THE PENNSYLVANIA STATE UNIVERSITY
DEPARTMENT OF ARCHITECTURAL ENGINEERING
SENIOR THESIS

UPMC Passavant Pavilion

Pittsburgh, Pa

Technical Assignment 1

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Executive Summary

This technical report will describe the construction management aspects of the UPMC Passavant Pavilion Addition project located in Pittsburgh, Pennsylvania. UPMC Passavant Pavilion is owned and operated by the University of Pittsburgh Medical Center. The addition and renovation of the project was designed by Burt Hill Architects and constructed by P.J. Dick, Inc both of Pittsburgh, Pa.

Within the report information and summaries will be provide for the following; project schedule, building systems, cost estimates, site plan and existing conditions, local conditions, client information, project delivery, and project staffing.

From this information and summaries many characteristics of the project were found. When comparing cost estimates from RS Means and D4Cost to the actual cost it was found that the estimates were substantially lower than the actual cost. Through the creation of the site plan of existing conditions the true constraints of the building site were made more visible and will help to understand the nature of the work and how the contractors must use coordination and cooperation to complete the project on time and on budget.

The project delivery system and staffing organizational charts provide the same visual representation of the project by allowing the contractual and communication structures to be visualized. This information will aid in the understanding of how and when parties communicate and how communication is made in a manner conducive to maintaining a positive project environment while enabling the parties to work towards project completion.

Throughout the research for this technical report many questions arose that may have bearing on the direction of future technical reports and thesis research. One of these questions is how does the choice of the General Contractor organization structure affect the schedule and budget of the project as opposed to a Construction Management structure? Also, how does the relationship between the subcontractors and the general contractor and the other subcontractors affect the coordination of such a large project.

There are a few aspects of the UPMC Passavant Pavilion project that set it apart from the typical building project. First and foremost is that UPMC has chosen to design and construction the Pavilion in accordance to LEED specifications in order to achieve Certified status. This goal will enable UPMC to move in a direction that is not only financially wise due to the long term cost savings but also in a direction that is environmentally conscious.

Another interesting aspect of the project is the implementation of Field Mobile Documents. A relatively new software system known as FASTTAC is being utilized to maintain an always up-to-date set of plans and as builts on site at all times. This is can be achieved through drawing revisions and mark ups being added directly to the electronic documents through a mobile field unit system. The impacts on construction and the advantages and disadvantages of the use of such a system could provide an excellent research scope for the AE Thesis as the research progresses.

A. Project Schedule Summary

Foundations

The foundation of the Pavilion plays a critical role in the sequencing of the overall project. Two foundation walls are located in the Pavilion with one being at both the east and west elevations of the building. The foundation wall at the east runs the entire width of the building while the wall at the west is only a portion of the width. Due to the east foundation walls' size and location and other site logistics factors the foundations were sequenced from the east to the west.

During excavation pyritic material was encountered and required that the contractor over excavate below the required subgrade level. This then required that the footings for the columns be formed instead of poured in place. The need for footing forms would increase the duration of the activity from what was originally proposed in the project schedule. This subgrade situation was encountered in both the Pavilion and the Central Plant.

Structural System

Since the foundations were sequenced from east to west the structural steel followed suit. The size and spacing of the footings for the columns allowed the crane to pass between them while tracking through the building footprint as the steel erection progressed. The steel was sequenced in two story and two to three bay increments. The majority of the columns were two stories tall and this enabled the erection process to progress faster than if only single story columns were used. Once the columns and beams were erected and the frames were temporarily braced the decking was staged on the floors with the decking on the upper level of the column being installed first so that the next sequence of steel could be erected above per OSHA standards.

Finishes

The finishes for the Pavilion will be sequenced from the Ground Floor and up through the Penthouse. The interior light gauge metal stud walls were installed relativeto the installation of the mechanical rough-ins. Since this is a medical facility plenum space is at a premium and the installation of studs to the underside of floor decks can be difficult if not completed before the mechanical ductwork is installed. With that in mind the interiors contractor sequenced their work, through coordination with the mechanical contractor, so that the walls in these locations could be framed and topped out so that installation was made easier for both parties. Flooring, wall coverings, and ceilings will not be installed until the roof and exterior walls are complete and the building is dried in.

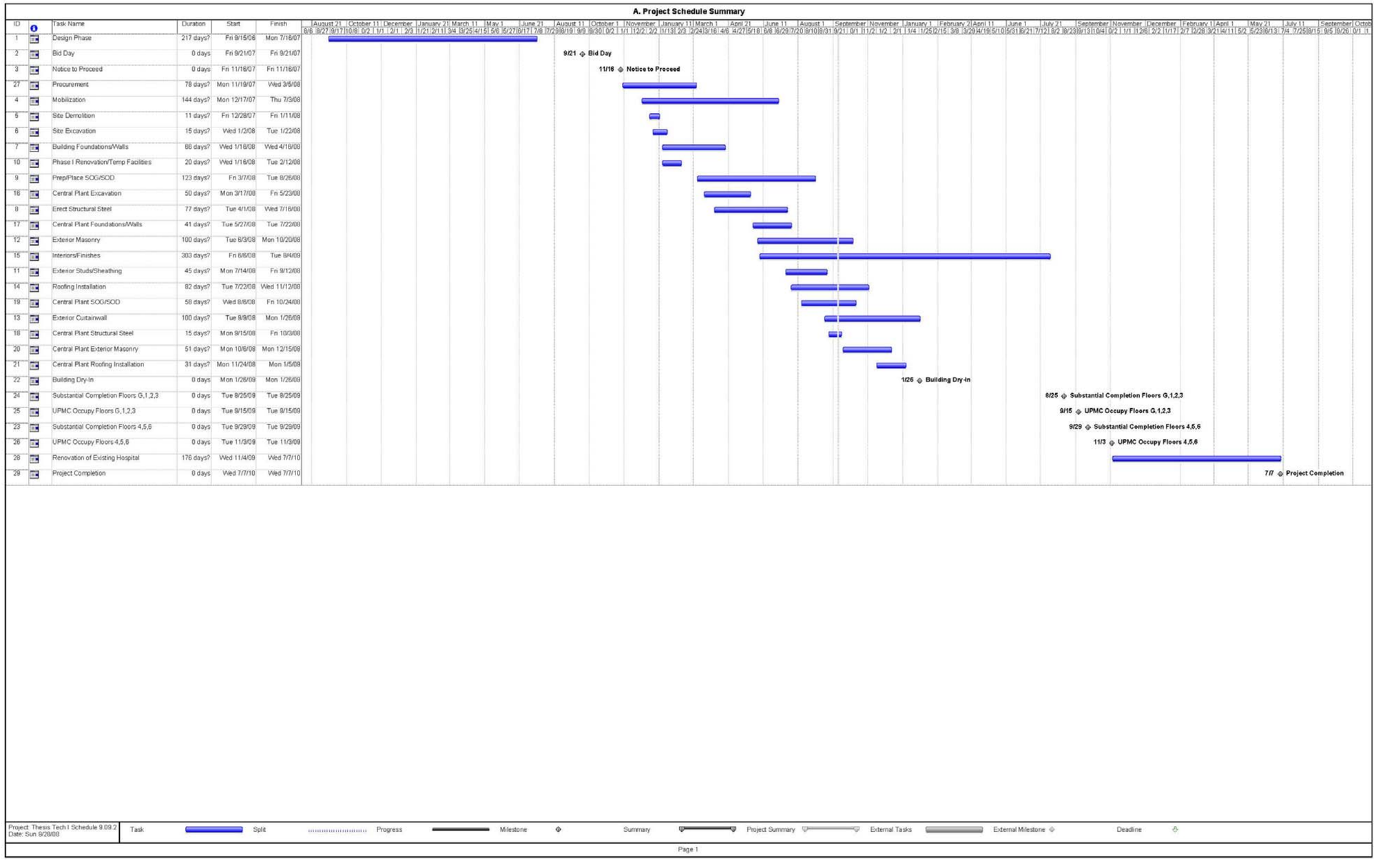

Figure 1 Project Summary Schedule

B. Building Systems Summary

Building Systems Summary				
Yes	No	Scope of Work	Issues	
X		Demolition Required	Materials:	Brick Veneer
				Aluminum/Glass Curtainwall
				Mechanical Duct and Piping
				Electrical
				Lighting Fixtures
				Plumbing
X		Structural Steel Frame	Type of Bracing:	
			Wind :	Braced Frame
			Lateral:	Moment Frame
			SOD:	Composite slab on metal deck with shear studs
				Light weight concrete
			Crane:	
			Size:	220 ton
			Type:	4100 Manitowac Crawler Crane
			Locations:	Crane located within the footprint of the building.
				Erected steel from east to west.
X		Cast in Place Concrete	Formwork:	All column footings formed because of over excavation due to pyritic material.
				Slab edges formed with pour stops or screed angles.
				Construction joints formed at the edge of pours.
			Placement:	All structural cast in place concrete placed through the use of pumps.
	X	Precast Concrete		N/A
X		Mechanical System	Mech. Rm. Locations:	7th Floor Penthouse, Central Plant
			Type of System:	Closed Loop Heating and Cooling Systems
				Majority of system is all air.
			Distribution Systems:	Air Distribution
				Sheet Metal Ductwork. Runs horizontally within the ceiling plenum on floors.
				Vertical risers utilize five shafts to run through the building.
				Chilled Water and Steam Distribution
				Piping runs from the Central Plant into the Pavilion and then vertically through a shaft at the north wall of the east stair tower.
				Piping also runs through the ceiling plenum to reheat coils and radiant heating panels.
			Fire Suppression:	Wet and dry sprinkler systems.
X		Electrical System	Size:	(2) 23kV Duquesne Light Company services
			Capacity:	5000 amps
			Redundancy:	Uninterruptable Power Supply
				(3) 1.5 MW diesel generators. 4160V.
X		Masonry	Load Bearing/Veneer:	Veneer
			Connection Details:	Masonry veneer connected to either CMU or structural sheathing backup with masonry anchors at 16" o.c.
				Where masonry veneer does not begin at ground level or bear on a floor slab it is supported with steel relief angles connected to the edge of slab or beam members.
			Scaffolding:	Walk through masonry scaffold bucks and planks.
X		Curtainwall	Materials:	Wausau Window and Wall Systems-SuperWall System
				Extruded aluminum framing members
				Reflective, Low-E Glazing
				Spandrel and Vision Glass
			Construction Method:	All frames are manufactured by Wausau Window and Wall System and arrive on site fully assembled in one floor bay units.
				Installation is completed by D-M Products.
				Attached to the building with welded lugs or bearing conditions.
			Design Responsibility:	The design and specifications for the curtainwall was completed by the architect. Wausau had to then submit very extensive shop drawings to ensure that the system they were providing would meet the design specifications and intent
X		Support of Excavation	Type:	The excavation of the Central Plant was the only deep excavation that required the use of a support system due to the depth of the cut.
				Soil nails used for support throughout the total depth of the excavation.
				Shotcrete used below grade to elevations where solid rock is was encountered.
			Dewatering System:	The excavations for the foundations of the Pavilion and the Central Plant both required the use of Tuff-N-Dri, a water barrier.
				All excavations required that area be dry before concrete footings and foundations could be installed. Where necessary temporary wellpoints were used to free the area of ground water.

Figure 2 Building Systems Summary

C. Project Cost Evaluation

Construction Costs

The Building Construction Cost for the UPMC Passavant Pavilion can be calculated through the use of the Overall Construction Cost. Building Construction Costs are essentially the Overall Construction Costs less those costs which are associated with the site work packages. The Overall Construction Cost in this case includes the cost of labor and materials plus the general contractor's general .

Overall Construction Cost (OC):	$85,900,000
Less Site Work Costs:	$ 5,347,383
Building Construction Cost (CC):	$80,552,617

Building Construction Cost per square foot can then be calculated from this value. Construction Cost per square foot helps the contractor compare the current project to past projects to evaluate rather or not the project is falling within an acceptable range or if it is coming in off of the normal budget numbers. It can also be used as historical data to compare future projects to.

CC:	$80,552,617
Building Square Footage:	239,400 sq. ft.
CC / SF:	$336.48/sq. ft.

The cost per square foot may be larger than the actual cost due to the nature of the project. UPMC Passavant Pavilion includes the construction of an 8 story, 209,400 sq. ft. addition plus 30,000 sq. ft. of renovation within the existing hospital. The Overall Construction Cost was not reported with regards to the separation of the addition and renovation phases. This combination of the separate phases will then cause the cost per square foot to be a hybrid cost and not a cost per square foot of new construction or of renovation.

