

Baltimore Washington Medical Center

Women's Center and Inpatient Tower *Glen Burnie, MD*



Technical Assignment #2





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Executive Summary

Technical Assignment 2 addresses the cost and methods analysis for the Baltimore Washington Medical Center- Women's Center and Inpatient Tower. The assignment includes a detailed project schedule, a site layout plan for the superstructure phase, an exterior façade assemblies estimate, a detailed structural systems estimate, and a general conditions estimate. This technical analysis primarily focuses on the superstructure of the tower. Technical Report 2 breaks down the various systems of the project in order to gain a better understanding of the costs and methods associated with the construction process.

After analyzing the costs and methods associated with the construction of the tower, it is apparent that the project as a whole is very complex. The detailed project schedule illustrates the construction of the various systems used for the project. The schedule is grouped by trade, which allows the project staff along with each subcontractor to easily visualize each system. Because the systems' sequences overlap, there needs to be a great deal of coordination to manage each trade. The site plan is separated into two main sections, which include the Patient Tower and West Lobby Area. By separating these two areas, the trades could work on the areas simultaneously. The detailed structural systems estimate along with the exterior façade assemblies estimate show the complexity of the systems. Because this building ties into the existing hospital, there are many challenges for designing the structure and façade. After looking at the structure, it is apparent that more than one structural system needed to be used. The façade system also needed to match the existing buildings yet have an aesthetic appearance; therefore, multiple systems were used to create this style. When comparing the general conditions estimate to the actual budget, it seemed as though the actual budget was fairly low for the size and complexity of the project.



Detailed Project Schedule

***Please refer to pages 5-8 for the gantt bar chart schedule for the BWMC Women's Center and Inpatient Tower.

The following detailed project schedule for the Baltimore Washington Medical Center-Women's Center and Inpatient is grouped by trade. The concrete structure was poured by floors with 4 phases per floor. The three phases for the Patient Tower began at the south end and moved to the north end. The fourth phase is the West Lobby Area, which is attached to the north-east end of the Patient Tower. (See new tower figure on following page) The steel truss, which is located above the existing mechanical room, was erected in three sections. Each section was erected before the concrete structure was placed for those levels. The hollow-core precast planks were placed by level after the steel truss was erected. During the placement of the concrete structure, the erection of the bridges began with the south bridge followed by the north bridge. As the concrete structure was finishing, the exterior wall framing and sheathing began on level 1.

The MEP equipment was installed at various times depending on the location of the equipment. Once level three of the concrete structure was placed, the MEP rough-ins began on the lower level and worked up the levels as the concrete structure was still being placed. The MEP rough-in was sequenced in the following order:

- Plumbing Mains and Branches
- HVAC Mains and Branches
- Ductwork
- Primary Electrical Feeders
- Plumbing Fixture Carriers
- Plumbing In-Wall Rough-In
- Electrical In-Wall Rough-In
- Duct VAV Boxes
- Medical Gas Rough-In
- Sprinkler Mains and Branches
- Electrical Systems Cable Tray
- HVAC Rough-In
- Plumbing Insulation
- Fire Alarm System Rough-In
- Duct Insulation
- HVAC Insulation
- In-Wall Inspection

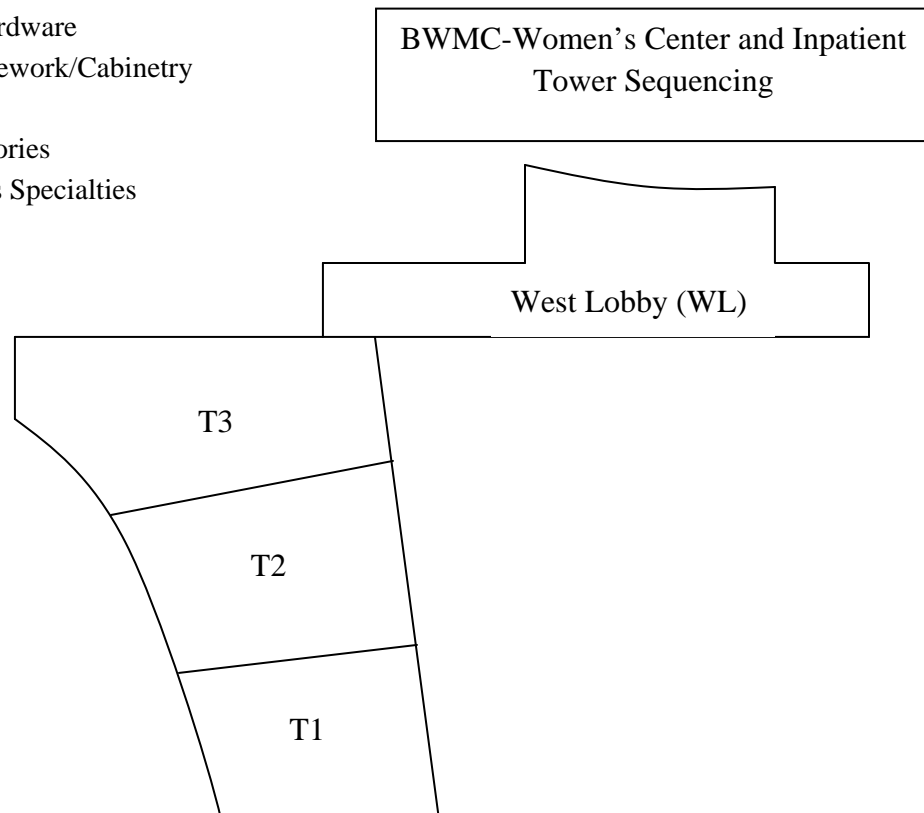


Detailed Project Schedule

After the MEP rough-ins began on each floor, the interior fit-out process would begin. The Patient Tower is planned to be turned over in two phases. The first phase consists of the lower level through level two, and the second phase is levels three through six. Once the interior fit-out and finishes were complete for each phase, the building could be turned over. The interior fit-out process was sequenced in the following order:

