October 8, 2010

Technical Assignment 2

Susquehanna Patient Tower Expansion

Williamsport, PA

Project 2012

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Executive Summary

Technical Assignment One is a comprehensive report that investigates the existing conditions as well as the scope of work for construction of the Susquehanna Health Patient Tower Expansion. This 243,000 SF expansion to the Williamsport Hospital and Medical Center is a unique project that presented its own set of difficult problems which tested the construction manager as well as the design team. Hospitals are extremely sensitive places that demand the greatest level of care when operating in and around them. The location of this project is one of the main factors that decided not only how this project would be constructed but also how it would be designed. During construction, it is absolutely imperative that none of the functions or activities of the existing hospital are disturbed. It is the intent of this report to cover all major construction practices and design features that were implemented to ensure a safe and successful project.

This in-depth look at the construction practices and design features will focus on several different aspects of the project. The first aspect that will be explored in this report will be a brief summary of the sequencing and milestones of this project. A broad schedule of major milestones will also be provided. From a design point of view, this report will present major building systems and the LEED related credits associated with them. This hospital is to be designed for LEED Certification for Hospitals. However, large costs associated with hiring LEED certified consultants pushed Susquehanna Health not to file the formal paper work. Instead, Susquehanna Health is reinvesting the money saved from hiring LEED consultants back into the building. Cost information and break downs for the entire project will also be provided in this report. Actual cost information will then be compared to cost information generated from online software. The estimates generated from these online resources proved to be extremely low. It is obvious that these resources should be used only to grab a quick snap shot of a project and should not be used for real world estimating. Existing and local conditions will also be investigated to better understand the size and complexity of the project. It was discovered that the area in which this project was constructed had suitable soil to construct very simple and easy foundations. Staffing plans and delivery methods will also be examined and graphically illustrated. Lastly, client information will be provided to comprehend the expectations, motivations and intentions for this project.

Information discovered in this report will pave the way for upcoming thesis research. The next phase of my thesis research will involve a more in-depth analysis of scheduling, phasing, and construction methods utilized on this project.

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Project Schedule Summary

*See APPENDIX A for Project Schedule

The construction of this project was scheduled and sequenced to maximize the amount of manpower while at the same time providing the quickest turnover date. L.F. Driscoll officially signed their contract with Susquehanna Health on 12/30/2008 and began actual construction on 10/22/2009. Two months prior to signing their contract, L.F. Driscoll was issued all of the design documents and has only had two reissues since then. It is the intent of this of this report to focus mainly on the Patient Tower Expansion. However, to better understand L.F. Driscoll's scope of work, other activities prior to the Patient Tower will be briefly. Including the Central Utility Plant, this project will be completed in several major phases.

The projects that had to be completed prior to the Patient Tower Expansion include construction of a state of the art Central Utility Plant, a mechanical chase, and a pedestrian walkway. The Central Utility Plant was constructed first to replace the existing out of date plant. The second phase of construction was the mechanical chase and pedestrian walkway that connect the Central Utility Plant to the existing Williamsport Hospital and Medical Center. Constructing these three projects prior to the Patient Tower Expansion was imperative to ensure that all systems for both the existing hospital and the expansion worked together in harmony. Another factor that pushed the time and sequence of these projects was government funding.

After Central Utility Plant and the mechanical chase were completed, construction of the Patient Tower Expansion project could begin. The third phase of construction for the entire project is actually the first phase of the Patient Tower Expansion. The foundations were the first major activity on this job. The continuous spread footings first started on the eastern side of the site and then moved west towards the Central Utility Plant. All of the wall footings, foundation walls, retaining walls, grade beams and piers were also sequenced in the same fashion and can be seen in ***Figure 1***.

The next major phase of construction is the erection of the structural steel. Like the footers, the structural steel starts on the eastern side of the building and moves west. However, structural steel stops mid-way through the building as shown on ***Figure 2.*** The blue zone represents the first phase of structural steel erection. The second phase is represented on ***Figure 2*** as the red zone. Much like the steel in the blue zone, this structural steel is also erected from east to west. The steel was erected in this manner so that concrete and HVAC trades could maximize the amount of manpower and materials they have on site. After metal decking is installed in the blue zone, concrete slabs will then start on the sixth level while structural steel is being erected in the red zone. The concrete slabs in the blue zone will then work their way up until they reach the roof. Metal decking and concrete will be sequenced in the red zone the same as in the blue zone. While the exterior skins are being installed, mechanical trades will then follow the same sequence as the concrete pours.

After all windows were installed and the building is sealed from the elements the interior fit outs can then begin. Fit outs will start on the entire 5th floor and then proceed to work down until the finish up with the lobby on the 1st floor. While the fit outs on these floors are finishing up commissioning, punchlists, and inspections will take place. This project is scheduled to be turned over to the owner on 9/25/2012.