The soft costs of the project were withheld due to the competitive nature of the healthcare industry. In order to calculate the Total Project Cost I utilized information from the 2008 RS Means Square Foot Costs 29th Annual Edition. For a 4 – 8 story hospital the fee charged by the Architect is shown to be 9% of the Building Construction Cost. The Architect's Fee is then multiplied by the CC and then added to the CC to obtain the Total Project Cost.

CC:	$80,552,617
Architect's Fee (9%):	$ 7,247,036
Total Project Cost (TC):	$87, 799653
TC / SF:	$366.75

Building Systems Costs

Due to the level of complexity that healthcare facilities have reached the building systems have become equal complex. The mechanical and electrical systems are some of the most complex systems within modern healthcare facilities and can make up the largest portions of the Building Construction Cost (CC). This is evident in the UPMC Passavant Pavilion where the mechanical and electrical systems account for 28% and 17% of the CC respectively.

System	Cost	Cost / SF
Structural	$3,530,000.00	$14.75
Mechanical	$22,926,040.00	$95.76
Electrical	$13,681,330.00	$57.15
Plumbing	$5,125,000.00	$21.41
Fire Protection	$599,500.00	$2.50

Parametric Estimate

D4Cost provides useful tool to allow contractors with limited historical data within their archives to produce a parametric estimate. The software works by utilizing project cost data that is submitted by contractors which is then compiled into a large database. With this database one can then search for projects which are comparable in size and nature to the project for which they are wishing to create an estimate.

The parametric estimate for the UPMC Passavant Pavilion project was created through the use of the steps above. Once comparable projects were found the cost information was then adjusted based on the square footage, 239 000 sf, and construction bid date, September 2007, of the Passavant project. These projects are outlined below.

Lancaster General Hospital

LGH expanded through the construction of a new 4 story building and a 5 ½ story addition to an existing building. Overall the construction effort created about 327,000 sq. ft. of new facilities for the hospital. This project is comparable to the Passavant project in stories, 9 ½ to 8, and in size, 327 000 sq. ft. to 239 400 sq. ft. The data from the LGH project was scaled back to the square footage of Passavant.

The LGH expansion also included 10 new operating rooms and the 5 ½ story addition was entirely comprised of patient rooms. This is comparable to the Passavant Pavilion which included 6 new operating rooms, 3 floors of patient rooms, and 1 floor of ICU rooms. The exterior of the buildings are also similar constructions with both using significant amounts of glass curtain wall with brick masonry accents.

LGH and Passavant differ in their overall intended use because the LGH expansion was primarily an orthopedic hospital while Passavant is intended for more of an overall care approach. UPMC Passavant also contains a very sizeable central plant addition which appears to be larger than the mechanical system included in the LGH project.

LGH was chosen to be used as an estimate of the cost of the Passavant project because of their overall similar usages and scope of construction and limited differences which appear to be minimal and should not affect the comparison too substantially.

Lancaster General Hospital			
Lancaster, Pa			
Division		Cost/SF	Cost
00	Bidding Requirements	$33.36	$6,985,326.00
01	General Requirements	$14.36	$3,007,967.00
03	Concrete	$20.49	$4,290,488.00
04	Masonry	$31.70	$6,638,962.00
05	Metals	$3.68	$770,351.00
07	Thermal & Moisture	$12.24	$2,562,956.00
08	Doors & Windows	$50.93	$10,665,246.00
09	Finishes	$24.37	$5,103,630.00
10	Specialties	$1.83	$383,303.00
11	Equipment	$30.58	$6,403,331.00
12	Furnishings	$4.13	$863,937.00
14	Conveying systems	$6.75	$1,414,224.00
15	Mechanical	$68.66	$14,376,182.00
16	Electrical	$27.89	$5,839,344.00
	Total	$330.97	$69,305,247.00

Figure 3 Lancaster General Hospital Costs. See Appendix B

Connecticut Children's Hospital

Connecticut Children's Hospital is a new facility constructed to house three hospitals which merged to create a more comprehensive care facility. The new hospital is a 9 story, 333 000 sq. ft. building while Passavant is 8 stories and 239 400 sq. ft. Much like the UPMC Passavant Pavilion it houses many different departments which create an overall care facility. With the size and usage of Children's Hospital nearly matching that of Passavant it is a prime choice for a parametric estimate.

Passavant and Children's Hospital differ in their exterior facades. The exterior of Passavant is primarily curtain wall with brick accents while Children's is curtain wall with many "overscaled geometric icons." These exterior features seem to be the only major differences between the two buildings.

Connecticut Children's Hospital			
Hartford, Connecticut			
Division		Cost/SF	Cost
00	Bidding Requirements	$3.14	$658,073.00
01	General Requirements	$11.55	$2,418,172.00
03	Concrete	$21.23	$4,446,411.00
04	Masonry	$9.74	$2,040,026.00
05	Metals	$26.67	$5,583,797.00
06	Wood & Plastics	$3.02	$632,536.00
07	Thermal & Moisture	$8.95	$1,874,034.00
08	Doors & Windows	$13.74	$2,876,858.00
09	Finishes	$33.02	$6,914,675.00
10	Specialties	$2.20	$459,669.00
11	Equipment	$1.69	$353,591.00
12	Furnishings	$6.06	$1,268,018.00
13	Specialties	$1.67	$349,663.00
14	Conveying systems	$5.52	$1,156,047.00
15	Mechanical	$69.65	$14,583,678.00
16	Electrical	$34.34	$7,191,655.00
	Total	$252.19	$52,806,903.00

Figure 4 Connecticut Children's Hospital Costs. See Appendix B

Utah Valley Regional Medical Center

The Utah Valley Regional Medical Center is a 5 story, 220 000 sq. ft. addition and renovation of a maternal and childcare facility. Included in the new building are patient, delivery, recovery, and ICU rooms. These features and the size of Utah Valley closely match that of UPMC Passavant and provide a basis for a parametric estimate.

Utah Valley Regional Medical Center			
Provo, Utah			
Division		Cost/SF	Cost
01	General Requirements	$12.44	$2,605,652.00
03	Concrete	$40.79	$8,540,694.00
04	Masonry	$0.87	$182,984.00
05	Metals	$22.28	$4,664,650.00
06	Wood & Plastics	$15.71	$3,288,808.00
07	Thermal & Moisture	$25.27	$5,291,051.00
08	Doors & Windows	$22.26	$4,662,102.00
09	Finishes	$27.15	$5,685,080.00
10	Specialties	$2.70	$564,587.00
11	Equipment	$1.52	$318,163.00
12	Furnishings	$0.79	$164,949.00
14	Conveying systems	$12.04	$2,520,197.00
15	Mechanical	$77.67	$16,264,569.00
16	Electrical	$62.06	$12,995,027.00
	Total	$323.55	$67,748,513.00

Figure 5 Utah Valley Regional Medical Center Costs. See Appendix B

When comparing the above three projects to UPMC Passavant Pavilion it is best to average the costs so that a more accurate estimate can be made. Below are the averages calculated from the project costs shown above.

Comparision of Projects			
Division		Cost/SF	Cost
00	Bidding Requirements	$12.17	$658,073.00
01	General Requirements	$12.78	$2,418,172.00
03	Concrete	$27.50	$4,446,411.00
04	Masonry	$14.10	$2,040,026.00
05	Metals	$17.54	$5,583,797.00
06	Wood & Plastics	$6.24	$632,536.00
07	Thermal & Moisture	$15.49	$1,874,034.00
08	Doors & Windows	$28.98	$2,876,858.00
09	Finishes	$28.18	$6,914,675.00
10	Specialties	$2.24	$459,669.00
11	Equipment	$11.26	$353,591.00
12	Furnishings	$3.66	$1,268,018.00
13	Specialties	$0.56	$349,663.00
14	Conveying systems	$8.10	$1,156,047.00
15	Mechanical	$71.99	$14,583,678.00
16	Electrical	$41.43	$7,191,655.00
	Total	$302.24	$52,806,903.00

Figure 6 Parametric Estimate Cost Comparison

The average costs for the parametric estimate are less than those of the Passavant Pavilion. The cost per square foot for Passavant was calculated as $336.48/sf and the total cost was $80,552,617. There is a significant difference between the costs from the parametric estimate and the actual costs of the project. This could be attributed to the fact that D4Cost only reports the Building Construction Cost without overhead and profit and other fees. Costs for the Passavant Pavilion include these additional costs since the percentages for the above mentioned fees were not disclosed. The costs can also vary due to the nature of the projects. Not every construction project has the same conditions. UPMC Passavant is an addition and renovation project of an operating hospital. Of the three comparison projects two were additions and renovations and one was new construction. When renovating existing structures, especially those that remain in operation throughout construction, the costs will vary from project to project due to the unknowns associated with the work.

Square Foot Estimate

When determining the feasibility of a construction project it is often helpful to develop a square foot estimate based off of historical data so that a general cost can associated to the project and the owner and design team know what the budget should look like prior to thorough design. If a company does not have a substantial database of historical projects they can utilize the RS Means Square Foot Costs. This resource provides costs for many types of commercial and residential projects and can be very helpful in determining an early budget.

UPMC Passvant Pavilion is an 8 story hospital so when performing the square foot estimate M.340 Hospital 4-8 story should be chosen. Once the appropriate type of building is selected the cost per square foot can be interpolated from the charts based on the square footage of the building, the exterior wall construction and the superstructure type.

Since UPMC Passavant's exterior wall construction is primarily aluminum and glass curtain wall, which is not one of the options within the RS Means chart, an exterior wall of face brick with structural facing tile was chosen with the intention of adjusting for the curtain wall later in the estimate.

Once the cost per square foot is established from the chart it became necessary to make adjustments based on the differences of the building in question and the model building used in the RS Means estimate. The first two adjustments are based on the linear footage of the perimeter and story height. If these either of these differ from the model cost it is essential to adjust the cost according to the values given in the chart.

When computing the square foot cost assemblies costs are given as well. If the assemblies of the model building do not match those of the building in question they can be adjusted using the assemblies section of the Square Foot Costs volume of RS Means or the RS Means Assemblies Cost Data. Below are the steps and calculations used in determining the square foot cost of the UPMC Passavant Pavilion.

RS Means Estimate		Cost/S.F.		
Exterior Wall	Sq. Ft Area	200000	209400	225000
	L.F. Perimeter	866	842	950
Face Brick with Structural Facing Tile	Steel Frame	$233.70	$232.99	$231.80
Perimeter Adj. +/-	Per 100 L.F.	$2.05	$2.09	$1.90
Story Ht. Adj. +/-	Per 1 ft.	$1.35	$1.35	$1.35

Figure 7 RS Means Estimate. See Appendix A

No perimeter adjustment is needed due to the perimeter, 842 L.F., of the building falling within the range, 866 and 950, of the RS Means values. The story height, however, does need to be adjusted due to the model building story height being 12' and Passavant's being 13'.

13 ft -12 ft =1ft x $1.35/ ft = $1.35 Story Height Adjustment

Adjustments	
SF Cost	$232.99
Perimeter Adj.	$0.00
Story Ht. Adj.	$1.35
Total SF Cost	$234.34

Figure 8 RS Means Adjustments.

Adjustments		Model	UPMC	SF Cost
				$234.34
Exterior Enclosure	-	$12.47	$9.22	$231.09
Roofing	-	$1.16	$3.43	$233.36
Roof Construction	-	$1.32	$0.51	$232.55
Electrical(Generators)	+	$4.11	$3.02	$239.68

Figure 9 RS Means Assemblies Adjustments. See Appendix A.

When evaluating the assemblies within the RS Means estimate it was determined that some of the systems did not match those of the Passavant Pavilion. To recalculate the cost for each assembly the model cost was subtracted from the square foot cost and the new cost added in.

The exterior enclosure system was the first assembly that was changed. RS Means' model had a face brick on structural sheathing exterior while Passavant is constructed of curtain wall, brick veneer, metal panels, translucent panels, and louvers. The square footages of the wall construction are shown in the breakdown of the adjustments in the appendices. Louvers and translucent panels were not included in the RS Means assemblies data and as such were grouped into the metal panels and curtain wall sections respectively.

Roofing also differed from the model when comparing it to the Passavant project. The model used a built up roof while Passavant is using a thermoplastic polyolefin (TPO). Data contained within RS Means did not include TPO systems so an EPDM roofing system was chosen as a substitute within the estimate. The roofing structural system was also adjusted to a steel joist system instead of the steel beam system utilized in the model.

The final adjustment that was made was the addition of two 1.5 MW generators to the estimate. One 800kW generator was included in the estimate along with an uninterrupted power supply system. This was the only mechanical system that was adjusted within the square foot estimate because the RS Means data does not contain systems as large as those within the Passavant Pavilion.