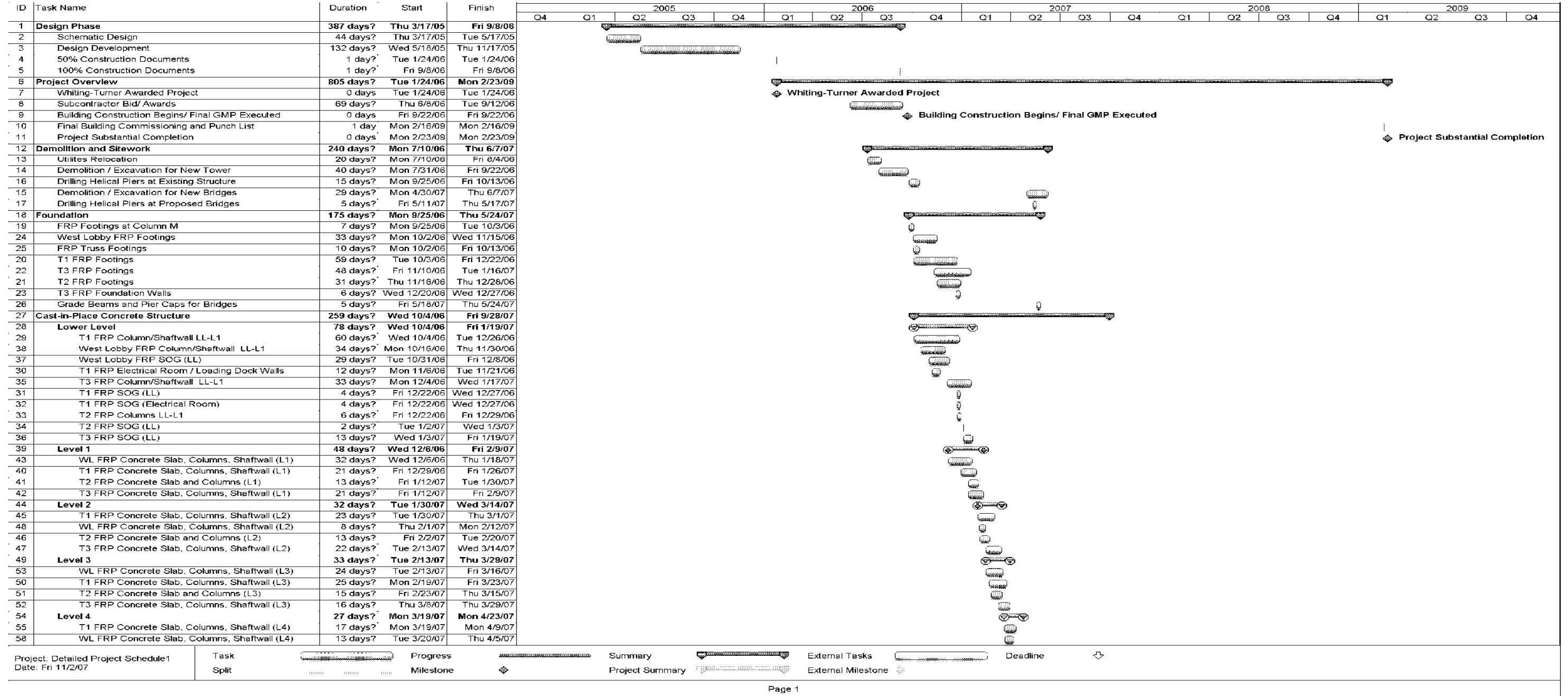
Interior Fit-out/ Finishes

- Layout Top and Bottom Track and Door Frames
- Interior Wall Framing
- Interior Drywall
- Tape and Mud Drywall
- Prime and 1st Coat Paint
- Ceiling Grid
- Flooring
- Ceramic Tile
- Doors and Hardware
- Millwork/Casework/Cabinetry
- Light Fixtures
- Toilet Accessories
- Miscellaneous Specialties
- Ceiling Tile
- Final Paint



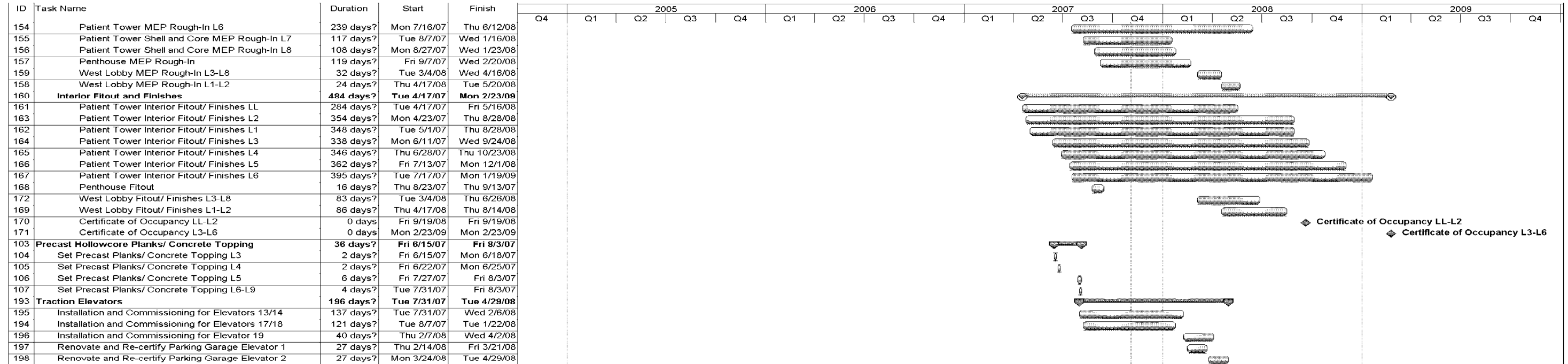


Detailed Project Schedule





Detailed Project Schedule



Project: Detailed Project Schedule 1
 Date: Fri 11/2/07

Task Progress Summary External Tasks Deadline

Split Milestone Project Summary External Milestone



Site Plan Layout for Superstructure Phase

***Please refer to pages 10-13 for the site plan of the superstructure phase for the BWMC Women's Center and Inpatient Tower.

The following four images show different views of the site model developed for the BWMC Women's Center and Inpatient Tower. There are two sections of the new tower. They consist of the Patient Tower and West Lobby Area. As you can see from the model, the site for this new expansion is congested due to the existing hospital and parking garage that surround the construction site.

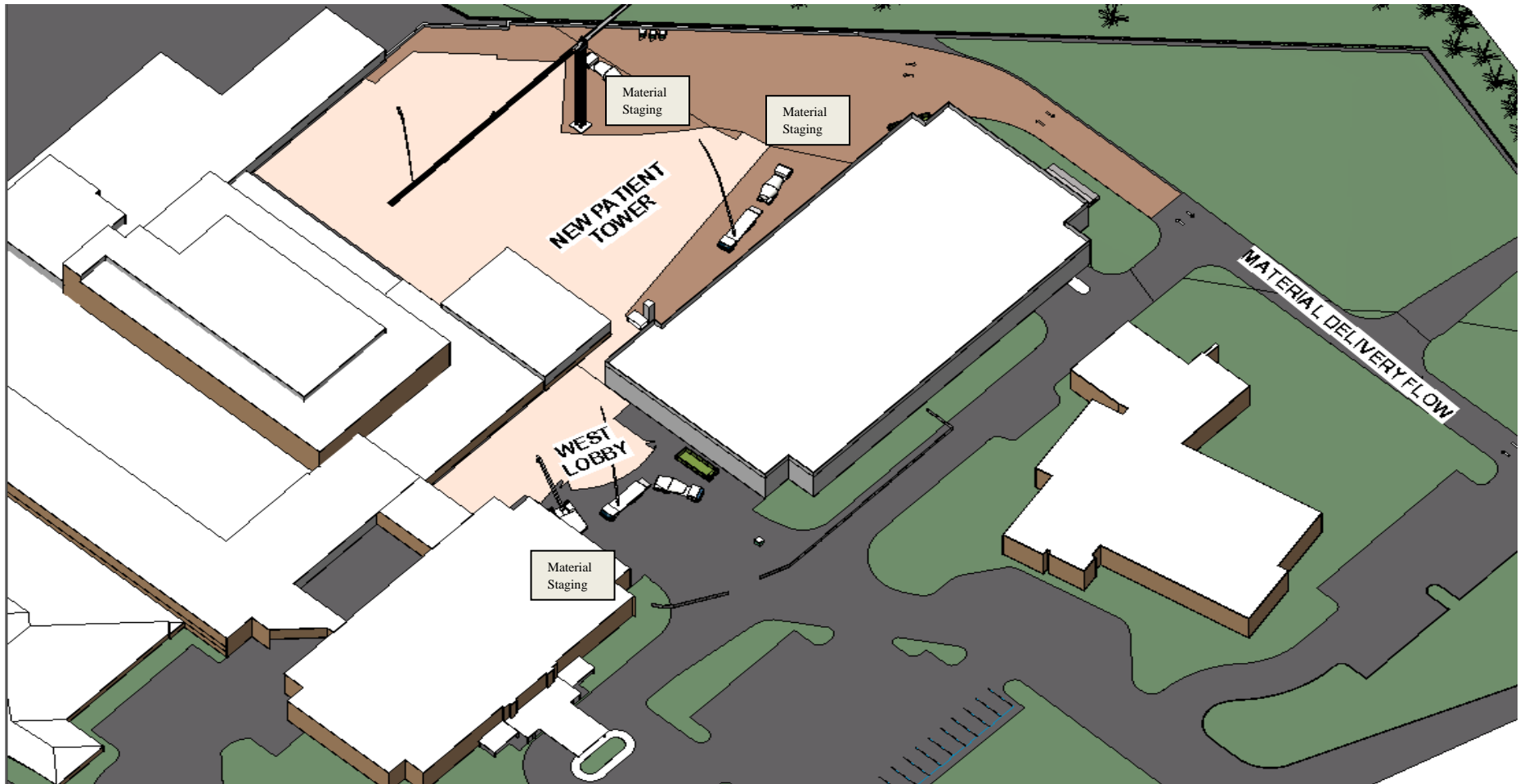
The site model was designed for the superstructure phase of the building; therefore, it shows the tower crane, mobile crane, concrete pumps and pump trucks, material staging areas, and a material hoist. There are a number of dumpsters and sanitary facilities located around the site. Construction fences also surround the construction areas in order to keep out people around the area.

