Maryland General Hospital
Central Care Expansion

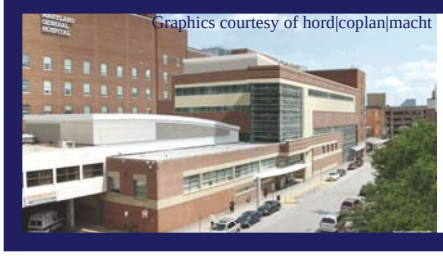
Baltimore, MD

Graphics courtesy of hord|coplan|macht

Technical Assignment 1

September 29th 2008

CPEP Website: http://www.engr.psu.edu/ae/thesis/portfolios/2009/bwg5000



Graphics courtesy of hord|coplan|macht

Brian Goodykoontz

Construction Management Option

Sponsored by:

Barton Malow

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EXECUTIVE SUMMARY

This technical assignment provides an introduction to the existing conditions of the Maryland General Hospital Central Care Expansion project, and the construction management techniques employed by the Barton Malow Company to successfully deliver the project. This report will present and analyze the project summary schedule, the building systems, project cost, existing conditions, local conditions, project delivery system, and the project staffing plan.

The project is a $57 million dollar addition and partial renovation to Maryland General Hospital located in Baltimore, MD. Barton Malow Company was hired by the owner of Maryland General, University of Maryland Medical System, to act as the construction manager at risk on the project. Hord Coplan Macht is the project architect hired by the University of Maryland. This project is quite unique because the phasing of the project requires the upper floors of the building to be enclosed and fit-out prior to the excavation of the basement, completion of the floor systems, and fit-out of the first three floors in the courtyard. The project has been staffed with a team who has strong working relationships and was strong with structural steel experience to work through some of the more complex portions of the project.

PROJECT SCHEDULE SUMMARY

Please see Appendix A for Project Schedule Summary

The project was broken into two phases with the structure, third floor pharmacy, and upper floors being completed in the first phase and the basement through partial third floor in the second phase.

Foundation Sequence

Since the basement of the courtyard infill will not be excavated until the second phase, the caissons were drilled from existing grade level through the area which will be the future basement until they hit their designed depth on rock 65 feet down. Several new spread footings were hand dug at the bottom of existing areaways to the basement in the courtyard. The new spread footings and reinforced footings in the existing building also had be hand dug, in some places up to 16 feet.

The foundation work started with the reinforcing of the existing and new spread footings in the existing building. This process lasted several months, spanning the duration of caisson work in the courtyard. Once the caissons were completed in the courtyard remaining spread footings in the areaways could then be completed.

Caisson Being Drilled

Caisson Excavation support

Structural Sequence

The new structural steel could not be set on top of the existing structure until all the columns and footings below had been reinforced. This process of reinforcing the columns and footings required selective demolition of existing walls, removal of any existing fireproofing, and the rerouting of any electric, telecommunication, plumbing, ductwork which were in the way of the column plating. To accommodate the hospital's needs during the construction, rooms in which columns needed to be reinforced could only be taken a few at a time.

Structural Steel Progress Photos: 9/5/08, 9/15/08, 9/23/08

Knowing this the structural steel was erected starting in the courtyard to allow the reinforcement in the existing building to be completed. The steel worked up five stories in the courtyard, then across the existing building, and finally back to complete courtyard steel.

Finish Sequence

Once the structure has been completed, a temporary enclosure will be constructed so that the interior work can begin as the permanent enclosure is being installed. Additionally, on each floor there will be selective demolition that will need to occur to tie the new building to the old prior to the completion of the finish sequence. For phase one the finishes will start on the third floor over the existing building and work up through the fourth and fifth floors. If phase two is approved, trades will similarly move from the basement up to the third floor in the courtyard.

Before the finish work can begin the MEP risers and over head rough-ins will be completed. The MEP and fire protection on the project was coordinated through weekly coordination meetings for several months leading up to the work. This process utilized a three dimensional model to produce the two dimensional coordinated drawings.

Once the major overhead MEP work has been completed the finish sequence will be:

- Metal Studs
- MEP Rough-in
- Gypsum Board
- Painting
- Electric/Lighting/Telecom Wire Pulls
- Ceiling Grid
- Ceramic Tile
- Diffuser/Electrical Fixtures/Fire Protection Drops to Grid
- Casework
- Finish Paint
- Flooring
- Ceiling Tile
- Doors & Hardware

BUILDING SYSTEMS SUMMARY

Work Scope	Yes/No
Demolition	Yes
Support of Excavation	Yes
Structural Steel	Yes
Cast in Place Concrete	Yes
Precast Concrete	No
Mechanical System	Yes
Electrical System	Yes
Masonry	Yes
Curtainwall	Yes

Demolition

Selective Demolition was required for numerous portions of the project including:

- Room Reconfigurations
- Column Reinforcement
- New/Addition Attachment
- Pockets for Steel

Asbestos abetment was necessary in the basement where there was asbestos flooring, and in several of the renovation and column reinforcing areas where pipes were being removed or relocated but had asbestos insulation.

Excavation

- Six foot diameter corrugated steel tube was used to as excavation support for the caissons. This support is permanent until phase two when it will get demolished as the excavation proceeds.
- Piles and lagging will be used for the excavation of the basement during phase two.

Structural Steel

- Wide flange beams and columns - ASTM A 36A/36M
- A 3 ¼" 3000 psi composite concrete slab on metal deck was use for each floor.
- Four new braced frames were installed to accept any increased lateral loads on the building.
- A 120 ton truck crane was utilized in two locations on the site to set all the members. The crane started in the south setting the courtyard steel and then moved.