These adjustments lead to a total cost per square foot and a total building cost as shown below.

Building Cost per SF:	$239.68
Building Construction Cost:	$239.68/sf x 239,400 sf = $57,379,392

The square foot cost for RS Means also includes the Architect's fee which is not included in the actual or the D4 estimated Building Construction Cost. This, therefore, needs to be extracted to be able to compare the costs on a level field.

Building Construction Cost without Architect's Fee:	$239.68/sf / 1.09 = $219.89 / sf
Building Construction Cost:	$52,641,666

Cost Comparison

Building Construction Costs	Actual	D4	RS Means
Construction Cost / SF	$336.48	$302.24	$219.89
Construction Cost	$80,552,617	$52,806,903.00	$52,641,666

Figure 10 Cost Estimate Comparison

The actual costs and the D4 and RS Means estimates can now be compared and analyzed. As shown above the actual costs are far greater than that of the D4 and the RS Means estimates. This can be due to a number of factors. First and foremost the scope of the Passavant Pavilion is far different from those used in the other estimates. This is due to the nature of the addition and renovation portions of the project. Also the cost of fuel and materials has increased drastically and cannot be projected any significant time into the future. The increase in material and fuel costs can be a major difference between the actual and they D4 estimate because it is based on historical data and may not include the increases from the past few years.

The difference in the square foot estimate from RS Means and the actual cost can be attributed to the scope of the projects. The RS Means model is based on new construction while the Passavant project is an addition and renovation. Passavant also contains a great amount of mechanical equipment which could not be included in the square foot estimate due to the lack of information within the RS Means data. Also the actual cost contains contractor overhead and profit costs while neither of the other estimates do.

D. Site Plan of Existing Conditions

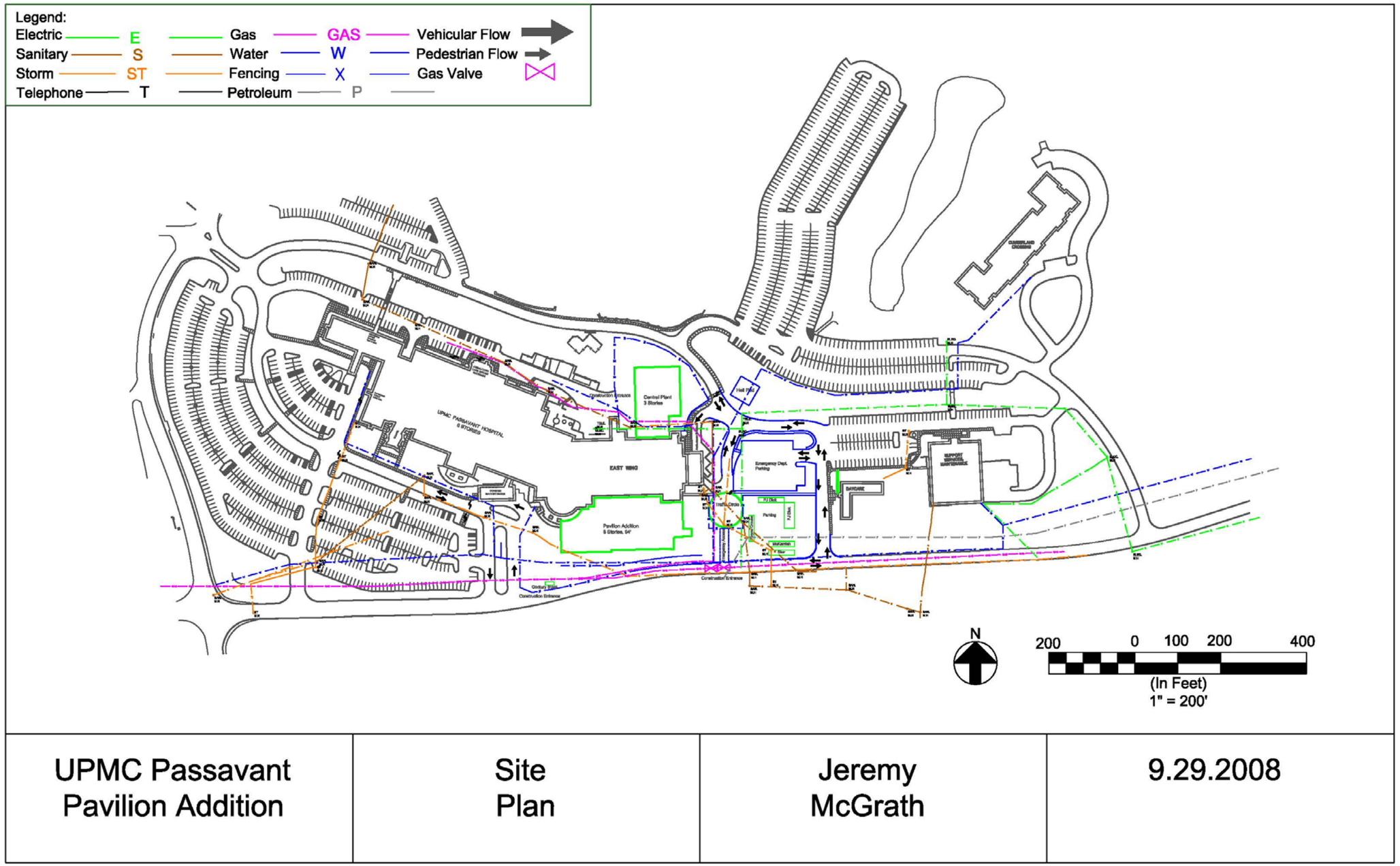

Figure 11 Site Plan

E. Local Conditions

Regional Construction Method

The UPMC Passavant Pavilion is being constructed in Pittsburgh, Pennsylvania. Due to its location within the heart of the steel production region of the United States structural steel is the predominant construction material of choice. Steel fabrication and erection are procured as one package in this region of the country. The entire steel package is awarded to the steel fabricator who then typically subcontracts the erection portion of the package to a separate steel erection entity or to their own steel erection subsidiary. This method helps to ensure proper coordination between the two entities which may not occur if the two contracts are held by the general contractor.

Labor

Pittsburgh and Pennsylvania, in general, are deeply rooted in organized labor. On many projects this requires that all contractors used, either employ union workers or pay the state mandated prevailing wage as set by the Department of Labor and Industry. In many situations project labor agreements are signed between the labor unions and general contractor that ensures that only union labor is used on the project. These labor agreements require that all subcontracts created by the general contractor be awarded to union companies unless the subcontract is for specialty work for which no union holds jurisdiction.

When working with unions, strikes and labor stoppages can be an issue if they interfere with the completion of the project. One way to alleviate this situation is for the owner, general contractor and labor unions to enter into a project stabilization agreement. This agreement ensures that the project is completed without a labor stoppage. These types of agreements and assurances are critical in delivering a very important facility such as a hospital on time and on budget.

Construction Parking

Due to the size and significance of operations occurring on the UPMC Passavant Campus construction parking is not allowed on site. PJ Dick staff and contractor foremen are allowed to park within the confines of the site trailer area but all tradesmen must park off campus. At the beginning of construction parking was allowed east of the site on Cumberland Road, which is a private road owned by UPMC. A parking lot at the end of Cumberland Road was part of the site package and once it was completed the trades parking was moved to this area. In both situations UPMC provided shuttle service to and from the parking areas and the construction site. This service ran from 5:45 to 8:30 in the morning and from 2:15 until 4:00 in the afternoon which encompassed all start and finish times for the various trades.

Recycling and Tipping

The Passavant Pavilion project utilizes Empire Roll-Off of Imperial, Pa for refuse removal and dumpster services. After pulling the dumpsters from the site Empire returns to their yard and sorts the refuse for

all recyclables and records the weight and percentage of each material. This process is utilized to comply with the LEED requirements as this project strives to achieve LEED Certified status.

This process was chosen over sorting the refuse on site due to the size and constraints of the construction site. If individual dumpsters were utilized on the Passavant site, space would be taken away from other operations such as steel lay down and material stock piling.

There is a premium charged for this type of service with each dumpster pull costing about $500 each. Due to the current state and instability in fuel prices there is also a fuel charge of $45 that is added to each pull. This brings the total cost for one dumpster pull to be about $545.

Soil and Subsurface Water Conditions

The subsurface soil and water report was conducted through the extraction of 8 test bores, 2 within the footprint of the Central Plant and 6 within that of the Pavilion. All borings found an area of clay and shale from 3 feet to 12 thick across the entire site with much of the thickness being attributed to previous re-grading of the area. These fill materials were found in all borings except; B-6, B-7, and B-8 at the south elevation of the proposed Pavilion. Below the clay layer of the borings lies a layer of gray silty and sandy shale. This layer was formed in place from the decomposition of the underlying bedrock layers. The moisture content of this layer ranged between 6% and 12% with an average of about 9%.

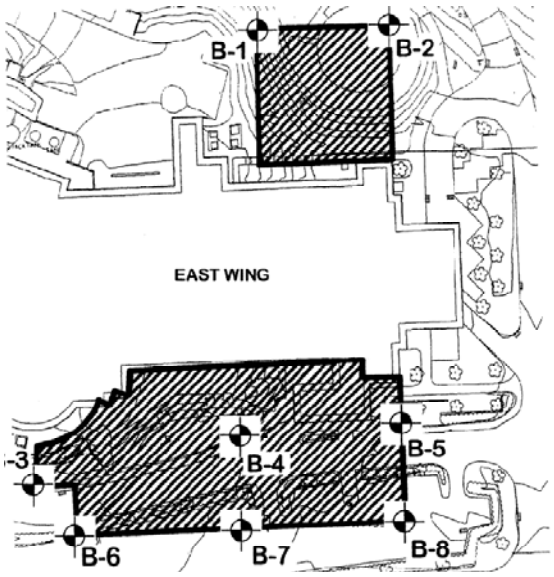

Figure 12 Boring Locations

Siltstone and shale bedrock was encountered at depths of between 3 feet and 18 feet within the confines of the Pavilion and about 3 feet within that of the Central Plant. All footings and foundations should bear on this layer of bedrock. If shallow foundations are required they are to be designed for soil bearing strengths of 12,000 per square foot. Any undercutting required to have foundations bear on the 12,000 psf layer should be replaced with lean concrete fill.

See the 12,000 psf bearing elevations in Figure ## to the right. The elevations throughout the site will vary from those listed and as such requires that all excavation be monitored.

Test Boring	Approx. Surface Elevation (ft)	Approx. 12,000 PSF Bearing Elev. (ft)
B-1	1135.1	1129.0
B-2	1145.5	1131.0
B-3	1134.7	1119.0
B-4	1134.7	1144.5
B-5	1133.1	1115.0
B-6	1133.1	1115.1
B-7	1134.2	1116.0
B-8	1132.7	1112.0

Figure 13 12,000 psf bearing elevations

All excavations below 6 feet in depth are likely to encounter a hard layer of bedrock and will required the use of special excavation tools such as hoe rams and rock breakers. The rock layer was also tested for pyritic properties due to slab heaving that has been observed in the existing structures. Although results of these tests were not included in the soil

report and it was to be expected that pyritic material would be encountered throughout the site which was the case during excavation. As called for in the soil report the areas in which these materials were found needed to be over excavated and brought back to subgrade elevation with offsite, inert fill.

The encountering of ground water is to be expected during the course of excavation on site, although no ground water was encountered during the boring operations. The ground water that is shown on the boring samples is a result of the use of drilling fluid. The soils report calls for a waterproofing layer to be installed on the subgrade. This was achieved through the use of Tuff-N-Dri, a spray on bitumen based waterproofing material. Ground water was encountered during the course of excavation of the Central Plant and needed to be remediated as required by the soil report before concrete could be placed in these areas.

Weather Conditions

Precipitation

The area surrounding UPMC Passavant normally receives about 38 inches of precipitation, a mix of rain and snow, a year with a record of 53 inches. In the previous year only 33 days had a rainfall total over 0.50 inches. The annual snowfall is typically about 41 inches per year with the record being 70 inches. These averages are relatively low compared with other areas of Western Pennsylvania and should not have a great impact on the schedule of construction unless an above average amount of precipitation falls within a short period of time.

Temperature

The average temperature for the period between December and March is about 32^{o}F with a range of 25^{o}F to 45^{o}F. For April and May the average is around 55^{o}F with a range of 40^{o}F to 70^{o}F. June, July and August provide the warmest average temperature for the area with an average of about 71^{o}F and a range from about 60^{o}F to 80^{o}F. The average temperature between September and November is about 53^{o}F with a range of 35^{o}F to 70^{o}F.