The tower crane is located along the west edge of the Patient Tower. It is placed in the middle area of the tower in order to reach all areas of the Patient Tower. Because the tower crane cannot reach the West Lobby, a hydraulic truck crane is located in front of the West Lobby. Concrete pumps and pump trucks were used to place the concrete structure. One pump truck is usually located at the West Lobby Area. For the Patient Tower, two concrete pumps ran up through the building. A concrete pump truck was also used along the north side of the tower for areas that were often hard to reach by the pumps. As the concrete structure started, a material hoist was erected in the area between the Patient Tower and West Lobby.

In order to avoid people around the area, the material delivery entrance is located on the west edge of the Baltimore Washington Medical Center site. The delivery road to the site, which connects to the main road, Hospital Drive, is used as both an entrance and exit for the delivery trucks.



Site Plan Layout for Superstructure Phase





Site Plan Layout for Superstructure Phase



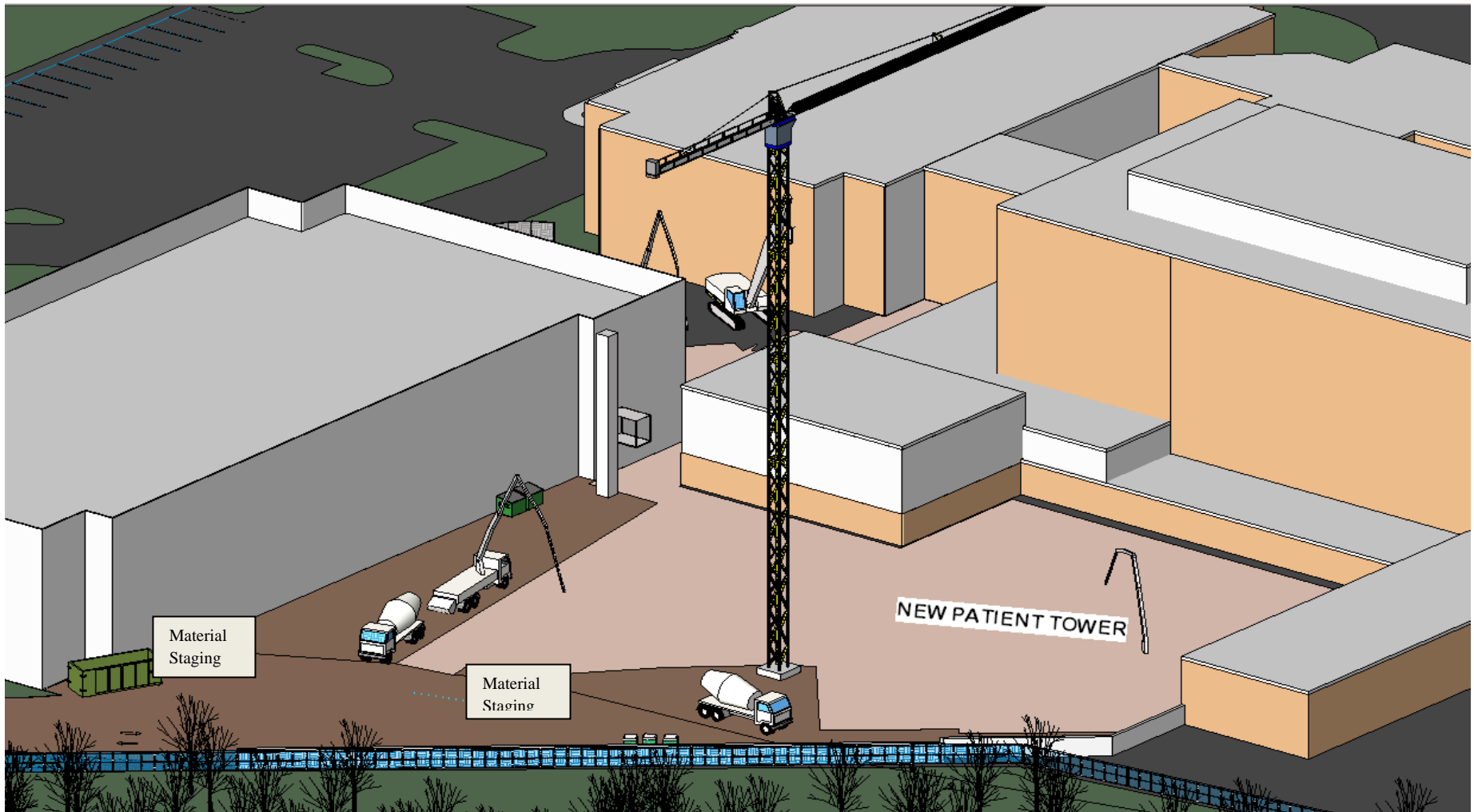


Site Plan Layout for Superstructure Phase





Site Plan Layout for Superstructure Phase





Exterior Façade Assemblies Estimate

***Please refer to Fig. 1 for the Exterior Façade Assemblies Estimate for the BWMC Women's Center and Inpatient Tower.

An Assemblies Estimate for the exterior façade of the BWMC Women's Center and Inpatient Tower was developed using the 2007 R.S. Means Assemblies Cost Data. The façade is broken down into four systems with aluminum windows. The square footage of each system was calculated and multiplied by the unit cost for that system. The exterior aluminum windows were also separated into different groups. The majority of the windows consisted of large aluminum glass windows with metal paneling. Small ribbon windows, which resembled the glass curtain wall, were also used as one of the window groups.

Fig. 1 Exterior Façade Assemblies Estimate

Building Façade Assemblies Estimate								
Item	Description	Unit	Quantity	Mat'l Unit Cost	Mat'l Cost	Installation Unit Cost	Installation Cost	Total Cost
Brick Face Composite Wall Double Wythe	Standard Face Brick 8" Concrete Block Backup Filled with Perlite	SF	17813	\$8.35	\$148,739	\$18.40	\$327,759	\$476,498
EIFS System	Cement Board Sheeting, 3 5/8" Metal Studs, 3" EPS	SF	66658	\$5.65	\$376,618	\$10.95	\$729,905	\$1,106,523
Metal Siding Panels	8" pitch panel; .040" thick Painted Aluminum Panel	SF	8322	\$3.08	\$25,632	\$3.20	\$26,630	\$52,262
Glass Curtain Wall Panels	Glazing Panels: 1" thick, 2 lites, 1/4" float clear	SF	3058	\$15.90	\$48,622	\$11.65	\$35,626	\$84,248
	Spandrel Glass: 1/4" plate glass, insulated with 1" fiberglass	SF	3058	\$13.20	\$40,366	\$7.30	\$22,323	\$62,689
Exterior Aluminum Windows	9.5'x4.5' Single Hung Insulated Glass Aluminum Windows	Unit	248	\$1,680.00	\$416,640	\$840.00	\$208,320	\$624,960
	2.8'x5' Single Hung Insulated Glass Aluminum Windows	Unit	22	\$280.00	\$6,160	\$130.00	\$2,860	\$9,020
	Glazing Panels: 1" thick, 2 lites, 1/4" float clear	SF	1384	\$15.90	\$22,006	\$11.65	\$16,124	\$38,129
	Spandrel Glass: 1/4" plate glass, insulated with 1" fiberglass	SF	692	\$13.20	\$9,134	\$7.30	\$5,052	\$14,186
	Ribbed 4" pitch panel; .0032" thick Natural Aluminum Panel	SF	2304	\$2.46	\$5,668	\$3.29	\$7,580	\$13,248
Total Building Façade Cost:								\$2,481,763



Detailed Structural Systems Estimate

***Please refer to Figs. 2-7 for the Detailed Structural Systems Estimate for the BWMC Women's Center and Inpatient Tower. Refer to Appendix A for the Detailed Structural Systems Takeoff Calculations.

