Bayhealth Medical Center

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Construction Management

Technical Assignment one

The Pennsylvania State University

AE Faculty Advisor:Chimay Anumba

Architectural engineering senior thesis

10/4/2010

I. Executive Summary

Technical assignment one is an overview of the existing conditions of the Bayhealth Medical Center expansion located in Dover Delaware. The expansion consists of a is 215,000 SQ feet pavilion building which will house a 225 bed patient care tower, an emergency department, oncology (both chemo and radiation), heliport, security, pharmacy, Diagnostic imaging, and shell space. A four level 370 space parking garage is already erected, and is attached to the pavilion building. A central service facility is also being built that houses all new mechanical equipment. Finally, a bridge connecting the central service building and employee parking lots to the pavilion will be erected. Construction was started on December 24 2007 and is expected to be completed on May 2012.

II. Table of Contents

III. Project Schedule Summary

The following schedule is a summary schedule based off a detailed 43 page schedule. This schedule summarizes the construction of the pavilion building which will be from its start on November 7, 2008 to its estimated completion May 23 2012.

Please see project summary schedule in appendix A

IV. Building Systems Summary

Building system 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	Support of Excavation

`Structural Steel Frame

The steel structure is a four story braced frame system with an average bay size of 30'X30'. Column sizes range from one floor W10X33 to the oversized W14X159. Some of the structural system is oversized, because of future plans to add additional stories to the pavilion. The floor system used in the pavilion is a 3.25" thick light weight concrete on 18 gauge composite decking reinforced with 6'X6' pieces of W2.9XW2.9 welded wire fabric.

Cast in Place Concrete

All cast in place concrete is located in the basement and foundation of the pavilion. The foundation, walls, and slab on grade concrete must have a minimum of 3000 psi compressive strength at 28 days. The pile caps that range from 9 sq ft in size and 3.5' thick to 286 sq ft in size and 6' thick require 5,000 psi compressive strength at 28 days.

Mechanical System

Most of the pavilion's mechanical systems are located in the central service building. It houses five 10,050 MBH water tube boilers, three 1450 ton capacity centrifugal water-cooled chillers, and three 4,500 GRM crossflow/induced draft cooling towers. The chilled water supply and return lines along with the high pressure steam lines are run underground from the central service building to two mechanical rooms located in the basement of the pavilion. The buildings five VAV AHU systems, which vary from 17,500 to 48,000 CFM, are also located in the basement of the pavilion.

The Pavilion is completely sprinkled with a wet-pipe system.

Electrical System

There are two separate sets of switch gear located in the basement of the pavilion. Each set is able to handle 2500/3325 KVA, 3-phase, at 60 hertz. There is also two emergency generators located in the central service building able to handle 3125 KVA, 3-phase, at 60 hertz.

Masonry

All the masonry on this project is for architectural purposes only. A typical masonry wall assembly consists of 3 5/8" thick brick, a 3/8" air space, and a 2" exterior polystyrene insulation.

Curtain Wall

A curtain is used along the east and west sides of the pavilion. The majority of the glass curtain wall is along the east side, which is also the side of the main entrance.

V. Project Cost Evaluation

The actual construction costs are based on the GMP tabulation provided by Whiting-Turner Construction. For comparison, two different types of cost estimates were used to examine the project cost. A parametric estimate using D4Cost estimating software and RS means.

Actual Costs

Building Construction Cost	$46,462,094.00
CC/ SQ FT	$216.10
Total Project Cost	$59,840,038
Building Equip. Cost	$13,491,368.00
TC/ SQ FT	$278.33

	Actual	Per SF
Concrete	$5,256,253.00	$24.45
Masonry	$1,519,209.00	$7.07
Structural Steel	$7,148,723.00	$33.25
Mechanical, Plumbing & HVAC	$9,052,082.00	$42.10
Electrical	$1,860,770.00	$8.65
Site Work	$4,165,925.00	$19.38

D4 Software

The building that I chose to compare the bayhealth medical center to is a 327,000 sq ft orthopedic hospital that was built in Lancaster, PA. This building was chosen because of its comparable size and time of construction. The D4 estimate was 6% lower than the actual estimate. The complete D4 cost estimate can be found in appendix C.

	Actual	Per SF
Building Cost	$51,135,791.00	$237.84
Existing Conditions	$1,227,588.00	$5.71
General Requirements	$5,154,013.00	$23.97
Total Project Cost	$56,058,093.00	$260.74

RS Means

The RS Means estimate was performed using available software on the RS Means website. The complete RS Means cost estimate can be found in appendix d.

	Actual	Per SF
Total Building Cost	$60,087,000.00	$279.47

Cost Comparison

Both the RS Means and the D4 estimates were relatively close to the actual cost of the pavilion building. As in the case with the D4 estimate, the individual divisions differ greatly but balance out at the end. Because of the bayhealth medical center being a very typical building, the RS Means software allowed me to accurately predict the cost of my building.

	Total cost	Per SF
Actual Cost	$59,840,038	$278.33
D4 Cost Software	$56,058,093.00	$260.74
RS Means Data	$60,087,000.00	$279.47

