
TECH #2: COST & METHODS ANALYSIS

Executive Summary

This technical Assignment contains analysis of the cost and construction method used on the Frederick Memorial Hospital Renovation and Additions. A detail project schedule has been determined showing all pertinent activities occurring during construction. The project has been phased to be finished from the top down for infection control purposes. A site layout plan for the structure phase is presented. An assemblies Estimate for the building façade has been calculated using RS Means Assemblies Cost Data 2005. A detailed structural systems estimate has been calculated using RS Means Construction Cost Data 2005. Finally, a general conditions estimate is shown demonstrating project staffing costs and monthly costs incurred by the construction manager during the renovation of the hospital.

Detailed Project Schedule

The detailed project schedule is shown for the hospital addition and renovation on the following pages. The project is scheduled so that trades move through the spaces from the top floor down. This is essential for infection control. It ensures that no contractors are moving through a finished space to get to one under construction.

ID	Task Name	Duration	Start	Finish	2006																													
					June		July		August		September		October		November		December		January		February		March		April		May		June		July		Aug	
					6/5	6/19	7/3	7/17	7/31	8/14	8/28	9/11	9/25	10/9	10/23	11/6	11/20	12/4	12/18	1/1	1/15	1/29	2/12	2/26	3/12	3/26	4/9	4/23	5/7	5/21	6/4	6/18	7/2	7/16
	Sitework	222 days	7/1/05	5/8/06																														
1	UG Storm & Sanitary	20 days	7/1/05	7/28/05																														
2	Site Demolition	5 days	3/1/06	3/7/06																														
3	Site Wall	10 days	3/8/06	3/21/06																														
4	New Curb and Gutter	10 days	3/22/06	4/4/06																														
5	Subbase & Paving	10 days	4/5/06	4/18/06																														
6	Signage & Accessories	10 days	4/19/06	5/2/06																														
7	Landscaping	12 days	4/21/06	5/8/06																														
	Area G	214 days	7/25/05	5/18/06																														
	Demolition	37 days	7/25/05	9/13/05																														
8	Ceiling Demo	5 days	7/25/05	7/29/05																														
9	Negative Air Systems & Temp. Water	10 days	7/25/05	8/5/05																														
10	Interior Demo	25 days	8/4/05	9/7/05																														
11	Courtyard Demo & Excavation	25 days	8/1/05	9/2/05																														
12	Structural Demolition	14 days	8/1/05	8/18/05																														
13	Window Removal	10 days	8/31/05	9/13/05																														
	Structure	52 days	8/26/05	11/7/05																														
14	Underslab Electrical/Piping	18 days	8/26/05	9/20/05																														
15	Courtyard Footings, 1st Column Lift	5 days	9/9/05	9/15/05																														
16	Courtyard SOG	5 days	9/20/05	9/26/05																														
17	FRP 1st Floor Slab	6 days	9/27/05	10/4/05																														
18	FRP 2nd Floor Columns & Slab	8 days	10/5/05	10/14/05																														
19	FRP 3rd Floor Columns & Slab	8 days	10/17/05	10/26/05																														
20	FRP 4th Floor Columns & Slab	8 days	10/27/05	11/7/05																														
21	Bridge Footings and Piers	6 days	9/7/05	9/14/05																														
22	Bridge Structural Steel/Deck	15 days	9/19/05	10/7/05																														
23	Connector Bridge Concrete	5 days	10/10/05	10/14/05																														
24	New Entrance Footings/Piers	7 days	9/7/05	9/15/05																														

