
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.

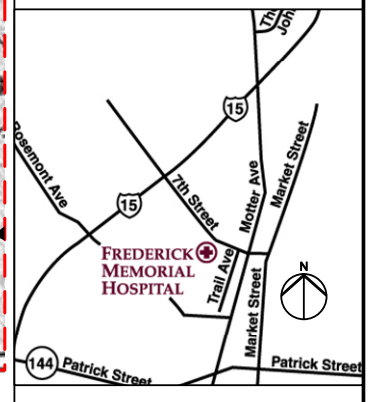
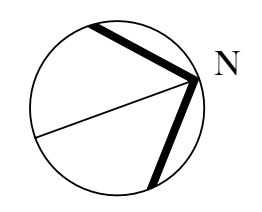
ID	Task Name	Duration	Start	Finish	2006																													
					June		July		August		September		October		November		December		January		February		March		April		May		June		July		Aug	
					6/5	6/19	7/3	7/17	7/31	8/14	8/28	9/11	9/25	10/9	10/23	11/6	11/20	12/4	12/18	1/1	1/15	1/29	2/12	2/26	3/12	3/26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

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

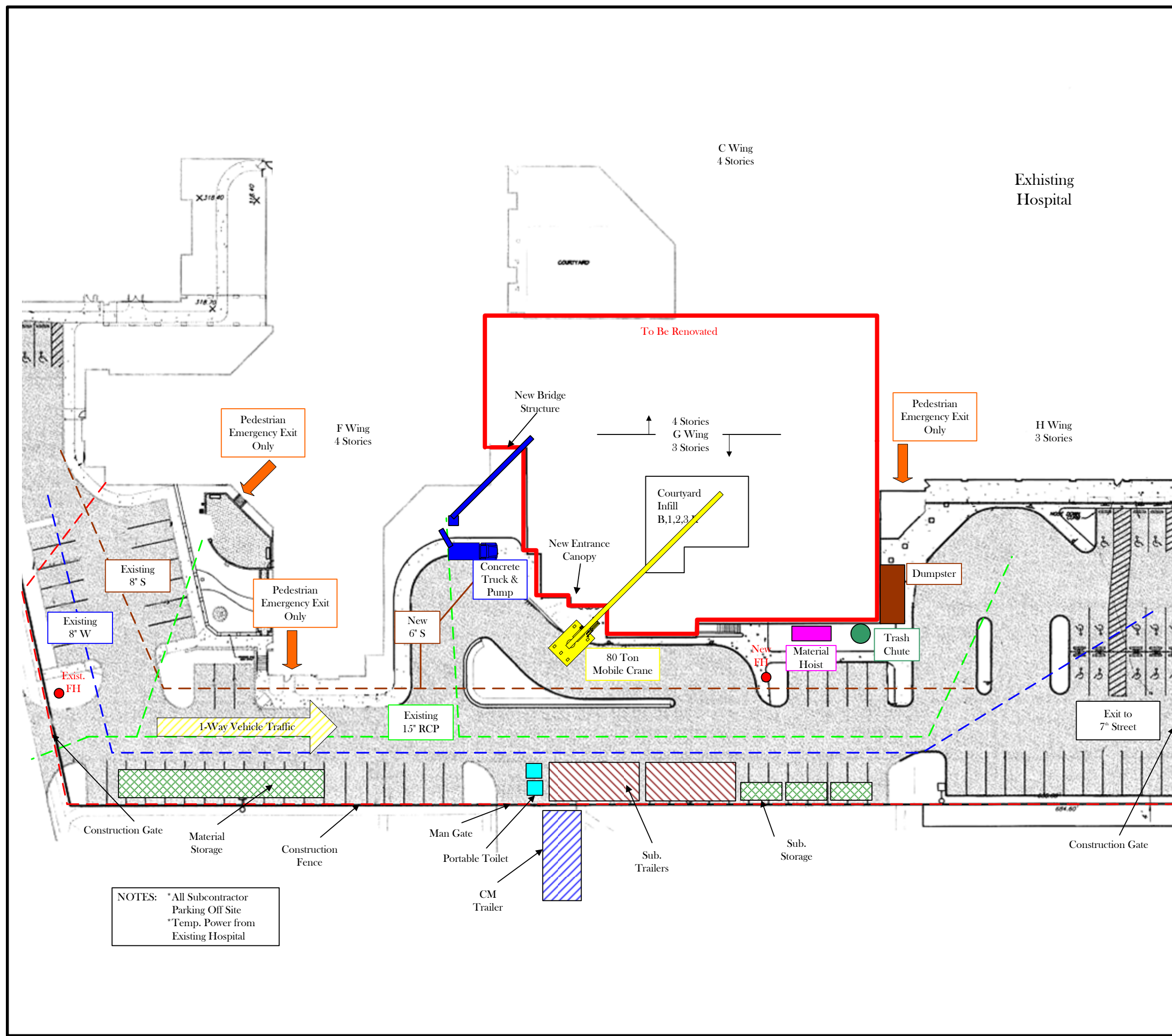


NAME

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

APPENDIX

RS Means Construction Cost Data 2005:

		03110 Structural C.I.P. Forms	Unit	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total Incl. O&P	
410	0010	FORMS IN PLACE, COLUMNS							410
	6650	4 use	SFCA	.80	4.35		5.15	7.70	

		03110 Structural C.I.P. Forms	Unit	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total Incl. O&P	
420	0010	FORMS IN PLACE, ELEVATED SLABS							420
	2000	Flat slab, drop panels, job-built plywood, to 15' high, 1 use	S.F.	4.44	3.56		8	10.45	

		03110 Structural C.I.P. Forms	Unit	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total Incl. O&P	
430	0010	FORMS IN PLACE, FOOTINGS Continuous wall, plywood, 1 use	SFCA	2.31	2.76		5.07	6.85	430

		03110 Structural C.I.P. Forms	Unit	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total Incl. O&P	
430	0010	FORMS IN PLACE, FOOTINGS Continuous wall, plywood, 1 use	SFCA	2.31	2.76		5.07	6.85	430
	5000	Spread footings, job-built lumber, 1 use	SFCA	1.66	3.40		5.06	7.15	

