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EXECUTIVE SUMMARY

This technical assignment will examine the construction techniques utilized on the Maryland General Hospital Project and summarize the findings of the PACE Roundtable (10/16/08) event. This technical assignment will provide an analysis of the project though a detailed project schedule, site layout diagrams, a detailed structural system estimate, and a general conditions estimate. Additionally, this assignment will examine the critical industry issues addressed at the PACE Roundtable and determine any applicable issues that could be applied to Maryland General Hospital.

To assist with the completion of this assignment three-dimensional (3D) model was created of Maryland General Hospital and the surrounding buildings. For this assignment the model was utilized to further demonstrate the detailed schedule, to illustrate site layout throughout the major phases of construction, and to provided quick quantity take-offs utilized for the estimates that had to be performed. In future assignments and research I hope to utilize this model as a true building information model (BIM) using it for any breadth analyses that will be performed.

The first item analyzed was a detailed construction schedule for the project. The schedule shows construction beginning on January 2, 2008 and obtaining certificate of occupancy on January 29th 2010. Since the last technical report it was announced that phase 2 of the project has been approved. As such the detailed project schedule incorporates a breakdown of these activities as well. Important milestones for the completion of the project are outlined in this section.

Next, the site layout planning was analyzed through the use of a four-dimensional (4D) model which allowed the relationship between work being completed and the site layout to be easily seen. This 4D model demonstrated the construction from the renovation/retrofitting work at the beginning of the project through the enclosure being completed.

The detailed general conditions and structural system estimates were performed for this assignment utilizing the take-offs from the 3D model and RS Means and historic cost data. The detailed structural system totaled $1,789,485 and incorporated all structural steel beams, columns, reinforced existing columns, metal decking, and braced frames for the project. The detailed general conditions estimate totaled $1,863,000 or 5.6% of the total building cost.

Lastly, a summary of the PACE roundtable even shows there are numerous issues facing the industry with respect to BIM and Sustainability. This presents numerous possibilities for research for in the coming months.

DETAILED PROJECT SCHEDULE

Please see Appendix A for Detailed Project Schedule

Key Project Start Dates

Table 1: Key Project Completion Dates	
Mobilize On-Site	1/2/2008
Chiller & Cooling Tower Replacement	8/4/28/08
Foundations	7/24/2008
Column Reinforcing	8/11/2008
Patients Out of Courtyard Rooms	7/1/2008
Topping Out	9/18/2009
Enclosure	12/4/2008
Partial Certificate of Occupancy -Pharmacy	1/29/2009
Commissioning	12/3/2009
Final Certificate of Occupancy	1/29/2009

The detailed project schedule breaks the two phases of the project down into several sequences of construction. Several critical sequences to the successful on time completion of the project are outlined below. Many of these stages require a significant amount of coordination with the owner to ensure that the hospital space needs are meet while meeting the project schedule. Other very important sequences to the completion of the project are outline on page 2 of the first technical report.

Reinforce Existing Columns/Footings

To reinforce the existing structure the numerous spaces were grouped into three large batches of areas where work would be completed. So that no department was completely disabled for the duration of these reinforcements the work in each was broken into different batches so that only portions of department space at a time had to be vacated for the construction. Table 2 shows the breakdown of these work areas.

Table 2: Column Reinforcing	
Batch #	Areas
1	Basement - Facilities Corridor 2nd Floor - Cardiology North - Braced Frame
2	Basement - Nuclear Medicine 1st Floor - Radiology 2nd Floor - Cardiology 3rd Floor - Ophthalmology
3	1st Floor – Cardiology, Radiology 2nd Floor – Ophthalmology

Replace/Infill Existing Windows

Table 3: Window Replacements Duration	
Activity	Duration
Owner Vacate/ICRA Precautions	1
Demo Existing Window	1
Frame/Insulate/Gypsum Board	2
Masonry Infill	2
Set Window	2
Patch/Repair Adjacent Wall	1
Tape/ Finish	2
Prime/Paint	1
Final Clean/Remove ICRA	1
Approx. Duration	13

Table 4: Infill Existing Windows Duration	
Activity	Duration
Owner Vacate/ICRA Precautions	1
Frame/Insulate/Gypsum Board	1
Tape/Finish	2
Prime/Paint	1
Final Clean/Remove ICRA	1
Approx. Duration	5

The replacement and infill of existing windows was only broken up by area as this work is highly repetitive. All of the areas that require this work have the same durations for each of the activities in the replacement and infill.

Room Reconfiguration/Renovations

As with the reinforcement sequence of work, the room reconfigurations were divided the work in each department into separate batches. The room reconfigurations were broken into two main batches. Table 3 shows the breakdown of these areas.

Table 5: Room Reconfigurations	
Batch #	Areas
1	2nd Floor - Maternity - 4 Rooms 3rd Floor - TBI - Rooms
2	2nd Floor - Maternity 2 – 6 Rooms 3rd Floor - TBI - 3 Rooms

SITE LAYOUT PLANNING

Please see Appendix B for Site Layout Planning Diagrams.

The site layout planning diagrams were generated from a 4D model created for the project. These diagrams will walk through the placement of laydown, entrances to the site, and critical equipment of each of the critical phases of construction. The Barton Malow construction trailers were placed in an existing surface lot which was provided by the hospital for use during construction.

Renovations/ Retrofits

During the renovations and retrofitting phase of the construction the fence contained the site at the face of the existing building which allowed the sidewalk on hospital side to remain open. Access to the site was provided with two gates into the courtyard at two existing curb cuts.
Elevators in the building used for transportation.

- Site Utilization
  - The courtyard was utilized for laydown of flange plates, and refuse dirt, and foreman parking during this stage.
  - Sea Containers were utilized in surface lot with the BMC trailers to provide storage for hospital office furniture displaced, and new materials for the renovated spaces.
- Equipment
  - *HEPA Microtrap Fans* to maintain Negative Air Pressure in work areas.
  - *Smoke Eaters* to eliminate fumes from welding of flanges to the existing columns.

Foundations

The first few caissons in the courtyard were drilled with the construction fence remaining in the same location. At the end of this stage however the construction fence was moved out to take the parking lane and one traffic lane provide increased public safety, increased construction laydown for upcoming steel shakeout, and work space for the caisson crew and the steel erectors. This was accomplished by eliminating hospital parking on both sides of the road for the remainder of the project so that traffic be shifted into the parking lane on the opposite side of the road and maintain two way traffic. Jersey barriers with 4 foot fence on top was provided to separate traffic from the construction site. At either end of the site gates in the fence provide access to the site for deliveries of material.

- Site Utilization
  - Laydown space in the surface lot was utilized throughout this stage for storage of rebar, and forms for the foundations.
  - Sea containers continued to be utilized for hospital and material storage.
- Equipment
  - *Auger Drill* was used to drill the caissons to the designated depth.
  - A small *all-terrain crane* was utilized for placement of the corrugated steel tube, caisson casing placement and removal, and placement of rebar cages into the caissons.
  - *Concrete Trucks* were used in conjunction with wheel barrows to place concrete for footing reinforcement in the basement and new footings in the courtyard.

Structural Steel

During the structural steel stage the site perimeter with the jersey barriers and fencing remained in the same location as it was left at the end of the foundations phase. This provided shake out space for the structural steel and for the truck crane that was used to erect it.

- Site Utilization
  - The two lanes and sidewalk at the north end of the site were used for shakeout of each of the sequences of steel in the courtyard. The shakeout area was then moved to the south end of these lanes to for erection at the north end over the existing building
- Equipment
  - *A 120 Ton Truck Crane* was utilized to place all new steel members and decking for the building.
  - A *Boom Lift* was utilized to assist with the connections on the lower levels of the courtyard steel.
  - *Safety Nets* which were required since the decking would not be installed on the first through third floor in the courtyard for phase 1.
  - *Concrete Pump Trucks* were utilized to pour the elevated slabs.

Enclosure

Again, during this stage the site perimeter will remain consistent however there will be increased space for material storage as the phase 2 deck and slabs should be poured and set by this point.

- Site Utilization
  - The two lanes in the construction zone provided laydown space for the brick and stone for the façade.
- Equipment
  - *Climbing Scaffolding* was utilized to install the building façade on the west side of the building
  - *Standard Scaffolding* was utilized to install the building façade on the north and east sides of the building.

DETAILED STRUCTURAL SYSTEM ESTIMATE

Please see Appendix C for Detailed Structural System Estimate

Structural System Estimate Summary:

Table 6: Structural Steel Estimate

Structural Component	Amount Phase 1	Phase 2
Concrete		
Caissons	$45,804	$0
Spread Footings	$14,365	$0
Pilaster and Grade Beams	$8,035	$0
Slabs	$166,195	$90,845
Foundation Wall	$0	$14,410
Subtotal Concrete	$234,398	$105,255
Steel		
Columns	$388,477	$0
Beams	$344,585	$139,069
Steel Decking	$344,191	$127,146
Steel Flange Plates	$106,364	$0
Subtotal Steel	$1,183,617	$266,215
Total	$1,418,015	$371,470
Grand Total Phase 1&2		$1,789,485

This estimate includes new and reinforced existing footings, reinforced existing columns, caissons, structural steel beams and columns, slab on grade, and slab on metal deck. The quantity takeoff for this estimate was prepared with the assistance of a BIM which I am in the process of developing for the project.