ID	Task Name	Duration	Start	Finish	2006																													
					June		July		August		September		October		November		December		January		February		March		April		May		June		July		Aug	
					6/5	6/19	7/3	7/17	7/31	8/14	8/28	9/11	9/25	10/9	10/23	11/6	11/20	12/4	12/18	1/1	1/15	1/29	2/12	2/26	3/12	3/26	4/9	4/23	5/7	5/21	6/4	6/18	7/2	7/16
25	New Entrance CMU Foundation Wall & SOG	9 days	9/16/05	9/28/05																														
26	New Entrance Canopy Framing	5 days	9/29/05	10/5/05																														
27	Fireproofing	8 days	10/17/05	10/26/05																														
	Enclosure	79 days	8/31/05	12/19/05																														
28	Bridge Framing & Sheathing	10 days	10/17/05	10/28/05																														
29	North Excavation	5 days	8/31/05	9/6/05																														
30	North Exterior Demo & New Brick Veneer	11 days	9/7/05	9/21/05																														
31	East Excavation	5 days	9/7/05	9/13/05																														
32	East Exterior Demo & New Brick Veneer	11 days	9/22/05	10/6/05																														
33	South Exterior Demo & New Brick Veneer	11 days	10/7/05	10/21/05																														
34	Connector Bridge Brick Veneer	11 days	10/31/05	11/14/05																														
35	Entrance Canopy Soffit/Fascia	8 days	10/24/05	11/2/05																														
36	Exterior Windows/Storefront	20 days	10/18/05	11/14/05																														
37	Set Roof Equipment	5 days	11/15/05	11/21/05																														
38	Roofing	20 days	11/22/05	12/19/05																														
	4th Floor Interior Rough-In	59 days	10/17/05	1/5/06																														
39	Partition Layout	5 days	10/17/05	10/21/05																														
40	Above Ceiling Plumbing (Gravity)	10 days	10/24/05	11/4/05																														
41	Above Ceiling HVAC	4 days	11/7/05	11/10/05																														
42	Above Ceiling Piping (Pressure)	4 days	11/11/05	11/16/05																														
43	Above Ceiling Electrical & Pull Wire	8 days	11/17/05	11/28/05																														
44	Fire Protection	5 days	11/29/05	12/5/05																														
45	Set Door Frames	3 days	12/6/05	12/8/05																														
46	Partition Framing	5 days	12/9/05	12/15/05																														
47	In-Wall MEP	5 days	12/16/05	12/22/05																														
48	Mechanical & Plumbing Insulation	6 days	12/20/05	12/27/05																														
49	Frame Bulkheads & Drywall Ceilings	5 days	12/28/05	1/3/06																														
50	Hang One Side Drywall	3 days	12/23/05	12/27/05																														

