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Construction Management
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Canton Crossing Tower
1501 S. Highland Avenue
Baltimore, Maryland 21224

Technical Assignment #2

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Executive Summary

The attached Technical Assignment #2 consists of a detailed project schedule, a site logistics plan for the steel erection phase of construction, an assemblies estimate for plumbing fixtures and fire protection system, a detailed structural system estimate, and a general conditions estimate. The attached document will help to analyze the key features of the Canton Crossing Tower that affected the projects execution.

The detailed project schedules gives an in depth look at the schedule broken down by trades. The implementation of the demanding 18-month schedule is shown in a chronological order that helps the reader to understand the procedures used to complete the tower on time to the owner, starting February 7th 2005 and ending July 27th, 2006.

The site logistics plan is shown for the steel erection phase of construction. Gilbane benefited from a large site that provided ample steel staging and laydown areas. The site is located directly adjacent to an exit from Interstate 95 which allowed deliveries to be on time and uncompromised. Once on site, the tractor and trailers had sufficient space to park and wait to be unloaded.

An assemblies estimate was performed for the plumbing fixtures and the fire protection system. The plumbing fixtures designed for the tower are only in the core area. The tenant fit-out areas will be done be each respective tenant contractor. The fire protection system, on the other hand, is designed into the tenant areas.

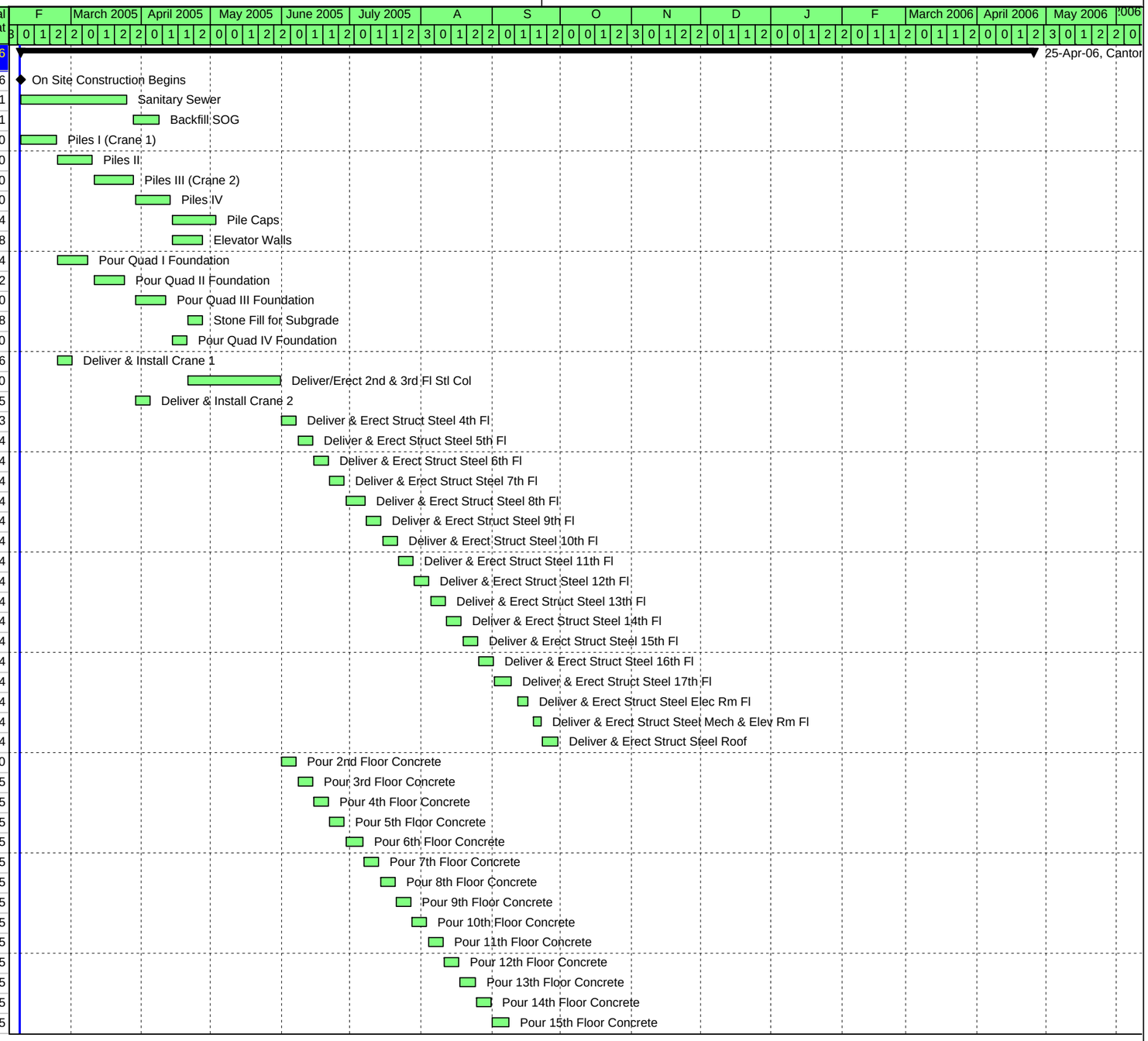
A detailed structural systems estimate was compiled using RS Means Cost Works 2005. A typical floor, typical machine room floor, foundation system, and roof system were all estimated. The typical floors were then multiplied out to compile a total building cost. The total building estimate value of $14,016,295 was 3% higher than the original budget of $13,580,765.

The general conditions estimate was completed using the 18-month duration and unit costs. It is important to note that home office overhead was not included in the estimate. The estimated value for general conditions was $2,877,534.

Detailed Project Schedule

The Canton Crossing Tower detailed schedule that is shown on the following pages consists of 200 items. The schedule is broken into categories by trade, making it easier to follow through chronological order. The tower had a demanding schedule of 18-months, with on-site construction beginning on February 7th, 2005 and project completion on July 27th, 2006. The schedule is currently showing exactly one day of total float for the project. The steel and concrete contractors each had one week to complete a typical floor. Each trade was followed closely by the next trade in line, leaving no room for delays. All trades had input and agreed upon this schedule at an initial project schedule meeting. The superintendent's two-week look-ahead meetings, held weekly, were important to the success of the on time completion.