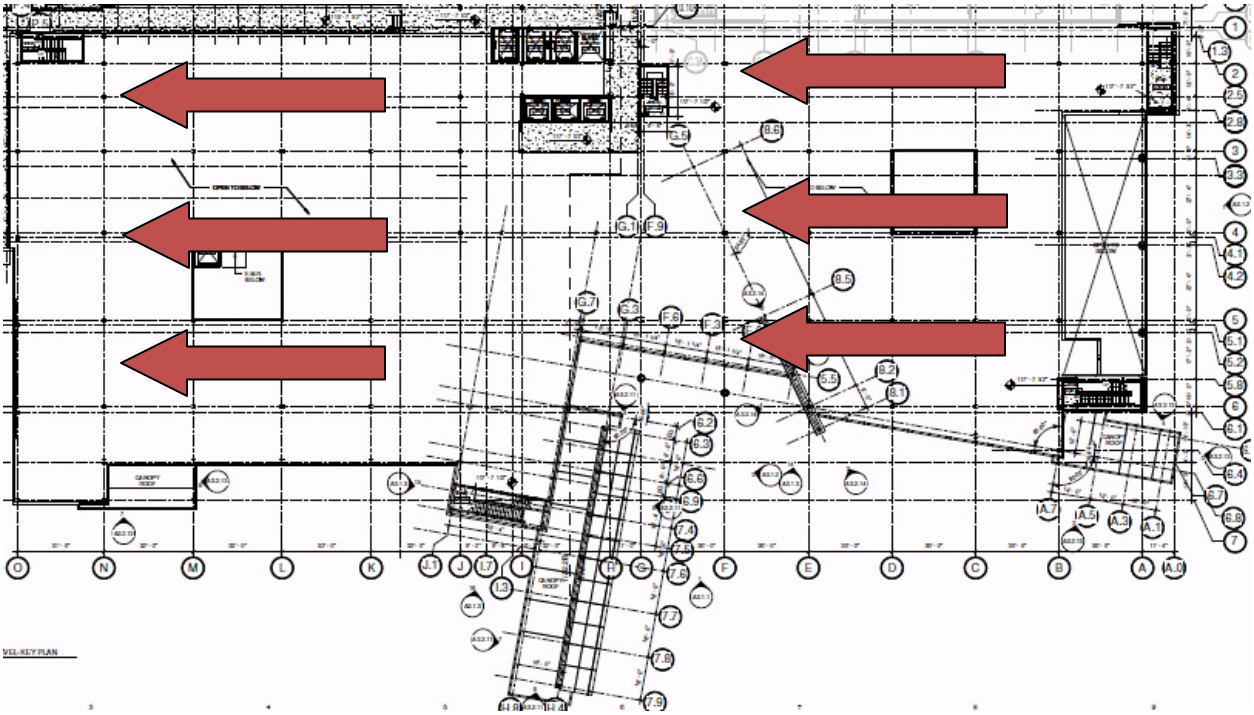


Figure 1: Foundation Sequence

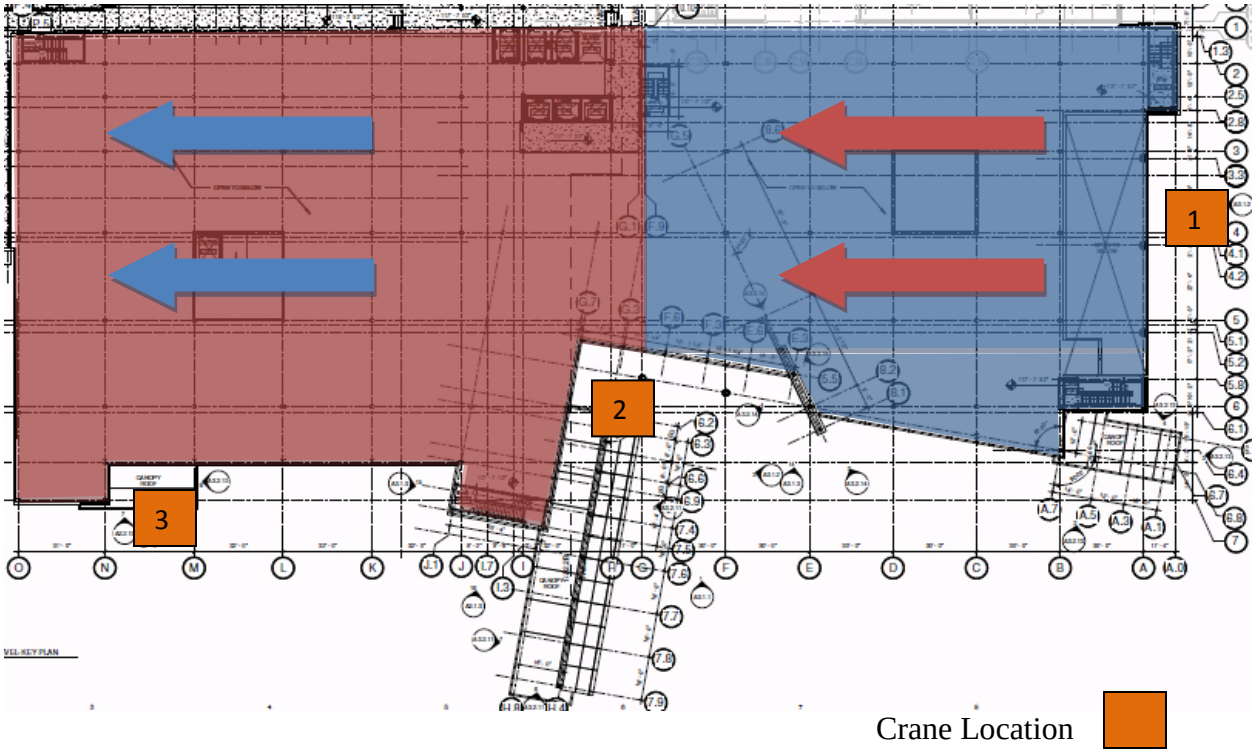


Figure 2: Steel Erection, Concrete, and Mechanical Sequence

Building Systems Summary

Building Systems Checklist		
YES	NO	WORK SCOPE
X		Demolition Required
X		Structural Steel Frame
X		Cast-in-Place Concrete
X		Precast Concrete
X		Mechanical System
X		Electrical System
X		Masonry
X		Curtain Wall
	X	Excavation Support

Table 1: Building Systems Checklist

Demolition

Even though this is an addition to an already existing building, very little demolition is being performed in L.F. Driscoll's GMP with Susquehanna Health. All site demolition was completed by another contractor before L.F. Driscoll was awarded the project. The only demolition that will be performed on the project will be where the three small walkways tie into the Williamsport Hospital and Medical Center. Demolition will consist of only the brick façade of the existing medical center. Because this is a hospital, infection control is of the upmost concern of Susquehanna Health and their patients. Infection Control Risk Assessment (ICRA) plans had to be developed by L.F. Driscoll and approved by Susquehanna Health before the first brick was removed. Luckily the façade that had to be demolished was near the mechanical rooms of the existing hospital and away from the patients. ICRA barriers were also assembled on the inside of the medical center to ensure that no infectious bacteria associated with the work would contaminate the building or the patients.

Structural Steel Frame

The Susquehanna Health Patient Tower Expansion project is a six story moment steel frame design with composite steel decks for the elevated slabs. Structural Steel on this project is fabricated in the state of Virginia and achieves LEED points for regional materials. All wide flange structural steel shapes for this project are ASTM A992. All other structural steel shapes besides the wide flange are ASTM A36. Beams and Columns are typically W-shaped; however, there are a few hollow structural section columns on the ground level. The majority of the steel columns range from W14X61 to W14X211. Beam and girder sizes vary greatly due to the fact that some areas of the hospital require that they be much larger to deal with vibration. Vibration plays a very important factor not only when constructing hospitals but also when designing them. Sensitive areas such as the neurosurgery rooms located on the 3rd floor require a more secure and stable design than other typical patient rooms. In addition to increased beam and girder sizes, all beam to girder connections require full depth double angle connections to satisfy the vibration criteria put together by a third party consultant. All steel on this project was erected by a 165 ton Demag AC 120 mobile crane. Steel erection started on the eastern side of the building and moved west. The

crane had three distinct locations. The first location was on the eastern side of the building. The next location was in the center of the building on the southern façade. The last and final location of the crane was on the western side of the building. Crane locations can be seen on ***Figure 2***.

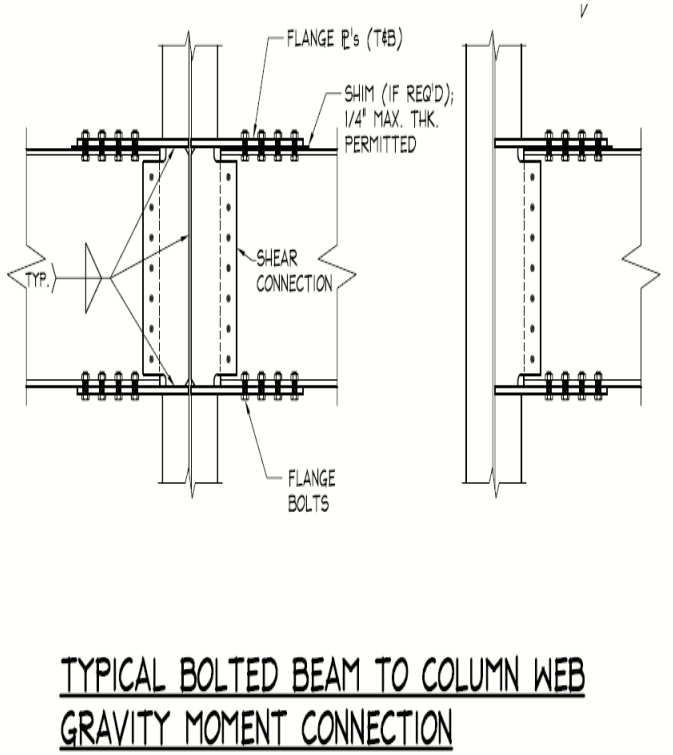


Figure 3: Typical Bolted Beam to Column Web Gravity Moment Connection

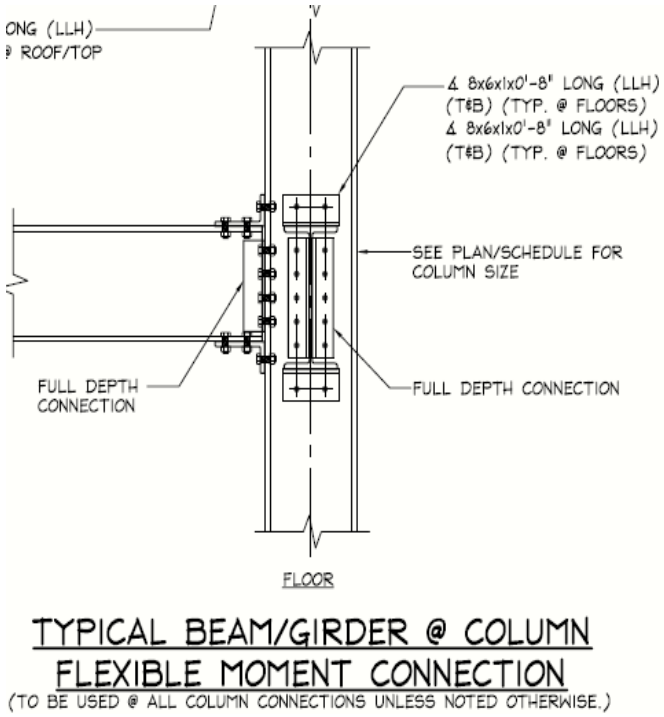


Figure 4: Typical Beam/Girder @ Column Flexible Moment Connection

Curtain Wall

The curtain walls in conjunction with the many windows which encompass the entire building, serve the vital function of providing natural light to the patients. This wedge shaped enclosure can be found on the southeastern exterior of the building. All windows and curtain walls for this project are either made of 1" insulated vision glass or 1" insulated spandrel and framed with aluminum members. Glazing on the curtain wall will be PPG Solarban z 50 with a visible light transmittance of 4%. This type of glazing qualifies for three LEED credits which include regional materials, low VOC's, and a high UL-rating. Even though the subcontractor is coordinating with the architect, it is the architect's responsibility to design the curtain wall system.

Masonry

Masonry makes up a very small portion of this project and can only be found where the metal panels meet the curtain wall as well as where the base wall meets the precast panels. The base wall is constructed of 6" concrete masonry units filled with 3000 psi grout and insulated with 2" foam plastic

board insulation. This particular type wall sits on top of the continuous spread footings and ties into the granite stone cladding wall as well as carrying part of the load of the precast concrete panels. The second masonry wall is located on top of the 4th floor and ties into the 3" insulated metal panels that make up part of the southern façade. These 8" concrete masonry units are insulated with 1" foam plastic board insulation and support a glazed aluminum curtain wall system.

Cast-In-Place

Cast-in place concrete makes up the continuous spread footings, wall footings, foundation walls, retaining walls, grade beams, piers, slabs on grade and slabs on metal deck. Concrete materials will be heavily recycled on this project and achieve LEED points. All cast-in-place concrete must minimum of 500lbs of cement per cubic yard as well as a minimum of 28 day compressive strength. The foundation for this project consists of steel reinforced continuous spread concrete footings that have a maximum bearing capacity of 4000 PSF. These footings range in size from 2'-0"W 32"H (CONT.) to 19'-0"X19'-0 X 60". On top of these footings rests four different types of piers that help to distribute the load. These piers start from the core expansion and extend to the canopy. Like the foundations, the 6" slab on grade must also have a bearing capacity of 4000 PSF. All cast-in-place concrete was pumped from multiple concrete trucks.