Actual Estimate vs. Calculated Detailed Estimates (RS Means)

Item	Actual Cost	Estimated Cost
Cast-In- Place Concrete	\$9,750,000	\$7,419,651
Structural Steel	\$2,589,000	\$653,223
Precast Concrete Planks	Included in Steel Price	\$50,516
Composite Slab	Included in Concrete Pricing	\$400,000
Metal Decking	Included in Steel Pricing	\$15,883

As shown above, the detailed structural system estimates are varied from the actual budget for the project. The structural steel estimate was much lower than the actual cost. Part of the reason for this difference is that the actual budget includes the precast concrete planks with the structural steel estimate. The planks are included with the structural steel because the same subcontractor is providing both the structural steel and precast planks. The structural steel budget also takes into account the metal decking for the bridges. The cast-in-place concrete estimate is somewhat comparable to the actual budget.



Detailed Structural Systems Estimate

Fig. 4 Structural Steel Estimate

Structural Steel Estimate										
Member Size	Unit	Quantity	Length (LF.)	Unit Mat'l Cost	Mat'l Cost	Unit Labor Cost	Labor Cost	Unit Equip. Cost	Equip. Cost	Total Item Cost
Wide-Flange Shapes										
W6x12	LF	19	6	\$10.50	\$1,197	\$3.77	\$430	\$2.58	\$294	\$1,921
W8x13	LF	11	6	\$12.00	\$792	\$3.77	\$249	\$2.58	\$170	\$1,211
W8x15	LF	6	6	\$13.00	\$468	\$3.77	\$136	\$2.58	\$93	\$697
W8x18	LF	11	8	\$15.00	\$1,320	\$3.77	\$332	\$2.58	\$227	\$1,879
W10x15	LF	11	10	\$23.00	\$2,530	\$3.77	\$415	\$2.58	\$284	\$3,229
W10x19	LF	10	12	\$24.00	\$2,880	\$3.77	\$452	\$2.58	\$310	\$3,642
W10x22	LF	12	12	\$25.00	\$3,600	\$3.77	\$543	\$2.58	\$372	\$4,514
W10x26	LF	1	18	\$26.00	\$468	\$3.77	\$68	\$2.60	\$47	\$583
W10x30	LF	1	14	\$30.00	\$420	\$3.77	\$53	\$2.68	\$38	\$510
W10x45	LF	7	14	\$55.00	\$5,390	\$4.11	\$403	\$2.81	\$275	\$6,068
W10x60	LF	2	12	\$65.00	\$1,560	\$4.20	\$101	\$2.86	\$69	\$1,729
W12x14	LF	1	4	\$15.80	\$63	\$2.57	\$10	\$1.76	\$7	\$81
W12x16	LF	72	14	\$23.00	\$23,184	\$2.57	\$2,591	\$1.76	\$1,774	\$27,549
W12x19	LF	23	18	\$24.00	\$9,936	\$2.57	\$1,064	\$1.76	\$729	\$11,729
W12x22	LF	23	14	\$25.00	\$8,050	\$2.57	\$828	\$1.76	\$567	\$9,444
W12x26	LF	2	18	\$29.50	\$1,062	\$2.57	\$93	\$1.76	\$63	\$1,218
W12x30	LF	5	16	\$32.00	\$2,560	\$2.57	\$206	\$1.76	\$141	\$2,906
W12x40	LF	5	20	\$40.00	\$4,000	\$2.90	\$290	\$2.00	\$200	\$4,490
W12x45	LF	11	20	\$42.00	\$9,240	\$2.90	\$638	\$2.00	\$440	\$10,318
W12x50	LF	2	20	\$48.00	\$1,920	\$2.92	\$117	\$2.40	\$96	\$2,133
W12x53	LF	15	20	\$50.00	\$15,000	\$2.92	\$876	\$2.40	\$720	\$16,596
W14x22	LF	4	26	\$28.00	\$2,912	\$2.82	\$293	\$1.56	\$162	\$3,368
W14x31	LF	1	20	\$34.00	\$680	\$2.51	\$50	\$1.72	\$34	\$765
W14x145	LF	7	14	\$140.00	\$13,720	\$3.28	\$321	\$2.30	\$225	\$14,267
W14x159	LF	4	12	\$150.00	\$7,200	\$3.50	\$168	\$2.45	\$118	\$7,486
W14x176	LF	1	12	\$158.00	\$1,896	\$3.75	\$45	\$2.75	\$33	\$1,974
W14x211	LF	1	18	\$175.00	\$3,150	\$4.00	\$72	\$3.00	\$54	\$3,276
W14x233	LF	1	48	\$190.00	\$9,120	\$4.20	\$202	\$3.15	\$151	\$9,473
W14x283	LF	1	48	\$210.00	\$10,080	\$4.35	\$209	\$3.30	\$158	\$10,447
W16x26	LF	18	24	\$29.50	\$12,744	\$2.26	\$976	\$1.55	\$670	\$14,390
W16x31	LF	9	28	\$35.00	\$8,820	\$2.51	\$633	\$1.72	\$433	\$9,886
W16x36	LF	7	32	\$40.00	\$8,960	\$2.70	\$605	\$1.82	\$408	\$9,972
W18x21	LF	3	16	\$37.00	\$1,776	\$3.34	\$160	\$1.68	\$81	\$2,017
W18x35	LF	40	24	\$39.50	\$37,920	\$3.40	\$3,264	\$1.73	\$1,661	\$42,845
W18x40	LF	20	32	\$45.00	\$28,800	\$3.40	\$2,176	\$1.73	\$1,107	\$32,083
W18x46	LF	23	38	\$51.00	\$44,574	\$3.50	\$3,059	\$1.78	\$1,556	\$49,189
W18x50	LF	6	20	\$56.50	\$6,780	\$3.58	\$430	\$1.82	\$218	\$7,428
W18x55	LF	1	34	\$62.00	\$2,108	\$3.58	\$122	\$1.82	\$62	\$2,292
W18x60	LF	1	18	\$6.00	\$108	\$3.58	\$64	\$1.82	\$33	\$205
W21x44	LF	4	20	\$49.50	\$3,960	\$3.07	\$246	\$1.56	\$125	\$4,330
W21x50	LF	1	28	\$56.50	\$1,582	\$3.07	\$86	\$1.56	\$44	\$1,712
W21x83	LF	2	32	\$80.00	\$5,120	\$3.30	\$211	\$1.75	\$112	\$5,443
W21x93	LF	1	38	\$82.00	\$3,116	\$3.33	\$127	\$1.80	\$68	\$3,311
W24x55	LF	13	24	\$62.00	\$19,344	\$2.94	\$917	\$1.50	\$468	\$20,729
W24x62	LF	7	32	\$70.00	\$15,680	\$2.94	\$659	\$1.50	\$336	\$16,675
W24x76	LF	1	36	\$85.50	\$3,078	\$2.94	\$106	\$1.50	\$54	\$3,238
W24x84	LF	3	28	\$94.50	\$7,938	\$3.03	\$255	\$1.54	\$129	\$8,322
W27x94	LF	4	26	\$106.00	\$11,024	\$2.75	\$286	\$1.40	\$146	\$11,456
Total Wide-Flange Member Estimate:										\$409,023