Activity ID	Activity Name	Original Duration	Remaining Duration	Schedule % Complete	Start	Finish	Total Float
Canton Crossing Tower 2		310	310	0%	07-Feb-05	25-Apr-06	66
A1001	On Site Construction Be...	0	0	0%	07-Feb-05		376
A1010	Sanitary Sewer	35	35	0%	07-Feb-05	25-Mar-05	311
A1020	Backfill SOG	10	10	0%	28-Mar-05	08-Apr-05	311
A1030	Piles I (Crane 1)	12	12	0%	07-Feb-05	22-Feb-05	80
A1040	Piles II	12	12	0%	23-Feb-05	10-Mar-05	80
A1050	Piles III (Crane 2)	12	12	0%	11-Mar-05	28-Mar-05	80
A1060	Piles IV	12	12	0%	29-Mar-05	13-Apr-05	80
A1070	Pile Caps	14	14	0%	14-Apr-05	03-May-05	314
A1080	Elevator Walls	10	10	0%	14-Apr-05	27-Apr-05	318
A1090	Pour Quad I Foundation	10	10	0%	23-Feb-05	08-Mar-05	354
A1100	Pour Quad II Foundation	10	10	0%	11-Mar-05	24-Mar-05	342
A1110	Pour Quad III Foundation	10	10	0%	29-Mar-05	11-Apr-05	330
A1120	Stone Fill for Subgrade	5	5	0%	21-Apr-05	27-Apr-05	318
A1130	Pour Quad IV Foundation	5	5	0%	14-Apr-05	20-Apr-05	80
A1132	Deliver & Install Crane 1	5	5	0%	23-Feb-05	01-Mar-05	116
A1133	Deliver/Erect 2nd & 3rd ...	28	28	0%	21-Apr-05	31-May-05	80
A1134	Deliver & Install Crane 2	5	5	0%	29-Mar-05	04-Apr-05	335
A1135	Deliver & Erect Struct St...	5	5	0%	01-Jun-05	07-Jun-05	193
A1136	Deliver & Erect Struct St...	5	5	0%	08-Jun-05	14-Jun-05	194
A1137	Deliver & Erect Struct St...	5	5	0%	15-Jun-05	21-Jun-05	194
A1138	Deliver & Erect Struct St...	5	5	0%	22-Jun-05	28-Jun-05	194
A1139	Deliver & Erect Struct St...	6	6	0%	29-Jun-05	07-Jul-05	194
A1140	Deliver & Erect Struct St...	5	5	0%	08-Jul-05	14-Jul-05	194
A1141	Deliver & Erect Struct St...	5	5	0%	15-Jul-05	21-Jul-05	194
A1142	Deliver & Erect Struct St...	5	5	0%	22-Jul-05	28-Jul-05	194
A1143	Deliver & Erect Struct St...	5	5	0%	29-Jul-05	04-Aug-05	194
A1144	Deliver & Erect Struct St...	5	5	0%	05-Aug-05	11-Aug-05	194
A1145	Deliver & Erect Struct St...	5	5	0%	12-Aug-05	18-Aug-05	194
A1146	Deliver & Erect Struct St...	5	5	0%	19-Aug-05	25-Aug-05	194
A1147	Deliver & Erect Struct St...	5	5	0%	26-Aug-05	01-Sep-05	194
A1148	Deliver & Erect Struct St...	5	5	0%	02-Sep-05	09-Sep-05	194
A1149	Deliver & Erect Struct St...	5	5	0%	12-Sep-05	16-Sep-05	194
A1150	Deliver & Erect Struct St...	4	4	0%	19-Sep-05	22-Sep-05	194
A1151	Deliver & Erect Struct St...	5	5	0%	23-Sep-05	29-Sep-05	194
A1158	Pour 2nd Floor Concrete	5	5	0%	01-Jun-05	07-Jun-05	80
A1159	Pour 3rd Floor Concrete	5	5	0%	08-Jun-05	14-Jun-05	205
A1160	Pour 4th Floor Concrete	5	5	0%	15-Jun-05	21-Jun-05	205
A1170	Pour 5th Floor Concrete	5	5	0%	22-Jun-05	28-Jun-05	205
A1180	Pour 6th Floor Concrete	5	5	0%	29-Jun-05	06-Jul-05	205
A1190	Pour 7th Floor Concrete	5	5	0%	07-Jul-05	13-Jul-05	205
A1200	Pour 8th Floor Concrete	5	5	0%	14-Jul-05	20-Jul-05	205
A1210	Pour 9th Floor Concrete	5	5	0%	21-Jul-05	27-Jul-05	205
A1220	Pour 10th Floor Concrete	5	5	0%	28-Jul-05	03-Aug-05	205
A1230	Pour 11th Floor Concrete	5	5	0%	04-Aug-05	10-Aug-05	205
A1240	Pour 12th Floor Concrete	5	5	0%	11-Aug-05	17-Aug-05	205
A1250	Pour 13th Floor Concrete	5	5	0%	18-Aug-05	24-Aug-05	205
A1260	Pour 14th Floor Concrete	5	5	0%	25-Aug-05	31-Aug-05	205
A1270	Pour 15th Floor Concrete	5	5	0%	01-Sep-05	08-Sep-05	205