		03150 Concrete Accessories	Unit	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total Incl. O&P	
600	0010	SHORES Erect and strip, by hand, horizontal members							600
	1500	Reshoring	S.F.	.38	.39		.77	1.02	

		03210 Reinforcing Steel	Unit	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total Incl. O&P	
600	0010	REINFORCING IN PLACE A615 Grade 60, incl. access. labor							600
	0400	Elevated slabs, #4 to #7	Ton	850	420		1,270	1,625	

		03210 Reinforcing Steel	Unit	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total Incl. O&P	
600	0010	REINFORCING IN PLACE A615 Grade 60, incl. access. labor							600
	0500	Footings, #4 to #7	Ton	760	580		1,340	1,800	

		03210 Reinforcing Steel	Unit	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total Incl. O&P	
600	0010	REINFORCING IN PLACE A615 Grade 60, incl. access. labor							600
	0200	Columns, #3 to #7	Ton	800	810		1,610	2,200	

		03310 Structural Concrete	Unit	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total Incl. O&P	
220	0010	CONCRETE, READY MIX Normal weight							220
	0400	5000 psi	C.Y.	90			90	99	

		03310 Structural Concrete	Unit	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total Incl. O&P	
700	0010	PLACING CONCRETE and vibrating, including labor & equipment							700
	1900	Footings, continuous, shallow, direct chute	C.Y.		11.20	.40	11.60	17.70	
	1950	Pumped	C.Y.		12.25	5	17.25	24.50	

		03310 Structural Concrete	Unit	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total Incl. O&P	
240	0010	CONCRETE IN PLACE Including forms (4 uses), reinforcing							240
	4650	Slab on grade, not including finish, 4" thick	C.Y.	104	48.50	.39	152.89	192	