Assumptions:

Foundations:

- Estimate excludes soil excavation and removal, miscellaneous metals, and steel for the entrance canopy and signage steel.
- Existing column footings which had to be reinforced and enlarged were taken off as the final size with an additional 20% for the complexity of the concrete work. These foundations are earth formed.
- Waste factors of 10% for rebar and pours with formwork, 5% waste factor for concrete.

Structural Steel Beams and Columns

- Pricing for wide flange beams and columns was rounded up to the closest column size in RS Means 2009.

GENERAL CONDITIONS ESTIMATE

Please see Appendix D for General Conditions Estimate

General Conditions Estimate Summary:

Table 7: General Conditions Estimate Summary

Description	Amount
Personnel	$1,184,850
Field Office Support	$145,700
Relocation, Travel, Meals	$25,200
Temporary Utilities	$7,500
Temporary Facilities	$290,750
Safety and Security	$8,000
Clean-up	$143,000
Protection of Finished Work	$0
Tools and Equipment	$5,000
Material Handling and Hoists	$0
Consultant and Professional Services	$10,000
Permits and Fees	$43,000
Grand Total	$1,863,000

The above general conditions estimate was prepared through the use of RS Means cost data and current industry unit costs provided by Barton Malow Company. The total cost for reimbursable general conditions based on this estimate is $1,863,000. Approximately 64% of these general conditions are comprised of the personnel costs for the project. These personnel costs were derived from RS Means 2009 with approximate durations which were established with the use of a staffing monitor for the project which was developed based on high construction volume and discussions with the project team. As described in the staffing plan of the first technical assignment, there were several additional personnel brought on to assist with the structural steel erection and pharmacy fit-out stages in the construction. Both the protection of finished work and material handling costs were included in each subcontractor's buy out on the project and were assumed to be the same for purposes of this estimate.

CRITICAL INDUSTRY ISSUES

The 2008 PACE Roundtable focused on the evolution of LEED, BIM strategies, and Energy and Economy. To discuss these topics in further detail there were several concurrent breakout sessions which all had very interesting discussions. I choose to attend the LEED evolution breakout session as I have a very strong interest in sustainability. Below you will find a summary of each of these sessions as was presented to the entire group and a more detailed overview of the LEED evolution discussion.

LEED Evolution

The LEED discussion started off by discussing some of the existing problems with the rating system. This commenced with discussing the costs of LEED on a project. While there have been numerous projects utilizing this sustainable rating system, there still debate in the industry about how much it costs to implement on projects. To evaluate each of these projects for some of the LEED points, a second, "base case" design must be performed. This additional design to evaluate the energy efficiency of the building costs more money. Additionally, Todd Vochinsky of Suffolk Construction emphasized that there the earlier the construction manager can get involved to provide cost and constructability feedback the better. This led to discussion of how imperative it is for the entire project team to be involved and on board with the LEED process from the beginning. In particular, the group came to the consensus that the owner needs to be more engaged with the process. To often owners simply ask for a LEED building without fully understanding the process and forgetting about the maintenance needs to maintain system design efficiencies. It was suggested that education for the client in these aspects is needed to better deliver and operate these types of projects.

Further we discussed how the rating system is changing at the beginning of the year. These changes are highly performance based, requiring additional controls, ongoing commissioning and permanent system level metering. Additionally, the new rating system is restructuring the regional points section. This restructure will create a bit more of a subjective system for the region points. A running list of points which are achieved will be kept and presented as precedence for future projects to use as a guide for obtaining points. Several suggestions for further changes to the rating program resulted from this discussion. Mike Miller of Southland Industries shared that on several occasions his company has gone after innovation points which they had gotten for projects in the past but did not get on succeeding projects. He suggested the new version of LEED have a way of tracking these past innovations points (much like the new regional system) and designate those which will not receive credit any more.

LEED Evolution (Continued)

Summary of Issues:

- There is still ambiguity with respect to LEED cost on projects.
- There is lack of project integration on projects has cost implications.
- Owner education of the LEED process is essential to the continued operation of green buildings that are built.
- What are the regional impacts of LEED?

Industry Attendees:
Michael Abbondante – Barton Malow Company
Leaha Martynuska – Barton Malow Company
Michael Miller – Southland Industries
Todd Vochinsky – Suffolk Construction

BIM Strategies

Summary of Issues:

- Pilot projects are needed to further investigate the implementation of BIM on projects.
- There is a lot of lost intelligence currently in the use of BIM. How do we collect and update the BIM with this intelligence.
- Models are often not used to their full potential. What opportunities are there for use of the BIM throughout the life cycle of the building?
- Currently, there is not an extensive library of products for modeling. There is a need for manufacturers to create libraries of their products for use in these models.

Industry Contacts:
Corinne Ambler – Barton Malow Construction
John Becktel – Office of the Physical Plant – The Pennsylvania State University
Jason Reece – Balfour Beatty Construction

Energy and Economy

Summary of Issues:

- Cost of materials is escalating. What new materials are out there that can be used to help with project cost?
- How do we maintain operations as the economy slows and funding for projects decreases. The market for new work will decline and the industry will see an increase in renovation and retrofit work to improve energy performance of the building. How do we adapt and adjust to fit this growing market?
- New power systems are developing to deal with transformer inefficiencies.

Industry Contacts:
Scott Mull – Barton Malow Company
Bill Moyer – Davis Construction

Changing Roles in the Industry

In addition to there breakout sessions there was a discussion with an industry panel about the changing roles in the industry. There were several points made during this session which echoed and added to those of the breakout sessions which I felt worth mentioning as there could be potentially good research topics to prepare for these changes in the industry.

Summary of Changing Roles:

- Increased project integration through the use of new project delivery methods such as collaborative contracts with the architect, owner, construction manager, and subcontractors. Construction managers could see more involvement in financing, design, and operations and maintenance of buildings.
- Improved standard operating procedures (SOPs)
- New renovation market opens the gates to new skill sets. Relocation management and understanding renovation costs will be critical.

Industry Panalists:

Bill Moyer – Davis Construction Company
Chris Smith – Benchmark Construction
Chuck Tomasco – Truland Construction Company
John Becktel – Office of the Physical Plant – The Pennsylvania State University

Research Potential

The roundtable helped me to solidify some of the issues that are facing the industry with respect to these growing trends. Using this industry input, and insight gained from graduate coursework; I have brainstormed numerous ideas that might be able to be applied to my project. These ideas are outlined below that might be applied to the Maryland Hospital Project:

- Four-Dimensional (4D) Modeling as a transparent construction production management tool.
- Owner education for sustainable construction AND operation.
- Project Integration as an economic and sustainable project delivery system.
- Pre-fabricated façade systems as a sustainable and schedule accelerating alternative.

In the third technical assignment I will further evaluate these with respect to the constructability challenges, scheduling acceleration, and value engineering topics which will be identified in that assignment. I will further develop each and how it could be/have been applied to the Maryland General Hospital Project.

Appendix A:

Detailed Project Schedule

Maryland General Hospital: Central Care Expansion

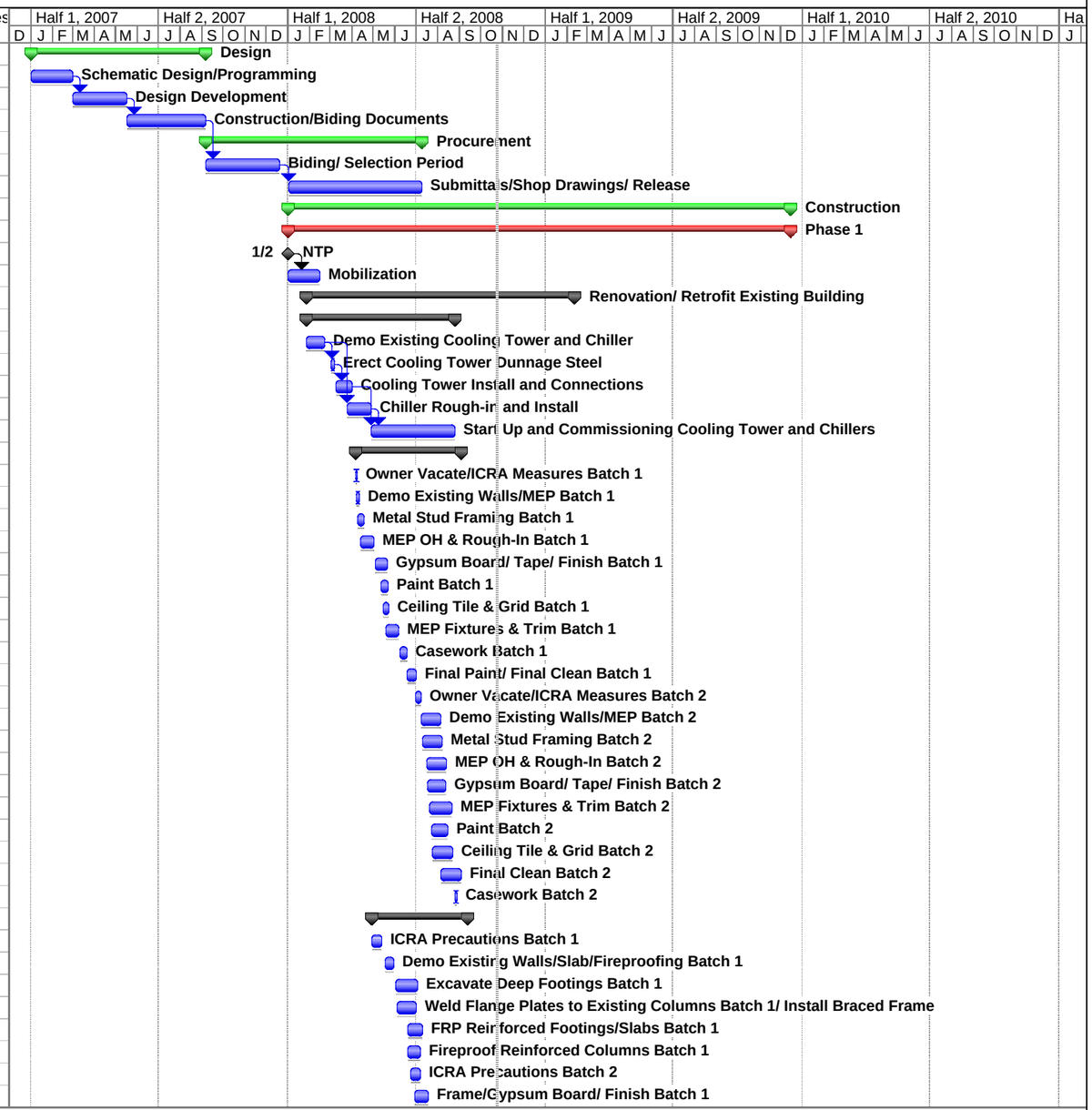
Technical Assignment 2

October 24th 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/

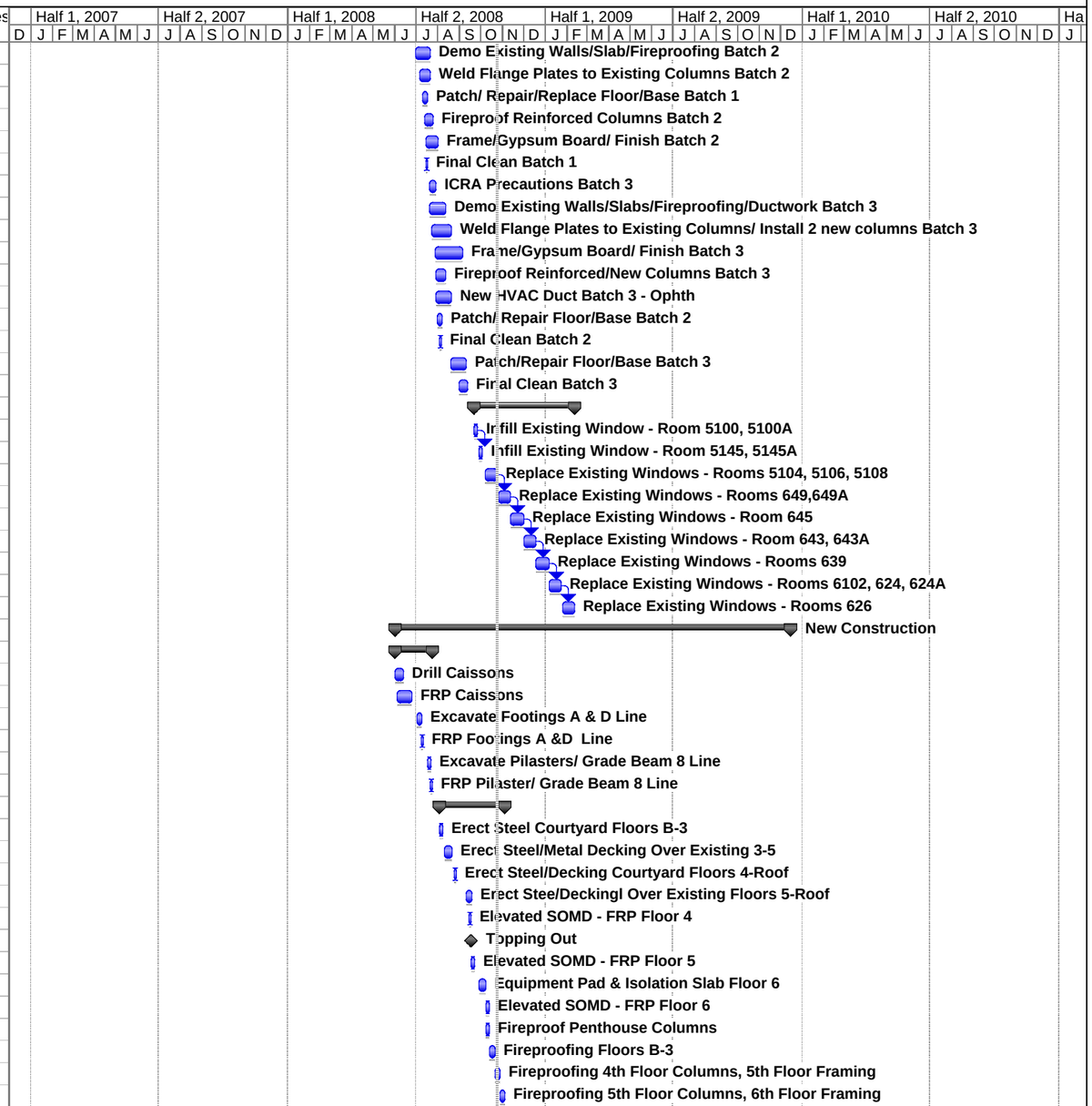
ID	Task Name	Duration	Start	Finish	Predeces
1	**Design**	**178 days**	**Tue 1/2/07**	**Thu 9/6/07**	
2	Schematic Design/Programming	43 days	Tue 1/2/07	Thu 3/1/07	
3	Design Development	55 days	Fri 3/2/07	Thu 5/17/07	2
4	Construction/Biding Documents	80 days	Fri 5/18/07	Thu 9/6/07	3
5	**Procurement**	**219 days**	**Fri 9/7/07**	**Wed 7/9/08**	
6	Biding/ Selection Period	75 days	Fri 9/7/07	Thu 12/20/07	4
7	Submittals/Shop Drawings/ Release	135 days	Thu 1/3/08	Wed 7/9/08	6
8	**Construction**	**510 days?**	**Wed 1/2/08**	**Tue 12/15/09**	
9	**Phase 1**	**510 days**	**Wed 1/2/08**	**Tue 12/15/09**	
10	NTP	0 days	Wed 1/2/08	Wed 1/2/08	
11	Mobilization	33 days	Wed 1/2/08	Fri 2/15/08	10
12	**Renovation/ Retrofit Existing Building**	**273 days**	**Mon 1/28/08**	**Wed 2/11/09**	
13	**Cooling Tower, Chiller, AHU Replacement**	**151 days**	**Mon 1/28/08**	**Mon 8/25/08**	
14	Demo Existing Cooling Tower and Chiller	20 days	Mon 1/28/08	Fri 2/22/08	
15	Erect Cooling Tower Dunnage Steel	5 days	Mon 3/3/08	Fri 3/7/08	14
16	Cooling Tower Install and Connections	17 days	Mon 3/10/08	Tue 4/1/08	15
17	Chiller Rough-in and Install	24 days	Wed 3/26/08	Mon 4/28/08	14
18	Start Up and Commissioning Cooling Tower and Chillers	85 days	Tue 4/29/08	Mon 8/25/08	17,16
54	**Room Reconfigurations/ Renovations**	**108 days**	**Mon 4/7/08**	**Wed 9/3/08**	
55	Owner Vacate/ICRA Measures Batch 1	2 days	Mon 4/7/08	Tue 4/8/08	
56	Demo Existing Walls/MEP Batch 1	4 days	Tue 4/8/08	Fri 4/11/08	
57	Metal Stud Framing Batch 1	7 days	Thu 4/10/08	Fri 4/18/08	
58	MEP OH & Rough-In Batch 1	15 days	Mon 4/14/08	Fri 5/2/08	
59	Gypsum Board/ Tape/ Finish Batch 1	13 days	Mon 5/5/08	Wed 5/21/08	
60	Paint Batch 1	8 days	Tue 5/13/08	Thu 5/22/08	
61	Ceiling Tile & Grid Batch 1	6 days	Fri 5/16/08	Fri 5/23/08	
62	MEP Fixtures & Trim Batch 1	14 days	Tue 5/20/08	Fri 6/6/08	
63	Casework Batch 1	8 days	Mon 6/9/08	Wed 6/18/08	
64	Final Paint/ Final Clean Batch 1	9 days	Thu 6/19/08	Tue 7/1/08	
65	Owner Vacate/ICRA Measures Batch 2	6 days	Tue 7/1/08	Tue 7/8/08	
66	Demo Existing Walls/MEP Batch 2	20 days	Wed 7/9/08	Tue 8/5/08	
67	Metal Stud Framing Batch 2	20 days	Fri 7/11/08	Thu 8/7/08	
68	MEP OH & Rough-In Batch 2	20 days	Thu 7/17/08	Wed 8/13/08	
69	Gypsum Board/ Tape/ Finish Batch 2	18 days	Fri 7/18/08	Tue 8/12/08	
72	MEP Fixtures & Trim Batch 2	24 days	Mon 7/21/08	Thu 8/21/08	
70	Paint Batch 2	17 days	Thu 7/24/08	Fri 8/15/08	
71	Ceiling Tile & Grid Batch 2	21 days	Fri 7/25/08	Fri 8/22/08	
74	Final Clean Batch 2	21 days	Wed 8/6/08	Wed 9/3/08	
73	Casework Batch 2	3 days	Tue 8/26/08	Thu 8/28/08	
19	**Reinforce Existing Columns/ Footings**	**98 days**	**Wed 4/30/08**	**Fri 9/12/08**	
20	ICRA Precautions Batch 1	10 days	Wed 4/30/08	Tue 5/13/08	
23	Demo Existing Walls/Slab/Fireproofing Batch 1	10 days	Mon 5/19/08	Fri 5/30/08	
24	Excavate Deep Footings Batch 1	23 days	Tue 6/3/08	Thu 7/3/08	
28	Weld Flange Plates to Existing Columns Batch 1/ Install Braced Frame	19 days	Thu 6/5/08	Tue 7/1/08	
25	FRP Reinforced Footings/Slabs Batch 1	15 days	Fri 6/20/08	Thu 7/10/08	
31	Fireproof Reinforced Columns Batch 1	12 days	Fri 6/20/08	Mon 7/7/08	
21	ICRA Precautions Batch 2	10 days	Tue 6/24/08	Mon 7/7/08	
35	Frame/Gypsum Board/ Finish Batch 1	15 days	Mon 6/30/08	Fri 7/18/08	