Actual Work | Critical Remaining Work | Summary
Remaining Work | Milestone

TASK filter: All Activities

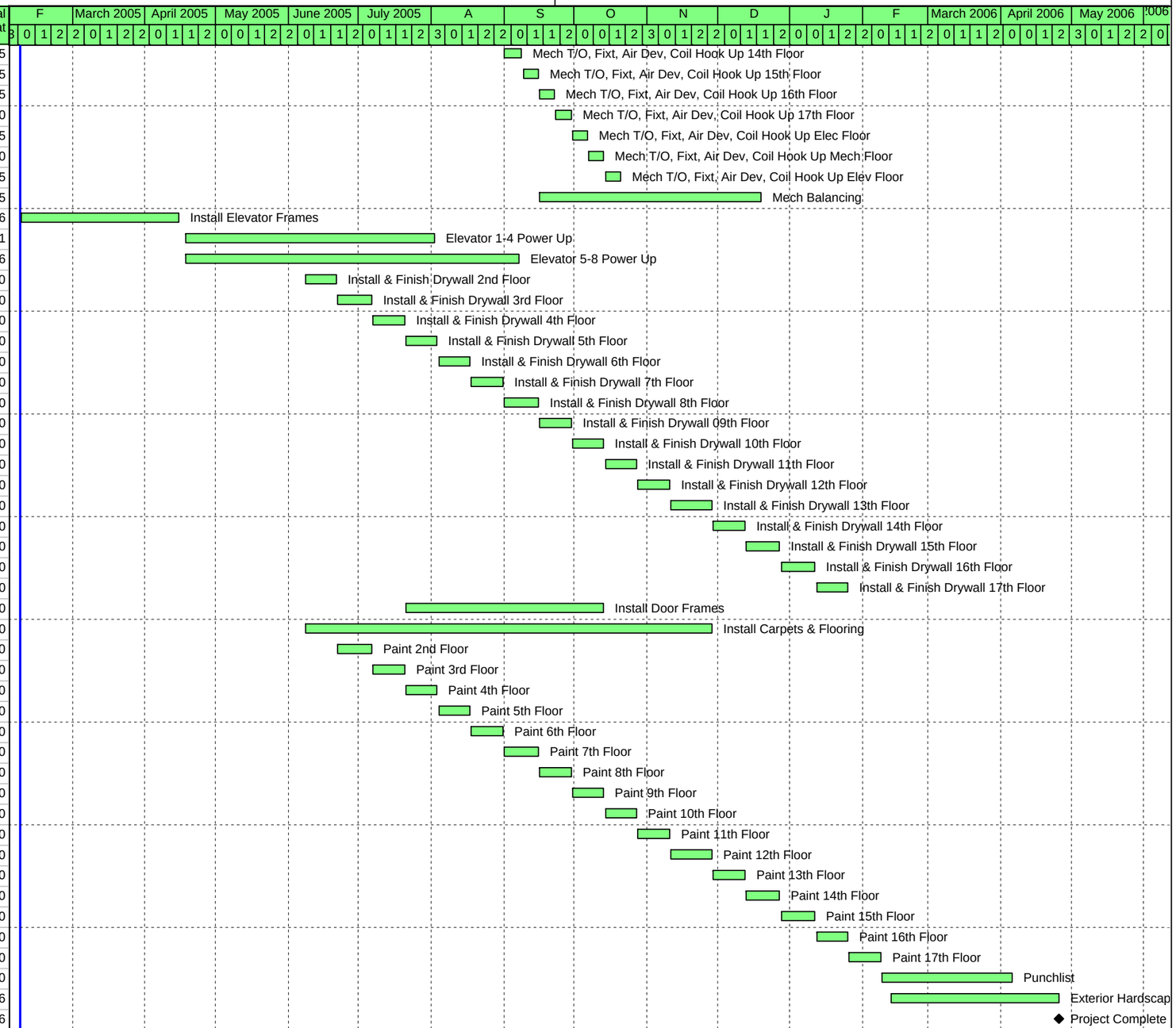
Activity ID	Activity Name	Original Duration	Remaining Duration	Schedule % Complete	Start	Finish	Total Float
A1280	Pour 16th Floor Concrete	5	5	0%	09-Sep-05	15-Sep-05	205
A1290	Pour 17th Floor Concrete	5	5	0%	16-Sep-05	22-Sep-05	205
A1300	Pour Elec Rm Floor Con...	5	5	0%	23-Sep-05	29-Sep-05	205
A1310	Pour Mech Rm Floor Co...	5	5	0%	30-Sep-05	06-Oct-05	205
A1320	Place SOG	7	7	0%	25-Apr-05	03-May-05	314
A1530	Precast 2nd Floor (2nd ...	7	7	0%	08-Jun-05	16-Jun-05	179
A1540	Precast 3rd Floor (2nd S...	7	7	0%	17-Jun-05	27-Jun-05	179
A1545	Precast 4th Floor (2nd S...	7	7	0%	28-Jun-05	07-Jul-05	179
A1550	Precast 5th Floor (2nd S...	4	4	0%	08-Jul-05	13-Jul-05	180
A1560	Precast 6th Floor (2nd S...	4	4	0%	14-Jul-05	19-Jul-05	181
A1570	Precast 7th Floor (2nd S...	4	4	0%	20-Jul-05	25-Jul-05	182
A1580	Precast 8th Floor (2nd S...	4	4	0%	26-Jul-05	29-Jul-05	183
A1590	Precast 9th Floor (2nd S...	4	4	0%	01-Aug-05	04-Aug-05	184
A1600	Precast 10th Floor (2nd ...	4	4	0%	05-Aug-05	10-Aug-05	185
A1610	Precast 11th Floor (1st ...	2	2	0%	11-Aug-05	12-Aug-05	188
A1620	Precast 12th Floor (1st ...	2	2	0%	15-Aug-05	16-Aug-05	191
A1630	Precast 13th Floor (1st ...	2	2	0%	17-Aug-05	18-Aug-05	194
A1640	Precast 14th Floor (1st ...	2	2	0%	19-Aug-05	22-Aug-05	197
A1650	Precast 15th Floor (1st ...	2	2	0%	26-Aug-05	29-Aug-05	197
A1660	Precast 16th Floor (1st ...	2	2	0%	02-Sep-05	06-Sep-05	209
A1670	Precast 17th Floor (1st ...	2	2	0%	12-Sep-05	13-Sep-05	206
A1680	Precast Gables (1st & 2...	16	16	0%	30-Sep-05	21-Oct-05	194
A1700	Install Windows 2nd Floor	5	5	0%	17-Jun-05	23-Jun-05	183
A1710	Install Windows 3rd Floor	5	5	0%	28-Jun-05	05-Jul-05	181
A1720	Install Windows 4th Floor	5	5	0%	08-Jul-05	14-Jul-05	179
A1730	Install Windows 5th Floor	5	5	0%	15-Jul-05	21-Jul-05	179
A1740	Install Windows 6th Floor	5	5	0%	22-Jul-05	28-Jul-05	179
A1750	Install Windows 7th Floor	5	5	0%	29-Jul-05	04-Aug-05	179
A1760	Install Windows 8th Floor	5	5	0%	05-Aug-05	11-Aug-05	179
A1770	Install Windows 9th Floor	5	5	0%	12-Aug-05	18-Aug-05	179
A1780	Install Windows 10th Floor	5	5	0%	19-Aug-05	25-Aug-05	179
A1790	Install Windows 11th Floor	5	5	0%	26-Aug-05	01-Sep-05	179
A1800	Install Windows 12th Floor	5	5	0%	02-Sep-05	09-Sep-05	179
A1810	Install Windows 13th Floor	5	5	0%	12-Sep-05	16-Sep-05	179
A1820	Install Windows 14th Floor	5	5	0%	19-Sep-05	23-Sep-05	179
A1830	Install Windows 15th Floor	5	5	0%	26-Sep-05	30-Sep-05	179
A1840	Install Windows 16th Floor	5	5	0%	03-Oct-05	07-Oct-05	199
A1850	Install Windows 17th Floor	5	5	0%	10-Oct-05	14-Oct-05	199
A1860	Install Storefront Windows	30	30	0%	03-Oct-05	11-Nov-05	179
A1870	Install Curtain Wall	30	30	0%	03-Oct-05	11-Nov-05	179
A1871	Building Enclosure	0	0	0%	14-Nov-05		179
A1880	Deliver & Install Fireproo...	5	5	0%	24-Jun-05	30-Jun-05	273
A1890	Deliver & Install Fireproo...	5	5	0%	01-Jun-05	07-Jun-05	290
A1900	Deliver & Install Fireproo...	5	5	0%	01-Jun-05	07-Jun-05	290
A1910	Deliver & Install Fireproo...	5	5	0%	08-Jun-05	14-Jun-05	285
A1920	Deliver & Install Fireproo...	5	5	0%	15-Jun-05	21-Jun-05	280
A1930	Deliver & Install Fireproo...	5	5	0%	22-Jun-05	28-Jun-05	275
A1940	Deliver & Install Fireproo...	5	5	0%	29-Jun-05	06-Jul-05	270
A1950	Deliver & Install Fireproo...	6	6	0%	08-Jul-05	15-Jul-05	263