Cast in Place Concrete

- A 3000 psi reinforced concrete was utilized for the caissons.
- A 3000 psi reinforced concrete utilized for the new and replacement footings in the basement. No formwork was necessary for theses footings as the holes were only slightly larger than the required footings.
- 4000 psi concrete was used stick built and modular formwork systems were utilized for the new footings at the courtyard perimeter and the two pilasters along the west wall of the courtyard.
- A 3 ¼" 3000 psi composite concrete slab with welded wire fabric on metal deck was use for each floor slab.

Mechanical System

- Two replacement 650 ton, 1950GPM cooling towers and two replacement 650 ton, 1293 GPM chillers were installed on the roof of the existing seven story building to east of the addition with a truck crane.
- Additionally, two new 380 ton air handling units located in the sixth floor penthouse will supply VAV boxes in the addition with constant air temperature which will then be heated to the appropriate supply temperature and supplied as need to rooms in the addition.
- The addition will utilize a wet type fire suppression system which will be tied into the existing hospital's system.

Electrical System

- A 2000A 480/277 Volt 3-phase electrical service will be provided to the hospital from an existing unit substation in the hospital.
- The hospital has an existing generator which will feed the emergency service for this expansion.

Masonry

- The majority of the façade consists of a field brick with accent brick and stone on a metal stud back up. Working from the outside in the system consists of brick/stone, air space, tyveck building wrap, denzglass board, metal studs and insulation, then interior gypsum board. This veneer façade will be installed with the use of a climbing scaffold on the west side of the building. On the north and partial east side of the standard scaffolding will be utilized on top of the existing roof to install the façade.

Curtainwall

- A glass curtainwall will be utilized at the south stairwell and the first through the third floors at the courtyard. This system will include a low- e coated, insulated glass with spandrel panels and be supported by mullions.

Conveying Systems

- For phase one the elevator will only service the fourth through the sixth floor. To accommodate this a suspended elevator pit will be utilized so that the elevator can become operational prior to the completion of phase two.

PROJECT COST EVALUATION

Please see Appendix B for D4 Cost Estimate

Cost Summary

Maryland General Hospital: Costs		
	Cost	Cost/SF
Construction Cost	$31,942,172	$330.89
Building Cost	$33,044,379	$342.31
Total Project Cost	$57,000,000	$590.47

*Construction Cost excludes sitework and permits

Building Systems Cost

Maryland General Hospital: Building System Costs		
Building System	Cost	Cost/SF
Structure	$2,801,220	$29.02
HVAC/Plumbing	$7,768,195	$80.47
Electrical	$4,576,400	$47.41
Fire Protection	$349,000	$3.62
Conveying System	$890,487	$9.22

D4 Cost Estimate:

Historical Data Projects			
Project Name	Size (SF)	# of Floors	Cost
Mississippi Baptist Health System	87,138	4	$11,672,790
Good Samaritan Medical Center	106,943	6	$11,816,795

Using the D4 program I prepared an estimate for Maryland General Hospital based on the above historical data projects. These projects were selected based on their similarity of occupant use, and to cover a range of size and number of floors which covered that of this project. Using the averaging wizard and adjusting for time and location the D4 estimate came out to be $22,414,361 or $232.2/SF This estimate was about $9.5 million less than budgeted cost for Maryland General.

RS Means

Building Attributes	
Perimeter (ft) *4th Floor	594.5
Total Area (SF)	96534
Basement Area(SF)	6200

I selected to use the 4-8 story hospital in the 2008 RS Means book. Since the area of the building was below the range of the areas and there was no way to interpolate for the area I assumed that the smallest area of 100,000. Additionally, since RS Means did not have Face Brick on a metal stud backup for Hospitals, I assumed for the proposes of this estimate that the exterior wall was face brick with structural facing tile.

RS Means Calculations			
Base Cost per SF	252.95	Per Unit Adjust	Notes
Perimeter Adjust	0	4.15	per 100 lf
Story Adjust	2.5	1.85	per 1 ft
Basement	2.01	31.25	per sf basement
Subtotal	257.46		
Location Adjust	0.9		Baltimore, MD
Total CC/SF	231.714		

*Note basement addition was normalized for cost per the total square feet of the building.

Comparison

Both the D4 and RS Means Estimates were over $100/sf less than the actual construction cost of Maryland General Hospital. There are several factors that I believe contributed to the lard discrepancy among the estimates:

- The extensive and tedious column reinforcing to prepare the existing structure for the added load requires a lot of extra time and money but does not add to the square footage of the building.
- ICRA procedures that had to be followed due to these reinforcing sequences and room reconfigurations which would not typically be necessary for a new construction project such as the ones in the estimating tools.
- Phasing requirements such as added enclosure and concrete encased columns in the courtyard which will be demoed as part of phase two add scope to the project are not taken into accounted.