		03310 Structural Concrete	Unit	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total Incl. O&P	
700	0010	PLACING CONCRETE and vibrating, including labor & equipment							700
	4300	Slab on grade, 4" thick, direct chute	C.Y.		12.25	.44	12.69	19.35	

		03310 Structural Concrete	Unit	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total Incl. O&P	
700	0010	PLACING CONCRETE and vibrating, including labor & equipment							700
	5600	Wheeled concrete dumping, add to placing costs above							
	5610	Walking cart, 50' haul, add	C.Y.		7.55	1.56	9.11	13.50	
	5620	150' haul, add	C.Y.		10.10	2.07	12.17	18	

		03310 Structural Concrete	Unit	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total Incl. O&P	
700	0010	PLACING CONCRETE and vibrating, including labor & equipment							700
	1400	Elevated slabs, less than 6" thick, pumped	C.Y.		13.10	5.35	18.45	26	
	1450	With crane and bucket	C.Y.		22	10.10	32.10	44.50	
	1500	6" to 10" thick, pumped	C.Y.		11.50	4.70	16.20	23	
	1550	With crane and bucket	C.Y.		18.90	8.75	27.65	38.50	

		03310 Structural Concrete	Unit	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total Incl. O&P	
700	0010	PLACING CONCRETE and vibrating, including labor & equipment							700
	1400	Elevated slabs, less than 6" thick, pumped	C.Y.		13.10	5.35	18.45	26	

		03350 Concrete Finishing	Unit	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total Incl. O&P	
300	0010	FINISHING FLOORS Monolithic, screed finish	S.F.		.29		.29	.43	300
	0250	Machine trowel	S.F.		.48		.48	.70	

		04810 Unit Masonry Assemblies	Unit	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total Incl. O&P	
186	0010	CONCRETE BLOCK FOUNDATION WALL C90/C145							186
	0350	12" thick	S.F.	2.51	4.97		7.48	10.35	

		05120 Structural Steel	Unit	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total Incl. O&P	
680	0010	STRUCTURAL STEEL PROJECTS							680
	0700	Offices, hospitals, etc., steel bearing, 1 to 2 stories	Ton	1,750	291	137	2,178	2,575	
	0800	3 to 6 stories	Ton	1,775	335	105	2,215	2,675	

		05310 Steel Deck	Unit	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total Incl. O&P	
300	0010	METAL DECKING Steel decking							300
	5700	3" deep, galv., 22 gauge	S.F.	1.53	.39	.03	1.95	2.40	
	5800	20 gauge	S.F.	1.71	.41	.03	2.15	2.65	
	5900	18 gauge	S.F.	2.10	.43	.03	2.56	3.12	
	6000	16 gauge	S.F.	2.80	.46	.03	3.29	3.93	

RS Means Assemblies Cost Data 2005:

B2010 134 Brick Face Cavity Wall									
	FACE BRICK	BACKUP MASONRY	TOTAL THICKNESS (IN.)	CAVITY INSULATION					
1000	Standard	4"common brick	10	polystyrene		S.F.	6.80	20	26.80
1020				none		S.F.	6.60	19.60	26.20
1040		6"SCR brick	12	polystyrene		S.F.	8.85	17.95	26.80

			DESCRIPTION			UNIT	MAT.	INST.	TOTAL
8200		sliding entrance	5' x 7' door	electric oper.	12'-0" x 7'-6"	Opng.	6,500	1,150	7,650
8250		sliding patio	temp. glass	economy	6'-0" x 7'-0"	Opng.	1,275	213	1,488
8300			temp. glass	economy	12'-0" x 7'-0"	Opng.	2,225	285	2,510
8350				premium	6'-0" x 7'-0"	Opng.	1,925	320	2,245
8400					12'-0" x 7'-0"	Opng.	3,350	430	3,780