Actual Work | Critical Remaining Work | Summary
Remaining Work | Milestone

TASK filter: All Activities

Activity ID	Activity Name	Original Duration	Remaining Duration	Schedule % Complete	Start	Finish	Total Float
A1960	Deliver & Install Fireproo...	6	6	0%	15-Jul-05	22-Jul-05	258
A1970	Deliver & Install Fireproo...	5	5	0%	22-Jul-05	28-Jul-05	254
A1980	Deliver & Install Fireproo...	5	5	0%	29-Jul-05	04-Aug-05	249
A1990	Deliver & Install Fireproo...	5	5	0%	05-Aug-05	11-Aug-05	244
A2000	Deliver & Install Fireproo...	5	5	0%	12-Aug-05	18-Aug-05	239
A2010	Deliver & Install Fireproo...	5	5	0%	19-Aug-05	25-Aug-05	234
A2020	Deliver & Install Fireproo...	5	5	0%	26-Aug-05	01-Sep-05	229
A2030	Deliver & Install Fireproo...	5	5	0%	02-Sep-05	09-Sep-05	224
A2040	Deliver & Install Fireproo...	5	5	0%	12-Sep-05	16-Sep-05	219
A2050	Deliver & Install Fireproo...	5	5	0%	19-Sep-05	23-Sep-05	214
A2060	Deliver & Install Fireproo...	5	5	0%	23-Sep-05	29-Sep-05	210
A2070	Deliver & Install Fireproo...	5	5	0%	30-Sep-05	06-Oct-05	205
A2080	SOG Underground Electric	20	20	0%	11-Apr-05	06-May-05	311
A2090	Underground Sanitary Pl...	10	10	0%	11-Apr-05	22-Apr-05	314
A2100	Underground Storm Plu...	10	10	0%	11-Apr-05	22-Apr-05	314
A2110	Underground Domestic ...	2	2	0%	11-Apr-05	12-Apr-05	322
A2120	Underground Gas Vent (...	8	8	0%	11-Apr-05	20-Apr-05	316
A2130	MEP Rough In 2nd Floor	5	5	0%	01-Jun-05	07-Jun-05	155
A2140	MEP Rough In 1st Floor	15	15	0%	01-Jun-05	21-Jun-05	280
A2150	MEP Rough In 3rd Floor	5	5	0%	08-Jun-05	14-Jun-05	155
A2160	MEP Rough In 4th Floor	5	5	0%	15-Jun-05	21-Jun-05	155
A2170	MEP Rough In 5th Floor	5	5	0%	22-Jun-05	28-Jun-05	155
A2180	MEP Rough In 6th Floor	5	5	0%	29-Jun-05	06-Jul-05	155
A2190	MEP Rough In 7th Floor	5	5	0%	07-Jul-05	13-Jul-05	155
A2200	MEP Rough In 8th Floor	5	5	0%	14-Jul-05	20-Jul-05	155
A2210	MEP Rough In 9th Floor	5	5	0%	21-Jul-05	27-Jul-05	155
A2220	MEP Rough In 10th Floor	5	5	0%	28-Jul-05	03-Aug-05	155
A2230	MEP Rough In 11th Floor	5	5	0%	04-Aug-05	10-Aug-05	155
A2240	MEP Rough In 12th Floor	5	5	0%	11-Aug-05	17-Aug-05	155
A2250	MEP Rough In 13th Floor	5	5	0%	18-Aug-05	24-Aug-05	155
A2260	MEP Rough In 14th Floor	5	5	0%	25-Aug-05	31-Aug-05	155
A2270	MEP Rough In 15th Floor	5	5	0%	01-Sep-05	08-Sep-05	155
A2280	MEP Rough In 16th Floor	5	5	0%	09-Sep-05	15-Sep-05	195
A2290	MEP Rough In 17th Floor	5	5	0%	16-Sep-05	22-Sep-05	195
A2300	MEP Rough In Elect Rm...	5	5	0%	23-Sep-05	29-Sep-05	195
A2310	MEP Rough In Mech R...	5	5	0%	30-Sep-05	06-Oct-05	195
A2320	MEP Rough In Elev Floor	5	5	0%	07-Oct-05	13-Oct-05	195
A2340	Mech T/O, Fixt, Air Dev, ...	5	5	0%	08-Jun-05	14-Jun-05	285
A2350	Mech T/O, Fixt, Air Dev, ...	5	5	0%	15-Jun-05	21-Jun-05	280
A2360	Mech T/O, Fixt, Air Dev, ...	5	5	0%	22-Jun-05	28-Jun-05	275
A2370	Mech T/O, Fixt, Air Dev, ...	5	5	0%	29-Jun-05	06-Jul-05	270
A2380	Mech T/O, Fixt, Air Dev, ...	5	5	0%	07-Jul-05	13-Jul-05	265
A2390	Mech T/O, Fixt, Air Dev, ...	5	5	0%	14-Jul-05	20-Jul-05	260
A2400	Mech T/O, Fixt, Air Dev, ...	5	5	0%	21-Jul-05	27-Jul-05	255
A2410	Mech T/O, Fixt, Air Dev, ...	5	5	0%	28-Jul-05	03-Aug-05	250
A2420	Mech T/O, Fixt, Air Dev, ...	5	5	0%	04-Aug-05	10-Aug-05	245
A2430	Mech T/O, Fixt, Air Dev, ...	5	5	0%	11-Aug-05	17-Aug-05	240
A2440	Mech T/O, Fixt, Air Dev, ...	5	5	0%	18-Aug-05	24-Aug-05	235
A2450	Mech T/O, Fixt, Air Dev, ...	5	5	0%	25-Aug-05	31-Aug-05	230