Detailed Structural Systems Estimate

Fig. 5 Structural Steel Estimate

Structural Steel Estimate										
Member Size	Unit	Quantity	Length (LF.)	Unit Mat'l Cost	Mat'l Cost	Unit Labor Cost	Labor Cost	Unit Equip. Cost	Equip. Cost	Total Item Cost
Steel Tube Shapes										
HSS 10x4x 1/4	Each	3	16	\$600.00	\$28,800	\$45.00	\$2,160	\$31.00	\$1,488	\$32,448
HSS 10x6x 5/16	Each	5	18	\$600.00	\$54,000	\$45.00	\$4,050	\$31.00	\$2,790	\$60,840
HSS 10x10x 1/2	Each	2	16	\$1,100.00	\$35,200	\$47.00	\$1,504	\$32.00	\$1,024	\$37,728
HSS 10x10x 3/8	Each	1	16	\$1,100.00	\$17,600	\$47.00	\$752	\$32.00	\$512	\$18,864
HSS 10x10x 5/8	Each	1	16	\$1,100.00	\$17,600	\$47.00	\$752	\$32.00	\$512	\$18,864
HSS 14x10x 5/8	Each	2	16	\$1,100.00	\$35,200	\$47.00	\$1,504	\$32.00	\$1,024	\$37,728
HSS 16x12x 5/8	Each	2	16	\$1,100.00	\$35,200	\$47.00	\$1,504	\$32.00	\$1,024	\$37,728
Total HSS Member Estimate:										\$244,200
Total Steel Member Estimate:										\$653,223

Fig. 6 Composite Slab Estimate

Composite Slab Estimate										
Item	Units	Quantity	Unit Mat'l Cost	Mat'l Cost	Unit Labor Cost	Labor Cost	Unit Equip. Cost	Equip. Cost	Total Item Cost	
3 1/4" Light Weight Concrete Slab (3500 psi)	cy	2117	\$106.00	\$224,402	\$14.20	\$30,061	\$5.35	\$11,326	\$265,789	
2"x20 Gage Composite Metal Decking	sf	7824	\$1.63	\$12,753	\$0.37	\$2,895	\$0.03	\$235	\$15,883	
6"x 6" W1.4 x W1.4 W.W.F	csf	78.24	\$12.75	\$998	\$18.90	\$1,479		\$0	\$2,476	
Total Composite Slab Estimate:										\$284,148

Fig. 7 Precast Concrete Hollow Core Planks Estimate

Precast Concrete Hollow Core Planks Estimate										
Item	Units	Quantity	Unit Mat'l Cost	Mat'l Cost	Unit Labor Cost	Labor Cost	Unit Equip. Cost	Equip. Cost	Total Item Cost	
8" Hollow Planks	sf	6168	6.7	41325.6	0.91	5612.88	0.58	3577.44	50515.92	
2" Concrete Topping	cy	1028	\$106.00	\$108,968	\$14.20	\$14,598	\$5.35	\$5,500	129065.4	
6"x 6" W1.4 x W1.4 W.W.F	csf	61.68	\$12.75	\$786	\$18.90	\$1,166		\$0	\$1,952	
Total Precast Concrete Planks Estimate:										\$181,533



General Conditions Estimate

***Please refer to Fig. 8 on the following page for the General Conditions Estimate for the BWMC Women's Center and Inpatient Tower.

A General Conditions Estimate was developed for the BWMC Women's Center and Inpatient Tower. The following page shows the grouping of all the items included for the estimate. For this estimate, both the 2007 R.S. Means Facilities Construction Cost Data and Whiting-Turner's Cost Data were used as cost references. The estimate was performed using the same items listed in Whiting-Turner's General Conditions Budget so that the estimate and budget could be compared. Many of the items listed in the estimate are calculated based on monthly costs. For these items, the project duration is assumed to be thirty-three months (June 2006-February 2009). For the project team, various durations were used for each employee depending on the estimated time that each employee will spend on the job site. The construction fee for this project is assumed to be 1.5% due to the large size of this project. The estimate cost is approximately \$2,834,700. The actual budget is \$1,541,270. One of the main reasons for the difference in cost could be the project staff estimate. The unit costs were taken from R.S. Means rather than from Whiting-Turner's data. The costs for the employees depend on the company and to some extent, can be difficult to estimate.



General Conditions Estimate

Fig. 8 General Conditions Estimate

General Conditions Estimate									
Item	Unit	Quantity	Mat'l Unit Cost	Mat'l Cost	Labor Unit Cost	Labor Cost	Equipment Unit Cost	Equipment Cost	Total Cost
Project Staff									
(2) Project Engineers	Month	31			1085	134540			\$134,540
(1) Assistant Project Manager	Month	31			1250	155000			\$155,000
(1) Assistant Superintendent	Month	34			1500	204000			\$204,000
(1) Project Manager	Month	33			1550	204600			\$204,600
(1) Superintendent	Month	35			1650	231000			\$231,000
(1) Senior Project Manager	Month	34			2025	275400			\$275,400
(1) MEP Project Manager	Month	34			1775	241400			\$241,400
(1) General Laborer	Month	30			1150	138000			\$138,000
Project Documentation									
Drawings and Specifications	Sets	120	\$700.00	\$84,000					\$84,000
Engineering Services									
As-Built Surveys	Acres	2.16	\$1,160.00	\$2,506	\$300.00	\$648	\$20.00	\$43	\$3,197
Topographic Surveys	Acres	2.16	\$17.00	\$37	\$294.00	\$635	\$17.60	\$38	\$710
Temporary Facilities									
50'x10' Job Trailers (Rented/ Month)	Each	2	\$330.00	\$660					\$660
Sanitary Facilities	Each	135	\$110.00	\$14,850					\$14,850
Project Signs	SF	30	\$16.55	\$497					\$497
Field Office Expenses									
Office Equipment	Month	33	\$150.00	\$4,950					\$4,950
Office Supplies	Month	33	\$95.00	\$3,135					\$3,135
Telephone bill	Month	33	\$210.00	\$6,930					\$6,930
Field Office Lights and HVAC	Month	33	\$110.00	\$3,630					\$3,630
Temporary Utilites									
Heat	CSF	3556	\$10.35	\$36,805	\$3.04	\$10,810			\$47,615
Lighting	CSF	3556	\$4.00	\$14,224	\$15.00	\$53,340			\$67,564
Power for Lighting	CSF	3556							\$5,334
Power for Job Duration	CSF	3556							\$266,700
Water Bill	Month	33	\$62.00	\$2,046					\$2,046
Temporary Barricades									
5' Ht. Temporary Fencing	LF.	50	\$6.00	\$300	\$1.15	\$58			\$358
Guardrail	LF.	6230	\$1.14	\$7,102	\$2.94	\$18,316			\$25,418
Clean-Up									
Daily Clean-Up	MSF	356	\$1.70	\$605	\$32.50	\$11,570	\$2.21	\$787	\$12,962
Final Clean-Up	MSF	450	\$2.71	\$1,220	\$45.00	\$20,250	\$3.07	\$1,382	\$22,851
Dumpsters	Pulls	500	\$345.00	\$172,500					\$172,500
Equipment									
Material Hoist	Each	1	\$350,000.00	\$350,000					\$350,000
Small Tools	Total	1	\$50,000.00	\$50,000					\$50,000
Total Costs									\$2,729,846
Insurance									
Builder's Risk Insurance	0.50%								\$13,649
Worker's Compensation	18.39%								\$50,200
Construction Manager Fee									
	1.5%								\$41,000
Total Project General Conditions									\$2,834,695