F. Client Information

The owner of the project is the University of Pittsburgh Medical Center (UPMC). UPMC is a network of twenty hospitals and other medical care sites throughout Western Pennsylvania. UPMC's mission is 'To provide outstanding patient care to shape tomorrow's health system through clinical innovation, biomedical and health services research, and education.' They were ranked 14th among 'America's Best Hospitals' by U.S. News & World Reports. In order to achieve their mission and continue to be one of the best hospitals in the country UPMC has chosen to expand and renovate Passavant Hospital and many of their other facilities. These renovation and expansion efforts are a result of their need to better serve the community through larger and more cutting edge facilities.

UPMC expects that the Passavant Pavilion project will be delivered in a manner that is conscious of cost and quality. They believe this can be accomplished through closely monitoring the construction efforts through a staff of onsite project managers and consultants. Costs are tracked by their staff through bi-weekly cost meetings with the general contractor and architect. Schedule concerns are also closely related to cost and quality and the owners are very cognizant of slips in the schedule and how they can affect the bottom line. With this in mind they have tried to work with the contractors by authorizing overtime and off hours work to ensure that everything is completed on time.

Safety is an important issue on any project, but could be more closely scrutinized due to UPMC ownership and the magnitude of the project. Like any project the goal is to have zero accidents or injuries not only to protect the health and welfare of the workers but also to keep the project in a positive light with the general public. Any accident on a job of this size and with hospital ownership could negatively affect the public's outlook on the project. The safety of the workers isn't the only important aspect of the project's overall safety plan, however, since the work is occurring so closely to an existing hospital facility. The safety of the general public is of utmost concern to both the ownership and the contractors. The interaction between construction and the general operations of the hospital are to be kept separate but cannot always be conducted in such a manner. When the unavoidable situations arise it is up to the contractors to use due diligence to avoid any incidences with the public.

Sequencing is of great interest to UPMC because the construction schedule and their future schedule of operations are very closely linked. If the addition is not complete on time they cannot move into the new building and in turn the renovation of the existing East Wing cannot begin. This creates a situation in which the expected revenues from the new facility cannot be realized at the time that they were planned for. Not only does that affect their own corporate revenues but also that of the doctors which utilize the facility for their practices.

Since the Pavilion addition is an 8 story structure it allows for phased occupancy. This is being achieved by occupying the Ground – 3rd floors in September of 2009 and then occupying the remaining floors at the beginning of November of the same year. This enables UPMC to transfer the different departments to their new facilities and enables them to have a smooth transition period once the renovation work begins in the existing building. This situation allows them to utilize the new facility in the generation of

revenue sooner than if they were to wait until the entire building was complete to begin to use the new building.

The keys to completing the project to the owner's satisfaction is to meet all of their wants and needs as stated above. This can be accomplished by working closely with UPMC to control the costs and the schedule, which are very closely linked, of the project. The quality must also meet the expectations of the ownership and meet industry standards because the final product will be in the constant view of the general public and will be scrutinized daily. The atmosphere of the project should also be kept as professional and friendly as possible to avoid any hard feelings that may erode the cooperation of any party involved within the project team. The task of completing a project of this size is a team effort and as such requires that all parties work closely together and be on good terms so that the goal can be achieved.

G. Project Delivery System

Project Delivery

The project delivery method for the UPMC Passavant Pavilion is Design-Bid-Build with a general contractor. This method was chosen for the project because it allows for the most complete design before construction begins. Due to the complexity of the systems within a healthcare facility it is key to have a complete, or nearly complete, design before bids are submitted and construction commences. This enables the contractors to submit accurate bids to the owner and architect and there are no bidding assumptions being made as there would be if the project was design-build.

PJ Dick Inc. was chosen by UPMC to serve as the general contractor on the Passvant project. They were chosen on the basis of their bid and their pre-qualifications. The contractual relationship between the two parties is based on a lump sum contract. The contracts between PJ Dick and the subcontractors are also lump sum contracts, however, the MEP contractors were chosen in a slightly different manner than the general contractor. Due to the size and complexity of the scope of the mechanical, electrical, and plumbing work within the project UPMC was part of the selection process of these contractors. Prior to bidding the project, all MEP contractors submitting bids were involved in the value engineering process. This enabled UPMC and PJ Dick to choose the contractors based on best value and not necessarily lowest bid which could ultimately provide them with a higher quality product.

The project delivery method and the contractual relationships between the parties appears to be the most appropriate system for this project. Using a Design-Bid-Build method enables the design of the project to be nearly complete before the project is sent out to bid and enables the contractors to provide an accurate estimate of the project costs. This method accompanied by the general contracting scenario allows the owner to oversee both sides of the design and construction.

Project Organizational Chart

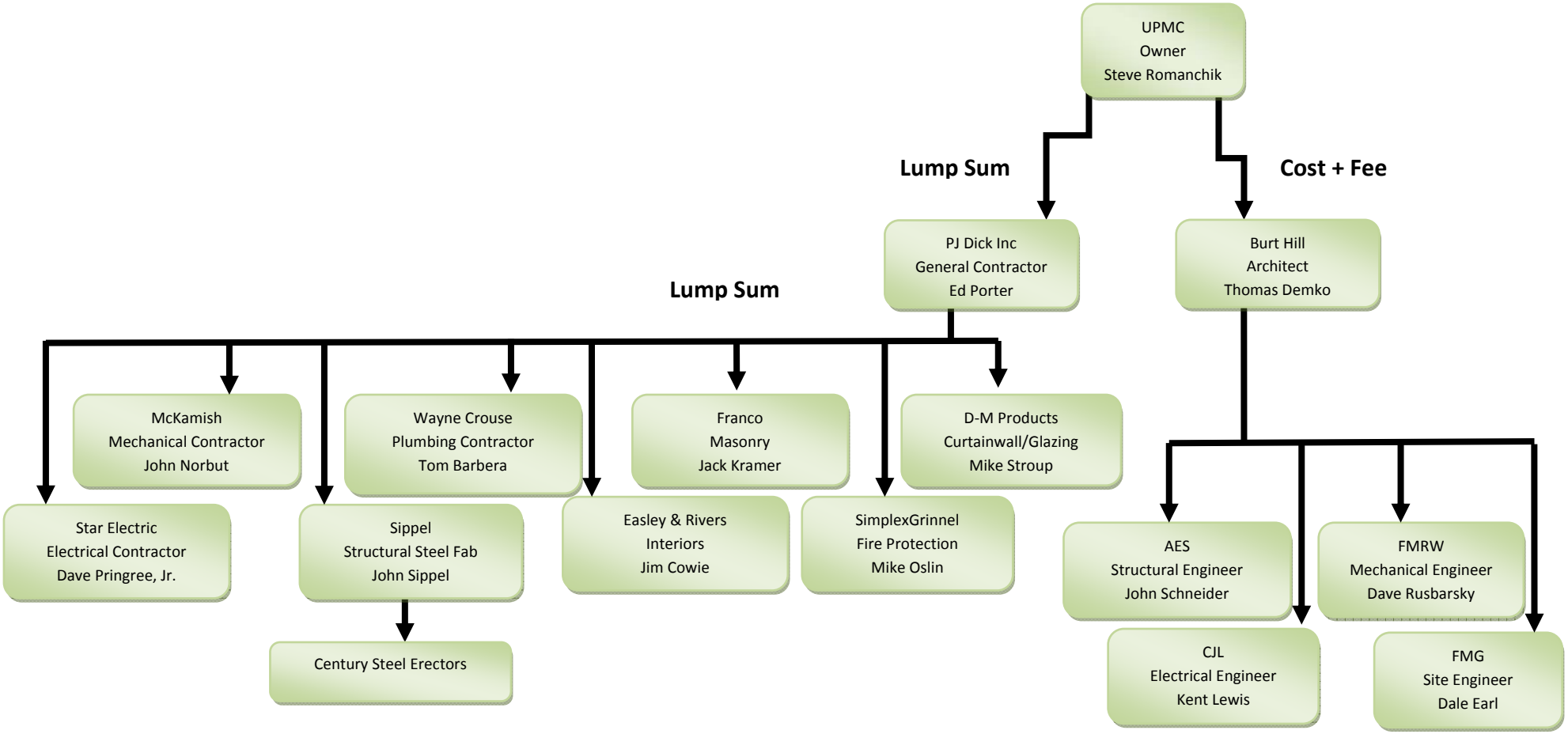

Figure 14 Project Organization Chart

Bonds and Insurance

UPMC requires performance and labor and material bonds for the Passavant project. All bonds obtained by the contractors are to be for the full contract sum. These bonds help to ensure that the project will be completed in the event that the contractor is in default of their contract and cannot or does not complete their work. In the event that this occurs the surety company which issues the bonds will be required to solicit bids and ensure that the work will be completed in accordance with the original contract.

The bid documents and the construction contract require that any contractor bidding the project and those selected to construct the project be fully insured. This requires that the contractors provide valid proof that they have both general liability and automobile liability insurance.

The owner of the project is to carry general liability insurance which fully insures their operations within the construction site. In addition to the general liability insurance the owner is also required to purchase property insurance which is written on a builder's risk "all risk" basis. This builder's risk insurance is to cover the original contract sum plus any modifications that are made to that sum. Builder's risk coverage includes loses due to fire, acts of God, vandalism, and mischief. The owner's builder's risk policy covers replacement cost of the building and does not include construction trailers, tools and equipment, or personal effects not included in the contract work.

All insurance policies, excluding worker's compensation, obtained and carried by the contractor are required to include as additionally insured the following parties; The University of Pittsburgh of the Commonwealth System of Higher Education, UPMC Passavant and the University of Pittsburgh Medical Center, the Owners and/or Developers, and Burt Hill and their consultants. This ensures that all parties that are affiliated with the construction project are covered by all forms of insurance.

H. Staffing Plan

The organizational structure of the project team is typical of a general contractor on a project of this size. At the top of the project team is Ed Porter the Project Executive. He oversees the cost and contract administration of the job while managing other jobs for the company. Under his supervision is Tom Berkebile, Project Manager, and Ralph Melocchi, the Superintendent. Tom is responsible for the cost and schedule of the project. He is also primarily responsible for divisions 2 through 7 of the specifications. Under his direct report are the Project Engineers, Dean Marraccini and Kristin Majcher. Kristin's primary responsibility lies in the handling of divisions 8 through 14. She is also responsible for the cost reporting and change order documentation onsite. Dean is responsible for the MEP work on the project, divisions 15 and 16. He works closely with the MEP contractors to coordinate the work in the field and was also in charge of running the preconstruction coordination meetings.

Ralph reports directly to the Ed and is responsible for ensuring that the project stays on schedule and budget while managing the work in the field. Under his direct report are the Assistant Superintendent and the Area Superintendents who deal with more of the day to day issues in the field. They are responsible for portions of the project and focus on the production and quality within that area.

All of the above mentioned field staff is located within the field office at the UPMC Passavant site. Their location on the site aids in their ability to coordinate and manage the work more efficiently than if they were remote from the site. It also aids in the relationship with the owner since all members of the project team are on site and the owner's representatives can meet with the staff whenever a question or concern arises.