SITE PLAN OF EXISTING CONDITIONS

Please see Appendix C for Existing Conditions Site Plan

Site Location

- The site is located in downtown Baltimore, MD.
- Bounded on all sides by streets:
    - Martin Luther King, Jr Boulevard and Armory St. to the North.
    - Linden Avenue to the west.
    - Howard Road to the east of the existing hosptial

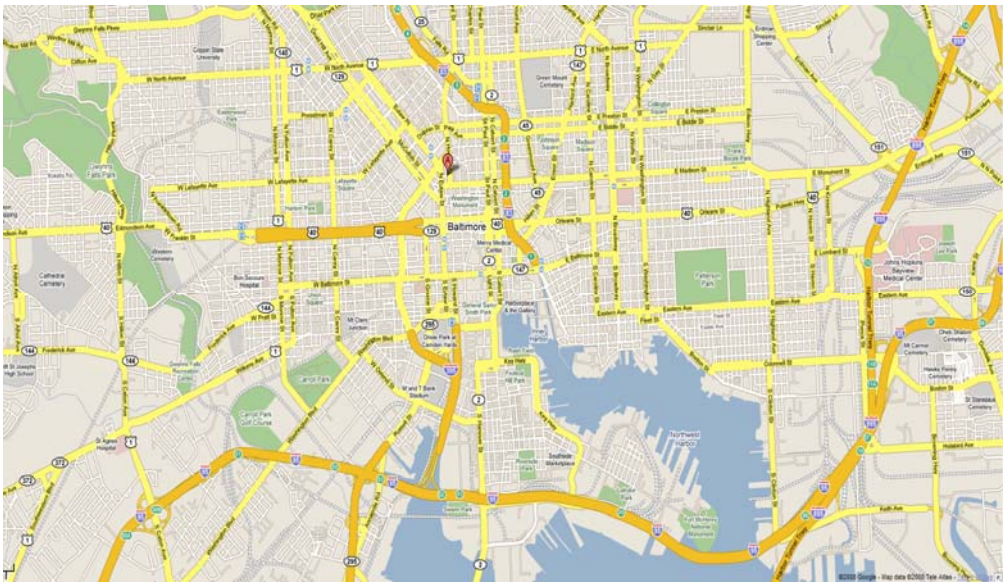
Neighboring Structures

- Two administration buildings (4 and 6 stories), parking garage (4 stories), and parking lot across Linden Ave from the site.
- Parking garage (6 stories) attached to the south end of the hospital.
- Brownstone houses (varying in heights), many with little restaurants on the ground floor across Howard St. from the site.
- Light Rail on Howard Street.
- Complex interchange among Martin Luther King Jr. Boulevard, Howard Street, and W. Chase Street to North of the site.

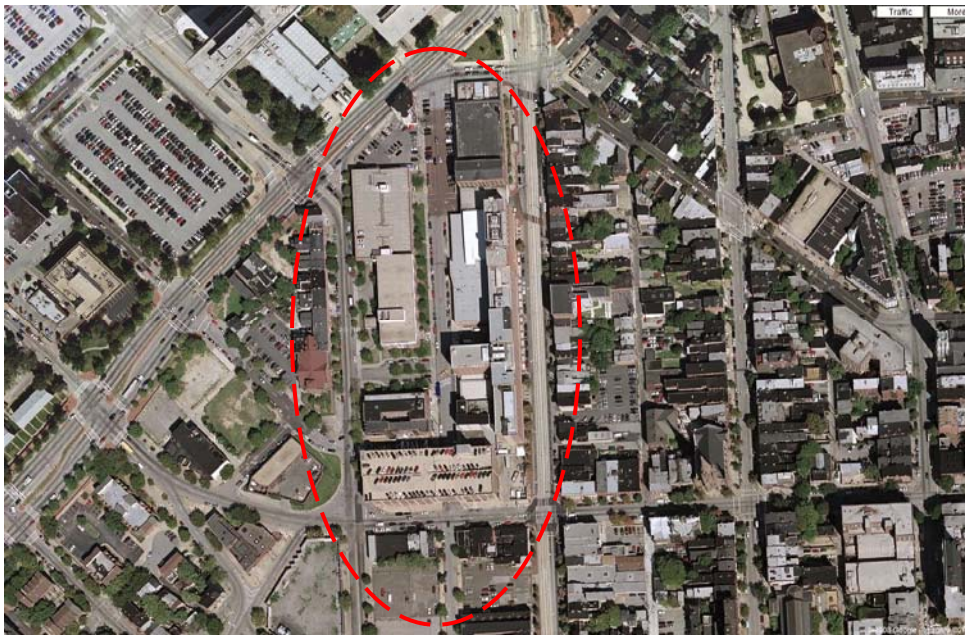
Utility Relocation

- Fiber optics feed going through courtyard into the hospital had to be relocated.
- Trench drains in the hospital were left in during phase 1 to provide drainage but will have to be removed during excavation in phase two**.**
- Water and electric lines in the courtyard will also have to be relocated prior to excavation in phase two.

Vicinity Maps



Baltimore MD. Red A marker indicates location of the site. (Courtesy Google Maps)



Areal View: Maryland General Hospital Campus. (Courtesy Google Maps)

LOCAL CONDITIONS

Preferred Method of Construction

Baltimore has a good mix of both concrete and steel structures. For this project however the preferred method of construction was with structural steel since the existing buildings to which the addition will attach are steel structures. Additionally, to complement the architecture of the existing buildings, a brick façade will be utilized.

City of Baltimore Concerns

- A parking and traffic lane on Linden Avenue will be needed for material laydown, deliveries, and installation of various systems. The traffic on Linen Avenue has been shifted into the far parking lane to maintain two-way traffic on the street for the duration of the project. Appropriate signage, markings, and barriers have been utilized to comply with MOSH and OSHA requirements.
- Trench Drains in the courtyard will be protected from any sediment and debris getting into the storm drains during construction. A class E geotextile with 4-6 inches of ¾" to 1 ½" stone will be used for the erosion and sediment control.