VI. Site Plan of Existing Conditions

See Appendix B for existing conditions site plan

VII. Local Conditions

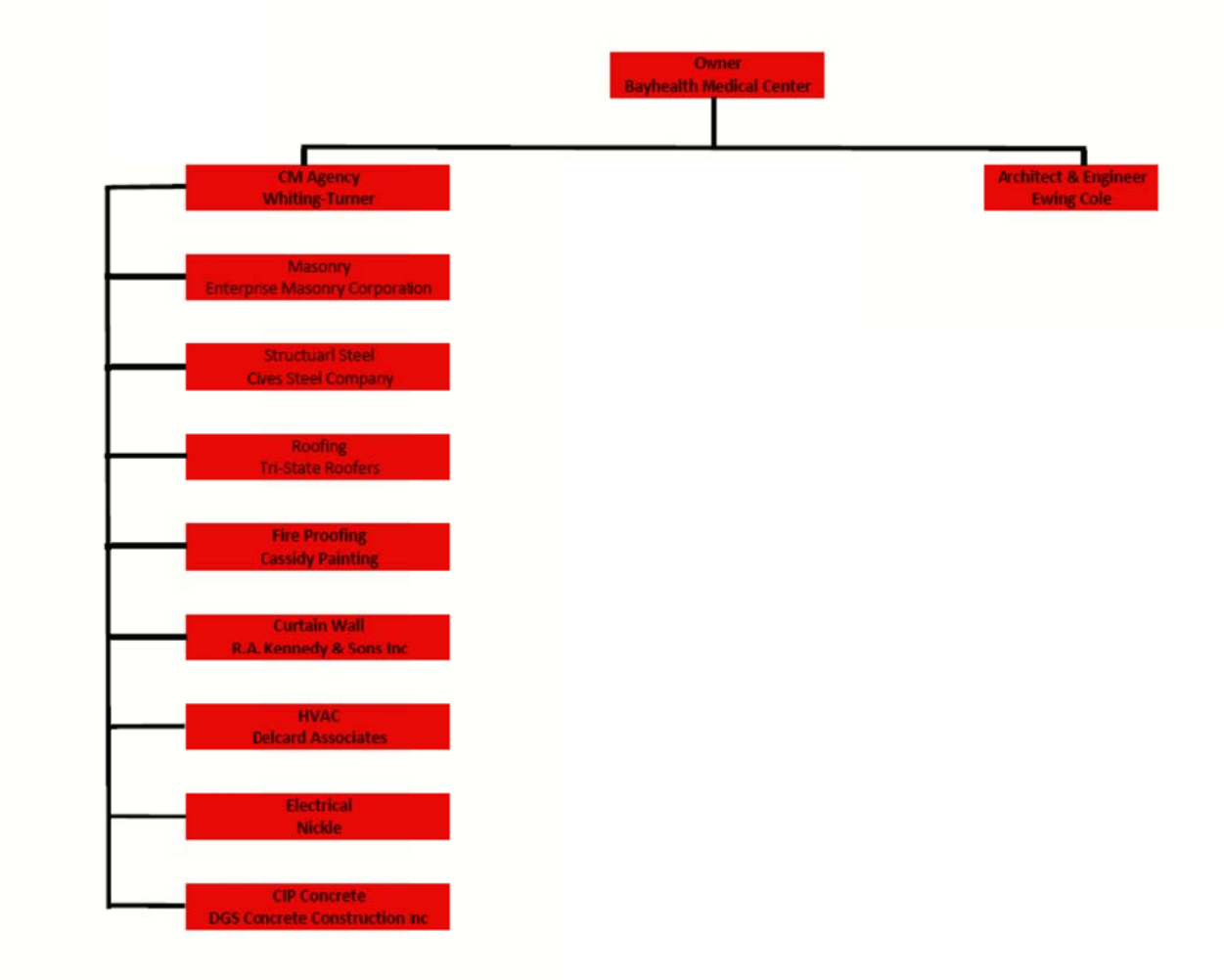
The project is located in 90 miles east of Washington D.C. along route one in Dover Delaware Subsurface conditions were investigated by drilling 37 auger test borings, four penetrometer tests, and three dilatometer tests. Both shallow and deep foundations were evaluated for the support of the pavilion building. It was found that an allowable soil bearing pressure of 3,000 psf can be used. It was also determined that Auger cast piles should be used, because of the heavy column loads. The subsurface materials encountered in the test borings indicated that topsoil depths ranged from about 4 to 12 inches below the existing surface. Asphalt and

gravel/stone base were encountered to depths ranging from about 2 to 7 inches and about 1 to 10 inches below the existing ground surface. Groundwater level observations were also made in the field during drilling and 24 hours after completion of the test borings. Groundwater was encountered at depths of about 4.3 to 19.1 feet below the existing ground surface. Because of the size of the site, there is adequate parking available north of the jobsite in the existing employee parking for all workers.

VIII. Client Information

The bayhealth medical center is central and southern Delaware's largest healthcare system, bayhealth is comprised of Kent General and Milford Memorial Hospitals, Middletown Medical Center and numerous satellite facilities. bayhealth medical center is than expansion of the bayhealth's current facilities in Dover Delaware. It includes a new pavilion building, that has 225 more patient beds, main entrance, emergency department, oncology, heliport, security, pharmacy, diagnostic imaging, and shell space. The expansion also includes a 370 space parking garage that will be attached to the pavilion building. The medical center is also upgrading their power plant with a new central service facility. The upgraded power plant will have new boilers, chillers, emergency generators, and have an expanded materials handling area. Finally, the expansion includes a new bridge that connects the central service build to the Pavilion. The bridge's main uses are to transport patients from the outer parking lots, and to connect the material handling in the central service building to the pavilion. The owner has three expectations to this project. First, the owner expects to job to be done on time. Because of the level of complexity of the pavilion building, the owner expects a high level of quality on this project. Lastly, since bayhealth is a not for profit organization, the project needs to come in under budget.