ID	Task Name	Duration	Start	Finish													2006																					
					June		July		August		September		October		November		December		January		February		March		April		May		June		July		August					
					6/5	6/19	7/3	7/17	7/31	8/14	8/28	9/11	9/25	10/9	10/23	11/6	11/20	12/4	12/18	1/1	1/15	1/29	2/12	2/26	3/12	3/26	4/9	4/23	5/7	5/21	6/4	6/18	7/2	7/16	7/30			
77	Mechanical & Plumbing Insulation	6 days	1/9/06	1/16/06																Mechanical & Plumbing Insulation																		
78	Frame Bulkheads & Drywall Ceilings	5 days	1/17/06	1/23/06																Frame Bulkheads & Drywall Ceilings																		
79	Hang One Side Drywall	3 days	1/9/06	1/11/06																Hang One Side Drywall																		
80	Wall Close-in Inspections	2 days	1/12/06	1/13/06																Wall Close-in Inspections																		
81	Second Side Drywall & Tape/Finish	5 days	1/16/06	1/20/06																Second Side Drywall & Tape/Finish																		
	3rd Floor Interior Finishes	51 days	1/24/06	4/4/06																3rd Floor Interior Finishes																		
82	Prime Paint/1st Coat	3 days	1/24/06	1/26/06																Prime Paint/1st Coat																		
83	Ceiling Grid	3 days	1/27/06	1/31/06																Ceiling Grid																		
84	Light Fixtures	5 days	2/1/06	2/7/06																Light Fixtures																		
85	Registers, Grilles, & Diffusers	5 days	2/8/06	2/14/06																Registers, Grilles, & Diffusers																		
86	Sprinkler Drops/Heads	3 days	2/8/06	2/10/06																Sprinkler Drops/Heads																		
87	Above Ceiling Inspection	1 day	2/13/06	2/13/06																Above Ceiling Inspection																		
88	Ceiling Close-In	3 days	2/15/06	2/17/06																Ceiling Close-In																		
89	Flooring	10 days	2/20/06	3/3/06																Flooring																		
90	Millwork	3 days	3/6/06	3/8/06																Millwork																		
91	Plumbing Fixtures	3 days	3/9/06	3/13/06																Plumbing Fixtures																		
92	Doors & Hardware	4 days	3/14/06	3/17/06																Doors & Hardware																		
93	Final Paint	3 days	3/20/06	3/22/06																Final Paint																		
94	Architectural Trim	3 days	3/23/06	3/27/06																Architectural Trim																		
95	MEP Trim	5 days	3/23/06	3/29/06																MEP Trim																		
96	Final Paint in Corridors & Touch-Up	4 days	3/30/06	4/4/06																Final Paint in Corridors & Touch-Up																		
	2nd Floor Interior Rough-In	72 days	11/3/05	2/10/06																2nd Floor Interior Rough-In																		
97	Partition Layout	5 days	11/3/05	11/9/05																Partition Layout																		
98	Above Ceiling Plumbing (Gravity)	7 days	11/14/05	11/22/05																Above Ceiling Plumbing (Gravity)																		
99	Above Ceiling HVAC	10 days	11/23/05	12/6/05																Above Ceiling HVAC																		