Appendix A

Detailed Structural Systems Estimate

Cast In Place Concrete Takeoff			
Item	Units	Quantity	
Footings			
Footing 1 (36)	cy	16664	
Footing 2 (15)	cy	469	
Footing 3 (2)	cy	1001	
Footing 4 (3)	cy	1071	
Footing 5 (2)	cy	840	
Footing 6 (2)	cy	325	
Footing 7 (3)	cy	884	
Strip Footing 1 (2)	cy	4277	
Strip Footing 2 (1)	cy	218	
Total Footing Concrete		954	
Slab on Grade			
	cy	479	
Floor Slabs			
West Lobby Slabs (L1-L9)	cy	2387	
Patient Tower Level 1	cy	766	
Patient Tower (L2-L9)	cy	5220	
Total Patient Tower Slabs		5986	
Drop Panels (238 Panels)			
Patient Tower (L1-L9)	cy	477	
Mat Slabs			
Mat Slab 1		3087	
Mat Slab 2- Sec. 1	cy	1904	
Mat Slab 2- Sec. 2	cy	3526	
Mat Slab 3- Sec. 1	cy	2488	
Mat Slab 3- Sec. 2	cy	502	
Total Mat Slab Concrete		426	
Shear Walls			
Shear Wall 1 (4)	cy	10152	
Shear Wall 2 (5)	cy	5400	
Shear Wall 3 (1)	cy	10152	
Shear Wall 4 (2)	cy	3920	
Shear Wall 5 (3)	cy	7020	
Reinforced Concrete Walls			
10" Wall	cy	1260	
12" Wall	cy	18681	
14" Wall	cy	1120	
18" Wall	cy	4266	
Total Concrete Wall		2295	

Cast In Place Concrete Takeoff		
Item	Units	Quantity
Beams		
Beam 1	cy	477
Beam 2	cy	2503
Beam 3	cy	953
Beam 4	cy	5482
Beam 5	cy	1170
Beam 6	cy	3120
Beam 7	cy	16759
Beam 8	cy	14365
Beam 9	cy	923
Beam 10	cy	2262
Beam 11	cy	10266
Beam 12	cy	3480
Beam 13	cy	14768
Beam 14	cy	2320
Beam 15	cy	340
Beam 16	cy	728
Beam 17	cy	26208
Beam 19	cy	6431
Beam 20	cy	34565
Beam 21	cy	12552
Beam 22	cy	10247
Beam 23	cy	8320
Beam 24	cy	480
Beam 26	cy	6916
Beam 27	cy	2610
Beam 28	cy	1170
Beam 29	cy	181
Beam 30	cy	1820
Beam 32	cy	5808
Beam 33	cy	676
Beam 34	cy	228
Beam 35	cy	1484
Beam 36	cy	780
Beam 38	cy	234
Beam 39	cy	3536
Beam 40	cy	50
Beam 41	cy	1170
Beam 42	cy	208
Beam 43	cy	919
Beam 44	cy	4938
Beam 45	cy	4160
Beam 46	cy	1044
Beam 47	cy	716
Beam 48	cy	131
Beam 49	cy	1248
Total Beam Concrete		8102
Columns		
Column 1 (43 Col.)	cy	892
Column 2 (2 Col.)	cy	15
Column 3 (9 Col.)	cy	117
Total Column Concrete		1024



Appendix A

Detailed Structural Systems Estimate

Rebar Takeoff						
Item	Quantity	Length (ft)	Total Length	Wt. Lbs/ ft.	Lbs.	Tons
Foundations						
Typical Footings						
Footing 1 (9)						
#6 Bars	72	4	288	1.502	433	0.22
Footing 2 (3)			0		0	0.00
#7 Bars	30	5	150	2.044	307	0.15
Footing 3 (8)			0		0	0.00
#9 Bars	192	11	2112	3.400	7181	3.59
Footing 4 (30)			0		0	0.00
#10 Bars	840	13	10500	4.303	45182	22.59
Footing 5 (3)			0		0	0.00
#10 Bars	43	10	430	4.303	1850	0.93
#10 Bars	34	14	459	4.303	1975	0.99
Footing 6 (1)			0		0	0.00
#8 Bars	20	9	180	2.670	481	0.24
#8 Bars	9	20	180	2.670	481	0.24
#10 Bars	20	9	180	4.303	775	0.39
#10 Bars	9	20	180	4.303	775	0.39
Footing 7 (2)			0		0	0.00
#10 Bars	24	10	240	4.303	1033	0.52
Footing 8 (2)			0		0	0.00
#4 Bars	16	4	56	0.668	37	0.02
Footing 9 (1)			0		0	0.00
#7 Bars	14	6	84	2.044	172	0.09
Footing 10			0		0	0.00
#7 Bars	16	6	88	2.044	180	0.09
Footing 11			0		0	0.00
#7 Bars	12	11	132	2.044	270	0.13
#9 Bars	6	5	30	3.400	102	0.05
Footing 12			0		0	0.00
#7 Bars	34	4	136	2.044	278	0.14
#8 Bars	12	17	204	2.670	545	0.27
Footing 13			0		0	0.00
#8 Bars	24	12	276	2.670	737	0.37
#8 Bars	32	16	512	2.670	1367	0.68
Continuous Footing 1			0		0	0.00
#4 Bars	5	564	2820	0.668	1884	0.94
Continuous Footing 2			0		0	0.00
#4 Bars	3	84	252	0.668	168	0.08
Total Footing Rebar (lbs.; tons)					66209	33.10
Footing Rebar (#4, #6, #7,#8, #9, #10)	68131	433	1206	3610	7283	51589



Appendix A

Detailed Structural Systems Estimate

Rebar Takeoff						
Item	Quantity	Length (ft)	Total Length	Wt. Lbs/ ft.	Lbs.	Tons
Floor Slabs						
Continuous Rebar						
Patient Tower Slab L1			0		0	0.00
#4 Bars	42	145	6090	0.668	4068	2.03
#5 Bars	42	145	6090	1.043	6352	3.18
Patient Tower Slab L1			0		0	0.00
#4 Bars	192	32	6144	0.668	4104	2.05
#5 Bars	192	32	6144	1.043	6408	3.20
Patient Tower Slab L1			0		0	0.00
#4 Bars	174	31	5394	0.668	3603	1.80
#5 Bars	174	31	5394	1.043	5626	2.81
Patient Tower Slab L1			0		0	0.00
#4 Bars	42	130	5460	0.668	3647	1.82
#5 Bars	42	130	5460	1.043	5695	2.85
Patient Tower Slab L1			0		0	0.00
#4 Bars	44	85	3740	0.668	2498	1.25
#5 Bars	44	85	3740	1.043	3901	1.95
Patient Tower Slab L1			0		0	0.00
#4 Bars	114	33	3762	0.668	2513	1.26
#5 Bars	114	33	3762	1.043	3924	1.96
Patient Tower Slab L2-L9			0		0	0.00
#4 Bars	336	145	48720	0.668	32545	16.27
#5 Bars	336	145	48720	1.043	50815	25.41
Patient Tower Slab L2-L9			0		0	0.00
#4 Bars	1536	32	49152	0.668	32834	16.42
#5 Bars	1536	32	49152	1.043	51266	25.63
Patient Tower Slab L2-L9			0		0	0.00
#4 Bars	1392	31	43152	0.668	28826	14.41
#5 Bars	1392	31	43152	1.043	45008	22.50
Patient Tower Slab L2-L9			0		0	0.00
#4 Bars	336	130	43680	0.668	29178	14.59
#5 Bars	336	130	43680	1.043	45558	22.78
Patient Tower Slab L2-L9			0		0	0.00
#4 Bars	352	85	29920	0.668	19987	9.99
#5 Bars	352	85	29920	1.043	31207	15.60
Patient Tower Slab L2-L9			0		0	0.00
#4 Bars	912	33	30096	0.668	20104	10.05
#5 Bars	912	33	30096	1.043	31390	15.70
West Lobby Slabs L1-L9			0		0	0.00
#5 Bars	1971	40	78840	1.043	82230	41.12
West Lobby Slabs L1-L9			0		0	0.00
#5 Bars	486	164	79704	1.043	83131	41.57
West Lobby Slabs L1-L9			0		0	0.00
#5 Bars	43	70	3010	1.043	3139	1.57
West Lobby Slabs L1-L9			0		0	0.00
#5 Bars	94	32	3008	1.043	3137	1.57
Total Slab Rebar (lbs.; tons)						
Elevated Slab Rebar (#4, #5)	183907		458786			