IX. Project Delivery System

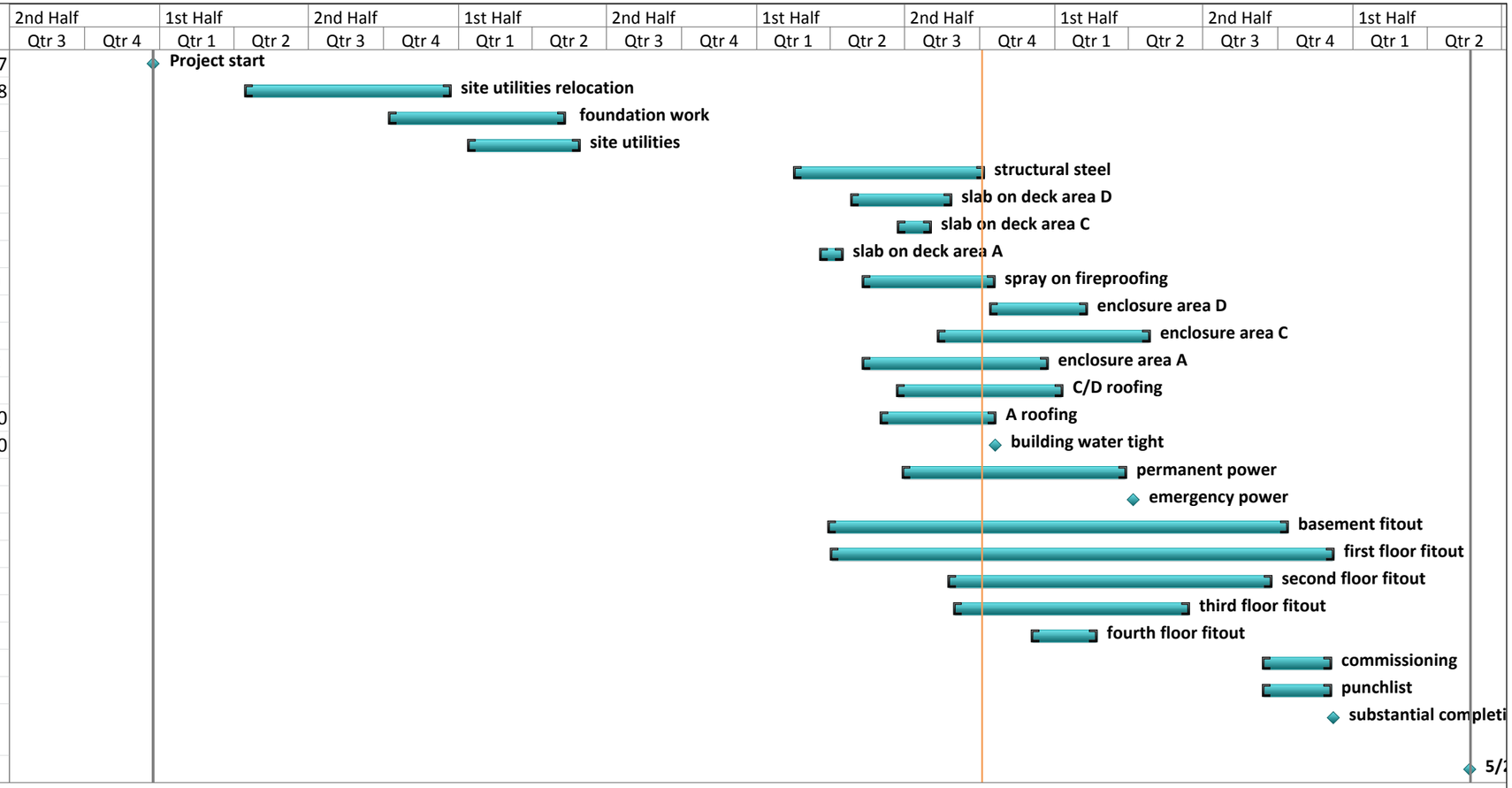


X. Staffing Plan

See Appendix C for the staffing plan

XI. Appendix A – Project summary Schedule

ID	Task Name	Duration	Start	Finish
1	Project start	0 days	Mon 12/24/07	Mon 12/24/07
2	site utilities relocation	181 days	Mon 4/14/08	Mon 12/22/08
3	foundation work	155 days	Tue 10/7/08	Mon 5/11/09
4	site utilities	100 days	Mon 1/12/09	Fri 5/29/09
5	structural steel	168 days	Mon 2/15/10	Wed 10/6/10
6	slab on deck area D	90 days	Mon 4/26/10	Fri 8/27/10
7	slab on deck area C	30 days	Tue 6/22/10	Mon 8/2/10
8	slab on deck area A	21 days	Fri 3/19/10	Fri 4/16/10
9	spray on fireproofing	117 days	Mon 5/10/10	Tue 10/19/10
10	enclosure area D	86 days	Wed 10/13/10	Wed 2/9/11
11	enclosure area C	187 days	Tue 8/10/10	Wed 4/27/11
12	enclosure area A	164 days	Mon 5/10/10	Thu 12/23/10
13	C/D roofing	146 days	Mon 6/21/10	Mon 1/10/11
14	A roofing	102 days	Tue 6/1/10	Wed 10/20/10
15	building water tight	0 days	Wed 10/20/10	Wed 10/20/10
16	permanent power	197 days	Mon 6/28/10	Tue 3/29/11
17	emergency power	0 days	Thu 4/7/11	Thu 4/7/11
18	basement fitout	404 days	Mon 3/29/10	Thu 10/13/11
19	first floor fitout	441 days	Thu 4/1/10	Thu 12/8/11
20	second floor fitout	285 days	Mon 8/23/10	Fri 9/23/11
21	third floor fitout	207 days	Mon 8/30/10	Tue 6/14/11
22	fourth floor fitout	57 days	Fri 12/3/10	Mon 2/21/11
23	commissioning	61 days	Mon 9/12/11	Mon 12/5/11
24	punchlist	61 days	Mon 9/12/11	Mon 12/5/11
25	substantial completion/occupancy	0 days	Thu 12/8/11	Thu 12/8/11
26	final completion	0 days	Wed 5/23/12	Wed 5/23/12



Project: Project summary schedul
Date: Mon 10/4/10

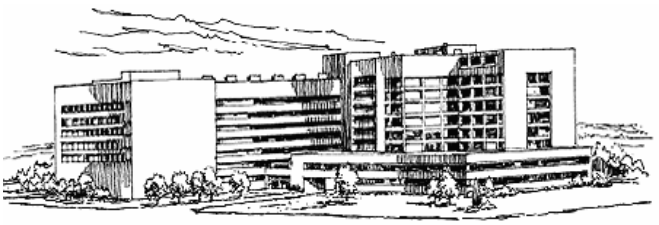
Task	Project Summary	Inactive Milestone	Manual Summary Rollup	Deadline			
Split	External Tasks	Inactive Summary	Manual Summary	Progress			
Milestone	External Milestone	Manual Task	Start-only				
Summary	Inactive Task	Duration-only	Finish-only				

XII. Appendix B - RSMeans Costwork Report

Square Foot Cost Estimate Report

Estimate Name: **Untitled**

Building Type:	**Hospital, 4-8 Story with Face Brick with Structural Facing Tile / Steel Frame**
Location:	DOVER, DE
Stories Count (L.F.):	**6.00**
Stories Height	**15.00**
Floor Area (S.F.):	**215,000.00**
LaborType	**Union**
Basement Included:	No
Data Release:	**Year 2009 Quarter 1**
Cost Per Square Foot	**$279.48**
Total Building Cost	**$60,087,000**