100	Above Ceiling Piping (Pressure)	6 days	11/30/05	12/7/05																Above Ceiling Piping (Pressure)																		
101	Above Ceiling Electrical & Pull Wire	11 days	12/14/05	12/28/05																Above Ceiling Electrical & Pull Wire																		
102	Fire Protection	5 days	12/29/05	1/4/06																Fire Protection																		

ID	Task Name	Duration	Start	Finish	2006																													
					June		July		August		September		October		November		December		January		February		March		April		May		June		July		Aug	
					6/5	6/19	7/3	7/17	7/31	8/14	8/28	9/11	9/25	10/9	10/23	11/6	11/20	12/4	12/18	1/1	1/15	1/29	2/12	2/26	3/12	3/26	4/9	4/23	5/7	5/21	6/4	6/18	7/2	7/16
103	Set Door Frames	3 days	1/5/06	1/9/06															1/15	1/22														
104	Partition Framing	5 days	1/10/06	1/16/06																														
105	In-Wall MEP	5 days	1/17/06	1/23/06																														
106	Mechanical & Plumbing Insulation	8 days	1/24/06	2/2/06																														
107	Frame Bulkheads & Drywall Ceilings	5 days	2/3/06	2/9/06																														
108	Hang One Side Drywall	3 days	1/24/06	1/26/06																														
109	Wall Close-in Inspections	2 days	1/27/06	1/30/06																														
110	Second Side Drywall & Tape/Finish	9 days	1/31/06	2/10/06																														
	2nd Floor Interior Finishes	55 days	2/13/06	4/28/06																														
111	Prime Paint/1st Coat	3 days	2/13/06	2/15/06																														
112	Ceiling Grid	3 days	2/16/06	2/20/06																														
113	Light Fixtures	5 days	2/21/06	2/27/06																														
114	Registers, Grilles, & Diffusers	5 days	2/28/06	3/6/06																														
115	Sprinkler Drops/Heads	3 days	2/28/06	3/2/06																														
116	Above Ceiling Inspection	1 day	3/3/06	3/3/06																														
117	Ceiling Close-In	3 days	3/7/06	3/9/06																														
118	Flooring	13 days	3/9/06	3/27/06																														
119	Millwork	3 days	3/28/06	3/30/06																														
120	Plumbing Fixtures	3 days	3/31/06	4/4/06																														
121	Doors & Hardware	6 days	4/5/06	4/12/06																														
122	Final Paint	3 days	4/13/06	4/17/06																														
123	Architectural Trim	3 days	4/18/06	4/20/06																														
124	MEP Trim	5 days	4/18/06	4/24/06																														
125	Final Paint in Corridors & Touch-Up	4 days	4/25/06	4/28/06																														
	1st Floor Interior Rough-In	77 days	11/10/05	2/24/06																														
126	Partition Layout	5 days	11/10/05	11/16/05																														
127	Above Ceiling Plumbing (Gravity)	9 days	11/24/05	12/6/05																														
128	Above Ceiling HVAC	10 days	12/7/05	12/20/05																														