B2020 106 Aluminum Windows									
	MATERIAL	TYPE	GLAZING	SIZE	DETAIL				
6400	Aluminum	projecting	std. glass	3'-1" x 3'-2"		Ea.	234	109	343
6450				4'-5" x 5'-3"		Ea.	330	137	467
6500			insul. glass	3'-1" x 3'-2"		Ea.	281	131	412
6550				4'-5" x 5'-3"		Ea.	395	164	559
6600		sliding	std. glass	3' x 2'		Ea.	177	109	286
6650				5' x 3'		Ea.	225	121	346
6700				8' x 4'		Ea.	325	182	507
6750				9' x 5'		Ea.	490	273	763
6800			insul. glass	3' x 2'		Ea.	197	109	306
6850				5' x 3'		Ea.	315	121	436
6900				8' x 4'		Ea.	520	182	702
6950				9' x 5'		Ea.	785	273	1,058

The following pages contain the drawings used for the estimate takeoffs.



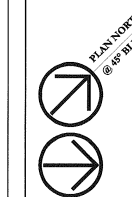
FREDERICK MEMORIAL HOSPITAL
PROJECT 2000

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AND HULL
ASSOCIATES, INC.

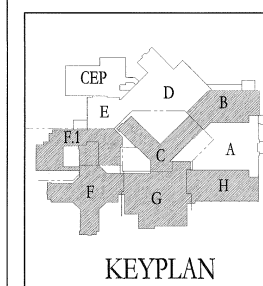


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PHASE 4 ADDITIONS & RENOVATIONS