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

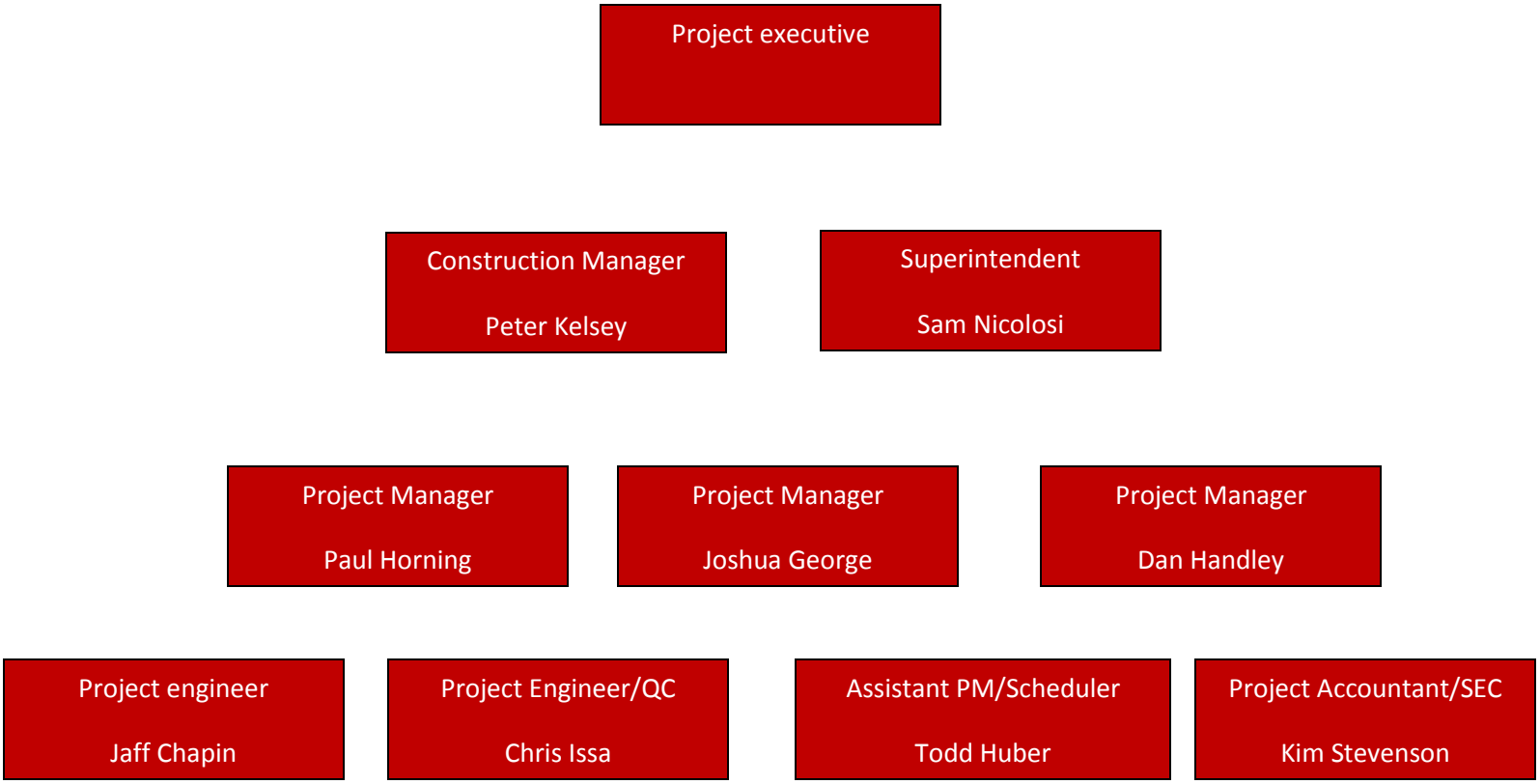
		% of Total	Cost Per SF	Cost
A Substructure		**2.0%**	**4.02**	**$864,000**
A1010	**Standard Foundations**		**2.42**	**$520,500**
	Strip footing, concrete, reinforced, load 44.0 KLF, soil bearing capacity 6 KSF, 24" deep x 96" wide			
	Spread footings, 3000 PSI concrete, load 400K, soil bearing capacity 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**		**1.22**	**$262,000**
	Slab on grade, 6" thick, light industrial, reinforced			
A2010	**Basement Excavation**		**0.03**	**$6,500**
	Excavate and fill, 30,000 SF, 4' deep, sand, gravel, or common earth, on site storage			
A2020	**Basement Walls**		**0.35**	**$75,000**
	Foundation wall, CIP, 4' wall height, direct chute, .148 CY/LF, 7.2 PLF, 12" thick			
B Shell		**19.8%**	**40.50**	**$8,708,500**
B1010	**Floor Construction**		**19.56**	**$4,206,000**
	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**		**1.73**	**$371,500**
	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**		**12.62**	**$2,714,000**
	Brick wall, cavity, standard face, 4" glazed tile back-up, 10" thick, styrofoam cavity fill			
B2020	**Exterior Windows**		**4.56**	**$981,000**
	Windows, aluminum, sliding, insulated glass, 5' x 3'			
B2030	**Exterior Doors**		**0.74**	**$159,500**
	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**		**1.26**	**$271,000**
	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**	**$5,500**
	Roof hatch, with curb, 1" fiberglass insulation, 2'-6" x 3'-0", galvanized steel, 165 lbs			
C Interiors		**22.8%**	**46.82**	**$10,066,000**
C1010	**Partitions**		**8.67**	**$1,864,000**
	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**		**10.00**	**$2,151,000**
	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**		**0.95**	**$205,000**
	Partitions, hospital curtain, ceiling hung, poly oxford cloth			
C2010	**Stair Construction**		**1.63**	**$350,500**
	Stairs, steel, cement filled metal pan & picket rail, 12 risers, with landing			
C3010	**Wall Finishes**		**7.63**	**$1,640,500**
	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**		**10.36**	**$2,226,500**
	Composition flooring, epoxy terrazzo, maximum			
	Terrazzo, maximum			
	Vinyl, composition tile, maximum			
	Tile, ceramic natural clay			
C3030	**Ceiling Finishes**		**7.57**	**$1,628,500**
	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		**46.4%**	**95.25**	**$20,478,000**
D1010	**Elevators and Lifts**		**6.47**	**$1,390,000**
	Traction, geared hospital, 6000 lb, 6 floors, 12' story height, 2 car group, 200 FPM			
D2010	**Plumbing Fixtures**		**11.34**	**$2,437,500**
	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**		**6.86**	**$1,475,500**
	Electric water heater, commercial, 100< F rise, 1000 gal, 480 KW 1970 GPH			
D2040	**Rain Water Drainage**		**0.53**	**$113,000**
	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**		**4.22**	**$906,500**
	Hot water reheat system for 200,000 SF hospital			
D3020	**Heat Generating Systems**		**0.39**	**$84,000**
	Boiler, electric, steel, steam, 510 KW, 1,740 MBH			
D3030	**Cooling Generating Systems**		**2.79**	**$599,500**
	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**		**29.55**	**$6,354,000**
	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**		**2.49**	**$534,500**
	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**		**0.55**	**$118,500**
	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**		**3.90**	**$838,500**
	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**		**19.68**	**$4,231,000**
	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**		**2.31**	**$497,500**
	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**		**4.18**	**$898,000**
	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		**9.0%**	**18.53**	**$3,984,000**
E1020	**Institutional Equipment**		**14.79**	**$3,180,000**
	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**		**3.74**	**$804,000**
	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%**	**$205.12**	**$44,100,500**
Contractor's Overhead & Profit		**25.0%**	**$51.28**	**$11,025,000**
Architectural Fees		**9.0%**	**$23.08**	**$4,961,500**
User Fees		**0.0%**	**$0.00**	**$0**
Total Building Cost			**$279.48**	**$60,087,000**

XIII. Appendix C– Staffing Plan


Project executive
Construction Manager
Peter Kelsey
Superintendent
Sam Nicolosi
Project Manager
Paul Horning
Project Manager
Joshua George
Project Manager
Dan Handley
Project engineer
Jaff Chapin
Project Engineer/QC
Chris Issa
Assistant PM/Scheduler
Todd Huber
Project Accountant/SEC
Kim Stevenson

XIV. Appendix D - D4 cost Report

Statement of Probable Cost

bayhealth - Nov 2009 - DE - Dover

Prepared By	:
Prepared By Firm	: IKM Incorporated Architects
Prepared By Street	: One PPG Place
Prepared By Address	: Pittsburgh, PA 15222
Prepared By Phone	:
Prepared By Fax	:
Prepared For	:
Prepared For Firm	:
Prepared For Street	:
Prepared For Address	: ,
Prepared For Phone	:
Prepared For Fax	:
Building Sq. Size	: 215000
Site Sq. Size	: 222156
Bid Date	: 8/1/2003
Project Height	: 75
1st Floor Size	: 53750
1st Floor Height	: 15
No. Of Buildings	: 1
No. Of Floors	: 4
Project Type	: NEW
Building Use	: Medical
Exterior Walls	: MAS
Interior Walls	: MSD
Foundation	: CON
Roof Type	: MEM
Floor Type	: CON
User Defined 1	:
User Defined 2	:
User Defined 3	:
User Defined 4	:
User Defined 5	:
User Defined 6	:
User Defined 7	:
User Defined 8	:

Building Costs

Code	Division Name	%	Sq. Cost	Projected
01	General Requirements	10.08	23.97	5,154,013
	Tower Bond	0.10	0.23	50,081
	Tower Supervision	0.56	1.34	287,539
	Construction Aids	0.28	0.68	145,329
	Temp Const Controls	0.15	0.36	77,389
	Dumpster	0.09	0.22	47,246
	Tower Final Cleaning	0.06	0.15	33,168
	Offsite Parking Allowance	0.04	0.09	18,898
	Allowances	0.56	1.34	287,741
	Change Orders	-2.19	-5.22	-1,121,591
	General Conditions	5.06	12.02	2,585,034
	General Condition Overtime	0.40	0.94	202,950
	Temp Offices	0.72	1.71	368,407
	General Requirements	0.34	0.80	172,174
	Surveys	0.27	0.65	139,165
	Overtime	0.12	0.28	59,342
	Insurance	1.06	2.52	541,563
	General Conditions 2	0.46	1.09	234,047