Precast

In order to speed construction up, precast concrete panels make up the majority of the south, east, and west façade. Much like the steel, precast was manufactured within 500 miles of the project and also achieves LEED points for regional materials. This project incorporates two different types of precast panels that work together with the windows and curtain walls to give the Williamsport Hospital and Medical Center a more modern feel. The white towers on the southern and eastern are enclosed with 6" patterned architectural precast concrete panels. These panels are backed with 3" mineral-wool board insulation and a fire resistive joint system. The second type of precast panel can be found on the southwestern side of the building and is very similar to the patterned architectural precast panels. These panels are also 6" thick and backed with 3" mineral-wool board insulation and fire resistive joint system. However, this type of panel is finished with a thin red brick faced veneer. The precast panels are typically connected to the structural steel using a lateral tie back system. ***Figures 5 and 6*** below are some typical details of how these precast panels were connected. All precast on this was casted by Universal Concrete in Stowe, Pennsylvania. To place the precast panels a 240 Ton Liebherr LTM 1200-5.1 track crane was utilized. Much like the steel erection, the crane moved from the eastern side of the building and worked its way around to the western side. The crane stopped and erected the precast panels in three different locations first the location was on the eastern side of the building where the white patterned precast is located. The next location was directly facing the south façade of the building right in front of the patterned precast tower which is located in the center of the building. The last and final location of the crane was on the western side of the building where the brick faced precast was installed. Crane locations can be seen on ***Figure 2***.

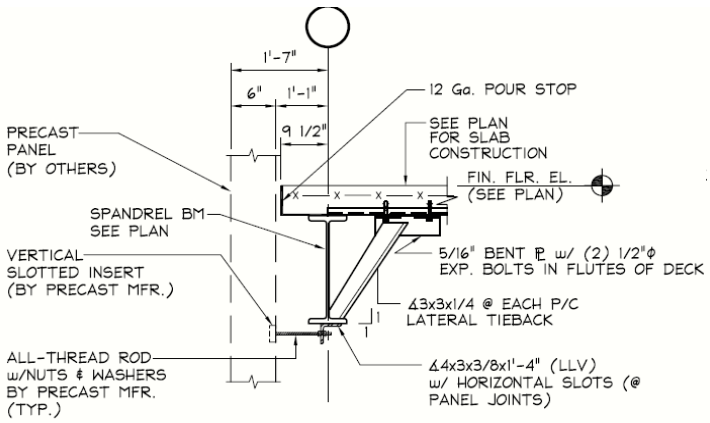


Figure 5: Typical Spandrel Beam Tieback Connection

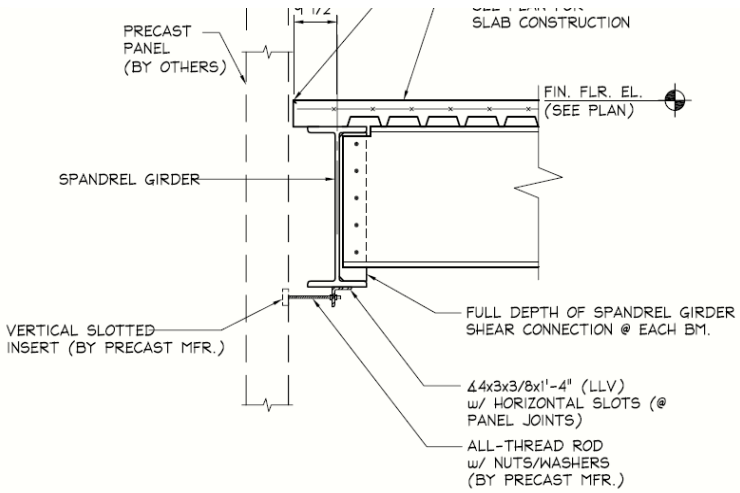


Figure 6: Typical Spandrel Girder Tieback Connection

Central Utility Plant Overview

The Williamsport Hospital and Medical Center as well as the patient tower expansion both run from the newly built Central Utility Plant. As stated earlier, building the Central Utility Plant was the first phase of construction in Driscoll's GMP with Susquehanna Health. The mechanical and electrical systems for these facilities are powered by a two megawatt cogeneration waste hot water recovery system. Unlike conventional power plants, this system doesn't waste the by-product heat that is created when generating electricity. Instead, it recycles this thermal energy and puts it to good use. This building has been finished and is projected to save Susquehanna an estimated $534,000 annually in energy costs.

Mechanical System

As previously mentioned, all mechanical systems in the Patient Tower Expansion project are powered by the two megawatt cogeneration system located in the Central Utility Plant. Also located in the Central Utility Plant, are two 3300 GPM chillers and related cooling towers, three 150 gallon boilers, and related steam and hot water tanks. The primary HVAC system for the Patient Tower Expansion is a variable air volume with mostly base mounted centrifugal fans. The eight air handlers for this project are located on the roof and range from 24,000-63,000 CFM. In addition to the air handlers the chillers for this project are also located on the roof and range from 180-24 GPM. The mechanical system also includes chilled water and chilled glycol system that cool the building. This energy efficient mechanical system achieves LEED points for performance. This hospital is also supported with an emergency system complete Type II sprinklers. The building itself contains nine electrical rooms accompanied by four mechanical rooms. These rooms are located all throughout the building and are broken down by the ***Table 2*** below.

Floor	Number of Mechanical Rooms	Number of Electrical Rooms
1st	1	2
2nd	0	1
3rd	1	1
4th	1	4
5th	0	0
6th	1	1

Table 2: Mechanical and Electrical Room Breakdowns

Electrical System

Like the mechanical system, the electrical system is powered by the cogeneration system located in the central utility plant. This system produces electricity by capturing and reusing waste heat to power the entire building. The power plant feeds the patient towers through a 15 KV feeder which then flows into a 3-phase 480Y/277 4 wire circuit. Like any hospital, electricity is the life line to many patients and must constantly be fed into the building no matter what. To ensure that facilities always have power, Susquehanna Health elected to install two 565 KW diesel powered emergency backup generators that are located in the Central Utility Plant.

Cost Data

*See APPENDIX B for D4 and RSMeans Cost Data

This project was awarded to L.F. Driscoll as a Single Prime Guaranteed Maximum Price (GMP) for $82,297,101. Included in this GMP was a mini GMP to build a central utility plant that would tie into the Williamsport Hospital and Medical Center as well as the Patient Tower Expansion. The Central Utility Plant was purchased for $3,529,000 and built prior to the Patient Tower Expansion. As previously stated, it is the intent of this report to mainly focus on the Patient Tower Expansion. Costs estimates for this report will be solely related to the Patient Tower Expansion. The Patient Tower Expansion was purchased for $78,797,101 with an actual construction cost of $77,364,901. All estimates for this section will be based on a 6 story, 243,000 SF hospital in Williamsport, Pennsylvania.

Type	Cost	Costs/SF
Construction	$77,364,901	$318.37
Construction Plus Fee	$78,797,101	$324.27

Table 3 Square Foot Cost Break Down

Building System	Contract Cost	Cost/ SF
Structural	$5,515,797	$23.57
HVAC	$16,246,629	$66.86
Plumbing	$4,836,391	$19.90
Electrical	$14,699,331	$60.49
Architectural Precast Concrete	$1,484,222	$6.10
Cast In Place Concrete	$3,351,150	$13.80

Table 4: Cost Break Downs for Major Building Systems

D 4 Estimates

The estimates in this section are based off case study MD051124. This case study, named the Winship Cancer Institute, is a 260,000 SF hospital in Atlanta, Georgia. This particular hospital's construction costs were $54,938,683 which calculates out to $211.30/SF.

Type	Cost	Costs/SF
Construction	$51,346,538	$211.30

Table 5: Patient Tower Expansion Based on D4 Case Study MD051124

Cost Works RSMeans Estimate

The Estimate in this section was done with Cost Works RS Means Square Floor Cost Estimate Report. This estimate was based off of a 4-8 story hospital with precast concrete panels with exposed aggregate.