Availability of Construction Parking

- The hospital has given Barton Malow a surface lot at the corner of Linden and Martin Luther King Boulevard to use for their site trailers, material staging, and some construction parking.
- While there are several parking decks on the same block as the hospital, these lots are reserved strictly for patient and staff parking. The hospital has provided parking for contractors in a surface lot on the other side of the Madison Avenue at the south end of the campus.

Available Recycling and Tipping Fees

- As a provision of the contract with the hospital, dumpsters are provided and removed at the hospital's expense.
- In Baltimore these tipping fees typically run around $400. There were no recycling dumpsters utilized for the project. Since the project is not seeking LEED certification this was not an issue.

Soil and Groundwater Conditions

- According to the geotechnical report, Amphibolite Bedrock which is suitable for bearing 30tsf was found between 62ft and 63ft in the courtyard area. Additionally, groundwater was found below 44ft in depth.
- During the drilling of the caissons little water was encountered, mainly after a substantial rainfall. Pumps were used to remove the water but no permanent dewatering was necessary.

CLIENT INFORMATION

Maryland General Hospital is one of the numerous hospitals in the University of Maryland Medical System providing healthcare to more than 110,000 patients in northwest Baltimore, annually. In recent years the hospital has received many honors for the extraordinary quality of service which they provide to patients. Such honors include being named one of "America's Best Hospitals" and in the top 16 percent of hospitals nationwide. This Central Care Expansion addresses the need to update the facility and provides room for the hospital to grow. It is a continuation of their outstanding commitment to the community for present and future healthcare needs as it continues to grow.

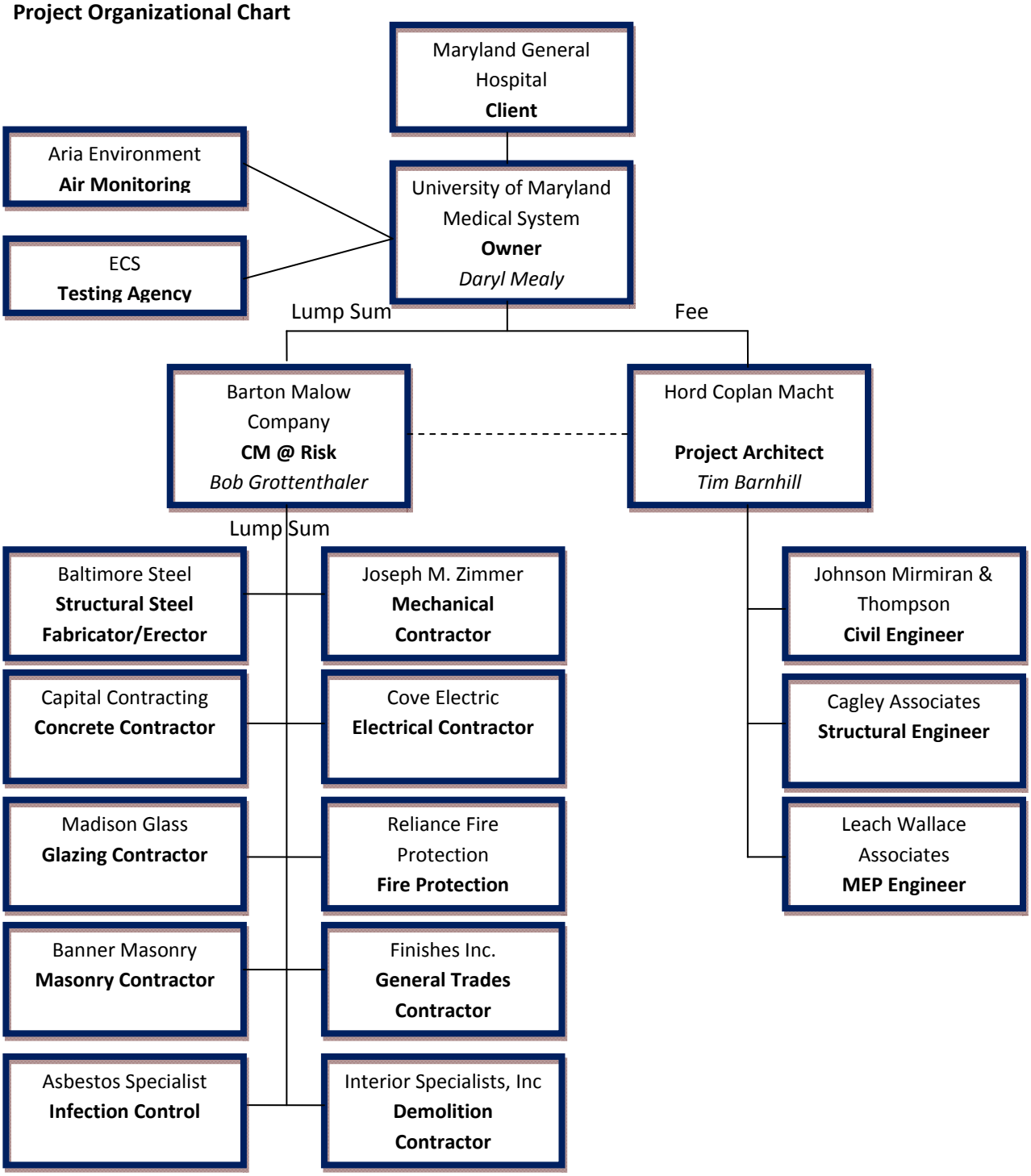
While the current operating room and intensive care unit facilities have gone through many technology upgrades since they were built in the 1950s and 1960s they are becoming outdated and are located too far apart in the existing hospital. This project brings these operating rooms, intensive care units, and a laboratory currently located in another building much closer together for more efficient operation of the hospital.