	P & P Bonds	0.15	0.35	74,279
	Allowances 2	0.27	0.64	137,013
	Office Shell Space	0.03	0.07	14,174
	Change Orders #2	-3.02	-7.18	-1,543,428
	Fee	1.74	4.14	890,249
	Overhead & Overtime	1.79	4.25	914,644
	Overtime Bid Package 8	0.02	0.04	7,777
	Contigency	0.00	0.00	1,002
	James Street Addition Bond	0.06	0.14	29,495
	James Street Super/Labor	0.54	1.28	275,660
	James Street Constr Aids	0.15	0.37	79,090
	James Street Temp Constr Contr	0.03	0.06	13,229
	James Street Dumpster Allowance	0.05	0.11	23,623
	James Street Final Cleaning	0.02	0.06	12,756
	James Street Field Office	0.02	0.06	12,284
	James Street Parking Allowance	0.04	0.09	18,898
	James Street ICRA Allowance	0.09	0.22	47,246
	James Street Change Orders	0.03	0.08	17,541
03	Concrete	4.34	10.32	2,219,382
	Concrete Saw Cutting	0.03	0.07	15,591
	Tower Formwork	0.14	0.34	72,286
	Shearwall Formwork	0.13	0.31	65,880
	Column Formwork	0.02	0.05	11,339
	12-Inch Formwork	0.22	0.53	113,749
	Reinforcing	0.09	0.21	45,356
	Shearwall Reinforcing	0.12	0.27	58,963
	Slab Reinforcing	0.12	0.29	61,750
	Wire Mesh	0.06	0.15	33,072
	Misc Accessories	0.05	0.12	25,513
	Foundation Accessories	0.03	0.07	16,064
	Flatwork Accessories	0.09	0.20	43,466
	Place & Finish Foundations	0.14	0.34	73,515
	Place & Finish Shearwall	0.07	0.16	35,434
	Place & Finish Columns	0.03	0.07	14,882
	Place & Finish Elevator Tower	0.10	0.25	53,624
	Place & Finish 12-Inch Slab	0.11	0.26	55,722
	Place & Finish 3rd & 4th Fl	0.09	0.20	43,466
	Place & Finish 5th Fr	0.16	0.39	83,153
	Place & Finish 6th Fl	0.16	0.39	83,153
	Place & Finish 7th Fl	0.16	0.39	83,153
	Place & Finish 8th Fl	0.15	0.35	75,594
	Sawcutting 2	0.09	0.22	46,915
	Underpinning	0.09	0.22	47,246
	Footing Concrete	0.28	0.66	141,738
	Wall Concrete	0.27	0.64	137,013
	Column Concrete	0.07	0.18	37,797
	Slab on Grade	0.06	0.13	28,348
	Slab on Deck	0.11	0.26	56,695
	Rebar	0.07	0.18	37,797
	Wire Mesh 2	0.01	0.03	7,087
	James Street Foundation Reinforcing	0.12	0.27	59,057
	James Street Wire Mesh	0.03	0.07	15,119
	James Street Accessories	0.01	0.02	4,725
	James Street Formwork	0.14	0.34	72,175
	James Street Place & Finish Foundations	0.13	0.30	65,105
	James Street Place & Finish Slab	0.15	0.35	74,460
	James Street Place & Finish 2nd Flr Slab	0.15	0.35	74,460
	James Street Place & Finish 3rd Fl Slab	0.15	0.35	74,460
	James Street Place & Finish Slab Roof	0.15	0.35	74,460
04	Masonry	6.19	14.72	3,165,669
	CMU Foundation to 4th Fl	0.39	0.93	199,000
	CMU Masonry 5th to 9th Fl	0.34	0.80	172,920
	Brick Veneer	0.01	0.03	6,803

	CMU Garage	0.31	0.74	158,746
	CMU Entrance	0.65	1.54	330,722
	Interior CMU	0.35	0.82	176,700
	Site Walls	0.23	0.55	118,115
	Brick Garage	0.26	0.62	132,289
	Brick Entrance	0.65	1.54	330,722
	Brick Site	0.06	0.13	28,348
	Granite	0.13	0.30	64,255
	Granite Entrance	0.32	0.76	162,526
	Granite Site	0.28	0.66	141,738
	Limestone	0.62	1.48	318,438
	Comosite Limestone Panels	0.20	0.48	103,941
	Cast Stone Garage	0.11	0.26	56,695
	Cast Stone Entrance	0.06	0.15	33,072
	Brick Pavers	0.06	0.14	30,237
	James Street Block	0.35	0.84	180,102
	James Street Masonry Brick	0.22	0.52	112,351
	James Street Masonry Brick Lime St	0.23	0.54	115,186
	James Street Masonry Brick Lime St 2	0.23	0.54	115,186
	James Street Precast/Granite	0.15	0.36	77,578
05	Metals	9.58	22.78	4,898,454
	Misc Metals Tower	0.06	0.13	28,820
	Misc Metal	0.12	0.29	61,420
	Architectural Metal	0.05	0.12	26,458
	Metal Stair 4	0.06	0.13	28,348
	Glass Railing	0.38	0.91	195,598
	Steel Overtime	0.03	0.08	16,241
	Structural Steel Bid Pack 2	7.87	18.72	4,024,000
	Structural Steel	0.65	1.54	331,411
	Metal Fabrications	0.14	0.33	71,084
	Show Drawing Review	0.03	0.07	15,763
	James Street Misc Metals Allowance	0.02	0.04	9,449
	James Street Misc Metals 2	0.15	0.36	77,578
	James Street Surgical Supports	0.02	0.06	12,284
06	Wood, Plastics, and Composites	1.11	2.64	568,392
	Rough Carpentry Tower	0.13	0.32	68,318
	Rough Carpentry 2	0.18	0.42	89,767
	Millwork	0.09	0.21	45,356
	Millwork Material	0.33	0.79	170,086
	Millwork Install	0.17	0.40	85,043
	Partitions	0.11	0.26	56,695
	James Street Rough Carpentry	0.10	0.25	53,127
07	Thermal and Moisture Protection	3.70	8.80	1,891,037
	Expansion Joint Covers	0.11	0.26	56,695
	Dampproofing Tower	0.01	0.02	4,158
	EIFS Panels Caulking	0.09	0.21	45,265
	EIFS Panels Fabrication	1.16	2.76	594,165
	EIFS Panel Installation	0.18	0.44	94,492
	EIFS Field Installed	0.11	0.26	56,695
	EIFS Shop Drawings	0.03	0.08	17,009
	Fireproofing Elevator Tower	0.11	0.27	58,585
	Fireproofing Overbuild	0.26	0.62	134,179
	Roofing Material	0.23	0.56	119,721
	Roofing Labor	0.10	0.24	51,309
	Firestopping	0.07	0.18	37,797
	Fire Caulking	0.01	0.04	7,559
	Caulking	0.01	0.02	4,819
	Waterproofing	0.03	0.06	13,229
	Dampproofing 2	0.01	0.02	3,780
	Fireproofing	0.16	0.37	80,318
	EIFS	0.04	0.11	22,678
	Roofing	0.20	0.48	103,941
	Caulking 2	0.03	0.07	15,119