Activity ID	Activity Name	Original Duration	Remaining Duration	Schedule % Complete	Start	Finish	Total Float
A2460	Mech T/O, Fixt, Air Dev, ...	5	5	0%	01-Sep-05	08-Sep-05	225
A2470	Mech T/O, Fixt, Air Dev, ...	5	5	0%	09-Sep-05	15-Sep-05	155
A2480	Mech T/O, Fixt, Air Dev, ...	5	5	0%	16-Sep-05	22-Sep-05	215
A2490	Mech T/O, Fixt, Air Dev, ...	5	5	0%	23-Sep-05	29-Sep-05	210
A2500	Mech T/O, Fixt, Air Dev, ...	5	5	0%	30-Sep-05	06-Oct-05	205
A2510	Mech T/O, Fixt, Air Dev, ...	5	5	0%	07-Oct-05	13-Oct-05	200
A2520	Mech T/O, Fixt, Air Dev, ...	5	5	0%	14-Oct-05	20-Oct-05	195
A2530	Mech Balancing	65	65	0%	16-Sep-05	19-Dec-05	155
A2540	Install Elevator Frames	50	50	0%	07-Feb-05	15-Apr-05	226
A2550	Elevator 1-4 Power Up	75	75	0%	18-Apr-05	02-Aug-05	251
A2560	Elevator 5-8 Power Up	100	100	0%	18-Apr-05	07-Sep-05	226
A2570	Install & Finish Drywall 2...	10	10	0%	08-Jun-05	21-Jun-05	80
A2580	Install & Finish Drywall 3...	10	10	0%	22-Jun-05	06-Jul-05	130
A2590	Install & Finish Drywall 4...	10	10	0%	07-Jul-05	20-Jul-05	130
A2600	Install & Finish Drywall 5...	10	10	0%	21-Jul-05	03-Aug-05	130
A2610	Install & Finish Drywall 6...	10	10	0%	04-Aug-05	17-Aug-05	130
A2620	Install & Finish Drywall 7...	10	10	0%	18-Aug-05	31-Aug-05	130
A2630	Install & Finish Drywall 8...	10	10	0%	01-Sep-05	15-Sep-05	130
A2640	Install & Finish Drywall 0...	10	10	0%	16-Sep-05	29-Sep-05	130
A2650	Install & Finish Drywall 1...	10	10	0%	30-Sep-05	13-Oct-05	130
A2660	Install & Finish Drywall 1...	10	10	0%	14-Oct-05	27-Oct-05	130
A2670	Install & Finish Drywall 1...	10	10	0%	28-Oct-05	10-Nov-05	130
A2680	Install & Finish Drywall 1...	10	10	0%	11-Nov-05	28-Nov-05	130
A2690	Install & Finish Drywall 1...	10	10	0%	29-Nov-05	12-Dec-05	130
A2700	Install & Finish Drywall 1...	10	10	0%	13-Dec-05	27-Dec-05	130
A2710	Install & Finish Drywall 1...	10	10	0%	28-Dec-05	11-Jan-06	130
A2720	Install & Finish Drywall 1...	10	10	0%	12-Jan-06	25-Jan-06	130
A2730	Install Door Frames	60	60	0%	21-Jul-05	13-Oct-05	200
A2740	Install Carpets & Flooring	120	120	0%	08-Jun-05	28-Nov-05	170
A2750	Paint 2nd Floor	10	10	0%	22-Jun-05	06-Jul-05	80
A2760	Paint 3rd Floor	10	10	0%	07-Jul-05	20-Jul-05	80
A2770	Paint 4th Floor	10	10	0%	21-Jul-05	03-Aug-05	80
A2780	Paint 5th Floor	10	10	0%	04-Aug-05	17-Aug-05	80
A2790	Paint 6th Floor	10	10	0%	18-Aug-05	31-Aug-05	80
A2800	Paint 7th Floor	10	10	0%	01-Sep-05	15-Sep-05	80
A2810	Paint 8th Floor	10	10	0%	16-Sep-05	29-Sep-05	80
A2820	Paint 9th Floor	10	10	0%	30-Sep-05	13-Oct-05	80
A2830	Paint 10th Floor	10	10	0%	14-Oct-05	27-Oct-05	80
A2840	Paint 11th Floor	10	10	0%	28-Oct-05	10-Nov-05	80
A2850	Paint 12th Floor	10	10	0%	11-Nov-05	28-Nov-05	80
A2860	Paint 13th Floor	10	10	0%	29-Nov-05	12-Dec-05	80
A2870	Paint 14th Floor	10	10	0%	13-Dec-05	27-Dec-05	80
A2880	Paint 15th Floor	10	10	0%	28-Dec-05	11-Jan-06	80
A2890	Paint 16th Floor	10	10	0%	12-Jan-06	25-Jan-06	80
A2900	Paint 17th Floor	10	10	0%	26-Jan-06	08-Feb-06	80
A2910	Punchlist	40	40	0%	09-Feb-06	05-Apr-06	80
A2920	Exterior Hardscape	52	52	0%	13-Feb-06*	25-Apr-06	66
A2930	Project Complete	0	0	0%		25-Apr-06	66