Type	Cost	Costs/SF
Construction	$39,333,500	$161.87

Table 6: Patient Tower Expansion RS Means Estimate

Cost Comparisons

Estimate Type	Total Cost	Costs/SF	Total Difference
Patient Tower Expansion Actual Construction	$77,364,901	$318.37	$0.00
D4 Construction	$51,346,538	$211.30	$-26,018,363
RS Means Construction	$39,333,500	$161.87	$-38,031,401

Table 7: Patient Tower Expansion Cost Comparison

From the ***Table 7*** it is clear that the estimates using the online software differed greatly than the actual cost of this project. After some investigation and comparison, it is clear that both reports are just general snap shots of what a project could be. The D4 cost estimate came in at $-26,018,363 under the actual cost of the project for many different reasons. The first major reason is that the case study that it was based off of was constructed in 1997. Mechanical, Electrical, and Structural systems are much more complicated and cost more than they did in 1997. The state of the art mechanical system on this project alone accounts for millions of the difference of these estimates. This estimate is also under the assumption that the building's façade will be made from masonry. The Patient Tower Expansion is comprised of five different types of façade that vary in price. The RSMeans estimate came in even lower than the D4 estimate and was off $-38,031,401from the original estimate. Like the D4 estimate, RSMeans assumed the building was made from only precast panels. As previously mentioned, this project is comprised of many different facades that will change the price of the building. RSMeans estimate assumed a concrete and structural steel frame design whereas this project is a structural steel frame. Two other reasons both estimates might be off is due to the high costs associated with LEED materials and BIM implementation.

Though both D4 and RSMeans estimates may be fast and easy, it is clear that they are not accurate enough to be implemented in real world scenarios. They assume a lot of different factors that can ultimately lead to under bidding projects by millions of dollars. Until more accurate estimating software is produced, it is clear that producing estimates by hand is the only efficient and effective way to produce a bid.

Existing Conditions

*See Appendix C for Existing Conditions Site Plan

Figure 7: Demolition and Existing Condions
Image Provided by Google Earth

As previously mentioned in this report, a considerable amout of demolition was performed by a separate contractor prior to L.F. Driscoll winning the bid for the Patient Tower Expansion. The light blue area on ***Figure 7*** represents all the demolition that was completed prior to the Cenral Utility Plant or even the Patient Tower Expansion being constructed. All of the parking in this area was owned by Suquehanna Health however the residential houses were owned by private citizens. Most of these houses were taken by eminant domain in an effort to clean up the rapidly decaying neighborhood. When the Central Utility Plant and Patient Tower Expansion were started, this area was simply a barron patch of land. The Patient Tower Expansion is located adjacet to the Williamsport Hospital and Medical Center and ties into the newly constructed Central Utility Plant. Because hospitals need a vast amount of utilties, the subsurface investigation of all these lines becomes a bit of a problem. Gas, water, storm and sanitary lines run all throughout the site. All existing electrical lines run through the Central Utiliy Plant and ties in directly to the first floor electrical room of the Patient Tower's core. Although this is not the most active side of the Williamsport Hospital, the area in which the project is located is critical to the staff and patients that park there. Auxillary parking around the hospital will be used to acomidate most motorists; however, L.F. Driscoll will provide some teporary parking to help aliviate some of the parking demands. Reference Appendix C for the existing conditoins site plan

Local Conditions

The Williamsport Hospital and Medical Center is located at 777 Rural Avenue Williamsport, PA. These facilities encompass six city blocks about 15 minutes away from downtown Williamsport. Most of the buildings around Williamsport are predominantly constructed out of structural steel with the occasional masonry supported building. This particular site doesn't have much vehicular or pedestrian traffic and is located in a suburban setting. However, as previously discussed, staff and patient parking is limited. Auxiliary lots handle most of the over flow and a temporary parking lot was established on site to help deal with this problem. As shown on the existing site plan L.F. Driscoll trailers and parking are established directly north of this temporary lot to help ensure that they are not in the way of any hospital activities. One area of concern however is located in the northeastern side of the site. Ambulances frequent this area and even have parking adjacent to the new construction. This poses an even bigger threat considering that all lay down and subcontractor trailers are on site.

The geotechnical site investigation for this project was conducted by CMT Laboratories, INC. The field investigation for the Patient Tower Expansion consisted of 10 borings that extended to depths ranging from 10-34 feet below the existing surface grade. These subsurface borings revealed that there was 3'-4' inches of topsoil followed by a dense layer of brown silty sand and gravel that extends 15' down. Past the brown silty sand and gravel extends a layer of very dense gray weathered shale. Ground water was recorded at varying depths; however, it never reached a depth above 24' deep. It is for this reason that standard continuous spread footings can be used for this project. However if there is ever a need to control groundwater conventional dewatering procedures can be used.

In Williamsport, PA dumpster the average cost for a dumpster per week costs about $400. Throughout the life of the project, it is estimated that at any given time the jobsite will require 2-3 dumpsters. In addition to these dumpsters, separated material dumpsters will also be needed. These dumpsters are used to separate material for recycling purposes. Separating and recycling material such as concrete earns LEED points for the project. Separated material dumpsters in Williamsport only cost $350 per week.

Client Information

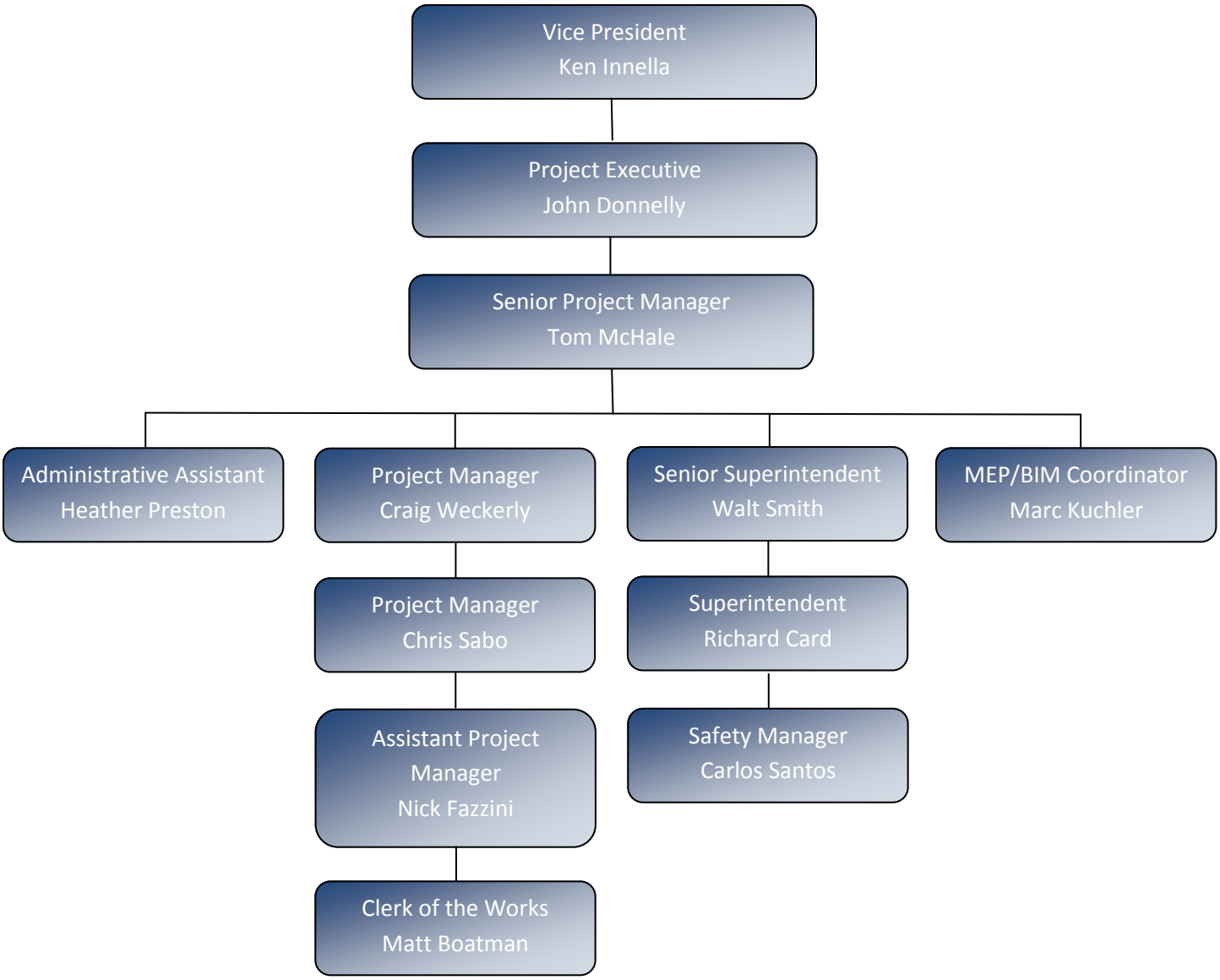
Susquehanna Health is a three-hospital integral hospital system that provides world class health care to 11 counties. Founded in 1994, this affiliation incorporates The Williamsport Regional Medical Center, Divine Providence Hospital, and Muncy Valley Hospital. This non-profit organization reinvests all of its profits into their facilities and neighboring communities. Susquehanna Heath is a heath care leader that has been recognized at the national and state levels for quality of care, including the Blue Cross of Northeastern Pennsylvania's Blue Distinctions designation for cardiac care, spine surgery hip and knee replacement as well as the Data advantage Top 100 Hospitals in the Nation. This three-hospital integral hospital system offers a wide variety of services that include assisted living, paramedic/ambulance services, behavioral health, physical rehabilitation, orthopedics neurosurgery, cancer treatment gastrointestinal services, behavioral health and vascular care/heart surgery.