Project: MGH-tech
Date: Fri 10/24/08

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

ID	Task Name	Duration	Start	Finish	Predeces
26	Demo Existing Walls/Slab/Fireproofing Batch 2	15 days	Tue 7/1/08	Mon 7/21/08	
29	Weld Flange Plates to Existing Columns Batch 2	11 days	Mon 7/7/08	Mon 7/21/08	
38	Patch/ Repair/Replace Floor/Base Batch 1	5 days	Fri 7/11/08	Thu 7/17/08	
32	Fireproof Reinforced Columns Batch 2	10 days	Mon 7/14/08	Fri 7/25/08	
36	Frame/Gypsum Board/ Finish Batch 2	13 days	Wed 7/16/08	Fri 8/1/08	
41	Final Clean Batch 1	2 days	Wed 7/16/08	Thu 7/17/08	
22	ICRA Precautions Batch 3	7 days	Mon 7/21/08	Tue 7/29/08	
27	Demo Existing Walls/Slabs/Fireproofing/Ductwork Batch 3	17 days	Mon 7/21/08	Tue 8/12/08	
30	Weld Flange Plates to Existing Columns/ Install 2 new columns Batch 3	20 days	Thu 7/24/08	Wed 8/20/08	
37	Frame/Gypsum Board/ Finish Batch 3	29 days	Tue 7/29/08	Fri 9/5/08	
33	Fireproof Reinforced/New Columns Batch 3	10 days	Wed 7/30/08	Tue 8/12/08	
34	New HVAC Duct Batch 3 - Ophth	16 days	Wed 7/30/08	Wed 8/20/08	
39	Patch/ Repair Floor/Base Batch 2	5 days	Fri 8/1/08	Thu 8/7/08	
42	Final Clean Batch 2	3 days	Mon 8/4/08	Wed 8/6/08	
40	Patch/Repair Floor/Base Batch 3	16 days	Wed 8/20/08	Wed 9/10/08	
43	Final Clean Batch 3	10 days	Mon 9/1/08	Fri 9/12/08	
44	**Replace/Infill Existing Windows 5 & 6 Floors**	**103 days**	**Mon 9/22/08**	**Wed 2/11/09**	
46	Infill Existing Window - Room 5100, 5100A	5 days	Mon 9/22/08	Fri 9/26/08	
47	Infill Existing Window - Room 5145, 5145A	5 days	Mon 9/29/08	Fri 10/3/08	46
48	Replace Existing Windows - Rooms 5104, 5106, 5108	13 days	Wed 10/8/08	Fri 10/24/08	
49	Replace Existing Windows - Rooms 649,649A	13 days	Mon 10/27/08	Wed 11/12/08	48
50	Replace Existing Windows - Room 645	13 days	Thu 11/13/08	Mon 12/1/08	49
51	Replace Existing Windows - Room 643, 643A	13 days	Tue 12/2/08	Thu 12/18/08	50
52	Replace Existing Windows - Rooms 639	13 days	Fri 12/19/08	Tue 1/6/09	51
53	Replace Existing Windows - Rooms 6102, 624, 624A	13 days	Wed 1/7/09	Fri 1/23/09	52
45	Replace Existing Windows - Rooms 626	13 days	Mon 1/26/09	Wed 2/11/09	53
75	**New Construction**	**402 days**	**Mon 6/2/08**	**Tue 12/15/09**	
76	**Caissons/ New Foundations in Courtyard**	**39 days**	**Mon 6/2/08**	**Thu 7/24/08**	
77	Drill Caissons	10 days	Mon 6/2/08	Fri 6/13/08	
78	FRP Caissons	15 days	Thu 6/5/08	Wed 6/25/08	
79	Excavate Footings A & D Line	5 days	Thu 7/3/08	Wed 7/9/08	
81	FRP Footings A &D Line	3 days	Wed 7/9/08	Fri 7/11/08	
80	Excavate Pilasters/ Grade Beam 8 Line	3 days	Fri 7/18/08	Tue 7/22/08	
82	FRP Pilaster/ Grade Beam 8 Line	3 days	Tue 7/22/08	Thu 7/24/08	
83	**Steel Erection/ SOMD**	**67 days**	**Mon 8/4/08**	**Tue 11/4/08**	
84	Erect Steel Courtyard Floors B-3	5 days	Mon 8/4/08	Fri 8/8/08	
85	Erect Steel/Metal Decking Over Existing 3-5	9 days	Mon 8/11/08	Thu 8/21/08	
86	Erect Steel/Decking Courtyard Floors 4-Roof	3 days	Mon 8/25/08	Wed 8/27/08	
87	Erect Stee/Deckingl Over Existing Floors 5-Roof	6 days	Thu 9/11/08	Thu 9/18/08	
89	Elevated SOMD - FRP Floor 4	3 days	Mon 9/15/08	Wed 9/17/08	
88	Topping Out	0 days	Thu 9/18/08	Thu 9/18/08	
90	Elevated SOMD - FRP Floor 5	3 days	Thu 9/18/08	Mon 9/22/08	
92	Equipment Pad & Isolation Slab Floor 6	8 days	Mon 9/29/08	Wed 10/8/08	
91	Elevated SOMD - FRP Floor 6	3 days	Thu 10/9/08	Mon 10/13/08	
96	Fireproof Penthouse Columns	3 days	Thu 10/9/08	Mon 10/13/08	
93	Fireproofing Floors B-3	6 days	Tue 10/14/08	Tue 10/21/08	
94	Fireproofing 4th Floor Columns, 5th Floor Framing	5 days	Wed 10/22/08	Tue 10/28/08	
95	Fireproofing 5th Floor Columns, 6th Floor Framing	5 days	Wed 10/29/08	Tue 11/4/08	