Organizational Chart

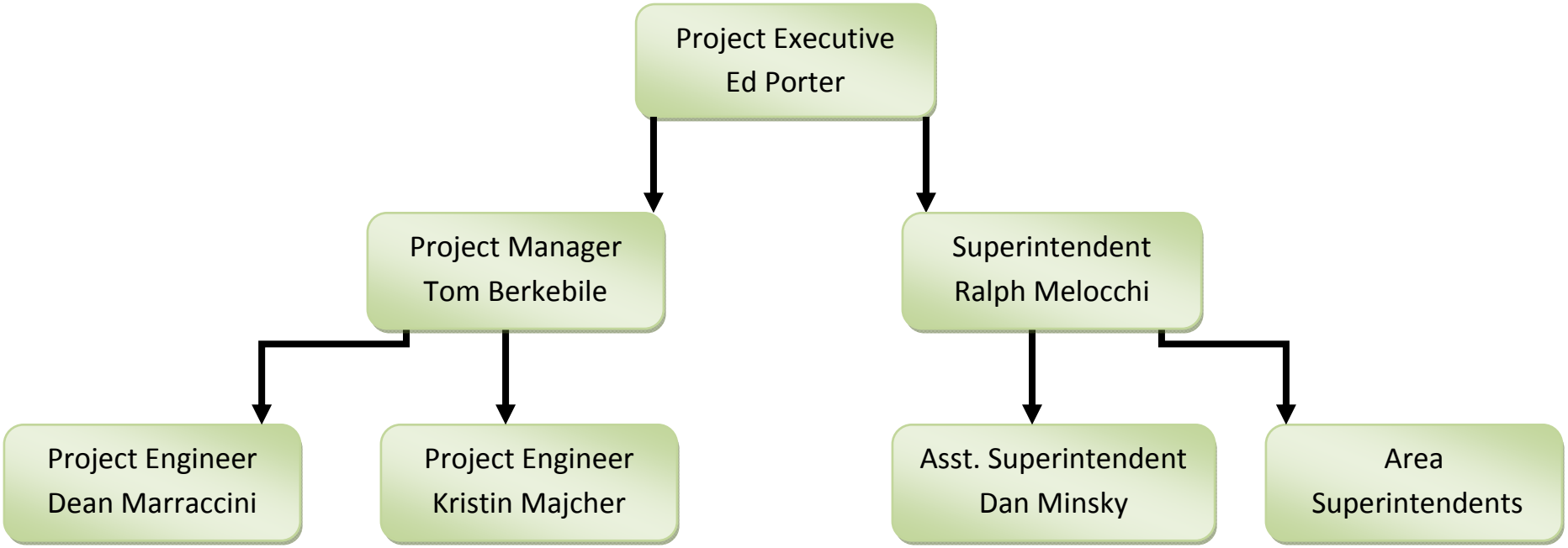

Figure 15 Staffing Chart

Appendix A

RS Means Data

R.S. Means Square Foot Cost Data

COMMERCIAL/INDUSTRIAL/INSTITUTIONAL | **M.340** | **Hospital, 4-8 Story**

Costs per square foot of floor area

Exterior Wall	S.F. Area	100000	125000	150000	175000	200000	225000	250000	275000	300000
	L.F. Perimeter	594	705	816	783	866	950	1033	1116	1200
Face Brick with Structural Facing Tile	Steel Frame	252.95	246.70	242.50	236.10	231.70	231.80	230.35	229.15	228.10
	R/Conc. Frame	262.40	256.00	251.80	245.35	242.95	241.05	239.55	238.30	237.30
Face Brick with Concrete Block Backup	Steel Frame	247.30	241.10	236.95	231.20	228.90	227.05	225.55	224.45	223.45
	R/Conc. Frame	258.50	252.35	248.20	242.45	240.10	238.30	236.85	235.70	234.65
Precast Concrete Panels With Exposed Aggregate	Steel Frame	249.85	243.65	239.50	233.55	231.20	229.40	227.90	226.75	225.75
	R/Conc. Frame	259.35	253.15	249.00	243.05	240.70	238.90	237.40	236.25	235.25
Perimeter Adj., Add or Deduct	Per 100 L.F.	4.15	3.30	2.75	2.35	2.05	1.90	1.60	1.50	1.40
Story Hgt. Adj., Add or Deduct	Per 1 Ft.	1.85	1.75	1.70	1.40	1.35	1.35	1.30	1.30	1.30
For Basement, add $31.25 per square foot of basement area										

The above costs were calculated using the basic specifications shown on the facing page. These costs should be adjusted where necessary for design alternatives and owner's requirements. Reported completed project costs, for this type of structure, range from $151.70 to $369.90 per S.F.

Common additives

Description	Unit	$ Cost
Cabinets, Base, door units, metal	L.F.	243
Drawer units	L.F.	480
Tall storage cabinets, 7' high, open	L.F.	455
With doors	L.F.	690
Wall, metal 12-1/2" deep, open	L.F.	180
With doors	L.F.	325
Closed Circuit TV (Patient monitoring)		
One station camera & monitor	Each	1750
For additional camera add	Each	940
For automatic iris for low light add	Each	2425
Hubbard Tank, with accessories		
Stainless steel, 125 GPM 45 psi	Each	26,800
For electric hoist, add	Each	2925
Mortuary Refrigerator, End operated		
2 capacity	Each	12,500
6 capacity	Each	22,500

Description	Unit	$ Cost
Nurses Call Station		
Single bedside call station	Each	299
Ceiling speaker station	Each	136
Emergency call station	Each	182
Pillow speaker	Each	286
Double bedside call station	Each	365
Duty station	Each	310
Standard call button	Each	157
Master control station for 20 stations	Each	5775
Sound System		
Amplifier, 250 watts	Each	2225
Speaker, ceiling or wall	Each	181
Trumpet	Each	345
Station, Dietary with ice	Each	16,300
Sterilizers		
Single door, steam	Each	161,500
Double door, steam	Each	207,500
Portable, counter top, steam	Each	3875 - 6050
Gas	Each	40,000
Automatic washer/sterilizer	Each	55,500

150

Important: See the Reference Section for Location Factor

Model costs calculated for a 6 story building with 12′ story height and 200,000 square feet of floor area

Hospital, 4-8 Story

				Unit	Unit Cost	Cost Per S.F.	% Of Sub-Total
A. SUBSTRUCTURE							
1010	Standard Foundations	Poured concrete; strip and spread footings		S.F. Ground	13.08	2.18	
1020	Special Foundations	N/A		–	–	–	
1030	Slab on Grade	4" reinforced concrete with vapor barrier and granular base		S.F. Slab	6.97	1.16	2.1%
2010	Basement Excavation	Site preparation for slab and trench for foundation wall and footing		S.F. Ground	.15	.03	
2020	Basement Walls	4' foundation wall		L.F. Wall	70	.30	
B. SHELL							
	B10 Superstructure						
1010	Floor Construction	Concrete slab with metal deck and beams, steel columns		S.F. Floor	19.13	15.94	10.1%
1020	Roof Construction	Metal deck, open web steel joists, beams, interior columns		S.F. Roof	7.92	1.32	
	B20 Exterior Enclosure						
2010	Exterior Walls	Face brick and structural facing tile	70% of wall	S.F. Wall	39.09	8.53	
2020	Exterior Windows	Aluminum sliding	30% of wall	Each	523	3.26	7.3%
2030	Exterior Doors	Double aluminum and glass and sliding doors		Each	4770	.68	
	B30 Roofing						
3010	Roof Coverings	Built-up tar and gravel with flashing; perlite/EPS composite insulation		S.F. Roof	6.96	1.16	0.7%
3020	Roof Openings	Roof hatches		S.F. Roof	.18	.03	
C. INTERIORS							
1010	Partitions	Gypsum board on metal studs with sound deadening board	9 S.F. Floor/L.F. Partition	S.F. Partition	6.69	7.43	
1020	Interior Doors	Single leaf hollow metal	90 S.F. Floor/Door	Each	869	9.64	
1030	Fittings	Hospital curtains		S.F. Floor	.93	.93	
2010	Stair Construction	Concrete filled metal pan		Flight	9700	1.26	24.5%
3010	Wall Finishes	40% vinyl wall covering, 35% ceramic tile, 25% epoxy coating		S.F. Surface	3.19	7.08	
3020	Floor Finishes	60% vinyl tile, 20% ceramic, 20% terrazzo		S.F. Floor	9.84	9.84	
3030	Ceiling Finishes	Plaster on suspended metal lath		S.F. Ceiling	5.76	5.76	
D. SERVICES							
	D10 Conveying						
1010	Elevators & Lifts	Six geared hospital elevators		Each	187,667	5.63	3.3%
1020	Escalators & Moving Walks	N/A		–	–	–	
	D20 Plumbing						
2010	Plumbing Fixtures	Kitchen, toilet and service fixtures, supply and drainage	1 Fixture/416S.F. Floor	Each	2658	6.39	
2020	Domestic Water Distribution	Electric water heater		S.F. Floor	4.61	4.61	6.7%
2040	Rain Water Drainage	Roof drains		S.F. Floor	3.30	.55	
	D30 HVAC						
3010	Energy Supply	Oil fired hot water, wall fin radiation		S.F. Floor	3.13	3.13	
3020	Heat Generating Systems	Hot water boilers, steam boiler for services		Each	27,625	.34	
3030	Cooling Generating Systems	Chilled water units		S.F. Floor	2.67	2.67	19.2%
3050	Terminal & Package Units	N/A		–	–	–	
3090	Other HVAC Sys. & Equipment	Conditioned air with reheat, operating room air curtains		S.F. Floor	26.75	26.75	
	D40 Fire Protection						
4010	Sprinklers	Wet pipe sprinkler system		S.F. Floor	2.16	2.16	1.5%
4020	Standpipes	Standpipe		S.F. Floor	.46	.46	
	D50 Electrical						
5010	Electrical Service/Distribution	4000 ampere service, panel board and feeders		S.F. Floor	3.84	3.84	
5020	Lighting & Branch Wiring	Hospital grade light fixtures, receptacles, switches, A.C. and misc. power		S.F. Floor	17.11	17.11	15.6%
5030	Communications & Security	Alarm systems, internet wiring, communications system, emergency lighting		S.F. Floor	1.75	1.75	
5090	Other Electrical Systems	Emergency generator, 800 kW with fuel tank, uninterruptible power supply		S.F. Floor	4.11	4.11	
E. EQUIPMENT & FURNISHINGS							
1010	Commercial Equipment	N/A		–	–	–	
1020	Institutional Equipment	Medical gases, curtain partitions		S.F. Floor	11.85	11.85	9.0 %
1030	Vehicular Equipment	N/A		–	–	–	
2020	Other Equipment	Patient wall systems		S.F. Floor	3.65	3.65	
F. SPECIAL CONSTRUCTION							
1020	Integrated Construction	N/A		–	–	–	0.0 %
1040	Special Facilities	N/A		–	–	–	
G. BUILDING SITEWORK		**N/A**					
					Sub-Total	171.53	**100%**
	CONTRACTOR FEES (General Requirements: 10%, Overhead: 5%, Profit: 10%)				25%	42.87	
	ARCHITECT FEES				9%	19.30	
					Total Building Cost	**233.70**	

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RS Means Square Foot Cost Adjustments

Adjustments							
Enclosure	Description	Unit	Unit Cost	S.F. of Wall	Cost	S.F. of Bldg	Cost/SF of Bldg
B2020 220 Curtain wall panels	1400 1" thick units, 2 lites, 1/4" float, clear	S.F. Wall	$27.40	39302	$1,076,874.80	239400	$4.50
B2020 210 Tubular aluminum Framing	2150 5'x20' opening, three intermediate horizontals	S.F. Wall	$22.15	31206	$691,212.90	239400	$2.89
B2010 130 Brick Veneer/Metal Stud	5400 16 ga. 3-5/8" LB 16" o.c. Running bond	S.F. Wall	$24.35	14815	$360,745.25	239400	$1.51
B2010 146 Metal Siding Panel	3250 24 ga. colored	S.F. Wall	$6.15	12842	$78,978.30	239400	$0.33
						Total	$9.22

Adjustments							
Enclosure	Description	Unit	Unit Cost	S.F. of Roof	Cost	S.F. of Bldg	Cost/SF of Bldg
B3010 120 Single Ply Membrane	2000 EPDM 45 mils, fully adhered	S.F.	$27.40	30000	$822,000.00	239400	$3.43
						Total	$3.43

Adjustments							
Superstructure	Description	Unit	Unit Cost	S.F. of Roof	Cost	S.F. of Bldg	Cost/SF of Bldg
B1020 112 Steel Joists, Beams, & Deck	4100 30x30 Bays	S.F.	$6.81	18000	$122,580.00	239400	$0.51
						Total	$0.51

Adjustments							
Electrical	Description	Unit	Unit Cost	kW	Cost	S.F. of Bldg	Cost/SF of Bldg
D5090 Generators	1400 1000kW Generator	kW	$240.95	3000	$722,850.00	239400	$3.02
						Total	$3.02

Appendix B

D4Cost Data

D4Cost Parametric Estimate Sheets

Utah Valley Regional Medical Center

Sunday, September 21, 2008 Page 1

Statement of Probable Cost

Senior Thesis Tech 1 - Sep 2007 - PA - Pittsburgh

Prepared By:	Jeremy McGrath	Prepared For:	Penn State AE Senior Thesis
	State College, Pa, pa		State College, Pa
	Fax:		Fax:
Building Sq. Size:	209400	Site Sq. Size:	70000
Bid Date:	4/1/1997	Building use:	Medical
No. of floors:	5	Foundation:	CON
No. of buildings:	1	Exterior Walls:	CUR
Project Height:	80	Interior Walls:	DRY
1st Floor Height:	18.6	Roof Type:	EPD
1st Floor Size:	55910	Floor Type:	TIL
		Project Type:	ADD/REN