Actual Work | Remaining Work | Critical Remaining Work | Milestone | Summary

TASK filter: All Activities

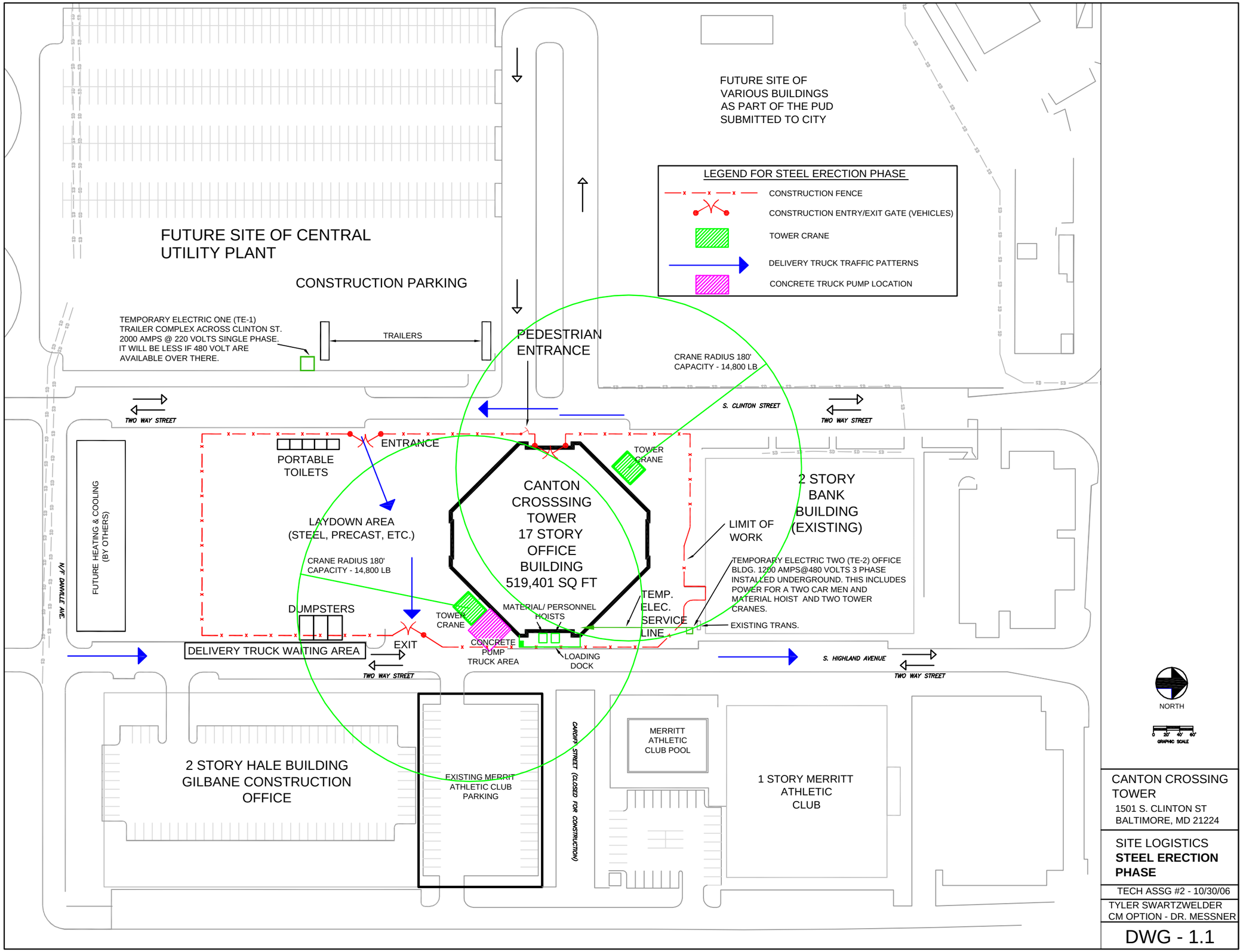
Site Layout Planning

Steel Erection Phase

The following site logistics plan is shown for the steel erection phase of the Canton Crossing Tower. Throughout construction the site logistics were in favor of the construction manager and the rest of the construction team. As you can see on the plan, there is plenty of space for steel lay down and staging. The steel delivery trucks have a simple path from Interstate 95 and are able to be parked right along South Highland Avenue while waiting to be unloaded.

The steel was erected using two tower cranes. The cranes were located on each side of the building. Each of them had a working radius of 180' and a capacity of 14,800 lb. There were also two material hoists used later in construction.

Also shown on this site layout is the concrete pump location because the concrete work followed the steel erection closely. The concrete floor slabs were all placed using the pump method. The concrete trucks also had an easy path from Interstate 95. Once on-site they had an unloading area that was located right on South Highland Avenue, making the traffic patterns uncomplicated.



CANTON CROSSING TOWER
1501 S. CLINTON ST
BALTIMORE, MD 21224

SITE LOGISTICS
STEEL ERECTION PHASE

TECH ASSG #2 - 10/30/06

TYLER SWARTZWELDER
CM OPTION - DR. MESSNER

DWG - 1.1

Assemblies Estimate

Plumbing Fixtures

The costs of the plumbing fixtures in the Canton Crossing Tower were estimated using RS Means Assemblies Cost Data. The calculated values can be found on the table shown on the next page. It is important to note that these fixtures only cover the core of the tower. The tenant fit-out areas are not included in this estimate. The design team used the 2001 National Standard Plumbing Code (NSPC) for their design. All of the requirements for this code were met by the design team for the tower.