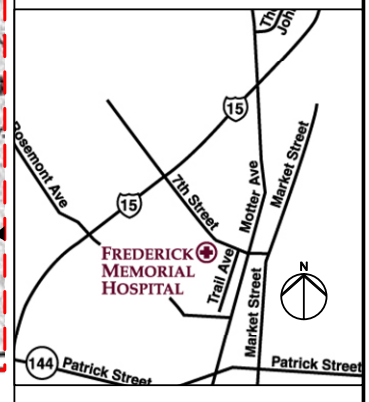
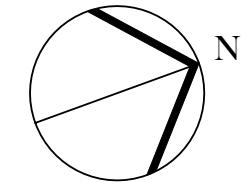
ID	Task Name	Duration	Start	Finish	2006																													
					June		July		August		September		October		November		December		January		February		March		April		May		June		July		Aug	
					6/5	6/19	7/3	7/17	7/31	8/14	8/28	9/11	9/25	10/9	10/23	11/6	11/20	12/4	12/18	1/1	1/15	1/29	2/12	2/26	3/12	3/26	4/9	4/23	5/7	5/21	6/4	6/18	7/2	7/16
129	Above Ceiling Piping (Pressure)	8 days	12/21/05	12/30/05																Above Ceiling Piping (Pressure)														
130	Above Ceiling Electrical & Pull Wire	11 days	12/29/05	1/12/06																Above Ceiling Electrical & Pull Wire														
131	Fire Protection	5 days	1/5/06	1/11/06																Fire Protection														
132	Set Door Frames	3 days	1/12/06	1/16/06																Set Door Frames														
133	Partition Framing	5 days	1/17/06	1/23/06																Partition Framing														
134	In-Wall MEP	5 days	1/24/06	1/30/06																In-Wall MEP														
135	Mechanical & Plumbing Insulation	8 days	2/3/06	2/14/06																Mechanical & Plumbing Insulation														
136	Frame Bulkheads & Drywall Ceilings	5 days	2/15/06	2/21/06																Frame Bulkheads & Drywall Ceilings														
137	Hang One Side Drywall	3 days	1/31/06	2/2/06																Hang One Side Drywall														
138	Wall Close-in Inspections	2 days	2/3/06	2/6/06																Wall Close-in Inspections														
139	Second Side Drywall & Tape/Finish	10 days	2/13/06	2/24/06																Second Side Drywall & Tape/Finish														
1st Floor Interior Finishes		56 days	2/27/06	5/15/06																1st Floor Interior Finishes														
140	Prime Paint/1st Coat	3 days	2/27/06	3/1/06																Prime Paint/1st Coat														
141	Ceiling Grid	3 days	3/2/06	3/6/06																Ceiling Grid														
142	Light Fixtures	5 days	3/7/06	3/13/06																Light Fixtures														
143	Registers, Grilles, & Diffusers	5 days	3/14/06	3/20/06																Registers, Grilles, & Diffusers														
144	Sprinkler Drops/Heads	3 days	3/14/06	3/16/06																Sprinkler Drops/Heads														
145	Above Ceiling Inspection	1 day	3/21/06	3/21/06																Above Ceiling Inspection														
146	Ceiling Close-In	3 days	3/22/06	3/24/06																Ceiling Close-In														
147	Flooring	12 days	3/28/06	4/12/06																Flooring														
148	Millwork	3 days	4/13/06	4/17/06																Millwork														
149	Plumbing Fixtures	3 days	4/18/06	4/20/06																Plumbing Fixtures														
150	Doors & Hardware	6 days	4/21/06	4/28/06																Doors & Hardware														
151	Final Paint	3 days	5/1/06	5/3/06																Final Paint														
152	Architectural Trim	3 days	5/4/06	5/8/06																Architectural Trim														
153	MEP Trim	5 days	5/4/06	5/10/06																MEP Trim														
154	Final Paint in Corridors & Touch-Up	3 days	5/11/06	5/15/06																Final Paint in Corridors & Touch-Up														
Basement Interior Rough-In		86 days	11/17/05	3/16/06																Basement Interior Rough-In														