As part of the funding process for the addition, the hospital has to obtain approval from the Maryland Health Commission. The commission is responsible for reviewing and approving healthcare projects in the state of Maryland. The commission has been a driving factor in some of the schedule requirements as the hospital has to meet certain deadlines. The project was broken into two phases as a risk mitigation strategy in the event that the hospital's financial situation changed. The phasing allows the hospital to complete the more critical operating rooms and intensive care units without being committed to the completion of phase two.

The hospital has several sequencing requirements to meet the needs of their patients. The room reconfigurations required that only a few rooms at a time be taken to renovate so that the department in which the work was being completed could stay operational. Additionally, the third floor pharmacy must be completed prior to the completion of the fourth floor because the existing pharmacy is in a portion of the fourth floor which has some partial demolition and reconfiguration for the new intensive care units.

PROJECT DELIVERY SYSTEM

Project Organizational Chart



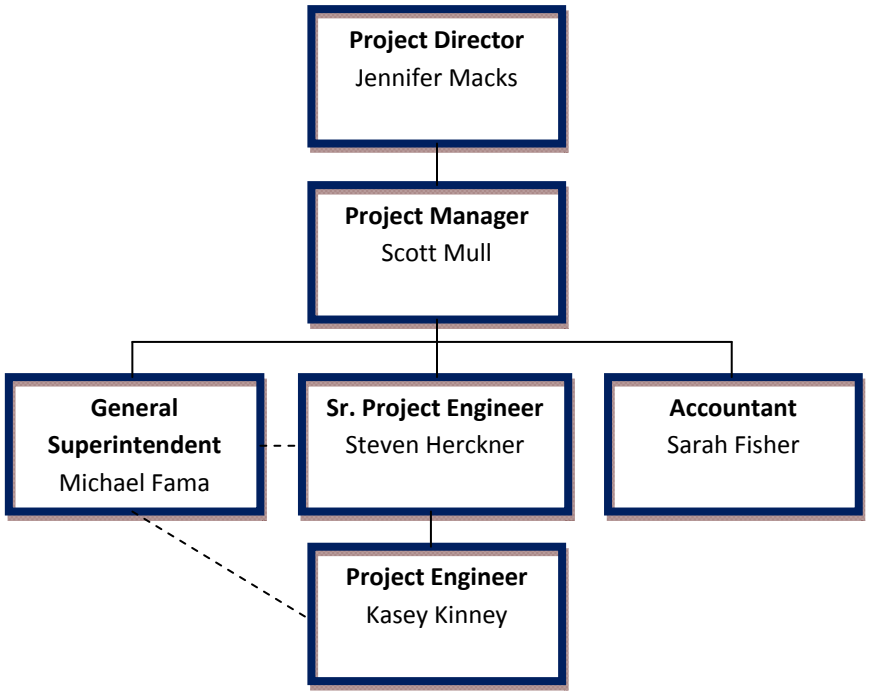
PROJECT DELIVERY SYSTEM

As shown in the project organization chart above there are four key players in the delivery of the project. The University of Maryland Medical System is the building owner while Maryland General Hospital is the client and building occupant. The project is being delivered as a design bid build project. Hord Coplan Macht is the architect and Barton Malow Company is the construction manager at risk on the project. Hord Coplan Macht was selected as the project architect based on their vast experience with healthcare projects and their performance on previous projects for the hospital. Barton Malow has a good and long standing relationship with the University of Maryland and was selected for this project based on their competitive low bid.

As Hord Coplan Macht performed the architectural services out of their office and contracted several consultants for the various other aspects of the project. Johnson Mirmiran and Thompson is the civil engineer on the project and was responsible for the geotechnical analysis, and all site work design. Cagley and Associates is responsible for all the structural design while Leach Wallace Associates is responsible of all mechanical, electrical, and plumbing design for the project. There are several other consultants to the architect who provide acoustic, interior, conveying system, and fire protection design services.

Each subcontractor to Barton Malow on the project was the lowest competitive bid and is in a lump sum contract with Barton Malow. Each of these subcontractors is required to meet minimum MBE requirements in addition to having general liability and builders risk insurances. These subcontractors do not however have to provide a performance bond. In an effort to save the owner cost Barton Malow has purchased Subguard insurance for the project. This eliminates the need for individual performance bonds which should cut down the cost to insure performance on the project. Shown in the organization chart are some of the key subcontractors to the project.

STAFFING PLAN



Barton Malow Company has staffed this job very similarly to other jobs of this size and scope. While this chart shows the general staffing of the project, the plan has been dynamic to accommodate the various stages of construction. As the steel erection approached, another superintendent, and another engineer were brought on to assist with the increased volume of construction in preparation for the steel to go up.

Project Director

The *project director* oversees the project ensuring that the entire team has everything they need to complete their job. Jennifer attends the weekly owners meetings and acts as the liaison between Barton Malow and the University of Maryland Medical System

Project Manager

The *project manager* is ultimately responsible for the successful completion of the project. Scott's daily responsibilities include: writing all contracts, tracking and processing all change orders and pay applications, tracking all budget items, and ensuring that the long term schedule is met.