Project: MGH-tech
Date: Fri 10/24/08

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

ID	Task Name	Duration	Start	Finish	Predeces
105	**Fit-Out 3rd Floor Pharmacy**	**97 days**	**Tue 9/16/08**	**Thu 1/29/09**	
107	ICRA Measures	2 days	Tue 9/16/08	Wed 9/17/08	
106	Demo Existing Roofing/Walls/Windows	3 days	Thu 9/18/08	Mon 9/22/08	
108	OH MEP/FP/PT Mains and Risers	30 days	Wed 9/24/08	Tue 11/4/08	
109	Metal Stud Framing	10 days	Wed 10/8/08	Tue 10/21/08	
110	MEP Rough-In	10 days	Wed 10/15/08	Tue 10/28/08	
111	Gypsum Board/Finish	10 days	Thu 10/30/08	Wed 11/12/08	
112	Paint	5 days	Mon 11/10/08	Fri 11/14/08	
113	Electirc, Lighting, Telecom Wire Pulls	10 days	Thu 11/20/08	Wed 12/3/08	
114	Drop Ceiling Grid/Tile	9 days	Fri 12/5/08	Wed 12/17/08	
115	MEP Fixtures/ Devices Trimout	5 days	Mon 12/8/08	Fri 12/12/08	
118	Floor and Base	8 days	Mon 12/15/08	Wed 12/24/08	
119	Doors & Hardware	4 days	Mon 12/22/08	Thu 12/25/08	
116	Casework	10 days	Mon 12/29/08	Fri 1/9/09	
117	Finish Paint	3 days	Fri 1/9/09	Tue 1/13/09	
120	Final Clean	2 days	Mon 1/12/09	Tue 1/13/09	
121	3rd Floor Pharmacy Turnover/ Partial CO	0 days	Thu 1/29/09	Thu 1/29/09	
157	**Mechanical Penthouse Fit-Out, Equip**	**65 days**	**Mon 9/29/08**	**Fri 12/26/08**	
160	Penthouse Walls/ Roof Soundproofing	5 days	Mon 9/29/08	Fri 10/3/08	
158	Set New AHUs/ Switchgear	5 days	Mon 10/13/08	Fri 10/17/08	
159	MEP Equipment/ Connections	45 days	Mon 10/27/08	Fri 12/26/08	
122	**Fit-out 4th Floor**	**312 days**	**Mon 10/6/08**	**Tue 12/15/09**	
123	ICRA Measures	5 days	Mon 10/6/08	Fri 10/10/08	
124	Demo Existing Walls/Windows	20 days	Mon 10/13/08	Fri 11/7/08	
125	Wall Layout/ Priority Studs/ IT & Electic Closets	15 days	Mon 11/3/08	Fri 11/21/08	
126	OH MEP/FP/PT Mains and Risers	40 days	Mon 11/24/08	Fri 1/16/09	
127	Metal Stud Framing	35 days	Wed 1/7/09	Tue 2/24/09	
128	MEP Branches & Rough-In	75 days	Wed 2/4/09	Tue 5/19/09	
129	Gypsum Boardl/Finish	35 days	Wed 5/13/09	Tue 6/30/09	
131	Electirc, Lighting, Telecom Wire Pulls	30 days	Wed 6/10/09	Tue 7/21/09	
130	Paint	20 days	Wed 6/24/09	Tue 7/21/09	
132	Drop Ceiling Grid/Tile	35 days	Wed 7/8/09	Tue 8/25/09	
135	Medical Headwall Installation	25 days	Wed 7/15/09	Tue 8/18/09	
134	Casework/Lockers	30 days	Wed 8/5/09	Tue 9/15/09	
136	Finish Paint	25 days	Wed 8/26/09	Tue 9/29/09	
133	MEP Fixtures/ Devices Trimout	20 days	Wed 9/16/09	Tue 10/13/09	
137	Floor and Base	25 days	Wed 9/30/09	Tue 11/3/09	
138	Doors & Hardware	20 days	Wed 11/4/09	Tue 12/1/09	
139	Final Clean/Startup/Test/Check	15 days	Wed 11/25/09	Tue 12/15/09	
97	**Enclosure**	**85 days**	**Wed 10/22/08**	**Tue 2/17/09**	
98	Metal Studs and Sheathing	15 days	Wed 10/22/08	Tue 11/11/08	
99	Masonry Wall	65 days	Wed 11/5/08	Tue 2/3/09	
100	Metal Panel Wall Penthouse	20 days	Wed 11/5/08	Tue 12/2/08	
103	6th Floor Roof	20 days	Mon 11/10/08	Fri 12/5/08	
101	Curtainwall @ Stairwell	30 days	Wed 11/12/08	Tue 12/23/08	
102	Punch/Strip Windows	65 days	Wed 11/19/08	Tue 2/17/09	
104	Penthouse Roof	5 days	Fri 11/28/08	Thu 12/4/08	
140	**Fit-out 5th Floor**	**267 days**	**Mon 11/3/08**	**Tue 11/10/09**	