The Patient Tower Expansion in Williamsport moves Susquehanna Health into the fourth of five phases in its $250 million "Project 2012" initiative. Project 2012 reaches out to all three of its hospitals and took its first step with a state of the art Central Utility Plant for the Patient Tower Expansion project. This redevelopment program originated from a series of issues and challenges that have come to Susquehanna Health's attention over the last couple of years. Some of these issues and challenges include aging current facilities, recruitment of healthcare professionals, and patient preference and expectations.

Project 2012 has many goals that are spread over the three hospitals. Some of these goals include "building green", reducing operation costs, updating out of date facilities, improving Susquehanna Heath's image, and giving back to the surrounding communities. More specifically the goals set out by Williamsport Regional Medical Center for its Patient Tower Expansion project include developing a south-facing marquee entrance from High Street, creating a park-like environment with green space and attractive landscaping, expanding surgical suites, emergency departments, the imaging center, and cardiovascular services. Other project goals include replacing the surgical suites, as well as the nursery and OB/GYN areas.

Susquehanna Health is funding their projects through a number of agencies and programs such as Blue Cross of Northeastern Pennsylvania, Count On Us For Life Capital Campaign, Department of Community and Economic Development Grant, and other Federal grants. However, the majority of the funding is coming new bond funds and Susquehanna capital. Even though the majority of this project is privately funded, some of the state and federal grants stipulate how the money must be spent. For example, the Pennsylvania Development awarded $1 million for the installation of a two megawatt cogeneration system that produces electricity by capturing and reusing waste heat to power heating and hot water systems that will supply the Williamsport Regional Medical Center as well as the new expansion project. This state of the art system will eliminate harmful and even poisonous gasses that are associated with producing electricity and heat. Susquehanna health was more than willing to put up $1.7 million of their own money to build this system when they realized that they would be saving an estimated $534,000 a year in operational costs. This kind of "green" building is carrying into all of their projects. The Patient Tower expansion project will be designed for LEED Certification for Healthcare. Due to the large costs associated with being LEED accredited, this project will never achieve the actual LEED certification. Susquehanna Health opted to take the money saved from not hiring LEED consultants and reinvest this money back into this project. This shows the level of quality and care that this organization has not only for its patients but also the community.

L.F. Driscoll Staffing Plan



This Project is being overseen by the Vice President of L.F. Driscoll as well as a Project Executive. Like most L.F. Driscoll projects, the Project Executive usually oversees 3-4 projects and gives status reports to the Vice President as well the President. This allows company management to successfully monitor all the projects and establish the health of the company and its projects. Unlike the Project Executive, the Senior Project Manager is only responsible for one project. It is the Senior Project Manager's job to successfully manage all aspects of the job and deliver a level of quality that meets L.F. Driscoll's expectations.

Office and managerial functions are divided up between project managers, assistant project managers, a clerk, and an administrative assistant. Project managers and assistant project managers divided bid

packages up based on level of experience as well as work load. Bid packages are strategically planned and assigned to

ensure that none of the personnel get overwhelmed throughout the entire life of the project. Another way that L.F. Driscoll lighted the work load was assign a MEP/BIM Coordinator to this project. Normally on L.F. Driscoll's projects, the responsibilities of the MEP/BIM Coordinator are handled by Project Managers.

Field work is managed by the Senior Superintendent who overseas and coordinates with all subcontractors. The Superintendent on this project serves much of the same function of the Senior Superintendent just on a smaller scale. Like all project L.F. Driscoll projects, this project has been assigned an experienced Safety Manager that ensures work is being done in a save manner.

Project Delivery System

*See APPENDIX D for Project Delivery System

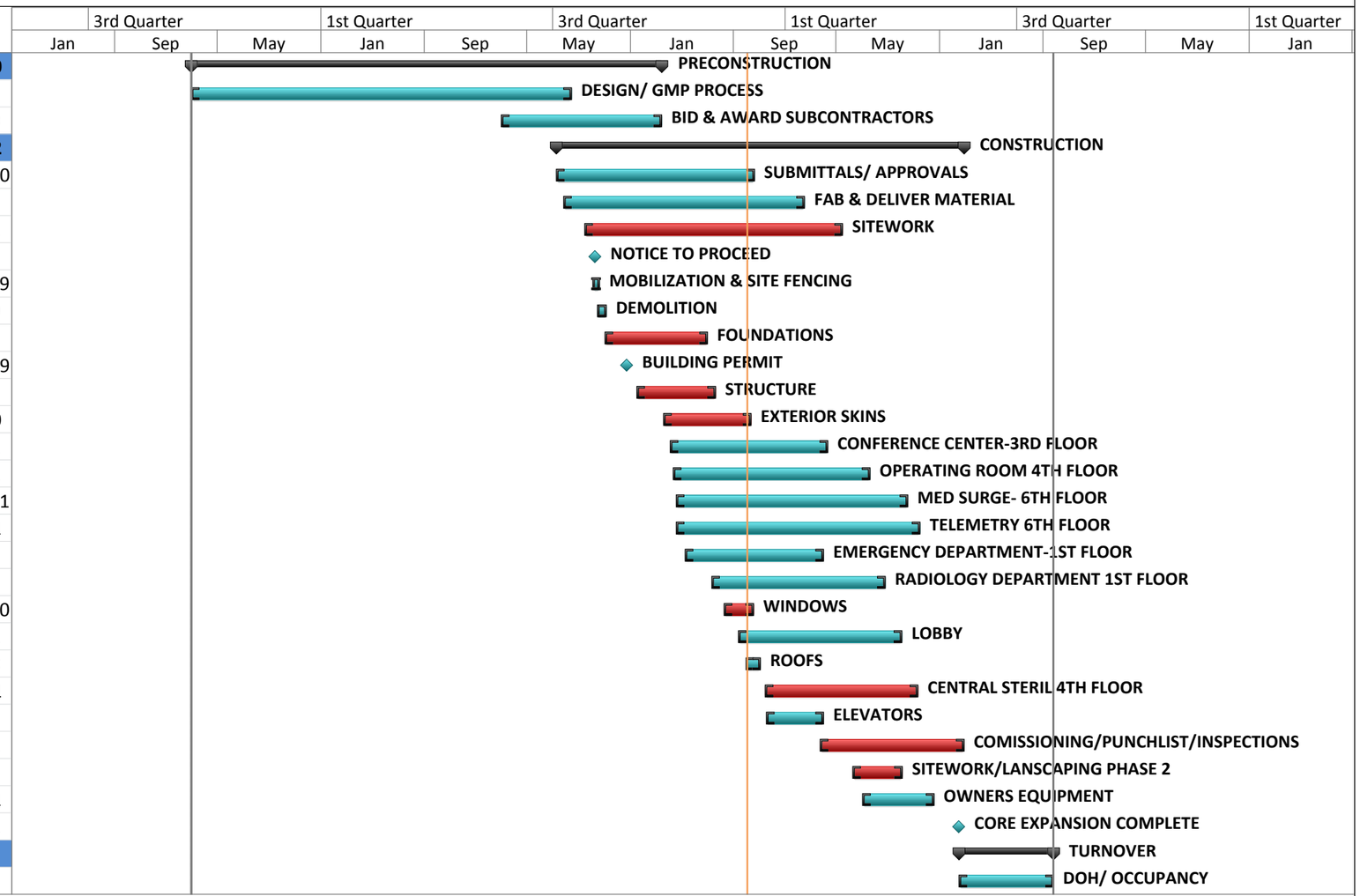
The project delivery system for Susquehanna Health Patient Tower Expansion is a traditional Design-Bid-Build with a negotiated guaranteed maximum price (GMP). Susquehanna Heath has previously had good experiences with this type of project delivery method and hope to continue this tradition. L.F. Driscoll's GMP with Susquehanna Health is set up with a contingency as well as room for negotiation due to the fact that the designs were not 100% complete. Within this GMP is also a mini GMP reserved for the Central Utility Plant that was constructed prior to the Patient Tower Expansion. In addition to their GMP with Susquehanna Health, L.F. Driscoll holds lump sum contracts with all of the subcontractors on the jobsite. This allows them to properly manage the job while also protecting themselves as well as the owner.

On the design side of this project all team members hold lump sum contracts with Susquehanna Health. Like most projects, the design team is led by the architect who is responsible for communicating and coordinating with the engineers and other designers. This project's architect is Granary Associates who has a long lasting relationship with Susquehanna Heath. In addition to the Patient Tower Expansion, Granary Associates have designed several projects for Susquehanna health. The civil engineer/landscape architect Larson Design Group has also worked on multiple with Granary Associates and Susquehanna Health. New to the design team are structural engineers O'Donnell & Naccarato and MEP Engineers PWI, Inc. Like the Architect, the engineers also have lump sum contracts with Susquehanna Health and coordinate with each other as well as L.F. Driscoll. To see the project delivery organizational structure reference Appendix D.