Fire Protection System

The fire protection system was also estimate using RS Means Assemblies Cost Data. The tower was designed with a wet sprinkler system and a two standpipes going up through the building. The estimate from RS Means is done using the square footage of each floor. The value had to be interpolated from the given square footage values to get the tower's square footage. The wet sprinkler system was used as a light hazard area. The standpipes were classified as Class I.

Plumbing Fixtures Assemblies Estimate for Canton Crossing Tower from RS Means 2006						
Category	**RS Means Item #**	**Description**	**Qty**	**Mat $**	**Inst $**	**Total Cost**
Water Closets - D2010-120	1760	First Closet Installed (2 on each floor)	34	960	640	54,400
	1800	Each Additional Closet	102	910	605	154,530
			Total Cost of Water Closets			**$208,930.00**
Urinals - D2010-210	1620	Wall hung urinal (2 per floor)	34	485	615	37,400
			Total Cost of Urinals			**$37,400.00**
Lavatories - D2010-310	1560	Vanity mounted lavatories (10 per floor)	170	360	545	153,850
			Total Cost of Lavatories			**$153,850.00**
Mop Sinks - D2010-420	2080	24"x20" Plastic sinks (1 per floor)	17	282	575	14,569
			Total Cost of Mop Sinks			**$14,569.00**
Water Fountains - D2010-820	1880	Wall mounted fountains (2 per floor)	34	1025	475	51,000
			Total Cost of Water Fountains			**$51,000.00**
Water Heaters - D2010-240	1820	Electric, 50 gal. (1 per floor)	17	3275	895	70,890
			Total Cost of Water Heaters			**$70,890.00**
			Subtotal of Plumbing Fixtures			**$536,639.00**
			Location Factor Adjustment (%)			92.9
			Time Factor Adjustment (%)			1.03
		Total Cost of Plumbing Fixtures				**$513,493.76**
**Note - All costs came from RS Means Assemblies Costs 2006 (Therefore a time factor had to be used to get 2005 values)*						

Fire Protection Assemblies Estimate for Canton Crossing Tower from RS Means 2006						
Category	**RS Means Item #**	**Description**	**Qty**	**Mat $**	**Inst $**	**Total Cost**
Wet Sprinkler System - D4010-410	0620/0640	Light hazard, first floor	28,262	0.78	1.39	61,329
	0740/0760	Light hazard, each additional floor	452,192	0.52	1.19	773,248
			Total Cost of Sprinklers			**$834,576.86**
Standpipe - D4020-310	0600	Class I Standpipe First Floor	1	4625	4,475	9,100
	0620	Each additional floor	16	1250	1,250	40,000
			Total Cost of Standpipes			**$49,100.00**
			Subtotal of Plumbing Fixtures			**$883,676.86**
			Location Factor Adjustment (%)			92.9
			Time Factor Adjustment (%)			1.03
		Total Cost of Fire Protection System				**$845,563.88**
**Note - All costs came from RS Means Assemblies Costs 2006 (Therefore a time factor had to be used to get 2005 values)*						

Detailed Structural Systems Estimate

A detailed structural systems estimate was done using RS Means Cost Works 2005. The structural steel was taken off by typical floors and the roof system. A 10% value was used for the steel connections. The concrete was taken off by the foundation and the typical floors. The typical floor values for each were added to the roof steel and the concrete foundation to get an estimate of the total structural system cost for the Canton Crossing Tower. The steel and concrete budget numbers from Gilbane's Original Budget (January 24th, 2005) are shown below compared to the calculated values.

Structural Steel

Budget Value - $10,184,745

Calculated Value - $11,185,855

Concrete

Budget Value - $3,396,020

Calculated Value - $2,830,440

Total Structural System

Budget Value - $13,580,765

Calculated Value - $14,016,295

The calculated values came in high by 9% for the structural steel and low by 17% for the concrete. The takeoffs were done assuming the typical floors were all designed exactly the same. This assumption and the fluctuating costs of construction materials are both factors that can affect the estimate differences. The total structural system estimate value of $14,016,295 was 3% higher than the original budget of $13,580,765.

Structural Steel Estimate for Canton Crossing Tower										
Item	Length (ft)	Qty	Tons	Material $/Unit	Total Material Cost ($)	Labor $/Unit	Total Labor Cost ($)	Equipment $/ Unit	Total Equipment Cost ($)	Total Cost ($)
Typical Floor Steel										
Beams										
W12 x 14	9	1	0.063	1,900	119.70	345	21.74	109	6.87	148.30
W12 x 14	7.5	6	0.315	1,900	598.50	345	108.68	109	34.34	741.51
W12 x 14	5.5	13	0.501	1,900	951.90	345	172.85	109	54.61	1,179.35
W12 x 22	8	6	0.528	1,900	1,003.20	345	182.16	109	57.55	1,242.91
W12 x 22	11	3	0.363	1,900	689.70	345	125.24	109	39.57	854.50
W14 x 22	31	2	0.682	1,900	1,295.80	345	235.29	109	74.34	1,605.43
W14 x 22	12.5	2	0.275	1,900	522.50	345	94.88	109	29.98	647.35
W16 x 26	31	2	0.806	1,900	1,531.40	345	278.07	109	87.85	1,897.32
W16 x 26	18.5	2	0.481	1,900	913.90	345	165.95	109	52.43	1,132.27
W16 x 26	18	3	0.702	1,900	1,333.80	345	242.19	109	76.52	1,652.51
W16 x 26	37	2	0.962	1,900	1,827.80	345	331.89	109	104.86	2,264.55
W16 x 26	41	2	1.066	1,900	2,025.40	345	367.77	109	116.19	2,509.36
W16 x 26	15	1	0.195	1,900	370.50	345	67.28	109	21.26	459.03
W16 x 26	32	1	0.416	1,900	790.40	345	143.52	109	45.34	979.26
W16 x 31	41	4	2.542	1,900	4,829.80	345	876.99	109	277.08	5,983.87
W16 x 31	31	4	1.922	1,900	3,651.80	345	663.09	109	209.50	4,524.39
W16 x 31	25.5	2	0.7905	1,900	1,501.95	345	272.72	109	86.16	1,860.84
W16 x 31	37	4	2.294	1,900	4,358.60	345	791.43	109	250.05	5,400.08
W18 x 35	41	6	4.305	1,900	8,179.50	345	1,485.23	109	469.25	10,133.97
W18 x 35	24	1	0.42	1,900	798.00	345	144.90	109	45.78	988.68
W18 x 35	25.5	2	0.8925	1,900	1,695.75	345	307.91	109	97.28	2,100.95
W18 x 35	17.5	2	0.6125	1,900	1,163.75	345	211.31	109	66.76	1,441.83
W18 x 40	41	16	13.12	1,900	24,928.00	345	4,526.40	109	1,430.08	30,884.48
W18 x 40	31	2	1.24	1,900	2,356.00	345	427.80	109	135.16	2,918.96
W18 x 40	35	2	1.4	1,900	2,660.00	345	483.00	109	152.60	3,295.60
W21 x 44	31	2	1.364	1,900	2,591.60	345	470.58	109	148.68	3,210.86
W21 x 44	12.5	8	2.2	1,900	4,180.00	345	759.00	109	239.80	5,178.80
W21 x 50	31	2	1.55	1,900	2,945.00	345	534.75	109	168.95	3,648.70
W21 x 50	33	4	3.3	1,900	6,270.00	345	1,138.50	109	359.70	7,768.20
W21 x 57	41	4	4.674	1,900	8,880.60	345	1,612.53	109	509.47	11,002.60
W24 x 62	31	2	1.922	1,900	3,651.80	345	663.09	109	209.50	4,524.39