Appendix A

Detailed Structural Systems Estimate

Rebar Takeoff						
Item	Quantity	Length (ft)	Total Length	Wt. Lbs/ ft.	Lbs.	Tons
Drop Panels (238 Total)						
#4 Bars	4760	10	47600	0.668	31797	15.90
Add. Rebar (9 Floors)						
#5 Bars	207	8	1656	1.043	1727	0.86
#5 Bars	594	10	5940	1.043	6195	3.10
#5 Bars	99	12	1188	1.043	1239	0.62
#5 Bars	27	14	378	1.043	394	0.20
#5 Bars	486	16	7776	1.043	8110	4.06
#5 Bars	54	18	972	1.043	1014	0.51
#5 Bars	54	20	1080	1.043	1126	0.56
#5 Bars	54	28	1512	1.043	1577	0.79
#6 Bars	119	8	952	1.502	1430	0.71
#6 Bars	153	10	1530	1.502	2298	1.15
#6 Bars	42	12	504	1.502	757	0.38
#6 Bars	445	16	7120	1.502	10694	5.35
#6 Bars	393	18	7074	1.502	10625	5.31
#6 Bars	43	20	860	1.502	1292	0.65
#6 Bars	6	22	132	1.502	198	0.10
#6 Bars	279	26	7254	1.502	10896	5.45
#6 Bars	216	28	6048	1.502	9084	4.54
#6 Bars	36	30	1080	1.502	1622	0.81
#7 Bars	261	12	3132	2.044	6402	3.20
#7 Bars	1566	16	25056	2.044	51214	25.61
#7 Bars	621	18	11178	2.044	22848	11.42
#7 Bars	747	20	14940	2.044	30537	15.27
#7 Bars	126	24	3024	2.044	6181	3.09
#7 Bars	720	26	18720	2.044	38264	19.13
#7 Bars	315	28	8820	2.044	18028	9.01
#7 Bars	396	30	11880	2.044	24283	12.14
#7 Bars	99	32	3168	2.044	6475	3.24
#8 Bars	126	16	2016	2.670	5383	2.69
#8 Bars	81	20	1620	2.670	4325	2.16
#8 Bars	99	22	2178	2.670	5815	2.91
#8 Bars	99	28	2772	2.670	7401	3.70
Add. Elev. Slab Rebar (#5, #6, #7, #8)	21384	48896	204232	22925		



Appendix A

Detailed Structural Systems Estimate

Rebar Takeoff						
Item	Quantity	Length (ft)	Total Length	Wt. Lbs/ ft.	Lbs.	Tons
Typical Reinforced Walls			0		0	0.00
10" Wall			0		0	0.00
#4 Bars	12	126	1512	0.668	1010	0.51
#4 Bars	126	12	1512	0.668	1010	0.51
12" Wall			0		0	0.00
#5 Bars	24	527	12648	1.043	13192	6.60
#5 Bars	1054	12	12648	1.043	13192	6.60
12" Wall			0		0	0.00
#5 Bars	44	158	6952	1.043	7251	3.63
#5 Bars	316	22	6952	1.043	7251	3.63
12" Wall			0		0	0.00
#5 Bars	72	36	2592	1.043	2703	1.35
#5 Bars	72	36	2592	1.043	2703	1.35
14" Wall			0		0	0.00
#6 Bars	24	80	1920	1.502	2884	1.44
#6 Bars	160	12	1920	1.502	2884	1.44
18" Wall			0		0	0.00
#6 Bars	24	474	11376	1.502	17087	8.54
#6 Bars	474	12	5688	1.502	8543	4.27
Total Wall Rebar (lbs.; tons)					178282	82.96
Reinf. Wall Rebar (#4 #5, #6)	2020		46293		31398	
Beams (9 Levels)			0		0	0.00
Beam 1		16	0		0	0.00
#6 Bars	8	16	128	1.502	192	0.10
#8 Bars	6	16	96	2.670	256	0.13
#9 Bars	7	16	112	3.400	381	0.19
Beam 2		84	0		0	0.00
#7 Bars	9	84	756	2.044	1545	0.77
#9 Bars	18	84	1512	3.400	5141	2.57
Beam 3		32	0		0	0.00
#7 Bars	8	32	256	2.044	523	0.26
#9 Bars	14	32	448	3.400	1523	0.76
Beam 4		184	0		0	0.00
#7 Bars	8	184	1472	2.044	3009	1.50
#9 Bars	10	184	1840	3.400	6256	3.13
Beam 5		36	0		0	0.00
#8 Bars	8	36	288	2.670	769	0.38
#9 Bars	13	36	468	3.400	1591	0.80
Beam 6		96	0		0	0.00
#7 Bars	8	96	768	2.044	1570	0.78
#9 Bars	17	96	1632	3.400	5549	2.77
Beam 7		476	0		0	0.00
#7 Bars	8	476	3808	2.044	7784	3.89
#9 Bars	11	476	5236	3.400	17802	8.90
Beam 8		408	0		0	0.00
#7 Bars	9	408	3672	2.044	7506	3.75
#9 Bars	10	408	4080	3.400	13872	6.94



Appendix A

Detailed Structural Systems Estimate

Rebar Takeoff						
Item	Quantity	Length (ft)	Total Length	Wt. Lbs/ ft.	Lbs.	Tons
Beams (9 Levels)						
Beam 9		142	0		0	0.00
#5 Bars	8	142	1136	1.043	1185	0.59
Beam 10		156	0		0	0.00
#7 Bars	6	156	936	2.044	1913	0.96
#8 Bars	4	156	624	2.670	1666	0.83
Beam 11		708	0		0	0.00
#7 Bars	6	708	4248	2.044	8683	4.34
#8 Bars	4	708	2832	2.670	7561	3.78
Beam 12		180	0		0	0.00
#4 Bars	2	180	360	0.668	240	0.12
#7 Bars	4	180	720	2.044	1472	0.74
#8 Bars	6	180	1080	2.670	2884	1.44
Beam 13		568	0		0	0.00
#6 Bars	12	568	6816	1.502	10238	5.12
Beam 14		464	0		0	0.00
#5 Bars	3	464	1392	1.043	1452	0.73
#7 Bars	4	464	1856	2.044	3794	1.90
Beam 15		136	0		0	0.00
#5 Bars	3	136	408	1.043	426	0.21
#7 Bars	4	136	544	2.044	1112	0.56
Beam 16		112	0		0	0.00
#5 Bars	8	112	896	1.043	935	0.47
#9 Bars	10	112	1120	3.400	3808	1.90
Beam 17		1008	0		0	0.00
#7 Bars	7	1008	7056	2.044	14422	7.21
#9 Bars	10	1008	10080	3.400	34272	17.14
Beam 19		224	0		0	0.00
#8 Bars	8	224	1792	2.670	4785	2.39
#9 Bars	7	224	1568	3.400	5331	2.67
Beam 20		1204	0		0	0.00
#7 Bars	7	1204	8428	2.044	17227	8.61
#9 Bars	9	1204	10836	3.400	36842	18.42
Beam 21		196	0		0	0.00
#7 Bars	8	196	1568	2.044	3205	1.60
#9 Bars	8	196	1568	3.400	5331	2.67
Beam 22		160	0		0	0.00
#4 Bars	2	160	320	0.668	214	0.11
#7 Bars	8	160	1280	2.044	2616	1.31
#9 Bars	10	160	1600	3.400	5440	2.72
Beam 23		256	0		0	0.00
#7 Bars	8	256	2048	2.044	4186	2.09
#9 Bars	13	256	3328	3.400	11315	5.66
Beam 24		64	0		0	0.00
#5 Bars	5	64	320	1.043	334	0.17
#7 Bars	7	64	448	2.044	916	0.46
Beam 26		304	0		0	0.00
#6 Bars	17	304	5168	1.502	7762	3.88