Appendix A: Project Schedule

Adam Lasher
CONSTRUCTION MANAGEMENT

ID	Task Name	Duration	Start	Finish
1	**PRECONSTRUCTION**	**793 days**	**Thu 3/1/07**	**Mon 3/15/10**
2	DESIGN/ GMP PROCESS	642 days	Thu 3/1/07	Fri 8/14/09
3	BID & AWARD SUBCONTRACTORS	271 days	Mon 3/2/09	Mon 3/15/10
4	**CONSTRUCTION**	**687 days**	**Fri 7/10/09**	**Mon 2/27/12**
5	SUBMITTALS/ APPROVALS	334 days	Fri 7/10/09	Wed 10/20/10
6	FAB & DELIVER MATERIAL	407 days	Mon 7/27/09	Tue 2/15/11
7	SITEWORK	435 days	Tue 9/15/09	Mon 5/16/11
8	NOTICE TO PROCEED	0 days	Fri 10/9/09	Fri 10/9/09
9	MOBILIZATION & SITE FENCING	12 days	Sun 10/4/09	Mon 10/19/09
10	DEMOLITION	15 days	Thu 10/15/09	Wed 11/4/09
11	FOUNDATIONS	174 days	Mon 11/2/09	Thu 7/1/10
12	BUILDING PERMIT	0 days	Wed 12/23/09	Wed 12/23/09
13	STRUCTURE	133 days	Sat 1/16/10	Tue 7/20/10
14	EXTERIOR SKINS	148 days	Sat 3/20/10	Tue 10/12/10
15	CONFERENCE CENTER-3RD FLOOR	266 days	Mon 4/5/10	Mon 4/11/11
16	OPERATING ROOM 4TH FLOOR	333 days	Mon 4/12/10	Wed 7/20/11
17	MED SURGE- 6TH FLOOR	391 days	Mon 4/19/10	Mon 10/17/11
18	TELEMETRY 6TH FLOOR	412 days	Mon 4/19/10	Tue 11/15/11
19	EMERGENCY DEPARTMENT-1ST FLOOR	235 days	Mon 5/10/10	Fri 4/1/11
20	RADIOLOGY DEPARTMENT 1ST FLOOR	294 days	Mon 7/12/10	Thu 8/25/11
21	WINDOWS	50 days	Tue 8/10/10	Mon 10/18/10
22	LOBBY	276 days	Mon 9/13/10	Mon 10/3/11
23	ROOFS	24 days	Fri 10/1/10	Wed 11/3/10
24	CENTRAL STERIL 4TH FLOOR	259 days	Mon 11/15/10	Thu 11/10/11
25	ELEVATORS	97 days	Thu 11/18/10	Fri 4/1/11
26	COMISSIONING/PUNCHLIST/INSPECTIONS	242 days	Fri 3/25/11	Mon 2/27/12
27	SITEWORK/LANSCAPING PHASE 2	83 days	Fri 6/10/11	Tue 10/4/11
28	OWNERS EQUIPMENT	122 days	Sun 7/3/11	Sun 12/18/11
29	CORE EXPANSION COMPLETE	0 days	Wed 2/15/12	Wed 2/15/12
30	**TURNOVER**	**159 days**	**Thu 2/16/12**	**Tue 9/25/12**
31	DOH/ OCCUPANCY	159 days	Thu 2/16/12	Tue 9/25/12



Project: SUSQUEHANNA PATIENT TOWER EXPANSION
Date: Mon 10/4/10

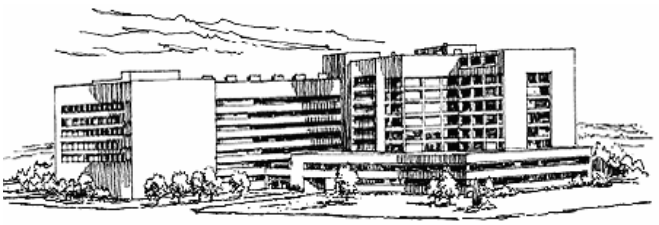
Task	Project Summary	Inactive Milestone	Manual Summary Rollup	Deadline	
Split	External Tasks	Inactive Summary	Manual Summary	Progress	
Milestone	External Milestone	Manual Task	Start-only		
Summary	Inactive Task	Duration-only	Finish-only		

Appendix B: RSMeans CostWorks 2009 Reports

Square Foot Cost Estimate Report

Estimate Name: **Untitled**

Building Type:	**Hospital, 4-8 Story with Precast Concrete Panels With Exposed Aggregate / Steel Frame**
Location:	WILLIAMSPORT, PA
Stories Count (L.F.):	**6.00**
Stories Height	**14.00**
Floor Area (S.F.):	**243,000.00**
LaborType	**Union**
Basement Included:	No
Data Release:	**Year 2009 Quarter 3**
Cost Per Square Foot	**$220.55**
Total Building Cost	**$53,592,000**



Costs are derived from a building model with basic components. Scope differences and market conditions can cause costs to vary significantly.

		% of Total	Cost Per SF	Cost
A Substructure		**1.9%**	**3.11**	**$756,500**
A1010	**Standard Foundations**		**1.87**	**$453,500**
	Strip footing, concrete, reinforced, load 44.0 KLF, soil bearing capacity 6 KSF, 24" deep x 96" wide			
	Spread footings, 3000 PSI concrete, load 400K, soil bearing capacity 6 KSF, 8' - 6" square x 27" deep			
	Spread footings, 3000 PSI concrete, load 500K, soil bearing capacity 6 KSF, 9' - 6" square x 30" deep			
	Spread footings, 3000 PSI concrete, load 600K, soil bearing capacity 3 KSF, 16' - 0" square x 35" deep			
	Spread footings, 3000 PSI concrete, load 600K, soil bearing capacity 6 KSF, 10' - 6" square x 33" deep			
	Spread footings, 3000 PSI concrete, load 800K, soil bearing capacity 3 KSF, 18' - 0" square x 39" deep			
A1030	**Slab on Grade**		**0.96**	**$233,000**
	Slab on grade, 6" thick, light industrial, reinforced			
A2010	**Basement Excavation**		**0.02**	**$5,500**
	Excavate and fill, 30,000 SF, 4' deep, sand, gravel, or common earth, on site storage			
A2020	**Basement Walls**		**0.27**	**$64,500**
	Foundation wall, CIP, 4' wall height, direct chute, .148 CY/LF, 7.2 PLF, 12" thick			
B Shell		**18.5%**	**29.87**	**$7,259,000**
B1010	**Floor Construction**		**15.06**	**$3,659,000**
	Steel column, W10, 200 KIPS, 10' unsupported height, 45 PLF			
	Floor, composite metal deck, shear connectors, 5.5" slab, 30'x30' bay, 26.5" total depth, 75 PSF superimposed load,			
	Fireproofing, gypsum board, fire rated, 2 layer, 1" thick, 10" steel column, 3 hour rating, 17 PLF			
B1020	**Roof Construction**		**1.34**	**$326,000**
	Floor, steel joists, beams, 1.5" 22 ga metal deck, on columns, 30'x30' bay, 28" deep, 40 PSF superimposed load, 62			
B2010	**Exterior Walls**		**7.80**	**$1,896,000**
	Exterior wall, precast concrete, flat, 8" thick, 10' x 10', white face, 2" rigid insulation, low rise			
B2020	**Exterior Windows**		**3.74**	**$909,500**
	Windows, aluminum, sliding, insulated glass, 5' x 3'			
B2030	**Exterior Doors**		**0.68**	**$165,000**
	Door, aluminum & glass, with transom, full vision, double door, hardware, 6'-0" x 10'-0" opening			
	Door, aluminum & glass, with transom, non-standard, double door, hardware, 6'-0" x 10'-0" opening			