Project: MGH-tech
Date: Fri 10/24/08

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

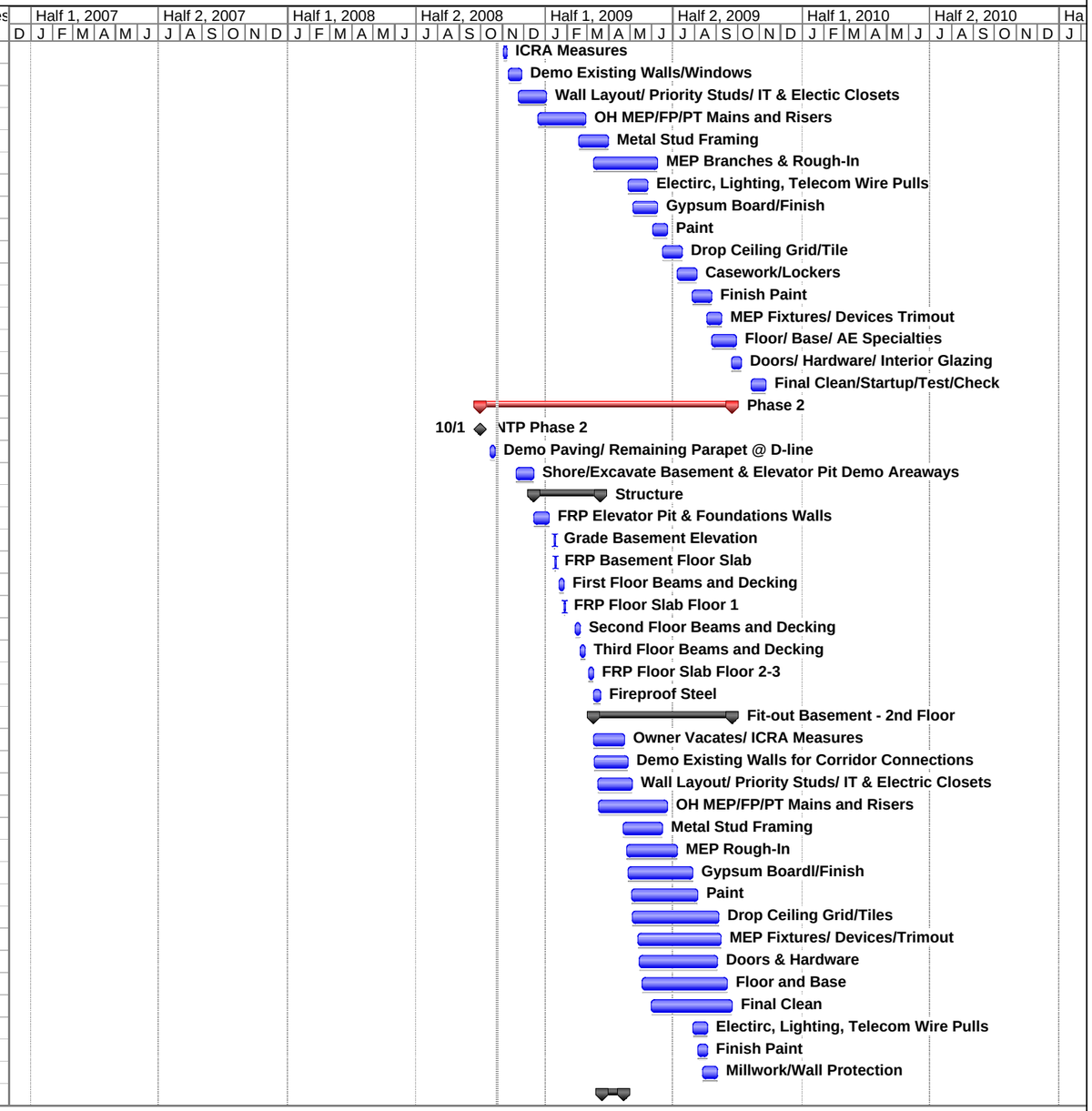
Technical Assignment 2

October 24th 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/

ID	Task Name	Duration	Start	Finish	Predeces
141	ICRA Measures	5 days	Mon 11/3/08	Fri 11/7/08	
142	Demo Existing Walls/Windows	15 days	Mon 11/10/08	Fri 11/28/08	
143	Wall Layout/ Priority Studs/ IT & Electic Closets	30 days	Mon 11/24/08	Fri 1/2/09	
144	OH MEP/FP/PT Mains and Risers	50 days	Mon 12/22/08	Fri 2/27/09	
145	Metal Stud Framing	30 days	Wed 2/18/09	Tue 3/31/09	
146	MEP Branches & Rough-In	65 days	Wed 3/11/09	Tue 6/9/09	
148	Electirc, Lighting, Telecom Wire Pulls	20 days	Wed 4/29/09	Tue 5/26/09	
147	Gypsum Board/Finish	25 days	Wed 5/6/09	Tue 6/9/09	
149	Paint	15 days	Wed 6/3/09	Tue 6/23/09	
150	Drop Ceiling Grid/Tile	20 days	Wed 6/17/09	Tue 7/14/09	
151	Casework/Lockers	20 days	Wed 7/8/09	Tue 8/4/09	
152	Finish Paint	20 days	Wed 7/29/09	Tue 8/25/09	
153	MEP Fixtures/ Devices Trimout	15 days	Wed 8/19/09	Tue 9/8/09	
154	Floor/ Base/ AE Specialties	25 days	Wed 8/26/09	Tue 9/29/09	
155	Doors/ Hardware/ Interior Glazing	10 days	Wed 9/23/09	Tue 10/6/09	
156	Final Clean/Startup/Test/Check	15 days	Wed 10/21/09	Tue 11/10/09	
161	**Phase 2**	**256 days?**	**Wed 10/1/08**	**Wed 9/23/09**	
162	NTP Phase 2	0 days	Wed 10/1/08	Wed 10/1/08	
163	Demo Paving/ Remaining Parapet @ D-line	5 days	Wed 10/15/08	Tue 10/21/08	
164	Shore/Excavate Basement & Elevator Pit Demo Areaways	17 days	Fri 11/21/08	Mon 12/15/08	
165	**Structure**	**69 days**	**Tue 12/16/08**	**Fri 3/20/09**	
166	FRP Elevator Pit & Foundations Walls	16 days	Tue 12/16/08	Tue 1/6/09	
167	Grade Basement Elevation	2 days	Wed 1/14/09	Thu 1/15/09	
168	FRP Basement Floor Slab	2 days	Thu 1/15/09	Fri 1/16/09	
169	First Floor Beams and Decking	5 days	Wed 1/21/09	Tue 1/27/09	
172	FRP Floor Slab Floor 1	2 days	Wed 1/28/09	Thu 1/29/09	
170	Second Floor Beams and Decking	5 days	Fri 2/13/09	Thu 2/19/09	
171	Third Floor Beams and Decking	5 days	Fri 2/20/09	Thu 2/26/09	
173	FRP Floor Slab Floor 2-3	5 days	Wed 3/4/09	Tue 3/10/09	
174	Fireproof Steel	8 days	Wed 3/11/09	Fri 3/20/09	
179	**Fit-out Basement - 2nd Floor**	**141 days?**	**Wed 3/11/09**	**Wed 9/23/09**	
180	Owner Vacates/ ICRA Measures	32 days	Wed 3/11/09	Thu 4/23/09	
181	Demo Existing Walls for Corridor Connections	34 days?	Thu 3/12/09	Tue 4/28/09	
182	Wall Layout/ Priority Studs/ IT & Electric Closets	35 days?	Tue 3/17/09	Mon 5/4/09	
183	OH MEP/FP/PT Mains and Risers	70 days?	Wed 3/18/09	Tue 6/23/09	
184	Metal Stud Framing	40 days?	Wed 4/22/09	Tue 6/16/09	
185	MEP Rough-In	52 days?	Mon 4/27/09	Tue 7/7/09	
186	Gypsum Boardl/Finish	66 days?	Wed 4/29/09	Wed 7/29/09	
187	Paint	68 days?	Mon 5/4/09	Wed 8/5/09	
189	Drop Ceiling Grid/Tiles	89 days?	Tue 5/5/09	Fri 9/4/09	
190	MEP Fixtures/ Devices/Trimout	84 days?	Wed 5/13/09	Mon 9/7/09	
194	Doors & Hardware	79 days?	Fri 5/15/09	Wed 9/2/09	
193	Floor and Base	87 days?	Tue 5/19/09	Wed 9/16/09	
195	Final Clean	83 days?	Mon 6/1/09	Wed 9/23/09	
188	Electirc, Lighting, Telecom Wire Pulls	15 days?	Thu 7/30/09	Wed 8/19/09	
192	Finish Paint	10 days?	Thu 8/6/09	Wed 8/19/09	
191	Millwork/Wall Protection	15 days?	Thu 8/13/09	Wed 9/2/09	
175	**Enclosure - Curtianwall Glass**	**23 days**	**Mon 3/23/09**	**Wed 4/22/09**	



Project: MGH-tech
Date: Fri 10/24/08

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

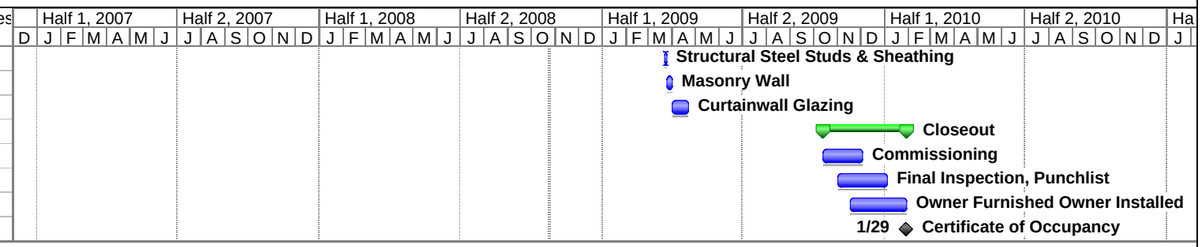
Technical Assignment 2

October 24th 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/

ID	Task Name	Duration	Start	Finish	Predeces
176	Structural Steel Studs & Sheathing	3 days	Mon 3/23/09	Wed 3/25/09	
177	Masonry Wall	5 days	Thu 3/26/09	Wed 4/1/09	
178	Curtainwall Glazing	15 days	Thu 4/2/09	Wed 4/22/09	
196	**Closeout**	**78 days?**	**Wed 10/14/09**	**Fri 1/29/10**	
197	Commissioning	37 days?	Wed 10/14/09	Thu 12/3/09	
198	Final Inspection, Punchlist	46 days?	Mon 11/2/09	Mon 1/4/10	
199	Owner Furnished Owner Installed Equipment	53 days?	Wed 11/18/09	Fri 1/29/10	
200	Certificate of Occupancy	0 days	Fri 1/29/10	Fri 1/29/10	



Project: MGH-tech
Date: Fri 10/24/08

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

Appendix B:

Site Layout Planning Diagrams

Maryland General Hospital: Central Care Expansion

(NOTE: Please note that construction cranes are not the correct size. For more drawings depicting reach please see Site Logistics Plan in Appendix D of Technical Assignment 1)

