid	12	11.333	9.23	44	5 520	23	5 520						
Fourth	12	11.333	9.23	44	5 520	23	5 520						
			50.63		2851		2851		234.76		367.14		

Formwork

593.69
588.00
475.99
475.99
475.99

Stair Tower NO. 2 North Wall (10' - 6" Wide)													
10.50	Concrete			Steel (Each Face)						Miscellaneous - Opening Steel			
	Thickness (in)	Height (ft)	CY	Vertical	lbs.	Horizontal	lbs.	Vertical	lbs.	Horizontal	lbs.		
Ground	12	14.1354	5.50	21	5 310	28	5 310						
First	12	14	5.44	21	5 307	28	5 307						
Second	12	11.333	4.41	21	5 248	23	5 248						
Thrid	12	11.333	4.41	21	5 248	23	5 248	8	5 94.56				
Fourth	12	11.333	4.41	21	5 248	23	5 248	8	5 94.56	8	5 87.61		
			24.16		1361		1361		189.13		87.61		

Formwork

268.57
266.00
215.33
215.33
215.33

Stair Tower NO. 2 East Wall (22' - 0" Wide)													
22.00	Concrete			Steel (Each Face)						Miscellaneous - Opening Steel			
	Thickness (in)	Height (ft)	CY	Vertical	lbs.	Horizontal	lbs.	Vertical	lbs.	Horizontal	lbs.		
Ground	12	14.1354	11.52	44	5 649	28	5 649	8	5 117.95	8	5 183.57		
First	12	14	11.41	44	5 642	28	5 642	8	5 116.82				
Second	12	11.333	9.23	44	5 520	23	5 520	8	5 94.56	8	5 183.57		
Thrid	12	11.333	9.23	44	5 520	23	5 520	8	5 94.56	8	5 183.57		
Fourth	12	11.333	9.23	44	5 520	23	5 520	8	5 94.56				
			50.63		2851		2851		518.45		550.70		

Formwork

593.69
588.00
475.99
475.99
475.99

Stair Tower NO. 2 South Wall (10' - 5" Wide)													
10.50	Concrete			Steel (Each Face)						Miscellaneous - Opening Steel			
	Thickness (in)	Height (ft)	CY	Vertical	lbs.	Horizontal	lbs.	Vertical	lbs.	Horizontal	lbs.		
Ground	12	14.1354	5.50	21	5 310	28	5 310						
First	12	14	5.44	21	5 307	28	5 307						
Second	12	11.333	4.41	21	5 248	23	5 248						
Thrid	12	11.333	4.41	21	5 248	23	5 248						
Fourth	12	11.333	4.41	21	5 248	23	5 248						
			24.16		1361		1361						

Formwork

268.57
266.00
215.33
215.33
215.33

Total Concrete: 416 CY 24624 lbs. 24624 lbs. 3535 lbs. 3331 lbs. 22200 SFCA

Total Steel: 28.06 Tons

[APPENDIX D]