Senior Project Engineer

The *senior project engineer* is responsible for setting up and overseeing the submittal and rfi system for the project. Additionally, because of the added complexity of some of the steel on the project, Steve who has extensive experience with structural steel, was the primary reviewer of structural steel submittals.

Project Engineer

The *project engineer* is responsible for tracking and posting all RFIs, submittals, and change bulletins. Additionally, the project engineer is responsible for monitoring and documenting the ICRA procedures throughout the duration of the project.

Superintendent

The *superintendent* is responsible for maintaining creating and maintaining the schedule, scheduling daily activities, maintaining quality throughout the project, and enforcing the ICRA procedures.

Accountant

The *accountant* is responsible for tracking all project costs and issuing subcontractor checks.

Appendix A

Maryland General Hospital: Central care Expansion
Project Schedule Summary

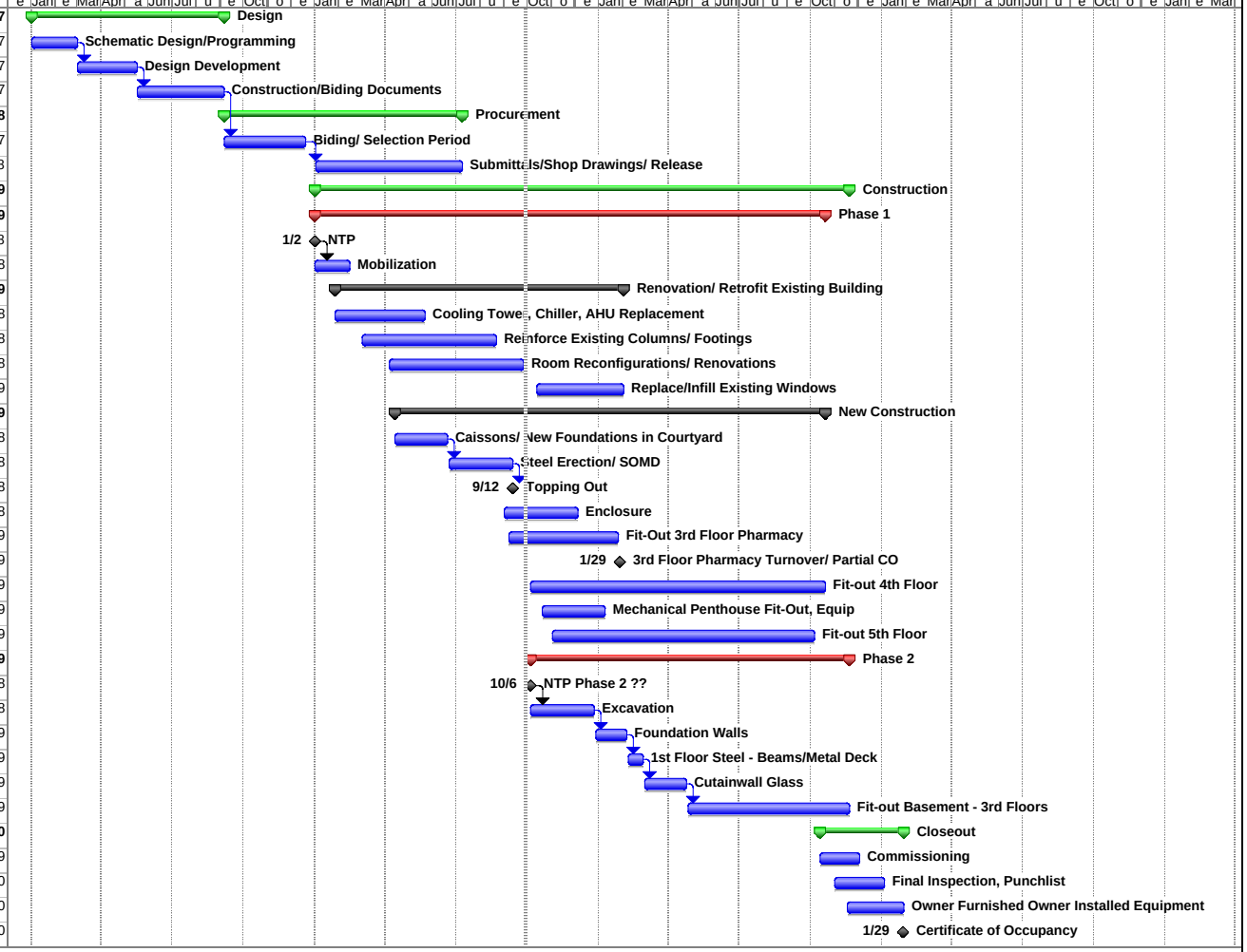
Technical Assignment 1

September 29th, 2008

Brian Goodykoontz
Construction Management Option
Advison Dr. Anumba

Maryland General Hospital
827 Linden Ave, Baltimore, MD
http://www.engr.psu.edu/ae/thesis/portfolios/2009/bwg5000/