Division		Percent	Sq. Cost	Amount
01	**General Requirements**	3.85	12.44	2,605,652
	General Requirements	3.85	12.44	2,605,652
03	**Concrete**	12.61	40.79	8,540,694
	Concrete	12.61	40.79	8,540,694
04	**Masonry**	0.27	0.87	182,984
	Masonry	0.27	0.87	182,984
05	**Metals**	6.89	22.28	4,664,650
	Metals	6.89	22.28	4,664,650
06	**Wood & Plastics**	4.85	15.71	3,288,808
	Wood & Plastics	4.85	15.71	3,288,808
07	**Thermal & Moisture Protection**	7.81	25.27	5,291,051
	Thermal & Moisture Protection	7.81	25.27	5,291,051
08	**Doors & Windows**	6.88	22.26	4,662,102
	Doors & Windows	6.88	22.26	4,662,102
09	**Finishes**	8.39	27.15	5,685,080
	Finishes	8.39	27.15	5,685,080
10	**Specialties**	0.83	2.70	564,587
	Specialties	0.83	2.70	564,587
11	**Equipment**	0.47	1.52	318,163
	Equipment	0.47	1.52	318,163
12	**Furnishings**	0.24	0.79	164,949
	Window Treatment	0.24	0.79	164,949
14	**Conveying Systems**	3.72	12.04	2,520,197
	Conveying Systems	3.72	12.04	2,520,197
15	**Mechanical**	24.01	77.67	16,264,569
	Mechanical	24.01	77.67	16,264,569
16	**Electrical**	19.18	62.06	12,995,027
	Electrical	19.18	62.06	12,995,027
Total Building Costs		100.00	323.54	67,748,512
02	**Site Work**	100.00	52.34	3,663,607
	Landscaping	7.49	3.92	274,554
	Site Work	92.51	48.42	3,389,053
Total Non-Building Costs		100.00	52.34	3,663,607

Statement of Probable Cost

Project Notes

Senior Thesis Tech 1 - Sep 2007 - PA - Pittsburgh

Estimate Based On Case: MD000514 - Utah Valley Regional Medical Ctr
Location: UT - Provo
Date: Apr 1997
Building Size: 218,213

* Provo, Utah.
* Construction Period May 1997 to May 1999.

Special Project Notes

Expanded maternal and childcare needs were met with 220,000 square feet of new additions and renovations to the Utah Valley Regional Medical Center. The facility now accommodates a labor and delivery unit, a mother/baby unit, nurseries, newborn intensive care unit, a pediatric intensive care unit and women's and children's outpatient services.

A healing environment was created at Utah Valley Regional Medical Center with patients surrounded by the most up-to-date technology, concerned physicians and caregivers as well as family and friends. Spacious delivery rooms, an outpatient surgical services area that's doubled in size, larger post-partum rooms with private bathrooms and a newborn intensive care unit (NICU) housing the latest medical
equipment all provide care to Utah Valley patients. Many windows, maximizing natural light and comfortable waiting areas for family members and friends also makes the West Building a place that promotes caring and healing.

In the labor and delivery unit, 18 large rooms ensure mom and family members a comfortable birthing experience. Each room has special extras including jetted tubs for delivering moms. The labor and delivery program is designed around the labor delivery recover (LDR) concept with decentralized caregiver workstations. Direct adjacency to individually customized NICU pods and elevator connection to
obstetrics and pediatric inpatient services provides a fully integrated center of excellence.

In the mother/baby unit, mother and baby can enjoy their time post-partum in one of 36 private rooms -- each with a private bathroom. These rooms are designed to provide a comfortable setting where mother, baby and family can spend time together including overnight stays. The medical center's larger nursery provides the opportunity for babies to be examined by staff while allowing the new mother the flexibility of having the baby stay when she is resting. Two NICU areas accommodate 49 babies. Large windows allow babies to heal in a natural light environment. Family members can relax close to their children in the comfort of a parent lounge. Mom and baby are also provided accommodations to sleep next to each other -- enjoying a healing touch.

Utah Valley Regional Medical Center's pediatric acute care unit capacity has increased from 26 to 33. The pediatric intensive care rooms are state-of-the art with central and video monitoring. In each patient room, there is a parent area where a parent may rest or spend the night. A parent lounge with a snack area and sleeping rooms for the pediatric intensive care parents is also located in the pediatric intensive care area. A child life specialist supervises two play areas for patients -- from toddlers to teens. A bright mural, neon lights and decor of suns, moons and stars throughout the unit provide a creative environment for children.

In addition to women's and children's services, the second floor allows for needed adult critical care expansion space. Eight surgical beds, nine medical beds and eight coronary care beds make up the new adult ICU. The nurses' station is placed so patients in every room can be seen easily, helping nurses respond quickly to critical needs.

MANUFACTURERS/SUPPLIERS

Exterior Walls- EIFS: Dryvit; Coiling Doors & Grilles: Cookson; Entrances & Storefronts, Curtainwall: EFCO Corporation; Glass: Interpane.
Roof- EPDM: Firestone; Roof Insulation: Firestone ISO95; Skylights: Kalwall; Smoke Vents: Milcor.
Floors- Grout: MAPEI.
Interior Walls- Fireproofing: W.R. Grace; Columns, Ceiling Cove - Hi-Tech Smooth Finish, Ultra-Cast: Knight Avante; Hollow Metal Frames & Doors: Steelcraft; Wood Doors: Weyerhaeuser; Hardware: Hager Companies, Yale, Norton, National Guard Products, Inc.; Fire Rated Partitions: Won-Door; Operable Partitions: Modernfold; Acoustical Treatment: Armstrong; Paint: Sherwin Williams; Zolatone Multicolor.
Elevators- KONE.

* Photo courtesy: Ed LaCaffe

Connecticut Children's Hospital

Thursday, September 25, 2008 Pa

Statement of Probable Cost

Senior Thesis Tech I - Jun 2007 - PA - Pittsburgh

Prepared By:		Prepared For:	
	HKS, Inc. 700 N. Pearl St., #1100 Dallas, TX 75201 Fax:		Fax:
Building Sq. Size:	209400	Site Sq. Size:	152460
Bid Date:	5/1/1983	Building use:	Medical
No. of floors:	9	Foundation:	CON
No. of buildings:	1	Exterior Walls:	CUR
Project Height:	129	Interior Walls:	GYP
1st Floor Height:	14	Roof Type:	MEM
1st Floor Size:	69011	Floor Type:	CAR
		Project Type:	NEW

Division		Percent	Sq. Cost	Amount
00	**Bidding Requirements**	1.25	3.14	658,073
	Bidding Requirments	1.25	3.14	658,073
01	**General Requirements**	4.58	11.55	2,418,172
	General Requirements	4.58	11.55	2,418,172
03	**Concrete**	8.42	21.23	4,446,411
	Concrete	8.42	21.23	4,446,411
04	**Masonry**	3.86	9.74	2,040,026
	Masonry	3.86	9.74	2,040,026
05	**Metals**	10.57	26.67	5,583,797
	Metals	10.57	26.67	5,583,797
06	**Wood & Plastics**	1.20	3.02	632,536
	Wood & Plastics	1.20	3.02	632,536
07	**Thermal & Moisture Protection**	3.55	8.95	1,874,034
	Thermal & Moisture Protection	3.55	8.95	1,874,034
08	**Doors & Windows**	5.45	13.74	2,876,858
	Doors & Windows	5.45	13.74	2,876,858
09	**Finishes**	13.09	33.02	6,914,675
	Finishes	13.09	33.02	6,914,675
10	**Specialties**	0.87	2.20	459,669
	Specialties	0.87	2.20	459,669
11	**Equipment**	0.67	1.69	353,591
	Equipment	0.67	1.69	353,591
12	**Furnishings**	2.40	6.06	1,268,018
	Furnishings	2.40	6.06	1,268,018
13	**Special Construction**	0.66	1.67	349,663
	Special Construction	0.66	1.67	349,663
14	**Conveying Systems**	2.19	5.52	1,156,047
	Conveying Systems	2.19	5.52	1,156,047
15	**Mechanical**	27.62	69.65	14,583,678
	Mechanical	27.62	69.65	14,583,678
16	**Electrical**	13.62	34.34	7,191,655
	Electrical	13.62	34.34	7,191,655
Total Building Costs		100.00	252.18	52,806,902
02	**Site Work**	100.00	40.96	6,244,276
	Site Work	100.00	40.96	6,244,276
Total Non-Building Costs		100.00	40.96	6,244,276
Total Project Costs		--	--	59,051,177

Thursday, September 25, 2008 Page

Statement of Probable Cost

Project Notes

Senior Thesis Tech I - Jun 2007 - PA - Pittsburgh

Estimate Based On Case: MD970139 - Connecticut Children's Hospital
Location: CT - Hartford
Date: Jun 1993
Building Size: 332,979

* Hartford, Connecticut
* Construction Period Dec 93 to Feb 96

Special Project Notes

This project is the result of a merger of three children's hospitals to provide comprehensive pediatric care for the greater Hartford area.

Design considerations centered on the functional efficiencies required in today's rapidly changing healthcare environment as well as the aesthetic quality appropriate for a stand alone pediatric hospital.

The new hospital is comprised of four major building components: diagnostic and treatment services and ambulatory clinics; patient care services; and elevator tower and mechanical interstitial mezzanine.

The facility will provide the children of Hartford a giant "toy", a place that brings smiles and excitement in place of the fear and cries common to a hospital. The entrances to the hospital are identified with bold forms- a cone, cube and sphere-and the use of vibrant color.

Functionally, the hospital serves a major outpatient component. These services were grouped on the first and second floors to provide easy access and designed with separate waiting areas and doctors' offices for each individual specialty.

The inpatient will be cared for in a private room with parent rooming-in privileges. These rooms have bay windows with floor to ceiling glass along the curved facade or large windows along the flat side of the curve.

Since the hospital is moving from a wooded campus to a dense urban environment, views from the hospital will be somewhat less inviting. To combat this, a proposed drive-in movie screen will be located on the facade of an adjacent multistory garage, with hopes that Bugs Bunny might pop up from time to time to be viewed by patients from their rooms or small seating areas within the hospital. In addition, the site required attention due to several factors, including limited site area, the fact that the site slopes 15 feet from one side to the other, and the need to provide both bridge and tunnel connections to Hartford Hospital.

The patient care tower was designed as a half cylinder configuration, reflecting the functional consideration of minimizing walking distances from the elevator core. The patient unit literally fans out from the elevators so that walking distances are equidistant to all patient bedrooms. A second patient care tower is planned to fan out in the opposite direction in the future.

Orientation was achieved by overscaled geometric icons identifying the major entrances of the hospital. The geodesic sphere identifies the main entry, the cube represents the ambulatory care entrance and eccentric cove signifies the walk-in emergency entrance. These forms are easily identified by patients to ease their wayfinding.

Suppliers/Manufacturers

Exterior Walls -
Curtainwall, Windows: Kawneer
Glazed Brick: Stark Ceramics
Tile: Latoo
Metal Doors & Frames: Curries
Wood Veneer Frame Doors: Weyerhaeuser
Mask Door: Stanley
Roll-Up Door: Overhead Door Co.
Sliding Glass Doors: Stanley, Bifold
Security Doors: Mosler
Roof -
Single-Ply: Carlisle SynTec
Skylights: Super Sky
Floors -
Carpet: Pacific Crest, Queen
Tile: Dal-Tile, Florida Tile
Vinyl: Mannington
Vinyl Sheet: Armstrong
Rubber: Freudenberg Building Systems

Statement of Probable Cost

Project Notes

Senior Thesis Tech I - Jun 2007 - PA - Pittsburgh

Rubber Base: Roppe
Interior Walls - Gypsum Board: Georgia-Pacific, National Gypsum, United States Gypsum; Operable Partitions: Hufcor, Won Door; Vinyl Wallcovering: Koroseal; Acoustical Treatment: Armstrong; Paint: Glidden; Toilet & Bath Accessories: McKinney, Bimns, JBJ; Toilet Partitions: Monarch.