General Conditions Estimate

DIVISION. 01 - GENERAL CONDITIONS	MEDICAL CENTER ADDITION ESTIMATE			
DESCRIPTION	QTY.	UNIT	UNIT COST	TOTAL COSTS
MOBILIZATION AND TEMPORARY FIELD OFFICES/EXPENSES				
WT SUPERINTENDENT FIELD OFFICE	1	LS	\$25,000.00	\$25,000
WT FIELD OFFICE CONSTRUCTION / DEMO	1	LS	\$0.00	BY OWNER
TRAILER ELECTRICAL / TELEPHONE CONNECTION	1	ALLOW	\$5,000.00	\$5,000
TRAILER TELEPHONE SERVICE - FAX LINE	18	MO	\$0.00	BY OWNER
TRAILER TELEPHONE EQUIPMENT	1	LS	\$0.00	BY OWNER
TRAILER ELECTRIC SERVICE	0	MO	\$0.00	BY OWNER
TRAILER WATER / SANITARY CONNECTION / TANK	1	ALLOW	\$0.00	BY OWNER
TRAILER WATER SERVICE	0	MO	\$0.00	BY OWNER
TRAILER ACCESS PLATFORMS AND MISC CARPENTRY - SUPPLY AND REMOVE	1	LS	\$2,500.00	\$2,500
OFFICE FURNITURE	1	LS	\$1,000.00	\$1,000
OFFICE SUPPLIES	17	MO	\$150.00	\$2,550
OFFICE POSTAGE & SHIPPING	17	MO	\$100.00	\$1,700
COMPUTER INTERNET SERVICE	18	MO	\$0.00	BY OWNER
OFFICE FAX MACHINE	1	EA	\$300.00	\$300
OFFICE PRINTER	2	EA	\$300.00	\$600
COLOR PRINTER	1	EA	\$500.00	\$500
SCANNER	1	EA	\$200.00	\$200
OFFICE COPIER (RENT-W/SERVICE AGREEMENT)	18	MO	\$0.00	BY OWNER
PRINTER CONSUMABLES (TONER, PRINTER CARTRIDGES, ETC...)	17	MO	\$50.00	\$850
PLOTTER	0	EA		\$0
FILE SERVER	1	EA	\$0.00	BY OWNER
OFFICE TRAILER CLEANING SERVICE	18	MO	\$0.00	BY OWNER
OFFICE TRAILER DUMPSTER/TRASH REMOVAL	18	MO	\$250.00	\$4,500
FIELD OFFICE TRAILER INSURANCE	1.5	YRS	\$250.00	\$375
			SUBTOTAL:	\$45,075
SMALL TOOLS AND EQUIPMENT				
MISCELLANEOUS MILEAGE	17	MO	\$100.00	\$1,700
MISC. SMALL TOOLS-BROOMS, GARBAGE CANS, MOPS ETC...	1	LS	\$750.00	\$750
MISC. SUPPLIES	17	MO	\$100.00	\$1,700
			SUBTOTAL:	\$4,150
PROJECT MANAGEMENT AND SUPERVISION				
JESSE BEAM - SENIOR PROJECT MANAGER	1440	HRS	\$120.00	\$172,800
LAWSON KILBOURNE - SUPERINTENDENT	2960	HRS	\$95.00	\$281,200
CHIP CINAMELLA - PROJECT MANAGER	3240	HRS	\$95.00	\$307,800
BOGDAN MINDA - PROJECT MANAGER	3240	HRS	\$95.00	\$307,800
SHELLY CHRISTMAN - ASSISTANT PROJECT MANAGER	1800	HRS	\$80.00	\$144,000
KEN FONDE - PROJECT ENGINEER	3240	HRS	\$70.00	\$226,800
FIELD ENGINEER	2500	HRS	\$70.00	\$175,000
PROJECT ACCOUNTANT/CLERICAL	2960	HRS	\$40.00	\$118,400
			SUBTOTAL:	\$1,733,800
TRAVEL AND LODGING				
JESSE BEAM - SENIOR PROJECT MANAGER	17	MO	\$400.00	\$6,800
DAILY COMMUTES	17	MO	\$2,000.00	\$34,000
MISC. MILEAGE / TRAVEL COSTS	17	MO	\$250.00	\$4,250
			SUBTOTAL:	\$45,050
PLANS, PERMITS AND POSTAGE				
DRAWINGS AND SPECIFICATIONS-BID SETS	150	SETS	\$200.00	\$30,000
DRAWINGS AND SPECIFICATIONS-ROUTINE UPDATES/BULLETINS	17	MO	\$250.00	\$4,250
BUILDING / SPECIAL PERMITS		N/A		BY OWNER
OVERNIGHT EXPRESS CHARGES / FEDEX / UPS	17	MO	\$250.00	\$4,250
POSTAGE AND SHIPPING-BID PERIOD	2	MO	\$750.00	\$1,500
SHOP DRAWINGS AND SAMPLES	1	ALLOW	\$1,000.00	\$1,000
RED-LINE AS-BUILT DRAWING COPIES	1	ALLOW	\$1,000.00	\$1,000
			SUBTOTAL:	\$42,000