Site Layout Planning

The site plan for the structure phase is shown on the following page. The crane used is an 80 ton mobile crane. Concrete trucks and all other vehicles enter from the south and travel one-way through the site. There is limited on site parking for subcontractors; all crews must park in public parking off site because of an existing agreement between the neighborhood and the hospital regarding contractor parking. There is no need for temporary power as it is supplied through the existing hospital.

Frederick Memorial Hospital

Project 2000 Phase 4 Additions & Renovations

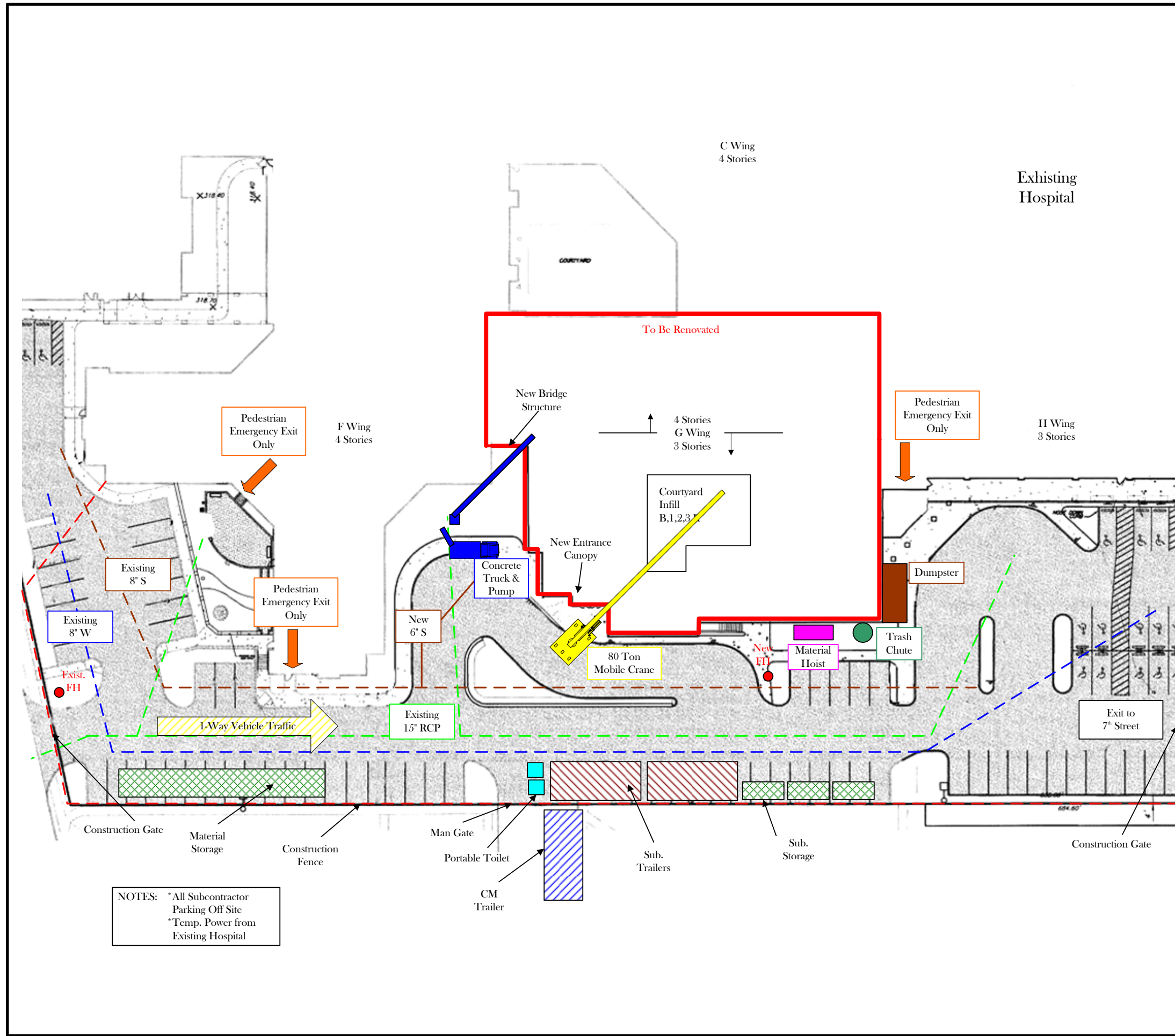


NAME

Abe Vogel
10.31.05

TITLE

STRUCTURE PHASE



NOTES: *All Subcontractor Parking Off Site
*Temp. Power from Existing Hospital

Assemblies Estimate

An assemblies estimate had been prepared for the building façade. The estimate includes the brick veneer, windows, and doors. For this estimate all windows were assumed to be the same size. All pricing information was obtained from RS Means Assemblies Cost Data 2005 and includes overhead and profit. Take off notes shown in the appendix.

Item	Assemblies #	Quantity	Unit Price	Cost
Brick Veneer, 4" standard brick with polystyrene cavity insulation	B2010-1020	15,772 SF	26.8 /SF	\$422,690
Sliding entrance door, 5'x7' with electric opener	B2030-8200	2 EA	7650 /EA	\$15,300
Aluminum sliding windows, insulated glass 9'x5'	B2020-7750	87 EA	1058 /EA	\$92,046
Location Modifier - Hagerstown			0.89	-\$58,304
Estimate Total				\$530,036

- Cost per SF - \$33.61/SF

Detailed Structural Systems Estimate

Due to the size of the project a detailed estimate was done for the entire building rather than just a typical bay. Included in the structural system are the courtyard infill structure, the new canopy structure, and the new bridge structure. The estimate is broken down by foundation, substructure, and superstructure. Cost data was obtained from RS Means Construction Cost Data 2005. Takeoff notes are shown in the appendix.