		% of Total	Cost Per SF	Cost
	Door, steel 18 gauge, hollow metal, 1 door with frame, no label, 3'-0" x 7'-0" opening			
B3010	**Roof Coverings**		**1.22**	**$297,000**
	Roofing, single ply membrane, reinforced, PVC, 48 mils, fully adhered, adhesive			
	Insulation, rigid, roof deck, composite with 2" EPS, 1" perlite			
	Roof edges, aluminum, duranodic, .050" thick, 6" face			
	Flashing, copper, no backing, 16 oz, < 500 lbs			
B3020	**Roof Openings**		**0.03**	**$6,500**
	Roof hatch, with curb, 1" fiberglass insulation, 2'-6" x 3'-0", galvanized steel, 165 lbs			
C Interiors		**22.5%**	**36.44**	**$8,855,000**
C1010	**Partitions**		**6.62**	**$1,609,500**
	Metal partition, 5/8" vinyl faced gypsum board face, 5/8"fire rated gypsum board base, 3-5/8" @ 24",s ame opposite			
	Gypsum board, 1 face only, 5/8" with 1/16" lead			
C1020	**Interior Doors**		**8.51**	**$2,068,000**
	Door, single leaf, kd steel frame, hollow metal, commercial quality, flush, 3'-0" x 7'-0" x 1-3/8"			
	Door, single leaf, kd steel frame, metal fire, commercial quality, 3'-0" x 7'-0" x 1-3/8"			
C1030	**Fittings**		**0.81**	**$198,000**
	Partitions, hospital curtain, ceiling hung, poly oxford cloth			
C2010	**Stair Construction**		**1.43**	**$347,000**
	Stairs, steel, cement filled metal pan & picket rail, 12 risers, with landing			
C3010	**Wall Finishes**		**5.66**	**$1,376,500**
	Glazed coating			
	Painting, interior on plaster and drywall, walls & ceilings, roller work, primer & 2 coats			
	Vinyl wall covering, fabric back, medium weight			
	Ceramic tile, thin set, 4-1/4" x 4-1/4"			
C3020	**Floor Finishes**		**7.80**	**$1,896,000**
	Composition flooring, epoxy terrazzo, maximum			
	Terrazzo, maximum			
	Vinyl, composition tile, maximum			
	Tile, ceramic natural clay			
C3030	**Ceiling Finishes**		**5.60**	**$1,360,000**
	Plaster ceilings, 3 coat prl, 3.4# metal lath, 3/4" crc, 12"OC furring, 1-1/2" crc, 36" OC support			
	Acoustic ceilings, 3/4"mineral fiber, 12" x 12" tile, concealed 2" bar & channel grid, suspended support			
D Services		**47.3%**	**76.48**	**$18,584,500**
D1010	**Elevators and Lifts**		**6.21**	**$1,509,500**
	Traction, geared hospital, 6000 lb, 6 floors, 12' story height, 2 car group, 200 FPM			
D2010	**Plumbing Fixtures**		**10.02**	**$2,434,500**
	Water closet, vitreous china, bowl only with flush valve, wall hung			
	Urinal, vitreous china, wall hung			
	Lavatory w/trim, wall hung, PE on CI, 19" x 17"			
	Kitchen sink w/trim, raised deck, PE on CI, 42" x 21" dual level, triple bowl			
	Laundry sink w/trim, PE on CI, black iron frame, 48" x 21" double compartment			
	Service sink w/trim, PE on CI, corner floor, wall hung w/rim guard, 22" x 18"			
	Bathtub, recessed, PE on CI, mat bottom, 5'-6" long			
	Shower, stall, baked enamel, terrazzo receptor, 36" square			
	Water cooler, electric, wall hung, wheelchair type, 7.5 GPH			
D2020	**Domestic Water Distribution**		**6.21**	**$1,508,000**
	Electric water heater, commercial, 100< F rise, 1000 gal, 480 KW 1970 GPH			
D2040	**Rain Water Drainage**		**0.46**	**$112,000**
	Roof drain, CI, soil,single hub, 5" diam, 10' high			
	Roof drain, CI, soil,single hub, 5" diam, for each additional foot add			

		% of Total	Cost Per SF	Cost
D3010	**Energy Supply**		**3.72**	**$904,000**
	Hot water reheat system for 200,000 SF hospital			
D3020	**Heat Generating Systems**		**0.35**	**$85,000**
	Boiler, electric, steel, steam, 510 KW, 1,740 MBH			
D3030	**Cooling Generating Systems**		**2.49**	**$604,000**
	Chiller, reciprocating, water cooled, standard controls, 100 ton			
	Chiller, reciprocating, water cooled, standard controls, 150 ton			
	Chiller, reciprocating, water cooled, standard controls, 200 ton			
D3090	**Other HVAC Systems/Equip**		**25.89**	**$6,292,000**
	Ductwork for 200,000 SF hospital model			
	Boiler, cast iron, gas, hot water, 2856 MBH			
	Boiler, cast iron, gas, hot water, 320 MBH			
	AHU, rooftop, cool/heat coils, VAV, filters, 5,000 CFM			
	AHU, rooftop, cool/heat coils, VAV, filters, 10,000 CFM			
	AHU, rooftop, cool/heat coils, VAV, filters, 20,000 CFM			
	VAV terminal, cooling, hot water reheat, with actuator / controls, 200 CFM			
	AHU, rooftop, cool/heat coils, VAV, filters, 30,000 CFM			
	Roof vent. system, power, centrifugal, aluminum, galvanized curb, back draft damper, 1500 CFM			
	Roof vent. system, power, centrifugal, aluminum, galvanized curb, back draft damper, 2750 CFM			
	Commercial kitchen exhaust/make-up air system, rooftop, gas, 5000 CFM			
	Plate heat exchanger, 400 GPM			
D4010	**Sprinklers**		**2.15**	**$523,500**
	Wet pipe sprinkler systems, steel, light hazard, 1 floor, 10,000 SF			
	Wet pipe sprinkler systems, steel, light hazard, each additional floor, 10,000 SF			
	Standard High Rise Accessory Package 8 story			
D4020	**Standpipes**		**0.46**	**$112,500**
	Wet standpipe risers, class III, steel, black, sch 40, 4" diam pipe, 1 floor			
	Wet standpipe risers, class III, steel, black, sch 40, 4" diam pipe, additional floors			
	Cabs, hose rack assembly, & extinguisher, 2-1/2" x 1-1/2" valve & hose, steel door & frame			
	Alarm, electric pressure switch (circuit closer)			
	Escutcheon plate, for angle valves, polished brass, 2-1/2"			
	Fire pump, electric, with controller, 5" pump, 100 HP, 1000 GPM			
	Fire pump, electric, for jockey pump system, add			
	Siamese, with plugs & chains, polished brass, sidewalk, 4" x 2-1/2" x 2-1/2"			
	Valves, angle, wheel handle, 300 lb, 2-1/2"			
	Cabinet assembly, includes. adapter, rack, hose, and nozzle			
D5010	**Electrical Service/Distribution**		**2.52**	**$612,000**
	Service installation, includes breakers, metering, 20' conduit & wire, 3 phase, 4 wire, 120/208 V, 2000 A			
	Feeder installation 600 V, including RGS conduit and XHHW wire, 2000 A			
	Switchgear installation, incl switchboard, panels & circuit breaker, 2000 A			
D5020	**Lighting and Branch Wiring**		**11.44**	**$2,781,000**
	Receptacles incl plate, box, conduit, wire, 20 per 1000 SF,2.4 W per SF, with transformer			
	Wall switches, 5.0 per 1000 SF			
	Miscellaneous power, 1.2 watts			
	Central air conditioning power, 4 watts			
	Motor installation, three phase, 460 V, 15 HP motor size			
	Motor feeder systems, three phase, feed to 200 V 5 HP, 230 V 7.5 HP, 460 V 15 HP, 575 V 20 HP			
	Fluorescent fixtures recess mounted in ceiling, 0.8 watt per SF, 20 FC, 5 fixtures @32 watt per 1000 SF			
D5030	**Communications and Security**		**1.46**	**$354,500**
	Communication and alarm systems, fire detection, addressable, 100 detectors, includes outlets, boxes, conduit and			

		% of Total	Cost Per SF	Cost
	Fire alarm command center, addressable with voice			
	Internet wiring, 8 data/voice outlets per 1000 S.F.			
D5090	**Other Electrical Systems**		**3.09**	**$752,000**
	Generator sets, w/battery, charger, muffler and transfer switch, diesel engine with fuel tank, 100 kW			
	Generator sets, w/battery, charger, muffler and transfer switch, diesel engine with fuel tank, 400 kW			
	Uninterruptible power supply with standard battery pack, 15 kVA/12.75 kW			
E Equipment & Furnishings		**9.9%**	**15.96**	**$3,878,500**
E1020	**Institutional Equipment**		**12.42**	**$3,017,000**
	Architectural equipment, laboratory equipment glassware washer, distilled water, economy			
	Architectural equipment, sink, epoxy resin, 25" x 16" x 10"			
	Architectural equipment, laboratory equipment eye wash, hand held			
	Fume hood, complex, including fixtures and ductwork			
	Architectural equipment, medical equipment sterilizers, floor loading, double door, 28"x67"x52"			
	Architectural equipment, medical equipment, medical gas system for large hospital			
	Architectural equipment, kitchen equipment, commercial dish washer, semiautomatic, 50 racks/hr			
	Architectural equipment, kitchen equipment, food warmer, counter, 1.65 KW			
	Architectural equipment, kitchen equipment, kettles, steam jacketed, 20 gallons			
	Architectural equipment, kitchen equipment, range, restaurant type, burners, 2 ovens & 24" griddle			
	Architectural equipment, kitchen equipment, range hood, including CO2 system, economy			
	Special construction, refrigerators, prefabricated, walk-in, 7'-6" high, 6' x 6'			
	Architectural equipment, darkroom equipment combination, tray & tank sinks, washers & dry tables			
E1090	**Other Equipment**		**0.00**	**$0**
E2020	**Moveable Furnishings**		**3.55**	**$861,500**
	Furnishings, hospital furniture, patient wall system, no utilities, deluxe , per room			
F Special Construction		**0.0%**	**0.00**	**$0**
G Building Sitework		**0.0%**	**0.00**	**$0**
Sub Total		**100%**	**$161.87**	**$39,333,500**
Contractor's Overhead & Profit		**25.0%**	**$40.47**	**$9,833,500**
Architectural Fees		**9.0%**	**$18.21**	**$4,425,000**
User Fees		**0.0%**	**$0.00**	**$0**
Total Building Cost			**$220.55**	**$53,592,000**