	James Street Expansion Joint	0.03	0.08	17,009
	James Street Dampproofing	0.01	0.02	4,914
	James Street Fireproofing Gr Fl	0.06	0.14	29,576
	James Street Fireproofing Main Fl	0.06	0.14	29,576
	James Street Fireproofing 2nd Fl	0.06	0.14	29,576
	James Street Fireproofing 3rd Fl	0.06	0.14	29,576
	James Street Roofing Material	0.22	0.53	114,165
	James Street Roofing Labor	0.10	0.23	48,928
	James Street EIFS	0.08	0.18	39,261
	James Street Caulking	0.02	0.04	8,977
	James Street Fire Stopping	0.04	0.08	17,967
08	Openings	15.39	36.60	7,869,184
	Curtainwall Remove & Replace	0.08	0.19	41,860
	Curtainwall Engineering	0.26	0.62	132,289
	Curtainwall Tower & Courtyard	0.42	1.01	216,765
	Link Curtainwalls	0.30	0.73	155,912
	Curtainwall South Elevation	0.42	0.99	213,457
	Curtainwall East Elevation	0.55	1.32	283,476
	Curtainwall North Elevation	0.39	0.92	197,630
	Hollow Metal Frames	0.08	0.19	41,104
	Doors	0.14	0.34	73,893
	Hardware	0.10	0.24	51,971
	Frames Hardware Install	0.06	0.15	33,072
	Automatic Swing Opener	0.04	0.10	21,355
	Glass & Glazing	0.02	0.04	7,748
	Aluminum Curtainwall	7.23	17.18	3,694,769
	Hollow Metal Doors & Frames	0.12	0.29	61,420
	Door Operators	0.02	0.04	9,449
	Curtainwall 2	3.36	8.00	1,719,441
	Interior Glazing	0.04	0.11	22,678
	James Street Hollow Metal Material	0.05	0.11	23,134
	James Street Doors Material	0.10	0.24	52,052
	James Street Hardware Material	0.08	0.19	40,484
	James Street Hardware Install	0.04	0.09	19,843
	James Street ICU Doors	0.01	0.04	7,559
	James Street Automatic Doors	0.06	0.14	30,237
	James Street Glass	0.03	0.07	14,311
	James Street Curtainwall Engineering	0.18	0.44	94,492
	James Street Curtainwall S Elevation	0.39	0.93	200,795
	James Street Curtainwall E Elev	0.42	0.99	213,552
	James Street Curtainwall E Elev 2	0.38	0.90	194,437
09	Finishes	7.36	17.51	3,765,634
	Mechanical Room Floor Covering	0.06	0.15	32,600
	Gypsum Metal Studs	0.59	1.41	302,847
	Gypsum Exterior Sheating	0.04	0.11	22,678
	Gypsum Insulation	0.15	0.35	75,594
	Drywall	0.53	1.27	272,137
	Gypsum System Finish	0.23	0.54	115,280
	Ceramic Tile	0.01	0.03	5,575
	Linear Metal Ceiling	0.01	0.02	4,725
	Acoustical Grid System	0.10	0.24	51,026
	Acoustical Tile	0.19	0.45	96,958
	Carpet	0.02	0.04	8,599
	Sheet Vinyl Material	0.39	0.92	198,433
	Sheet Vinyl Labor	0.18	0.44	94,057
	VCT	0.03	0.07	15,780
	VCT Base	0.04	0.09	19,475
	Epoxy Flooring	0.07	0.16	35,335
	Paint	0.11	0.27	57,782
	Vinyl Wall Covering	0.17	0.40	85,893
	Drywall 2	1.32	3.14	675,617
	Stone Flooring	0.52	1.23	264,577
	Acoustical Ceiling	0.06	0.15	32,127

	Resilient Flooring	0.13	0.30	64,255
	Wall Finishes	0.10	0.24	51,971
	James Street Mech Room Flooring	0.07	0.16	34,017
	James Street Metal Studs	0.57	1.35	290,107
	James Street Exterior Sheathing	0.04	0.09	18,920
	James Street Insulation	0.10	0.23	50,454
	James Street Drywall Hang	0.41	0.97	208,121
	James Street Drywall Finish	0.12	0.29	63,067
	James Street Ceramic Tile	0.06	0.15	31,182
	James Street Linear Ceiling	0.10	0.24	51,971
	James Street Acoustical Grid	0.11	0.25	53,860
	James Street Acoustical Tile	0.19	0.44	95,437
	James Street Sheet Vinyl	0.29	0.68	146,497
	James Street VCT	0.03	0.07	14,519
	James Street Carpet	0.09	0.22	46,805
	James Street Vinyl Base	0.03	0.07	14,519
	James Street Paint	0.07	0.17	35,817
	James Street Vinyl Wall Covering	0.05	0.13	27,020
10	Specialties	0.55	1.32	282,814
	Cubical Curtain Track	0.01	0.01	3,024
	Architectural Louvers	0.09	0.21	44,695
	Markerboards	0.03	0.08	17,009
	Wall Protection	0.07	0.17	35,907
	Wainscoat	0.01	0.03	5,670
	Metal Lockers	0.01	0.04	7,559
	Fire Extinguishers & Cabinets	0.01	0.02	4,725
	Toilet Accessories	0.02	0.06	12,284
	TV Brackets	0.02	0.04	9,449
	XRay View Boxes	0.01	0.02	3,780
	Building Specialties	0.03	0.07	14,174
	James Street Cubical Curtains	0.04	0.09	18,426
	James Street Architectural Louvers	0.03	0.08	16,253
	James Street Marker Boards	0.01	0.03	5,670
	James Street Toilet Partitions	0.00	0.01	1,417
	James Street Wall Protection	0.07	0.16	34,962
	James Street Metal Lockers	0.02	0.06	12,284
	James Street Fire Cabinets	0.00	0.01	1,890
	James Street Toilet Accessories	0.01	0.02	3,307
	James Street TV Brackets	0.01	0.02	3,780
	James Street Microwaves	0.00	0.01	1,701
	James Street XRay View Boxes	0.05	0.12	24,851
11	Equipment	9.24	21.97	4,724,597
	Equipment	9.24	21.97	4,724,597
12	Furnishings	1.25	2.96	637,443
	Casework Material	0.31	0.75	160,636
	Corian Material	0.15	0.36	76,538
	Casework & Corian Install	0.17	0.41	87,878
	Stainless Steel Casework	0.09	0.21	45,356
	Window Treatment	0.08	0.18	38,742
	Furnishings	0.04	0.08	17,953
	James Street Casework	0.23	0.55	118,115
	James Street Corian	0.04	0.09	18,898
	James Street Millwork Installation	0.06	0.15	33,072
	James Street Stainless Steel Casework	0.06	0.14	30,710
	James Street Window Treatments	0.02	0.04	9,544
14	Conveying Systems	2.04	4.85	1,043,463
	Elevators	1.86	4.42	950,389
	Pneumatic Systems	0.18	0.43	93,075
21	Fire Suppression	1.52	3.62	778,493
	Fire Protection	1.52	3.62	778,493
22	Plumbing	0.01	0.03	6,134
	Overtime	0.01	0.03	6,134
23	HVAC	19.21	45.69	9,822,614