SITE LAYOUT PLANNING DIAGRAMS

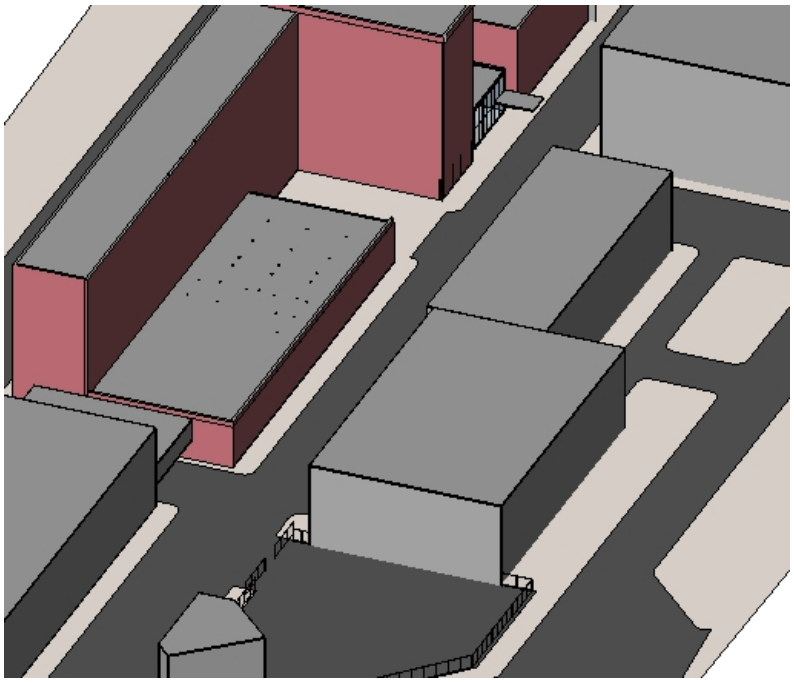


Figure 1: Existing Conditions

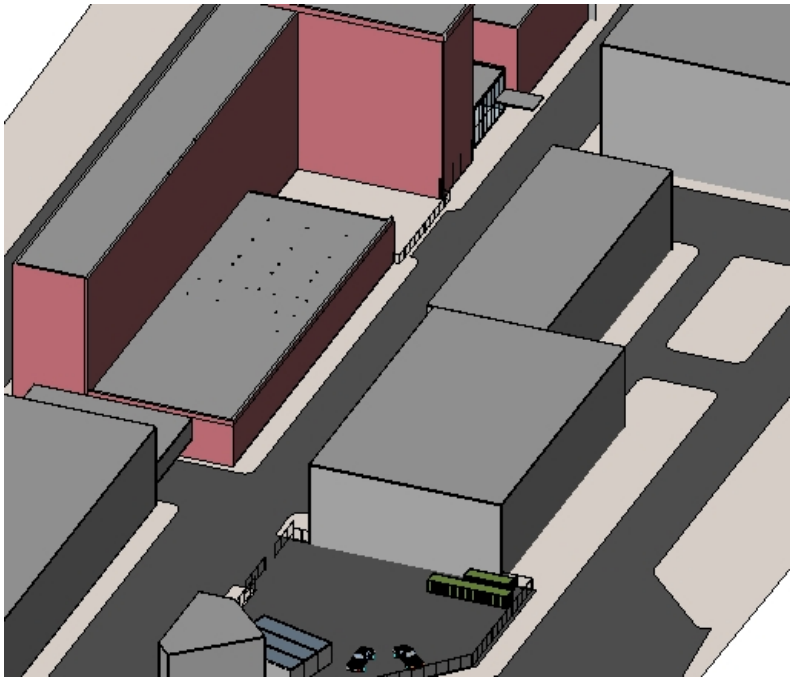


Figure 2: Renovation/Retrofitting

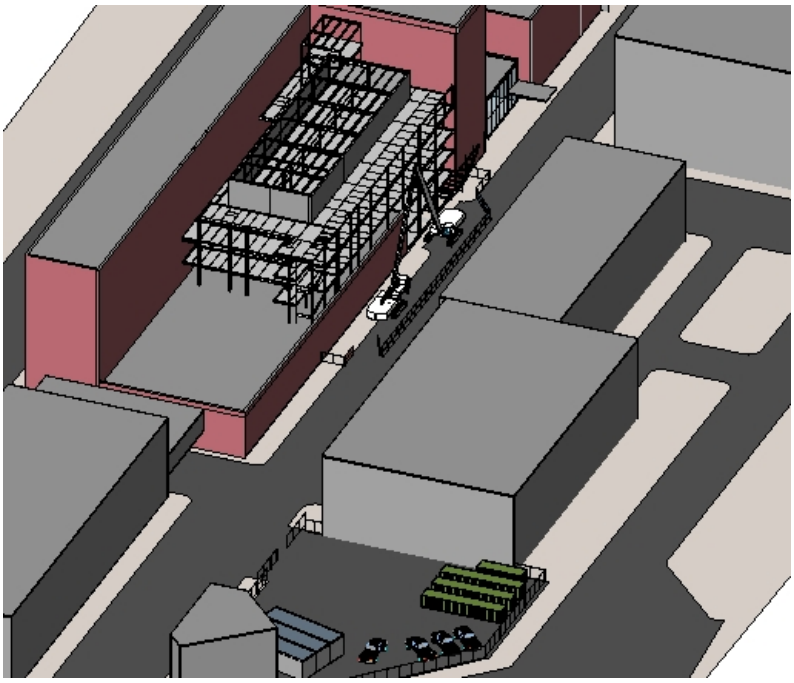


Figure 3: Structural Steel

Appendix C:

Detailed Structural System Estimate

Maryland General Hospital: Central Care Expansion

STRUCTURAL SYSTEM

Detailed Cost Estimate

Project Name: Maryland General Hospital

Construction Duration: January 2, 2008 - January 29, 2010 (25 Months)

03 CONCRETE	Notes	Qty	Unit	Price	Amount
ALL Caissons - Phase 1					
3000 PSI CIP		159	CY	$114.00	$18,126
# 9 reinforcing steel - vertical	3' -6" dia caissons	4.16	Ton	$2,725.00	$11,336
# 10 reinforcing steel - vertical	4' - 0" dia caissons	4.6	Ton	$2,725.00	$12,535
# 3 reinforcing steel - ties @ 18" oc	3' -6" dia caissons	0.3	Ton	$3,250.00	$975
# 4 reinforcing steel - ties @ 18" oc	4' - 0" dia caissons	0.8	Ton	$3,250.00	$2,600
3/4" Anchor bolts		24	ea	$9.65	$232
Subtotal ALL Ciassons - Phase 1					$45,804
ALL Spread Footings - Phase 1					
Existing - Add 3000 PSI CIP, reinforced*		22	CY	$564.00	$12,408
New - 3000 PSI CIP, reinforced		4	CY	$470.00	$1,880
New - 3/4 Anchor Bolts		8	ea	$9.65	$77
Subtotal ALL Spread Footings - Phase 1					$14,365
Pilaster and Beam @ 8 line - Phase 1					
24" x 24" Reinforced Concrete Pilaster CIP		3.4	CY	$1,375.00	$4,675
24" Concrete Beam CIP		2.8	CY	$1,200.00	$3,360
Subtotal Pilaster and Beam @8 line - Phase 1					$8,035
Slabs - Phase 1					
3 1/4" LW CIP SOMD - 4th through 6th floors		47825	SF	$2.94	$140,606
6x6 - W2.1xW2.1 WWF		478.3	CSF	$53.50	$25,589
Subtotal Slabs Phase 1					$166,195
SUB-TOTAL CONCRETE - PHASE 1					$234,398
Foundation Wall - Phase 2					
24" Reinforced Continuous Footing		5.9	CY	$300.00	$1,770
12" Thick Reinforced 4000 PSI		31.6	CY	$400.00	$12,640
Subtotal Foundation Wall Phase 2					$14,410
Slabs - Phase 2					
5" CIP SOG		6280	SF	$3.43	$21,540
6x6 - W2.1xW2.1 WWF		62.8	CSF	$53.50	$3,360
3 1/4" LW CIP SOMD - 1st through 3rd floors		18977	SF	$2.94	$55,792
6x6 - W2.1xW2.1 WWF		189.8	CSF	$53.50	$10,153
Subotal Slabs - Phase 2					$90,845
SUBTOTAL CONCRETE - PHASE 2					$105,255
SUBTOTAL CONCRETE - PHASE 1 & 2					$339,654

05 STEEL		Notes	Qty	Unit	Price	Amount
ALL Columns - Phase 1						
	W 10 x 33		645	LF	$87.50	$56,438
	W 10 x 39		476.7	LF	$87.50	$41,709
	W 10 x 45		198	LF	$87.50	$17,325
	W 10 x 49		366	LF	$129.00	$47,214
	W 10 x 54		348	LF	$129.00	$44,892
	W 10 x 60		44.67	LF	$129.00	$5,762
	W 10 x 68		50.67	LF	$129.00	$6,536
	W 12 x 58		205	LF	$164.00	$33,620
	W 12 x 65		52	LF	$164.00	$8,528
	W 12 x 72		59.33	LF	$164.00	$9,730
	W 12 x 96		137.7	LF	$224.00	$30,838
	W 14 x 61		58	LF	$140.00	$8,120
	W 14 x 90		281.7	LF	$224.00	$63,094
	HSS 6 x 6 x 1/2		74	LF	$35.83	$2,651
	HSS 6 x 6 x 5/16		264.2	LF	$35.83	$9,466
	HSS 8 x 8 x 1/2		43.33	LF	$58.93	$2,553
Subtotal Columns						$388,477

05 STEEL (CONTD)		Notes	Qty	Unit	Price	Amount
Beams - Phase 1						
Level 1						
	W 18 x 40		47.5	LF	$80.00	$3,800
Level 2						
	2L 3x3x1/4		509.5	LF	$41.00	$20,890
	W14 x 22		275.7	LF	$53.00	$14,611
	W14 x 30		24	LF	$61.50	$1,476
	W16 x 26		34.67	LF	$53.00	$1,838
	W16 x 31		49.5	LF	$63.50	$3,143
	W16 x 40		24	LF	$80.00	$1,920
	W18 x 35		117.5	LF	$72.00	$8,460
	W18 x 50		47.5	LF	$100.00	$4,750
	W21 x 73		24	LF	$159.00	$3,816
Level 3						
	2L 3x3x5/16		509.7	LF	$41.00	$20,896
	W12 x 16		14.33	LF	$36.00	$516
	W14 x 22		275.5	LF	$36.00	$9,918
	W14 x 30		24	LF	$61.50	$1,476
	W16 x 26		34.67	LF	$53.00	$1,838
	W16 x 31		49.5	LF	$63.50	$3,143
	W16 x 40		24	LF	$80.00	$1,920
	W18 x 35		117.5	LF	$72.00	$8,460
	W18 x 50		23.5	LF	$88.43	$2,078
	W21 x 73		24	LF	$159.00	$3,816

05 STEEL (CONTD)		Notes	Qty	Unit	Price	Amount
Beams - Phase 1						
Level 4						
	W8 x 10		104	LF	$28.50	$2,964
	W12 x 16		19.67	LF	$36.00	$708
	W12 x 19		352	LF	$47.00	$16,544
	W12 x 22		88	LF	$47.00	$4,136
	W12 x 26		27.33	LF	$54.00	$1,476
	W12 x 35		9.83	LF	$71.00	$698
	W14 x 22		706	LF	$53.00	$37,418
	W16 x 31		1418	LF	$63.50	$90,011
	W18 x 35		274.7	LF	$72.00	$19,776
	W18 x 40		58	LF	$81.00	$4,698
	W18 x 50		19	LF	$100.00	$1,900
	W18 x 55		172	LF	$109.00	$18,748
	W18 x 86		23.5	LF	$165.00	$3,878
	W21 x 57		17.67	LF	$121.00	$2,138
	W21 x 68		25	LF	$131.00	$3,275
	W21 x 73		24	LF	$159.00	$3,816
	W24 x 55		16.67	LF	$107.00	$1,784
	W24 x 62		28.67	LF	$120.00	$3,440
	W24 x 94		47	LF	$179.00	$8,413
Subtotal Steel Beams - Phase 1						$344,585
Slabs - Phase 1						
	2" 18 Gage Composit Steel Decking		47825	SF	$6.70	$320,428
	1 1/2" Wide Rib 22 Gage Roof Decking		6928	SF	$3.43	$23,763
Subtotal Slabs - Phase 1						$344,191
Column Reinforcing						
	1/2" Plates		655	SF	$33.50	$21,956
	3/4" Plates		138	SF	$50.50	$6,956
	1" Plates		60	SF	$67.50	$4,049
	1 1/4" Plates		73	Sf	$84.35	$6,184
	Steel Type 5/16" Fillet Weld		996	LF	$67.50	$67,219
Subtotal Column Reinforcing						$106,364
SUBTOTAL STRUCTURAL STEEL - PHASE 1						$1,183,617