Appendix B: D4 Estimate

Statement of Probable Cost

Patient Tower Expansion - Jul 2009 - PA - Williamsport

Prepared By:	**Adam Lasher**	Prepared For:	
	,		,
	Fax:		**Fax:**
Building Sq. Size:	**243000**	Site Sq. Size:	**87120**
Bid Date:	**10/22/2009**	Building use:	**Medical**
No. of floors:	**5**	Foundation:	**CON**
No. of buildings:	**1**	Exterior Walls:	**PRE**
Project Height:	**96**	Interior Walls:	**GYP**
1st Floor Height:	**14**	Roof Type:	**MEM**
1st Floor Size:	**64732**	Floor Type:	**CON**
		Project Type:	**NEW/ADD**

Division		Percent	Sq. Cost	Amount
01	**General Requirements**	**14.92**	**31.52**	**7,658,973**
	General Requirements	14.92	31.52	7,658,973
03	**Concrete**	**13.93**	**29.43**	**7,150,825**
	Concrete	13.93	29.43	7,150,825
04	**Masonry**	**1.38**	**2.91**	**707,211**
	Masonry	1.38	2.91	707,211
05	**Metals**	**3.09**	**6.54**	**1,589,100**
	Metals	3.09	6.54	1,589,100
06	**Wood & Plastics**	**2.93**	**6.18**	**1,502,280**
	Wood & Plastics	2.93	6.18	1,502,280
07	**Thermal & Moisture Protection**	**2.97**	**6.28**	**1,526,986**
	Thermal Moisture Protection	2.97	6.28	1,526,986
08	**Doors & Windows**	**3.93**	**8.31**	**2,019,573**
	Doors & Windows	3.93	8.31	2,019,573
09	**Finishes**	**11.90**	**25.15**	**6,111,473**
	Finishes	11.90	25.15	6,111,473
10	**Specialties**	**0.88**	**1.86**	**452,784**
	Specialties	0.88	1.86	452,784
11	**Equipment**	**1.13**	**2.39**	**579,934**
	Equipment	1.13	2.39	579,934
12	**Furnishings**	**3.88**	**8.20**	**1,991,544**
	Furnishings	3.88	8.20	1,991,544
13	**Special Construction**	**1.05**	**2.21**	**536,895**
	Special Construction	1.05	2.21	536,895
14	**Conveying Systems**	**2.11**	**4.45**	**1,081,950**
	Conveying Systems	2.11	4.45	1,081,950
15	**Mechanical**	**21.80**	**46.07**	**11,194,344**
	Mechanical	21.80	46.07	11,194,344
16	**Electrical**	**14.11**	**29.81**	**7,242,665**
	Electrical	14.11	29.81	7,242,665
Total Building Costs		**100.00**	**211.30**	**51,346,538**
02	**Site Work**	**100.00**	**50.06**	**4,361,317**
	Site Work	100.00	50.06	4,361,317
Total Non-Building Costs		**100.00**	**50.06**	**4,361,317**

Total Project Costs	**--**	**--**	**55,707,855**

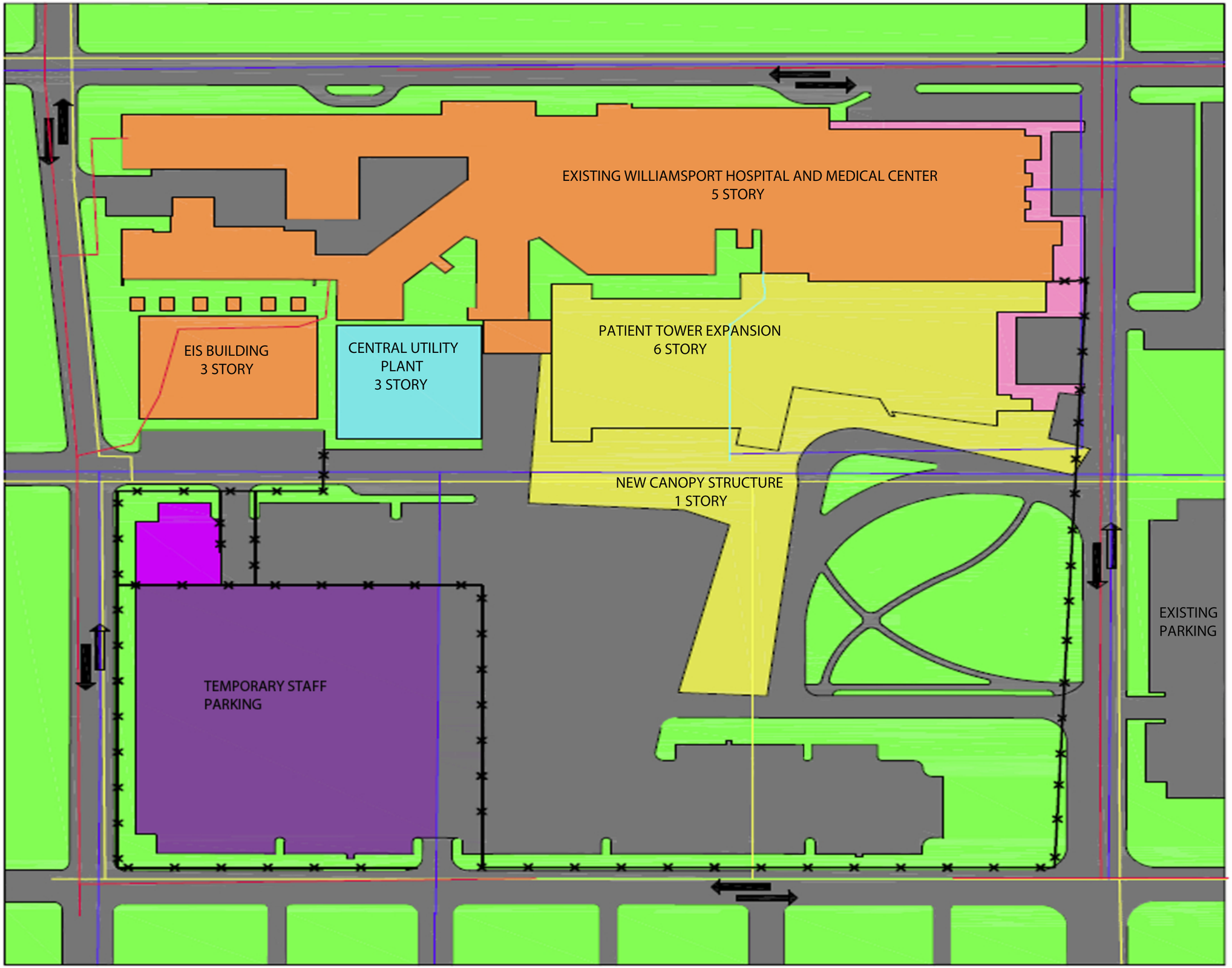
Statement of Probable Cost

Building Division Notes

Patient Tower Expansion - Jul 2009 - PA - Williamsport

Concrete	Formwork, reinforcement, accessories, cast-in-place, curing, cementitious decks & toppings, grout, mass.
Masonry	Masonry & grout, accessories, unit, stone.
Metals	Materials, coatings, fastening, cold formed framing, fabrications, sheet metal, ornamental, expansion control.
Wood & Plastics	Fasteners & adhesives, rough & finish carpentry, wood & metal systems, wood treatment, woodwork, solid polymer fabrications.
Thermal Moisture Protection	Waterproofing, dampproofing, water repellents, vapor retarders, air barriers, insulation, EIFS, fireproofing, firestopping, shingles & roof tiles, membrane roof, traffic coatings, flashing & sheet metal, roof specialties, skylights, joint sealers.
Doors & Windows	Metal doors & frames, wood & plastic doors, door opening assemblies, special doors, entrances & storefronts, metal windows, hardware, glazing, glazed curtainwalls.
Finishes	Metal support systems, lath & plaster, gypsum, tile, terrazzo, acoustical, special wall & ceiling surfaces, resilient, carpet, special flooring & coatings, painting, wall coverings.
Special Construction	Special purpose rooms, sound, vibration, & seismic, radiation, pre-engineered structure, liquid & gas storage tanks, utility control, building automation, fire suppression, special security.
Conveying Systems	Elevators, lifts, material handling systems.
Mechanical	Basic materials & methods, insulation, specialties, plumbing, HVAC, heat generation, refrigeration, heat transfer, air distribution, controls, testing, adjusting & balancing.
Electrical	Basic materials & methods, medium voltage distribution, service & distribution, lighting, special systems, communications, electric resistance heating, controls, testing, adjusting & balancing.

Appendix C: Existing Conditions



LEGEND:

- EXISTING WILLIAMSPORT HOSPITAL AND MEDICAL CENTER
- PATIENT TOWER EXPANSION
- CENTRAL UTILITY PLANT
- AMBULENCE PARKING
- L.F. DRISCOLL TRAILER
- TEMPORARY STAFF PARKING

- CONSTRUCTION FENCE
- WATER
- SANITARY
- GAS
- STORM WATER
- TRAFFIC PATTERNS

SUSQUEHANNA HEATH
PATIENT TOWER EXPANSION

EXISTING CONDITIONS SITE PLAN

OCTOBER 4, 2010

ADAM LASHER CM

Appendix D: Project Delivery System

PROJECT DELIVERY SYSTEM