Phase	CSI	Description	Quantity	Unit Price	Cost
Foundations	03110	Formwork for Spread Footings	623 SF	7.15 /SF	\$4,454
	03110	Formwork for Continuous Footings	816 SF	6.85 /SF	\$5,590
	03210	Rebar for Spread Footings	2 Tons	1800 /Tons	\$3,600
	03210	Rebar for Continuous Footings	2 Tons	1800 /Tons	\$3,600
	03310	Concrete for Spread Footings, 5000 PSI	87 CY	123.5 /CY	\$10,745
	03310	Concrete for Continuous Footings, 5000 PSI	43 CY	123.5 /CY	\$5,311
Substructure	03310	5" Slab on Grade, 5000 PSI, hand placed	46 CY	229.35 /CY	\$10,550
	04810	12" CMU Foundation Walls	500 SF	10.35 /SF	\$5,175
Superstructure	03110	Plywood Forming System for Columns	1330 SF	7.7 /SF	\$10,241
	03110	Plywood Forming System for 2-Way Flat Plate with Drops	8712 SF	10.45 /SF	\$91,040
	03150	Shoring System for 2-Way Flat Plate with Drops	7480 SF	1.02 /SF	\$7,630
	03210	Reinforcing Steel for 2-Way Flat Plate with Drops	25 Tons	1625 /Tons	\$40,625
	03210	Reinforcing Steel for Columns	4 Tons	2200 /Tons	\$8,800
	03310	3" Concrete fill for Floor Deck	17 CY	125 /CY	\$2,125
	03310	5000 PSI Placed with Crane, for Flat Plates and Columns	252 CY	137.5 /CY	\$34,650
	03350	Machine Trowel Finish 2-Way Flat Plates	7480 SF	0.7 /SF	\$5,236
	05120	Steel Framing	19 Tons	2675 /Tons	\$50,825
	05310	16 Ga 3" Floor Deck	1845 SF	3.93 /SF	\$7,251
05310	18 Ga 3" Roof Deck	2175 SF	3.12 /SF	\$6,786	
Location Modifier - Hagerstown				0.89	-\$34,566
Estimate Total					\$279,667

- Cost per GSF - \$3.29

General Conditions Estimate

The general conditions estimate includes project staffing costs and monthly costs incurred by the construction manager during the renovation of the hospital. Cost data was obtained from Barton Malow, the construction manager on the project. Home office overhead is not included in the estimate. A project staffing plan presenting the number of hours worked by each of the personnel is shown prior to the general conditions estimate. Even though the project is scheduled for substantial completion in May, the team works into July with project closeout.

Personnel	Start Date	End Date	Hours per week
Project Manager	7/1/05	4/30/06	40
	5/1/06	5/31/06	30
	6/1/06	6/30/06	20
	7/1/06	7/31/06	12
Project Engineer	7/1/05	6/30/06	40
	7/1/06	7/31/06	30
Superintendent	7/1/05	4/30/06	40
	5/1/06	6/30/06	30
	7/1/06	7/31/06	20
Saturday Super.	8/1/05	3/31/06	8
MEP Coordinator	9/1/05	5/31/06	8
	6/1/06	6/30/06	4
Office Manager	7/1/05	5/31/06	40
Field Accountant	7/1/05	5/31/06	8
	6/1/06	6/30/06	4
	7/1/06	7/31/06	2
Safety Director	8/1/05	2/28/06	2

Item	Unit Cost/Hr	Time (Hrs)	Cost
Project Manager	\$52	1852	\$96,304
Project Engineer	\$36	2046	\$73,656
Superintendent	\$65	2210	\$143,650
MEP Coordinator	\$89	330	\$29,370
Office Manager	\$21	1780	\$37,380
Safety Director	\$50	62	\$3,100
	Unit Cost/Wk	Time (Wks)	Cost
Trailer Setup	\$3,000	LS	\$3,000
Trailer Rental	\$175	44	\$7,700
Final Clean-Up	\$225	44	\$9,900
Rubbish Removal	\$450	44	\$19,800
Temporary Fence	\$175	44	\$7,700
Job Signs	\$3,000	LS	\$3,000
Telephone	\$90	44	\$3,960
Office Supplies	\$250	44	\$11,000
Safety Supplies	\$4,000	LS	\$4,000
Bond Premiums	\$26,000	LS	\$26,000
Liability Insurance	\$17,500	LS	\$17,500
Computers	\$10,500	LS	\$10,500
Hoist Set-Up	\$10,000	LS	\$10,000
Hoist Rental	\$500	44	\$22,000
Travel Expenses	\$400	44	\$17,600
Temporary Utilities	\$175	44	\$7,700
Estimate Total			\$564,820

- Cost per week - \$12,837