ID	Task Name	Duration	Start	Finish
1	**Design**	**178 days**	**Tue 1/2/07**	**Thu 9/6/07**
2	Schematic Design/Programming	43 days	Tue 1/2/07	Thu 3/1/07
3	Design Development	55 days	Fri 3/2/07	Thu 5/17/07
4	Construction/Biding Documents	80 days	Fri 5/18/07	Thu 9/6/07
5	**Procurement**	**219 days**	**Fri 9/7/07**	**Wed 7/9/08**
6	Biding/ Selection Period	75 days	Fri 9/7/07	Thu 12/20/07
7	Submittals/Shop Drawings/ Release	135 days	Thu 1/3/08	Wed 7/9/08
8	**Construction**	**493 days**	**Wed 1/2/08**	**Fri 11/20/09**
9	**Phase 1**	**470 days**	**Wed 1/2/08**	**Tue 10/20/09**
10	NTP	0 days	Wed 1/2/08	Wed 1/2/08
11	Mobilization	33 days	Wed 1/2/08	Fri 2/15/08
12	**Renovation/ Retrofit Existing Bu**	**266 days**	**Mon 1/28/08**	**Mon 2/2/09**
13	Cooling Tower, Chiller, AHU	84 days	Mon 1/28/08	Thu 5/22/08
14	Reinforce Existing Columns/	125 days	Mon 3/3/08	Fri 8/22/08
16	Room Reconfigurations/ Ren	125 days	Mon 4/7/08	Fri 9/26/08
15	Replace/Infill Existing Windo	80 days	Tue 10/14/08	Mon 2/2/09
17	**New Construction**	**397 days**	**Mon 4/14/08**	**Tue 10/20/09**
18	Caissons/ New Foundations	50 days	Mon 4/14/08	Fri 6/20/08
19	Steel Erection/ SOMD	60 days	Mon 6/23/08	Fri 9/12/08
20	Topping Out	0 days	Fri 9/12/08	Fri 9/12/08
21	Enclosure	69 days	Tue 9/2/08	Fri 12/5/08
22	Fit-Out 3rd Floor Pharmacy	101 days	Mon 9/8/08	Mon 1/26/09
23	3rd Floor Pharmacy Turnove	0 days	Thu 1/29/09	Thu 1/29/09
24	Fit-out 4th Floor	272 days	Mon 10/6/08	Tue 10/20/09
26	Mechanical Penthouse Fit-O	59 days	Tue 10/21/08	Fri 1/9/09
25	Fit-out 5th Floor	242 days	Mon 11/3/08	Tue 10/6/09
27	**Phase 2**	**295 days**	**Mon 10/6/08**	**Fri 11/20/09**
28	NTP Phase 2 ??	0 days	Mon 10/6/08	Mon 10/6/08
29	Excavation	60 days	Mon 10/6/08	Fri 12/26/08
30	Foundation Walls	30 days	Mon 12/29/08	Fri 2/6/09
31	1st Floor Steel - Beams/Metal De	15 days	Mon 2/9/09	Fri 2/27/09
32	Cutainwall Glass	40 days	Mon 3/2/09	Fri 4/24/09
33	Fit-out Basement - 3rd Floors	150 days	Mon 4/27/09	Fri 11/20/09
34	**Closeout**	**78 days**	**Wed 10/14/09**	**Fri 1/29/10**
35	Commissioning	37 days	Wed 10/14/09	Thu 12/3/09
36	Final Inspection, Punchlist	46 days	Mon 11/2/09	Mon 1/4/10
37	Owner Furnished Owner Installed Equ	53 days	Wed 11/18/09	Fri 1/29/10
38	Certificate of Occupancy	0 days	Fri 1/29/10	Fri 1/29/10



Project: Maryland General Hospital
Date: Sun 9/28/08

Task — Progress — Summary — External Tasks — Deadline
Split — Milestone — Project Summary — External Milestone

Appendix B

Maryland General Hospital: Central care Expansion
D4 Cost Estimate

Statement of Probable Cost

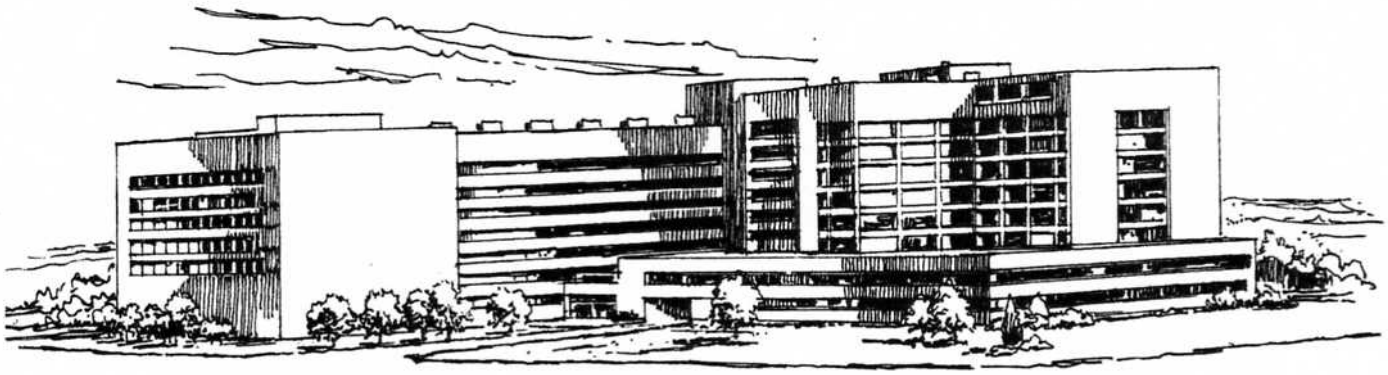
Maryland General Hospital - Jan 2010 - MD - Baltimore