05 STRUCTURAL STEEL (CONTD)		Notes	Qty	Unit	Price	Amount
Beams - Phase 2						
Level 1						
	W8 x 15		27.33	LF	$37.00	$1,011
	W12 x 16		71.25	LF	$36.00	$2,565
	W14 x 22		856	LF	$53.00	$45,368
	W16 x 26		17.33	LF	$53.00	$918
	W16 x 31		25.67	LF	$63.50	$1,630
	W18 x 35		133.3	LF	$72.00	$9,600
Level 2						
	C12 x 20.7		103.8	LF	$61.50	$6,381
	W8 x 15		13.75	LF	$37.00	$509
	W12 x 16		71	LF	$36.00	$2,556
	W12 x 22		102.7	LF	$47.00	$4,825
	W12 x 26		13.75	LF	$54.00	$743
	W14 x 22		556.3	LF	$53.00	$29,481
Level 3						
	W12 x 16		71	LF	$36.00	$2,556
	W14 x 22		583.5	LF	$53.00	$30,926
Subtotal Steel Beams - Phase 2						$139,069
Slabs - Phase 2						
	2" 18 Gage Composite Steel Decking		18977	SF	$6.70	$127,146
Subtotal Slabs - Phase 2						$127,146
SUBTOTAL STRUCTURAL STEEL - PHASE 2						$266,215
SUBTOTAL STRUCTURAL STEEL - PHASE 1 &2						$1,449,831

Appendix D:

Detailed General Conditions Estimate

Maryland General Hospital: Central Care Expansion

GENERAL CONDITIONS						
Detailed Cost Estimate						
	Project Name: Maryland General Hospital					
	Construction Duration: January 2, 2008 - January 29, 2010 (25 Months)					
PERSONNEL		Notes	Qty	Unit	Price	Amount
	Project Director	avg 15% of time	14	WK	$4,000.00	$56,000
	Project Manager		100	WK	$3,375.00	$337,500
	Sr. Project Engineer		63	WK	$2,100.00	$132,300
	Project Engineer		90	WK	$1,800.00	$162,000
	Project Engineer		32	WK	$1,800.00	$57,600
	General Superintendent		100	WK	$3,125.00	$312,500
	Assisstant Superintendent		37	WK	$2,750.00	$101,750
	Field Accountant	avg 15% of time	14	WK	$1,800.00	$25,200
	Secretary/Clerk	no secretary	0	WK		$0
						$0
SUB-TOTAL PERSONNEL						$1,184,850
FIELD OFFICE SUPPORT		Notes	Qty	Unit	Price	Amount
	Office Trialer Rental	3 @ $410	25	MO	$1,230.00	$30,750
	Office Space or Trialer Setup		1	LS	$250.00	$250
	Storage Containers		25	MO	$200.00	$5,000
	Radio/Cell Phone		25	MO	$700.00	$17,500
	Telephone/Network Setup		1	LS	$16,000.00	$16,000
	Telephone Monthly Costs		25	MO	$88.00	$2,200
	Office Furniture/Furnishings		1	LS	$2,500.00	$2,500
	Fax Machines/Supplies		1	LS	$1,500.00	$1,500
	Office and Miscellaneous Supplies		25	MO	$500.00	$12,500
	Engineering Supplies		1	LS	$1,000.00	$1,000
	Copier/Supplies		25	MO	$500.00	$12,500
	Cameras/Film and Processing		1	LS	$1,000.00	$1,000
	Drawing Reproduction		1	LS	$6,000.00	$6,000
	Computer Hardwar/Software (Prolog, Suretrak)		1	LS	$22,000.00	$22,000
	Postage/Overnight Express		25	MO	$600.00	$15,000
SUB-TOTAL OFFICE SUPPORT						$145,700
SUB-TOTAL PAGE 1						$1,330,550

RELOCATION, TRAVEL, MEALS		Notes	Qty	Unit	Price	Amount
	Local Travel - Field Personnel		25	MO	$280.00	$7,000
	Out-of-Town Travel		1	LS	$3,000.00	$3,000
	On-Site work vehicle (Superintendent)		25	MO	$500.00	$12,500
	Business Meals/Working Lunches		1	LS	$2,700.00	$2,700
SUB-TOTAL RELOCATION, TRAVEL, MEALS						$25,200
TEMPORARY UTILITIES -TEMPORARY HEAT		Notes	Qty	Unit	Price	Amount
	Temporary Electric Setup		1	LS	$2,500.00	$2,500
	Temporary Electric Usage		25	MO	$200.00	$5,000
	Temporary Water and Sewer Hookup					
	Temporary Water and Sewer Usage					
						$0
						$0
SUB-TOTAL TEMPORARY UTILITIES TEMPORARY HEAT						$7,500
TEMPORARY FACILITIES, FENCES, BARRICADES, CONTROLS		Notes	Qty	Unit	Price	Amount
	Temporary Toilets/Port-a-Johns		25	MO	$1,000.00	$25,000
	Temporary Fence w/ Jersey Barriers in road		1	LS	$16,000.00	$16,000
	Job Signage and Traffic Control		1	LS	$6,000.00	$6,000
	Drinking Water		25	MO	$150.00	$3,750
	Temporary Partitions	included in sub buyout	1	LS	$100,000.00	$0
	Infection Control Procdures	included in sub buyout	1	LS	$240,000.00	$240,000
SUB-TOTAL TEMPORARY FACILITIES, FENCES, BARRICADES, CONTROLS						$290,750
SAFETY AND SECURITY		Notes	Qty	Unit	Price	Amount
	Safety Supplies		1	LS	$8,000.00	$8,000
	Site Security		1	LS	$3,000.00	$3,000
SUB-TOTAL SAFETY AND SECURITY						$8,000
SUB-TOTAL PAGE 2						$331,450

CLEAN-UP		Notes	Qty	Unit	Price	Amount
	Periodic Clean-up		25	MO	$4,000.00	$100,000
	Road Clean-up		1	LS	$2,000.00	$2,000
	Final Cleanup		1	LS	$20,000.00	$20,000
	Dump Fees with Dumpsters	part. by hosptial	25	MO	$800.00	$20,000
	Dump Carts		1	LS	$1,000.00	$1,000
SUB-TOTAL CLEAN-UP						$143,000
PROTECTION OF FINISHED AND EXISTING WORK		Notes	Qty	Unit	Price	Amount
PROTECTION OF FINISHED AND EXISTING WORK INCLUDED IN SUBCONTRACTOR BUY OUT						
SUBTOTAL PROTECTION OF FINISHED AND EXISTING WORK						$0
TOOLS AND EQUIPMENT		Notes	Qty	Unit	Price	Amount
	Small Tools		1	LS	$5,000.00	$5,000
SUB-TOTAL TOOLS AND EQUIPMENT						$5,000
MATERIAL HANDLING AND HOISTS		Notes	Qty	Unit	Price	Amount
PROTECTION OF FINISHED AND EXISTING WORK INCLUDED IN SUBCONTRACTOR BUY OUT						
SUB-TOTAL MATERIAL HANDELING AND HOISTS						$0
CONSULTANT AND PROFESSIONAL SERVICES		Notes	Qty	Unit	Price	Amount
	Surveyor		1	LS	$10,000.00	$10,000
						$0
SUB-TOTAL CONSULTANT AND PROFESSIONAL SERVICES						$10,000
PERMITS AND FEES		Notes	Qty	Unit	Price	Amount
	Lane Closure Permit		1	LS	$43,000.00	$43,000
						$0
SUB-TOTAL PERMITS AND FEES						$43,000
SUB-TOTAL PAGE 3						$201,000
GRAND TOTAL						$1,863,000

Appendix E:

Staff Monitor

Maryland General Hospital: Central Care Expansion

Staffing Monitor
% Time Spent On Job/Mo.

	2008												2009												2010			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Total (%)	Total (weeks)
Project Director	30	30	20	20	10	10	10	10	10	10	10	20	30	10	10	10	10	10	10	10	10	10	10	20	20	10	15	15
Project Manager	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	75	100	100
Sr. Project Engineer	100	100	100	100	100	100	100	100	100	100	100	100	100	75	75	75	50	50	0	0	0	0	0	0	0	0	63	63
Project Engineer	0	0	50	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	91	91
Project Engineer	0	0	0	0	50	100	100	100	75	75	75	50	50	50	50	25	25	0	0	0	0	0	0	0	0	0	32	32
Superintendent	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	75	50	98	98
Superintendent	0	0	0	0	0	50	75	100	100	100	100	100	75	75	75	50	50	0	0	0	0	0	0	0	0	0	37	37