Appendix A

Detailed Structural Systems Estimate

Rebar Takeoff						
Item	Quantity	Length (ft)	Total Length	Wt. Lbs/ ft.	Lbs.	Tons
Beams (9 Levels)						
Beam 27		180	0		0	0.00
#4 Bars	1	180	180	0.668	120	0.06
#7 Bars	3	180	540	2.044	1104	0.55
#8 Bars	4	180	720	2.670	1922	0.96
Beam 28		156	0		0	0.00
#6 Bars	10	156	1560	1.502	2343	1.17
Beam 29		32	0		0	0.00
#5 Bars	6	32	192	1.043	200	0.10
Beam 30		26	0		0	0.00
#4 Bars	1	26	26	0.668	17	0.01
#6 Bars	8	26	208	1.502	312	0.16
#7 Bars	11	26	286	2.044	585	0.29
Beam 32		88	0		0	0.00
#4 Bars	2	88	176	0.668	118	0.06
#7 Bars	16	88	1408	2.044	2878	1.44
Beam 33		26	0		0	0.00
#7 Bars	14	26	364	2.044	744	0.37
Beam 34		8	0		0	0.00
#7 Bars	12	8	96	2.044	196	0.10
Beam 35		32	0		0	0.00
#4 Bars	1	32	32	0.668	21	0.01
#7 Bars	6	32	192	2.044	392	0.20
#9 Bars	8	32	256	3.400	870	0.44
Beam 36		40	0		0	0.00
#6 Bars	5	40	200	1.502	300	0.15
#7 Bars	12	40	480	2.044	981	0.49
Beam 38		12	0		0	0.00
#6 Bars	18	12	216	1.502	324	0.16
Beam 39		136	0		0	0.00
#6 Bars	14	136	1904	1.502	2860	1.43
Beam 40		10	0		0	0.00
#7 Bars	12	10	120	2.044	245	0.12
Beam 41		52	0		0	0.00
#6 Bars	4	52	208	1.502	312	0.16
#8 Bars	8	52	416	2.670	1111	0.56
Beam 42		16	0		0	0.00
#7 Bars	12	16	192	2.044	392	0.20
Beam 43		32	0		0	0.00
#8 Bars	7	32	224	2.670	598	0.30
#9 Bars	10	32	320	3.400	1088	0.54



Appendix A

Detailed Structural Systems Estimate

Rebar Takeoff						
Item	Quantity	Length (ft)	Total Length	Wt. Lbs/ ft.	Lbs.	Tons
Beams (9 Levels)						
Beam 44		172	0		0	0.00
#7 Bars	8	172	1376	2.044	2813	1.41
#9 Bars	10	172	1720	3.400	5848	2.92
Beam 45		160	0		0	0.00
#7 Bars	8	160	1280	2.044	2616	1.31
#9 Bars	10	160	1600	3.400	5440	2.72
Beam 46		54	0		0	0.00
#4 Bars	1	54	54	0.668	36	0.02
#8 Bars	5	54	270	2.670	721	0.36
#9 Bars	3	54	162	3.400	551	0.28
Beam 47		18	0		0	0.00
#4 Bars	3	18	54	0.668	36	0.02
#8 Bars	5	18	90	2.670	240	0.12
#9 Bars	6	18	108	3.400	367	0.18
Beam 48		6	0		0	0.00
#4 Bars	1	6	6	0.668	4	0.00
#6 Bars	4	6	24	1.502	36	0.02
#9 Bars	6	6	36	3.400	122	0.06
Beam 49		64	0		0	0.00
#7 Bars	7	64	448	2.044	916	0.46
#9 Bars	10	64	640	3.400	2176	1.09
Total Beam Rebar (lbs.; tons)					318794	159.40
Beam Rebar (#4, #5, #6, #7, #8, #9)	807	4531	24681	95344	22513	170918
Column 1 (6 Col.)						
#7 Bars	96	52	4992	2.044	10204	5.10
#8 Bars	96	24	2304	2.670	6152	3.08
#9 Bars	96	36	3456	3.400	11750	5.88
Column 2 (31 Col.)			0		0	0.00
#8 Bars	496	52	25792	2.670	68865	34.43
#9 Bars	496	24	11904	3.400	40474	20.24
#10 Bars	496	36	17856	4.303	76834	38.42
Column 3 (7 Col.)			0		0	0.00
#9 Bars	112	52	5824	3.400	19802	9.90
#10 Bars	112	24	2688	4.303	11566	5.78
#11 Bars	112	36	4032	5.313	21422	10.71
Column 4 (13 Col.)			0		0	0.00
#7 Bars	156	112	17472	2.044	35713	17.86
#7 Bars	137	112	15288	2.044	31249	15.62
Column 5 (2 Col.)			0		0	0.00
#6 Bars	16	112	1792	1.502	2692	1.35
#6 Bars	16	112	1792	1.502	2692	1.35
Total Column Rebar (lbs.; tons)					339413	169.71
Column Rebar (#6, #7, #8, #9, #10, #11)	5383	77165	75016	31552	88401	21422



Appendix A

Detailed Structural Systems Estimate

Structural Steel Takeoff		
Member Size	Quantity	Length (LF.)
W6x12	19	6
W8x13	11	6
W8x15	6	6
W8x18	11	8
W10x15	11	10
W10x19	10	12
W10x22	12	12
W10x26	1	18
W10x30	1	14
W10x45	7	14
W10x60	2	12
W12x14	1	4
W12x16	72	14
W12x19	23	18
W12x22	23	14
W12x26	2	18
W12x30	5	16
W12x40	5	20
W12x45	11	20
W12x50	2	20
W12x53	15	20
W14x22	4	26
W14x31	1	20
W14x145	7	14
W14x159	4	12
W14x176	1	12
W14x211	1	18

Structural Steel Takeoff		
Member Size	Quantity	Length (LF.)
W14x233	1	48
W14x283	1	48
W16x26	18	24
W16x31	9	28
W16x36	7	32
W18x21	3	16
W18x35	40	24
W18x40	20	32
W18x46	23	38
W18x50	6	20
W18x55	1	34
W18x60	1	18
W21x44	4	20
W21x50	1	28
W21x83	2	32
W21x93	1	38
W24x55	13	24
W24x62	7	32
W24x76	1	36
W24x84	3	28
W27x94	4	26
HSS 10x4x 1/4	3	16
HSS 10x6x 5/16	5	18
HSS 10x10x 1/2	2	16
HSS 10x10x 3/8	1	16
HSS 10x10x 5/8	1	16
HSS 14x10x 5/8	2	16
HSS 16x12x 5/8	2	16

Precast Concrete Hollow Core Planks Takeoff		
Item	Units	Quantity
8" Hollow Planks	sf	6168
2" Concrete Topping	cy	1028
6" x 6" W1.4 x W1.4 W.W.F	csf	6168

Composite Slab Takeoff		
Item	Units	Quantity
3 1/4" Concrete Slab		
South Bridge (L2-L6)	cy	1515
North Bridge (L4-L6)	cy	429
Atrium Area (L3)	cy	173
Total Light-Weight Concrete	cy	2117
2" x 20 Gage Non-cellular Composite Metal Decking		
South Bridge (L2-L6)	sf	5600
North Bridge (L4-L6)	sf	1584
Atrium Area (L3)	sf	640
Total Metal Decking	sf	7824
W1.4 x W1.4 W.W.F	csf	7824