* Photo courtesy: Robert Benson Photography.
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Lancaster General Hospital

Thursday, September 25, 2008 — Page

Statement of Probable Cost

Senior Thesis Tech I - Sep 2007 - PA - Pittsburgh

Prepared By:	**IKM Incorporated Architects** **One PPG Place** **Pittsburgh, PA 15222** **Fax:**	Prepared For:	**Fax:**
Building Sq. Size:	**209400**	Site Sq. Size:	**222156**
Bid Date:	**8/1/2003**	Building use:	**Medical**
No. of floors:	**8**	Foundation:	**CON**
No. of buildings:	**3**	Exterior Walls:	**MAS**
Project Height:	**119.4**	Interior Walls:	**MSD**
1st Floor Height:	**15.4**	Roof Type:	**MEM**
1st Floor Size:	**57000**	Floor Type:	**CON**
		Project Type:	**NEW**

Division		Percent	Sq. Cost	Amount
01	**General Requirements**	**10.08**	**33.36**	**6,985,326**
	Tower Bond	0.10	0.32	67,875
	Tower Supervision	0.56	1.86	389,707
	Construction Aids	0.28	0.94	196,968
	Temp Const Controls	0.15	0.50	104,887
	Dumpster	0.09	0.31	64,033
	Tower Final Cleaning	0.06	0.21	44,953
	Offsite Parking Allowance	0.04	0.12	25,613
	Allowances	0.56	1.86	389,981
	Change Orders	-2.19	-7.26	-1,520,112
	General Conditions	5.06	16.73	3,503,543
	General Condition Overtime	0.40	1.31	275,061
	Temp Offices	0.72	2.38	499,309
	General Requirements	0.34	1.11	233,350
	Surveys	0.27	0.90	188,613
	Overtime	0.12	0.38	80,427
	Insurance	1.06	3.51	733,990
	General Conditions 2	0.46	1.51	317,208
	P & P Bonds	0.15	0.48	100,672
	Allowances 2	0.27	0.89	185,697
	Office Shell Space	0.03	0.09	19,210
	Change Orders #2	-3.02	-9.99	-2,091,835
	Fee	1.74	5.76	1,206,571
	Overhead & Overtime	1.79	5.92	1,239,634
	Overtime Bid Package 8	0.02	0.05	10,540
	Contigency	0.00	0.01	1,358
	James Street Addition Bond	0.06	0.19	39,975
	James Street Super/Labor	0.54	1.78	373,607
	James Street Constr Aids	0.15	0.51	107,192
	James Street Temp Constr Contr	0.03	0.09	17,929
	James Street Dumpster Allowance	0.05	0.15	32,017
	James Street Final Cleaning	0.02	0.08	17,289
	James Street Field Office	0.02	0.08	16,649
	James Street Parking Allowance	0.04	0.12	25,613
	James Street ICRA Allowance	0.09	0.31	64,033
	James Street Change Orders	0.03	0.11	23,773
03	**Concrete**	**4.34**	**14.36**	**3,007,967**
	Concrete Saw Cutting	0.03	0.10	21,131
	Tower Formwork	0.14	0.47	97,971
	Shearwall Formwork	0.13	0.43	89,288
	Column Formwork	0.02	0.07	15,368
	12-Inch Formwork	0.22	0.74	154,167
	Reinforcing	0.09	0.29	61,472
	Shearwall Reinforcing	0.12	0.38	79,914
	Slab Reinforcing	0.12	0.40	83,692
	Wire Mesh	0.06	0.21	44,823
	Misc Accessories	0.05	0.17	34,578
	Foundation Accessories	0.03	0.10	21,771
	Flatwork Accessories	0.09	0.28	58,911
	Place & Finish Foundations	0.14	0.48	99,636
	Place & Finish Shearwall	0.07	0.23	48,025
	Place & Finish Columns	0.03	0.10	20,170

	Place & Finish Elevator Tower	0.10	0.35	72,678
	Place & Finish 12-Inch Slab	0.11	0.36	75,521
	Place & Finish 3rd & 4th Fl	0.09	0.28	58,911
	Place & Finish 5th Fr	0.16	0.54	112,899
	Place & Finish 6th Fl	0.16	0.54	112,899
	Place & Finish 7th Fl	0.16	0.54	112,899
	Place & Finish 8th Fl	0.15	0.49	102,453
	Sawcutting 2	0.09	0.30	63,585
	Underpinning	0.09	0.31	64,033
	Footing Concrete	0.28	0.92	192,100
	Wall Concrete	0.27	0.89	185,997
	Column Concrete	0.07	0.24	51,227
	Slab on Grade	0.06	0.18	38,420
	Slab on Deck	0.11	0.37	76,840
	Rebar	0.07	0.24	51,227
	Wire Mesh 2	0.01	0.05	9,605
	James Street Foundation Reinforcing	0.12	0.38	80,042
	James Street Wire Mesh	0.03	0.10	20,491
	James Street Accessories	0.01	0.03	6,403
	James Street Formwork	0.14	0.47	97,820
	James Street Place & Finish Foundations	0.13	0.42	88,238
	James Street Place & Finish Slab	0.15	0.48	100,916
	James Street Place & Finish 2nd Flr Slab	0.15	0.48	100,916
	James Street Place & Finish 3rd Fl Slab	0.15	0.48	100,916
	James Street Place & Finish Slab Roof	0.15	0.48	100,916
04	**Masonry**	**6.19**	**20.49**	**4,290,488**
	CMU Foundation to 4th Fl	0.39	1.29	269,708
	CMU Masonry 5th to 9th Fl	0.34	1.12	234,362
	Brick Veneer	0.01	0.04	9,221
	CMU Garage	0.31	1.03	215,152
	CMU Entrance	0.65	2.14	448,233
	Interior CMU	0.35	1.14	239,485
	Site Walls	0.23	0.76	160,083
	Brick Garage	0.26	0.86	179,293
	Brick Entrance	0.65	2.14	448,233
	Brick Site	0.06	0.18	38,420
	Granite	0.13	0.42	87,685
	Granite Entrance	0.32	1.05	220,275
	Granite Site	0.28	0.92	192,100
	Limestone	0.62	2.06	431,585
	Composite Limestone Panels	0.20	0.67	140,873
	Cast Stone Garage	0.11	0.37	76,840
	Cast Stone Entrance	0.06	0.21	44,823
	Brick Pavers	0.06	0.20	40,981
	James Street Block	0.35	1.17	244,095
	James Street Masonry Brick	0.22	0.73	152,271
	James Street Masonry Brick Lime St	0.23	0.75	156,113
	James Street Masonry Brick Lime St 2	0.23	0.75	156,113
	James Street Precast/Granite	0.15	0.50	105,143
05	**Metals**	**9.58**	**31.70**	**6,638,962**
	Misc Metals Tower	0.06	0.19	39,060
	Misc Metal	0.12	0.40	83,243
	Architectural Metal	0.05	0.17	35,859
	Metal Stair 4	0.06	0.18	38,420
	Glass Railing	0.38	1.27	265,098
	Steel Overtime	0.03	0.11	22,012
	Structural Steel Bid Pack 2	7.87	26.04	5,453,799
	Structural Steel	0.65	2.15	449,167
	Metal Fabrications	0.14	0.46	96,342
	Shop Drawing Review	0.03	0.10	21,364
	James Street Misc Metals Allowance	0.02	0.06	12,807
	James Street Misc Metals 2	0.15	0.50	105,143
	James Street Surgical Supports	0.02	0.08	16,849
06	**Wood, Plastics, and Composites**	**1.11**	**3.68**	**770,151**
	Rough Carpentry Tower	0.13	0.44	92,592
	Rough Carpentry 2	0.18	0.58	121,663

	Millwork	0.09	0.29	61,472
	Millwork Material	0.33	1.10	230,520
	Millwork Install	0.17	0.55	115,260
	Partitions	0.11	0.37	76,840
	James Street Rough Carpentry	0.10	0.34	72,004
07	**Thermal and Moisture Protection**	**3.70**	**12.24**	**2,562,956**
	Expansion Joint Covers	0.11	0.37	76,840
	Dampproofing Tower	0.01	0.03	5,635
	EIFS Panels Caulking	0.09	0.29	61,349
	EIFS Panels Fabrication	1.16	3.85	805,283
	EIFS Panel Installation	0.18	0.61	128,067
	EIFS Field Installed	0.11	0.37	76,840
	EIFS Shop Drawings	0.03	0.11	23,052
	Fireproofing Elevator Tower	0.11	0.38	79,401
	Fireproofing Overbuild	0.26	0.87	181,855
	Roofing Material	0.23	0.77	162,260
	Roofing Labor	0.10	0.33	69,540
	Firestopping	0.07	0.24	51,227
	Fire Caulking	0.01	0.05	10,245
	Caulking	0.01	0.03	6,531
	Waterproofing	0.03	0.09	17,929
	Dampproofing 2	0.01	0.02	5,123
	Fireproofing	0.16	0.52	108,857
	EIFS	0.04	0.15	30,736
	Roofing	0.20	0.67	140,873
	Caulking 2	0.03	0.10	20,491
	James Street Expansion Joint	0.03	0.11	23,052
	James Street Dampproofing	0.01	0.03	6,659
	James Street Fireproofing Gr Fl	0.06	0.19	40,085
	James Street Fireproofing Main Fl	0.06	0.19	40,085
	James Street Fireproofing 2nd Fl	0.06	0.19	40,085
	James Street Fireproofing 3rd Fl	0.06	0.19	40,085
	James Street Roofing Material	0.22	0.74	154,730
	James Street Roofing Labor	0.10	0.32	66,313
	James Street EIFS	0.08	0.25	53,212
	James Street Caulking	0.02	0.06	12,166
	James Street Fire Stopping	0.04	0.12	24,351
08	**Openings**	**15.39**	**50.93**	**10,665,246**
	Curtainwall Remove & Replace	0.08	0.27	56,734
	Curtainwall Engineering	0.26	0.86	179,293
	Curtainwall Tower & Courtyard	0.42	1.40	293,785
	Link Curtainwalls	0.30	1.01	211,310
	Curtainwall South Elevation	0.42	1.38	289,302
	Curtainwall East Elevation	0.55	1.83	384,200
	Curtainwall North Elevation	0.39	1.28	267,651
	Hollow Metal Frames	0.08	0.27	55,709
	Doors	0.14	0.48	100,148
	Hardware	0.10	0.34	70,437
	Frames Hardware Install	0.06	0.21	44,823
	Automatic Swing Opener	0.04	0.14	28,943
	Glass & Glazing	0.02	0.05	10,501
	Aluminum Curtainwall	7.23	23.91	5,007,587
	Hollow Metal Doors & Frames	0.12	0.40	83,243
	Door Operators	0.02	0.06	12,807
	Curtainwall 2	3.36	11.13	2,330,389
	Interior Glazing	0.04	0.15	30,736
	James Street Hollow Metal Material	0.05	0.15	31,353
	James Street Doors Material	0.10	0.34	70,547
	James Street Hardware Material	0.08	0.26	54,869
	James Street Hardware Install	0.04	0.13	26,894
	James Street ICU Doors	0.01	0.05	10,245
	James Street Automatic Doors	0.06	0.20	40,981
	James Street Glass	0.03	0.09	19,396
	James Street Curtainwall Engineering	0.18	0.61	128,067
	James Street Curtainwall S Elevation	0.39	1.30	272,142
	James Street Curtainwall E Elev	0.42	1.38	289,431
	James Street Curtainwall E Elev 2	0.38	1.26	263,524
09	**Finishes**	**7.36**	**24.37**	**5,103,630**
	Mechanical Room Floor Covering	0.06	0.21	44,183