Prepared By:	**Brian Goodykoontz** **AE Senior Thesis: Class of 2009** **The Pennsylvannia State University** **University Park, PA 16801** **585-269-9551 Fax:**	Prepared For:	**Faculty Consultant: Dr. Anumba** **The Pennsylvannia State University** **104 Eng. Unit A** **University Park, PA 16801** **814-865-6394 Fax:814863-4789**
Building Sq. Size:	**97040**	Site Sq. Size:	**1306800**
Bid Date:	**12/1/2007**	Building use:	**Medical**
No. of floors:	**5**	Foundation:	**CAS**
No. of buildings:	**1**	Exterior Walls:	**CON**
Project Height:	**85.5**	Interior Walls:	**GYP**
1st Floor Height:		Roof Type:	**BIT**
1st Floor Size:		Floor Type:	**VCT**
		Project Type:	**ADD/REN**

Division		Percent	Sq. Cost	Amount
00	**Bidding Requirements**	**2.77**	**6.40**	**621,418**
	Bidding Requirements	2.77	6.40	621,418
01	**General Requirements**	**5.46**	**12.60**	**1,222,962**
	General Requirements	5.46	12.60	1,222,962
02	**Site Work**	**7.54**	**17.41**	**1,689,911**
	Site Work	7.54	17.41	1,689,911
03	**Concrete**	**11.29**	**26.08**	**2,530,875**
	Concrete	11.29	26.08	2,530,875
04	**Masonry**	**2.43**	**5.61**	**544,401**
	Masonry	2.43	5.61	544,401
05	**Metals**	**6.07**	**14.03**	**1,361,191**
	Metals	6.07	14.03	1,361,191
06	**Wood & Plastics**	**4.08**	**9.43**	**915,547**
	Wood & Plastics	4.08	9.43	915,547
07	**Thermal & Moisture Protection**	**5.70**	**13.18**	**1,278,634**
	Thermal & Moisture Protection	5.70	13.18	1,278,634
08	**Doors & Windows**	**3.85**	**8.89**	**862,245**
	Doors & Windows	3.85	8.89	862,245
09	**Finishes**	**9.63**	**22.25**	**2,159,309**
	Finishes	9.63	22.25	2,159,309
10	**Specialties**	**0.22**	**0.52**	**50,067**
	Specialties	0.22	0.52	50,067
11	**Equipment**	**11.75**	**27.15**	**2,634,733**
	Equipment	11.75	27.15	2,634,733
14	**Conveying Systems**	**0.55**	**1.28**	**124,027**
	Conveying Systems	0.55	1.28	124,027
15	**Mechanical**	**19.89**	**45.93**	**4,457,514**
	Mechanical	19.89	45.93	4,457,514
16	**Electrical**	**8.75**	**20.21**	**1,961,527**
	Electrical	8.75	20.21	1,961,527
Total Building Costs		**100.00**	**230.98**	**22,414,361**
Total Non-Building Costs		**100.00**	**0.00**	**0**
Total Project Costs		**--**	**--**	**22,414,361**

Appendix C

2008 RS Means Square Foot Costs
Hospitals 4-8 Stories



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	233.70	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 Back-up	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

Important: See the Reference Section for Location Factors

Appendix D

Maryland General Hospital: Central care Expansion
Existing Conditions Site Plan

Existing Light
Remove and Dispose

Existing Light
To Remain

Existing Fire Hydrant
To Remain

Existing Light
To Remain

N

Technical Assignment 1

September 29th, 2008

Brian Goodykoontz
Construction Management Option
Advisor: Dr. Anumba

Maryland General Hospital
827 Linden Ave, Baltimore, MD

http://www.engr.psu.edu/ae/thesis/portfolios/2009/bwg5000/

Graphics courtesy of hornkoplan|macht

E — Electric

W — Water

FO — Fiberoptic/Tel

SAN — Sanitary

Existing Trench Drain

Notes:

Four Sanitary Lines to the Courtyard are new lines for the addition

Site Utilities Plan

Scale: 1”=20’

Howard St

Existing Armory Building

4 Stories

Existing Hospital

7 Stories

Existing Hospital

2 Stories

Addition

4 Stories Over Existing

6 Stories In Courtyard

Existing Courtyard

EMT Entrance

ER Entrance

Main Entrance

Dmpstr

Linden Ave

Parking Garage

6 Stories

(Patient/ Staff Parking Only)

Existing Medical Office Building

4 Stories

Existing Administrative Building

6 Stories

Parking Garage

4 Stories

(Patient/Staff Parking Only)

BMC Trailers

Sea Containers for Material Storage

Martin Luther King Jr Blvd

N

Courtyard Steel Erection

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Legend

- Gate
- Fence
- Construction Deliveries
- Pedestrian Route
- Jersey Barrier + Fence
- Material Laydown
- Doctor Parking
- Metered Parking

Site Logistics Plan

Scale: 1”=80’

Howard St

Existing Armory Building

4 Stories

Existing Hospital

7 Stories

Existing Hospital

2 Stories

Addition

4 Stories Over Existing

6 Stories In Courtyard

Existing Courtyard

EMT Entrance

ER Entrance

Dmpstr

Main Entrance

Linden Ave

Parking Garage

6 Stories

(Patient/ Staff Parking Only)

Existing Medical Office Building

4 Stories

Parking Garage

4 Stories

(Patient/Staff Parking Only)

Existing Administrative Building

6 Stories

BMC Trailers

Sea Containers for Material Storage

Martin Luther King Jr Blvd

N

North Steel Erection

Technical Assignment 1

September 29th, 2008

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Construction Management Option
Advisor: Dr. Anumba

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Legend

- Gate
- Fence
- Construction Deliveries
- Pedestrian Route
- Jersey Barrier + Fence
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Site Logistics Plan

Scale: 1”=80’