No.	Revisions / Submissions	Date

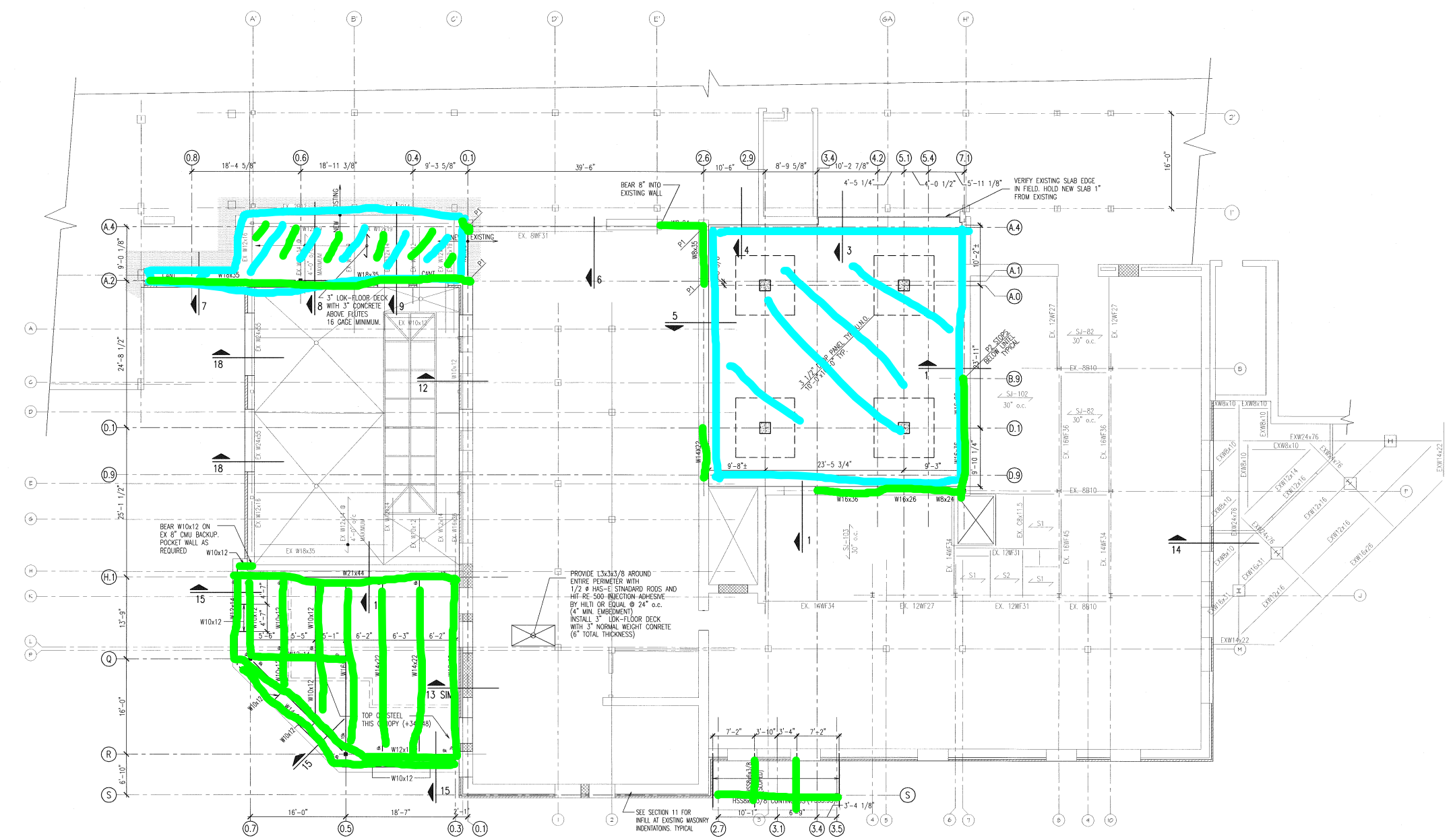


SECOND FLOOR FRAMING PLAN

<input type="checkbox"/> PRELIMINARY NOT FOR CONSTRUCTION	DATE: 15 JULY 2005
<input type="checkbox"/> ISSUED FOR BUILDING PERMIT	JOB NUMBER: 04167
<input type="checkbox"/> PRICING	COMMISSION:
<input type="checkbox"/> PACKAGE 1	SCALE:
<input checked="" type="checkbox"/> PACKAGE 2	

S2.1

KEY:
Concrete/Reinforcing/Formwork Takeoff
Steel Takeoff



SECOND FLOOR FRAMING PLAN 1/8" = 1'-0"
SEE S1.2 FOR CONCRETE FLOOR FRAMING NOTES

- NOTES FOR ROOF FRAMING.
- ROOF SYSTEM SHALL BE AS INDICATED ON THE ARCHITECTURAL DRAWINGS ON 1.5"-20 GAGE TYPE "B" GALVANIZED METAL ROOF DECK BY UNITED STEEL DECK OR EQUIVALENT (3 SPAN MINIMUM) UNLESS NOTED OTHERWISE ON PLAN. ATTACH ROOF DECK TO STEEL SUPPORTS USING A 3/6" PATTERN (EVERY FLUTE WELDED TO STEEL SUPPORT).
 - TOP OF STEEL IS INDICATED THUS (+000.00').
 - COORDINATE OPENINGS THROUGH THE ROOF WITH THE ARCHITECTURAL, MECHANICAL, ELECTRICAL, AND PLUMBING DRAWINGS. FRAME ALL OPENINGS THROUGH THE ROOF DECK, GREATER THAN 8", THROUGH THE ROOF AND ROOF DRAINS WITH 5"x5"x3/8" ANGLES (LONG LEG VERTICAL) ON ALL SIDES.
 - NET UPLIFT FORCES ON THE FRAMED ROOF ARE AS NOTED BELOW. THE JOIST AND METAL DECK SUPPLIERS SHALL SUBMIT CALCULATIONS TO DEMONSTRATE THAT THE JOISTS AND METAL DECK AND THEIR RESPECTIVE CONNECTIONS MEET THE FOLLOWING NET UPLIFTS.
 - FOR A 10.00' WIDE STRIP AROUND THE PERIMETER OF THE FRAMED ROOF AREA, THE METAL DECK AND JOISTS SHALL BE DESIGNED FOR A 20 PSF NET UPLIFT LOAD.
 - ALL REMAINING FRAMED ROOF AREA SHALL BE DESIGNED FOR A 10 PSF NET UPLIFT LOAD.



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