	HVAC	16.14	38.38	8,251,097
	Control Devices	0.72	1.72	369,482
	Field Labor	0.43	1.03	220,922
	Electrical	0.05	0.12	26,741
	Design& Programming	0.09	0.21	45,120
	Coordination & Shop Drawings	0.01	0.04	7,559
	Start Up & Commissioning	0.08	0.20	41,931
	Commissioning Allowance	0.04	0.10	21,166
	Temporary HVAC Allowance	0.05	0.11	23,623
	Miscellaneous	0.02	0.05	10,895
	Spray On Fireproofing Repair	0.01	0.03	5,447
	Taxes	0.00	0.01	1,616
	Overhead & Profit	0.39	0.92	198,830
	Bonds	0.04	0.10	21,733
	Change Orders - Controls	-0.07	-0.17	-35,674
	Testing & Balancing	0.20	0.49	104,295
	Mechanical Sub Utility	0.99	2.36	507,829
26	Electrical	8.43	20.04	4,308,468
	Low Voltage Lights	1.09	2.59	556,486
	Electric Service	0.03	0.06	13,498
	Overtime	0.01	0.01	2,912
	Electric Core Bond	0.05	0.13	27,913
	Electric Core Permit	0.05	0.12	26,458
	Electric Core Mobilization	0.07	0.18	37,797
	Electric Core Demolition	0.02	0.06	12,284
	Electric Core Temp Power	0.13	0.30	64,255
	Electric Core Temp Lighting	0.18	0.44	94,492
	Procurement	0.93	2.21	475,294
	Procurement Lighting Fixtures	1.02	2.42	519,706
	Procurement Transfer Switches	0.33	0.79	170,086
	Procurement Lightning	0.04	0.09	18,898
	Procurement FA System	0.46	1.09	235,285
	Electric Core Med Voltage Dist	0.28	0.67	143,628
	Electric Core Normal Power Dist	1.02	2.42	519,706
	Electric Core Emerg Power	0.55	1.32	283,476
	Electric Core HVAC	0.34	0.80	172,920
	Electric Core Fixtures	1.06	2.52	541,469
	Electric Core FA Installation	0.21	0.51	108,666
	Electric Core Grounding	0.03	0.07	14,174
	Electric Core Clean Up	0.26	0.63	134,595
	Electric Core Snow Melt	0.20	0.48	103,941
	Electric Core Testing	0.03	0.07	14,174
	Electric Core Change Orders	0.03	0.08	16,357
	Total Building Costs	100.00	237.84	51,135,791

Non-Building Costs

Code	Division Name	%	Sq. Cost	Projected
02	Existing Conditions	24.94	5.53	1,227,588
	Selective Demolition	2.28	0.50	112,098
	Site Restoration	0.18	0.04	8,623
	Demolition	15.63	3.46	769,135
	Site Demo	4.23	0.94	208,388
	Building Demo	2.63	0.58	129,344
31	Earthwork	19.78	4.38	973,530
	Excavation & Backfill	15.08	3.34	742,148
	James Street Foundation Excavation	4.70	1.04	231,382
32	Exterior Improvements	32.95	7.30	1,621,759
	Paving	3.08	0.68	151,548
	Pavement	1.17	0.26	57,486

	Curb	0.88	0.19	43,115
	Sidewalk	2.19	0.49	107,787
	Stone under Slab	1.46	0.32	71,858
	Pin Piles	2.48	0.55	122,158
	Fencing	0.73	0.16	35,929
	Bulk Cut	6.57	1.46	323,360
	Footings	9.05	2.01	445,519
	Concrete Fill	3.80	0.84	186,830
	Site Furnishings	1.31	0.29	64,672
	Landscaping	0.23	0.05	11,497
33	Utilities	22.34	4.95	1,099,425
	Water Line	0.88	0.19	43,115
	Storm Sewer	8.61	1.91	423,961
	Sanitary Sewer	12.85	2.85	632,349
	Total Non-Building Costs	100.00	2215.70	4,922,302
	Total Project Costs			56,058,093

Building Division Notes

James Street Place & Finish Slab

Main floor.

Equipment

Medical equipment for operating rooms: lighting, booms, patient tracking system, digital information management system, and communications.

Electric Core HVAC

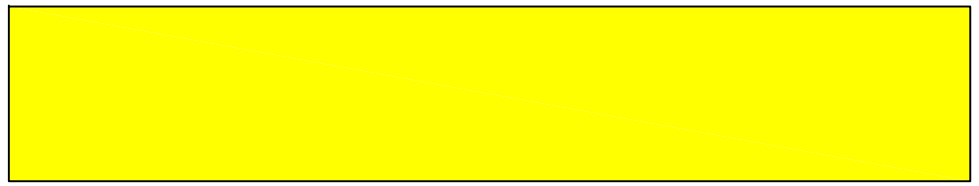
Includes equipment feeders.

Electric Core Fixtures

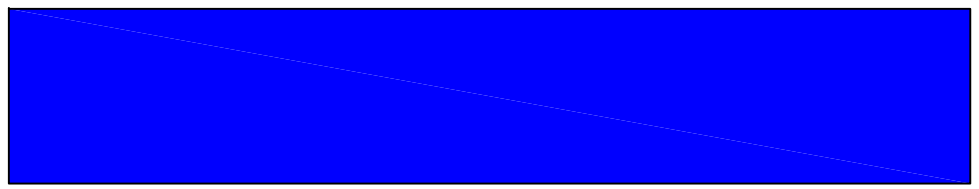
Fixtures & branch wiring install.

Non-Building Division Notes

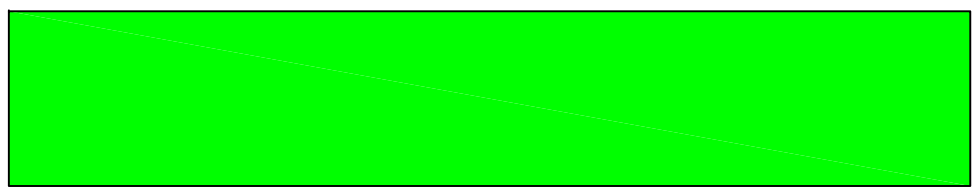
XIII. Appendix D - Existing Conditions Site Plan