	Gypsum Metal Studs	0.59	1.96	410,454
	Gypsum Exterior Sheating	0.04	0.15	30,736
	Gypsum Insulation	0.15	0.49	102,453
	Drywall	0.53	1.76	368,832
	Gypsum System Finish	0.23	0.75	156,241
	Ceramic Tile	0.01	0.04	7,556
	Linear Metal Ceiling	0.01	0.03	6,403
	Acoustical Grid System	0.10	0.33	69,156
	Acoustical Tile	0.19	0.63	131,409
	Carpet	0.02	0.06	11,654
	Sheet Vinyl Material	0.39	1.28	268,940
	Sheet Vinyl Labor	0.18	0.61	127,478
	VCT	0.03	0.10	21,387
	VCT Base	0.04	0.13	26,395
	Epoxy Flooring	0.07	0.23	47,891
	Paint	0.11	0.37	78,313
	Vinyl Wall Covering	0.17	0.56	116,413
	Drywall 2	1.32	4.37	915,676
	Stone Flooring	0.52	1.71	358,587
	Acoustical Ceiling	0.06	0.21	43,543
	Resilient Flooring	0.13	0.42	87,085
	Wall Finishes	0.10	0.34	70,437
	James Street Mech Room Flooring	0.07	0.22	46,104
	James Street Metal Studs	0.57	1.88	393,188
	James Street Exterior Sheathing	0.04	0.12	25,643
	James Street Insulation	0.10	0.33	68,381
	James Street Drywall Hang	0.41	1.35	282,071
	James Street Drywall Finish	0.12	0.41	85,476
	James Street Ceramic Tile	0.06	0.20	42,262
	James Street Linear Ceiling	0.10	0.34	70,437
	James Street Acoustical Grid	0.11	0.35	72,998
	James Street Acoustical Tile	0.19	0.62	129,347
	James Street Sheet Vinyl	0.29	0.95	198,551
	James Street VCT	0.03	0.09	19,677
	James Street Carpet	0.09	0.30	63,435
	James Street Vinyl Base	0.03	0.09	19,677
	James Street Paint	0.07	0.23	48,544
	James Street Vinyl Wall Covering	0.05	0.17	36,621
10	**Specialties**	**0.55**	**1.83**	**383,303**
	Cubical Curtain Track	0.01	0.02	4,098
	Architectural Louvers	0.09	0.29	60,576
	Markerboards	0.03	0.11	23,052
	Wall Protection	0.07	0.23	48,665
	Wainscoat	0.01	0.04	7,684
	Metal Lockers	0.01	0.05	10,245
	Fire Extinguishers & Cabinets	0.01	0.03	6,403
	Toilet Accessories	0.02	0.05	16,649
	TV Brackets	0.02	0.06	12,807
	XRay View Boxes	0.01	0.02	5,123
	Building Specialties	0.03	0.09	19,210
	James Street Cubical Curtains	0.04	0.12	24,079
	James Street Architectural Louvers	0.03	0.11	22,027
	James Street Marker Boards	0.01	0.04	7,684
	James Street Toilet Partitions	0.00	0.01	1,921
	James Street Wall Protection	0.07	0.23	47,385
	James Street Metal Lockers	0.02	0.05	16,649
	James Street Fire Cabinets	0.00	0.01	2,561
	James Street Toilet Accessories	0.01	0.02	4,482
	James Street TV Brackets	0.01	0.02	5,123
	James Street Microwaves	0.00	0.01	2,305
	James Street XRay View Boxes	0.05	0.16	33,682
11	**Equipment**	**9.24**	**30.58**	**6,403,331**
	Equipment	9.24	30.58	6,403,331
12	**Furnishings**	**1.25**	**4.13**	**863,937**
	Casework Material	0.31	1.04	217,713
	Corian Material	0.15	0.50	103,734
	Casework & Corian Install	0.17	0.57	119,102
	Stainless Steel Casework	0.09	0.29	61,472
	Window Treatment	0.08	0.25	52,507
	Furnishings	0.04	0.12	24,333
	James Street Casework	0.23	0.76	160,083

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	James Street Curtain	0.04	0.12	25,613
	James Street Millwork Installation	0.06	0.21	44,823
	James Street Stainless Steel Casework	0.06	0.20	41,622
	James Street Window Treatments	0.02	0.06	12,935
14	**Conveying Systems**	**2.04**	**6.75**	**1,414,224**
	Elevators	1.86	6.15	1,288,079
	Pneumatic Systems	0.18	0.60	126,146
21	**Fire Suppression**	**1.52**	**5.04**	**1,055,105**
	Fire Protection	1.52	5.04	1,055,105
22	**Plumbing**	**0.01**	**0.04**	**8,314**
	Overtime	0.01	0.04	8,314
23	**HVAC**	**19.21**	**63.58**	**13,312,763**
	HVAC	16.14	53.40	11,182,859
	Control Devices	0.72	2.39	500,766
	Field Labor	0.43	1.43	299,420
	Electrical	0.05	0.17	36,243
	Design& Programming	0.09	0.29	61,152
	Coordination & Shop Drawings	0.01	0.05	10,245
	Start Up & Commissioning	0.08	0.27	56,830
	Commissioning Allowance	0.04	0.14	28,687
	Temporary HVAC Allowance	0.05	0.15	32,017
	Miscellaneous	0.02	0.07	14,766
	Spray On Fireproofing Repair	0.01	0.04	7,383
	Taxes	0.00	0.01	2,190
	Overhead & Profit	0.39	1.29	269,478
	Bonds	0.04	0.14	29,455
	Change Orders - Controls	-0.07	-0.23	-48,350
	Testing & Balancing	0.20	0.68	141,354
	Mechanical Sub Utility	0.99	3.29	688,270
26	**Electrical**	**8.43**	**27.89**	**5,839,344**
	Low Voltage Lights	1.09	3.60	754,215
	Electric Service	0.03	0.09	18,294
	Overtime	0.01	0.02	3,947
	Electric Core Bond	0.05	0.18	37,831
	Electric Core Permit	0.06	0.17	35,869
	Electric Core Mobilization	0.07	0.24	51,227
	Electric Core Demolition	0.02	0.08	16,649
	Electric Core Temp Power	0.13	0.42	87,085
	Electric Core Temp Lighting	0.18	0.61	128,067
	Procurement	0.93	3.06	644,175
	Procurement Lighting Fixtures	1.02	3.36	704,366
	Procurement Transfer Switches	0.33	1.10	230,520
	Procurement Lightning	0.04	0.12	25,613
	Procurement FA System	0.46	1.52	318,886
	Electric Core Med Voltage Dist	0.28	0.93	194,661
	Electric Core Normal Power Dist	1.02	3.36	704,366
	Electric Core Emerg Power	0.55	1.83	384,200
	Electric Core HVAC	0.34	1.12	234,362
	Electric Core Fixtures	1.06	3.50	733,853
	Electric Core FA Installation	0.21	0.70	147,277
	Electric Core Grounding	0.03	0.09	19,210
	Electric Core Clean Up	0.26	0.87	182,419
	Electric Core Snow Melt	0.20	0.67	140,673
	Electric Core Testing	0.03	0.09	19,210
	Electric Core Change Orders	0.03	0.11	22,168
Total Building Costs		**100.00**	**330.97**	**69,305,250**
02	**Existing Conditions**	**24.94**	**4.92**	**1,093,917**
	Selective Demolition	2.28	0.45	99,892
	Site Restoration	0.18	0.03	7,684
	Demolition	15.63	3.09	685,384
	Site Demo	4.23	0.84	185,697
	Building Demo	2.63	0.52	115,260
31	**Earthwork**	**19.78**	**3.91**	**867,523**
	Excavation & Backfill	15.08	2.98	661,336

	James Street Foundation Excavation	4.70	0.93	206,187
32	**Exterior Improvements**	**32.95**	**6.51**	**1,445,168**
	Paving	3.08	0.61	135,046
	Pavement	1.17	0.23	51,227
	Curb	0.88	0.17	38,420
	Sidewalk	2.19	0.43	96,050
	Stone under Slab	1.46	0.29	64,033
	Pin Piles	2.48	0.49	108,857
	Fencing	0.73	0.14	32,017
	Bulk Cut	6.57	1.30	288,150
	Footings	9.05	1.79	397,007
	Concrete Fill	3.80	0.75	166,487
	Site Furnishings	1.31	0.26	57,630
	Landscaping	0.23	0.05	10,245
33	**Utilities**	**22.34**	**4.41**	**979,710**
	Water Line	0.88	0.17	38,420
	Storm Sewer	8.61	1.70	377,797
	Sanitary Sewer	12.85	2.54	563,493
Total Non-Building Costs		**100.00**	**19.74**	**4,386,318**
Total Project Costs		--	--	**73,691,567**

Statement of Probable Cost

Project Notes

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Estimate Based On Case: MD070536 - Orthopedic Hospital
Location: PA - Lancaster
Date: Aug 2003
Building Size: 327,000

* Lancaster, Pennsylvania
** Construction Period September 2003 to January 2006

Special Project Notes

In the spring of 2001, Lancaster General Hospital (LGH) concluded that they could improve patient care and outcomes for orthopedic surgery patients if that service line was moved into a separate, yet co-joined facility. The decision to create a new orthopedic hospital integral with the existing campus challenged many longstanding assumptions about the facility; provided a way to fundamentally change the organization of the campus and aligned it with this new vision as LGH moves into the new century.

The project includes a four-story orthopedic hospital, new main entrance atrium building, screen for an existing parking garage, and a 5 ½ story vertical expansion of an existing building for new bed tower.

The new four-story building reestablishes the sidewalk boundary and garden yard for the neighborhood. The new facade presents a studied scale that is sympathetic to the neighboring row houses. The entrance retreats from the street as a concave motor court inviting both vehicles and pedestrians through an elegant walled garden approach to the building. The existing garage has a new screen wall that mimics the exterior language of the Orthopedic Center and extends the new unifying architecture across the south end of the campus.

The entrance atrium has a bridge that sweeps through a stand of structural column trees, connecting the Orthopedic Center with the Existing Hospital. Opposite the front door, an interior water wall offers allure and retreat as a separating screen for the new Chapel area. Other amenities include concierge, gift shop, reception desk, grand piano lounge, patient resource center, and gourmet cafe.

Two second floor waiting areas serve the Perioperative Services. Each is set in the atrium and is designed to make the family time for surgical patients more relaxed. Features of these lounges include seating to accommodate laptops, wireless connections for the public, and family sized, "Romeo & Juliet" balconies to accommodate larger extended families in Lancaster County. The noise of children's play and television viewing has been managed by providing areas for these activities, leaving the lounges free for social conversation.

The new 10 Operating Room Suite is organized with 5 rooms on either side of a sterile core providing better infection control and a location where case carts are staged, to facilitating room turnaround. The operating rooms are identical and fully digitized. The multi-boomed 720 square foot rooms have cameras in the light heads as well as throughout the room giving complete visual access of the surgical field to remote locations. The information management system allows for automated room set-ups as well as the ability to send still and video images to all web enabled locations for instruction and consultation.

The project also built 5½ floors for patient unit expansion including a vertical transportation core for patient circulation. This dedicated patient transport core allows for the movement of inpatients without overlapping public and staff circulation.

After surgery, the patient is moved to one of two orthopedic units on the fourth floor. Two nursing units, an 18 bed total joint unit and a 24 bed general orthopedic unit, share this floor with a dedicated physical and occupational therapy suite. Hospitality sensibilities have been designed into the private patient rooms providing for family/caregiver, patient, and staff. Patient rooms array around the perimeter with a central nursing/support core. Nursing care is delivered using a hybridized model. A primary team station is near the unit entrance and supports the work of the Unit Clerk. Physician consults and dictation occur in a discreet room off of this station. Other nurse work areas are distributed through the core.

The success of this project is tied to the client's desire to be the undisputed leader for orthopedic care in the community. Careful planning and standards of excellence have been applied in detail to this project, leading to a clear increase in patient satisfaction and physician loyalty. The new Orthopedic Hospital and associated additions for Lancaster General have placed it on solid foundations to face the competitive healthcare environment of the new century.

MANUFACTURERS
DIV. 2: Pavers: Hanover Architectural Products.
Div: 3: Moisture Control: Munters.
DIV. 4: Brick: Endicott; Granite: Cold Spring Granite; Stone: Arriscraft Block.
DIV. 7: Roof: Firestone; Finishes: Rimex Materials; Expansion Joints: C/S Group; EIFS: Dryvit.
DIV. 8: Curtainwall, Windows: National Glass & Metal; Glazing: PPG Sungate(R) 500 Low E, PPG Gray; Automatic Door Openers: Besam; Louvers: Aerolite.
DIV. 9: Flooring: Toli, Forbo, Stonhard; Access Panels: Airtight Panels by Panel & Louvre Group; Paint: M.A. Bruder.

Statement of Probable Cost

Project Notes

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DIV. 12: Furniture: Steelcase; Steel Benches: DuMor, Inc.
DIV. 14: Elevators: Otis, Pneumatic Tube: Pevco
DIV. 15: Mechanical: Carrier, Trane.

CONSTRUCTION TEAM
STRUCTURAL ENGINEER: Atlantic Engineering Corporation - 650 Smithfield Street, #1200, Pittsburgh, PA 15222
ELECTRICAL & MECHANICAL ENGINEER: PWI Engineering - 327 North 17th Street, Philadelphia, PA 15222
CONSTRUCTION MANAGER: L.F. Driscoll Company - 9 Presidential Boulevard, Bala Cynwyd, PA 19004
GENERAL CONTRACTOR - Orthopedic Center & Lime Street Overbuild: Benchmark Construction - P.O. Box 806, Brownstown, PA 17508
GENERAL CONTRACTOR - Atrium: Wohlsen Construction Company - P. O. Box 7066, Lancaster, PA 17604
COST ESTIMATOR: Project and Construction Services - 1360 East 9th St. #910, Cleveland, OH 44114
MEDICAL PLANNER: Metis Associates Ltd. - 10255 W. Higgins Road, #840, Rosemont, IL 60018

Photos Courtesy of Nathan Cox Photography