SPECIAL REQUIREMENTS					
PROGRESS PHOTOS-MONTHLY UPDATES		17	MO	\$50.00	\$850
FINAL PHOTOS		1	LS	\$2,000.00	\$2,000
PROGRESS PHOTOS-DIGITAL CAMERA		1	EA	\$400.00	\$400
AERIAL PHOTOS (MONTHLY)		17	MO	\$300.00	\$5,100
PROGRESS MEETINGS		17	MO	\$100.00	\$1,700
MONTHLY REPORTS		17	MO	\$100.00	\$1,700
CPM SCHEDULE-SET UP / INDEPENDENT CONSULTANT		1	LS	\$7,500.00	\$7,500
CPM SCHEDULE UPDATES		17	MO	\$500.00	\$8,500
ARCHITECT AND ENGINEERING FEES			N/A		BY OWNER
PUNCHLIST/CLOSEOUT		1	ALLOW	\$2,500.00	\$2,500
QUALITY CONTROL PROGRAM		1	EA	\$500.00	\$500
QUALITY CONTROL AWARDS		17	MO	\$50.00	\$850
LOSS PREVENTION PROGRAM		1	EA	\$500.00	\$500
SAFETY PROGRAM		1	EA	\$500.00	\$500
SAFETY AWARDS		17	MO	\$100.00	\$1,700
MISC JOB STORAGE TRAILERS		17	MO	\$500.00	\$8,500
JOB DRINKING WATER		17	MO	\$250.00	\$4,250
				SUBTOTAL:	\$47,050
TESTING & INSPECTIONS					
EXTERIOR SKIN WATER/LEAK TEST		5	DAYS	\$2,500.00	\$12,500
INDEPENDENT TESTING & INSPECTION			LS		BY OWNER
				SUBTOTAL:	\$12,500
SITE REQUIREMENTS					
TEMPORARY FENCES / PEDESTRIAN PROTECTION (~ 1,000 LF)		1	LS	\$15,000.00	\$15,000
GATES		3	EA	\$750.00	\$2,250
TEMPORARY ACCESS ROADS		0	LS	\$0.00	\$0
TEMPORARY PARKING / LAYDOWN		1	LS	\$15,000.00	\$15,000
MAINTAIN ACCESS ROADS & PARKING		17	MO	\$500.00	\$8,500
SURVEY AND ESTABLISH BENCHMARKS		1	ALW	\$5,000.00	\$5,000
SAFETY MAINTENANCE		17	MO	\$1,000.00	\$17,000
BARRICADES & SAFETY		1	ALW	\$25,000.00	\$25,000
FLOOR OPENING PROTECTIONS		1	ALW	\$7,500.00	\$7,500
ELEVATOR SHAFTS OPENING PROTECTION		10	EA	\$500.00	\$5,000
WEATHER & DUST PROTECTION		1	ALW	\$10,000.00	\$10,000
TEMPORARY FIRE PROTECTION-EXTINGUISHERS (1 EVERY 3,000 SF)		50	EA	\$75.00	\$3,750
FLOOR PROTECTION			SF		BY SUB
DAILY CLEANUP - LABORERS		12	MO	\$7,500.00	\$90,000
FINAL CLEANING		90000	SF	\$2.34	\$210,600
FINAL WINDOW CLEANING		1	LS	\$15,000.00	\$15,000
DUMPSTER SERVICE		17	MO	\$5,000.00	\$85,000
STREET CLEANING		12	MO	\$2,000.00	\$24,000
SNOW REMOVAL (INSIDE JOB FENCE ONLY)		1	ALW	\$10,000.00	\$10,000
TEMPORARY SANITARY FACILITIES (PORTA TOILETS)		17	MO	\$1,000.00	\$17,000
TEMPORARY POWER / WATER CONSUMPTION			MO		BY OWNER
SELECT TEMPORARY HEAT		4	MO	\$10,000.00	\$40,000
PROJECT SIGN		2	EA	\$750.00	\$1,500
CONSTRUCTION SIGNAGE		1	LS	\$2,500.00	\$2,500
MAINTAIN SEDIMENT AND EROSION CONTROL		17	MO	\$500.00	\$8,500
STABILIZED CONSTRUCTION ENTRANCE		2	EA	\$5,000.00	\$10,000
CRANE USAGE WITH OPERATORS		1	LS	\$9,520.00	\$9,520
ELEVATOR OPERATOR (BY ELEVATOR CONTRACTOR)		2	MO	\$20,000.00	\$40,000
VENTILATION / NEGATIVE AIR MACHINE - TO BE SUPPLIED AS DICTATED			ALW		BY OWNER
HEPA-VACS / CLEANING SUPPLIES - TO BE SUPPLIED AS DICTATED			ALW		BY OWNER
				SUBTOTAL:	\$631,870
BUILDING ACCESS					
MATERIAL HOIST		6	MO	\$15,000.00	\$90,000
SET-UP / BREAKDOWN OF MATERIAL HOIST		1	LS	\$15,000.00	\$15,000
TRASH CHUTE			LS		NOT USED
				SUBTOTAL:	\$105,000
GRAND TOTAL GENERAL CONDITIONS =					\$2,666,495

WEEKLY COSTS: \$34,185.83