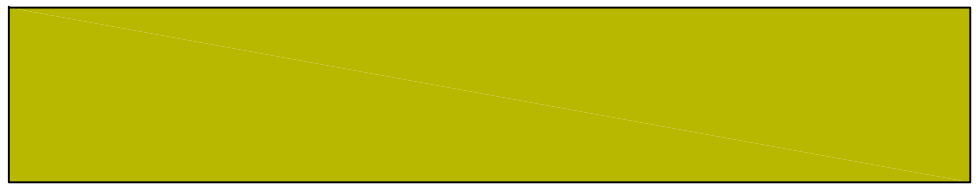
underground electric



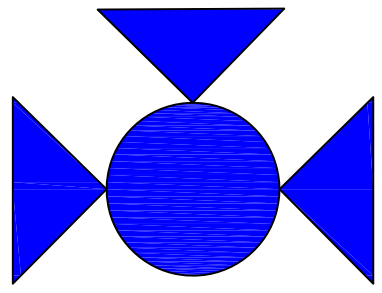
underground water



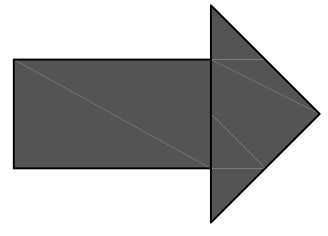
underground gas



stormwater drainage



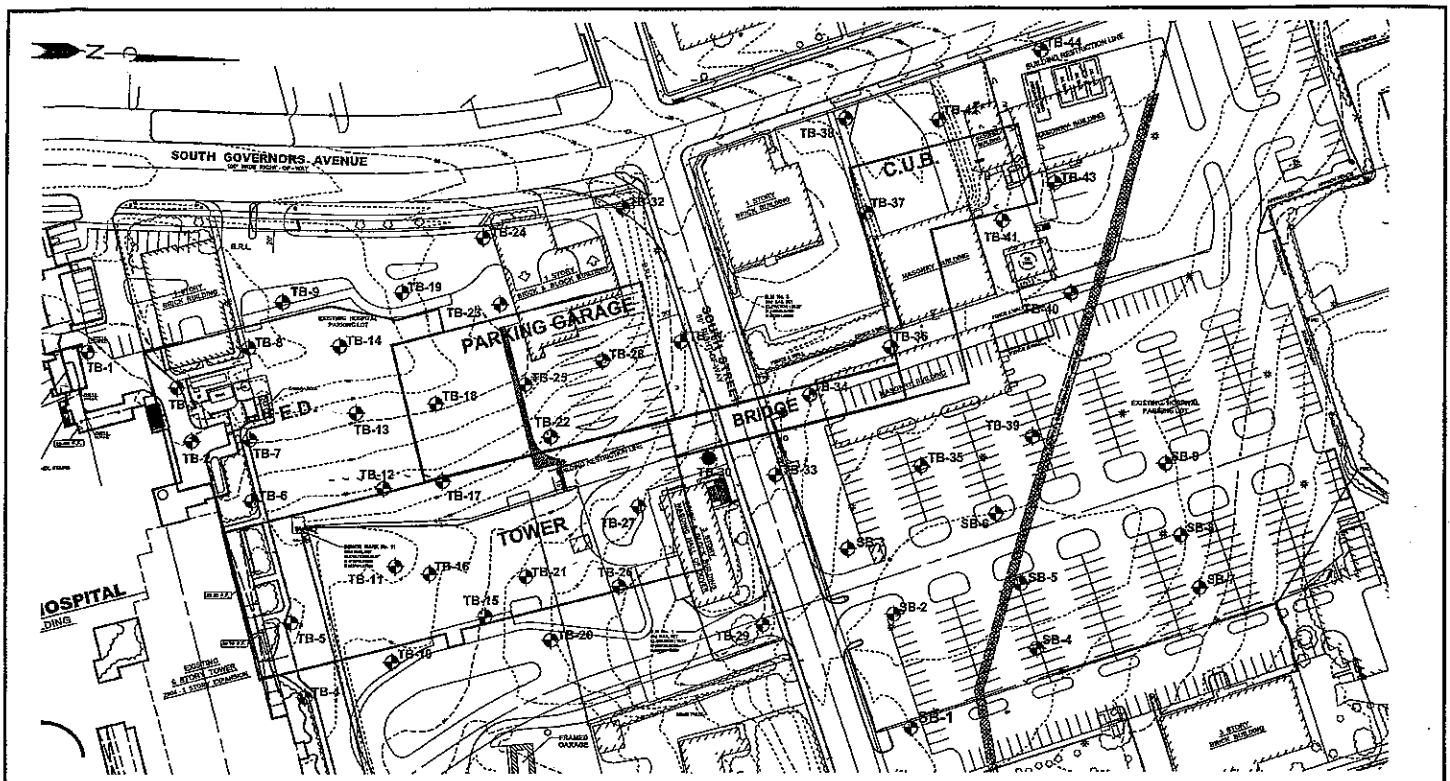
underground electric



traffic flow


N
proposed central service building
Existing 1 story brick building
Existing 1 story brick building
proposed 4 story parking garage
proposed 4 story pavilion building
Existing 1 story building
Existing 3 story building
Existing 3 story hospital
Existing 2 story house
Existing 2 story house
Existing 3 story hospital

XIV. Appendix E - Boring Test Locations & soil types



L E G E N D

TB-1 APPROXIMATE BORING LOCATION

TB-30 APPROXIMATE BORING LOCATION NOT COMPLETED BECAUSE OF OVERHEAD AND UNDERGROUND UTILITY CONFLICTS

GeoConcepts Engineering, Inc.

19955 Highland Vista Dr., Suite 170 (703) 726-8030
Ashburn, Virginia 20147 (703) 726-8032 fax

BAYHEALTH MEDICAL CENTER, STATE STREET AND GOVERNORS AVENUE, DOVER, KENT COUNTY, DELAWARE

BORING LOCATION PLAN		Scale: 1"= 80'	Fig. 6
Date: DECEMBER, 2007	Checked By: P.E.B.	Project No.: 27206	

Summary of Soil Laboratory Test Results

Project: Bayhealth Medical Center

Contract No.: 25219

Boring	Depth (ft.)	Sample Type	Stratum	Description of Soil Specimen	Sieve Results		Atterberg Limits			Natural Moisture Content (%)	Remarks
					Percent Retained # 4 Sieve	Percent Passing # 200 Sieve	LL	PL	PI		
TB-1	1-2.5	Jar	B	silty clayey SAND (SC-SM)	0.0	27.4	18	14	4	9.1	--
TB-1	13.5-15	Jar	B	silty SAND (SM)	2.3	12.7	NP	NP	NP	18.9	--
TB-1	48.5-50	Jar	C2	POORLY GRADED SAND with silt (SP-SM)	0.4	5.3	18	16	2	19.3	--
TB-16	1-2.5	Jar	B	sandy LEAN CLAY (CL)	0.8	53.4	28	18	10	15.3	--
TB-16	24-25.5	Jar	C1	LEAN CLAY (CL)	0.0	93.8	46	18	28	39.2	--
TB-27	9-10.5	Jar	B	silty clayey SAND (SC-SM)	0.0	14.0	27	20	7	15.3	--
TB-27	23.5-25	Jar	B	silty SAND (SM)	0.0	24.5	22	20	NP	18.9	--
TB-27	58.5-60	Jar	C2	POORLY GRADED SAND (SP)	0.5	4.0	NP	NP	NP	14.9	--

Notes:

1. Soil tests are in accordance with applicable ASTM standards.
2. Soil classification symbols are in accordance with Unified Soil Classification System.
3. Visual identification of samples is in accordance with ASTM D-2488.
4. Key to abbreviations: LL= Liquid Limit; PL= Plastic Limit; PI= Plasticity Index; NP= Nonplastic; N/T = Not Tested