W24 x 62	37	2	2.294	1,900	4,358.60	345	791.43	109	250.05	5,400.08
W27 x 194	37	2	7.178	1,900	13,638.20	345	2,476.41	109	782.40	16,897.01
W27 x 194	18.5	4	7.178	1,900	13,638.20	345	2,476.41	109	782.40	16,897.01
W27 x 194	24	4	9.312	1,900	17,692.80	345	3,212.64	109	1,015.01	21,920.45
W33 x 118	37	4	8.732	1,900	16,590.80	345	3,012.54	109	951.79	20,555.13
W33 x 118	31	8	14.632	1,900	27,800.80	345	5,048.04	109	1,594.89	34,443.73
W40 x 249	37	2	9.213	1,900	17,504.70	345	3,178.49	109	1,004.22	21,687.40
Columns										
W14 x 99	13.33	2	1.32	1,900	2,508.00	345	455.40	109	143.88	3,107.28
W14 x 257	13.33	16	27.41	1,900	52,079.00	345	9,456.45	109	2,987.69	64,523.14
W14 x 283	13.33	4	7.54	1,900	14,326.00	345	2,601.30	109	821.86	17,749.16
W14 x 370	13.33	20	49.32	1,900	93,708.00	345	17,015.40	109	5,375.88	116,099.28
Bracing										
HSS8 x 8 x 1/2	16	11	4.29	1,900	8,151.00	345	1,480.05	109	467.61	10,098.66
Decking										
3"x 20 gauge galvanized decking			28,262 sf	6.45	182,289.90	0.9	25,435.80	0.06	1,695.72	209,421.42
Totals for Typical Floor			**200.32**		**562,902.65**		**94,547.06**		**23,530.87**	**680,980.59**
Totals for 17 Typical Floors			**3,405.48**		**9,569,345.05**		**1,607,300.06**		**400,024.83**	**$11,576,669.95**

Typical Machine Rm Floor Steel										
W12x14	7.5	8	0.42	1,900	798.00	345	144.90	109	45.78	988.68
W12x22	8	10	0.88	1,900	1,672.00	345	303.60	109	95.92	2,071.52
W14x22	31	3	1.023	1,900	1,943.70	345	352.94	109	111.51	2,408.14
W16x26	18	6	1.404	1,900	2,667.60	345	484.38	109	153.04	3,305.02
W16x31	8	2	0.248	1,900	471.20	345	85.56	109	27.03	583.79
W18x35	31	3	1.6275	1,900	3,092.25	345	561.49	109	177.40	3,831.14
W18x40	31	5	3.1	1,900	5,890.00	345	1,069.50	109	337.90	7,297.40
W21x50	31	2	1.55	1,900	2,945.00	345	534.75	109	168.95	3,648.70
W24x55	37	2	2.035	1,900	3,866.50	345	702.08	109	221.82	4,790.39
W18x86	41	8	14.104	1,900	26,797.60	345	4,865.88	109	1,537.34	33,200.82
Totals for Machine Rm Floors			**3,804.93**		**50,143.85**		**9,105.07**		**2,876.67**	**62,125.59**
Totals for 3 Machine Rm Floors			**11,414.80**		**150,431.55**		**27,315.20**		**8,630.02**	**$186,376.77**
Roof Steel										
W12 x 14	6	8	0.336	1,900	638.40	345	115.92	109	36.62	790.94
W12 x 26	12	8	1.248	1,900	2,371.20	345	430.56	109	136.03	2,937.79
W12 x 26	18	8	1.872	1,900	3,556.80	345	645.84	109	204.05	4,406.69
W12 x 26	24	8	2.496	1,900	4,742.40	345	861.12	109	272.06	5,875.58
W12 x 26	30	8	3.12	1,900	5,928.00	345	1,076.40	109	340.08	7,344.48
W12 x 26	36	8	3.744	1,900	7,113.60	345	1,291.68	109	408.10	8,813.38
W12 x 26	44	12	6.864	1,900	13,041.60	345	2,368.08	109	748.18	16,157.86
W16 x 26	31	56	0.868	1,900	1,649.20	345	299.46	109	94.61	2,043.27
W16 x 26	18.5	72	17.32	1,900	32,908.00	345	5,975.40	109	1,887.88	40,771.28
W16 x 57	31	8	7.068	1,900	13,429.20	345	2,438.46	109	770.41	16,638.07
W21 x 111	18.5	16	16.428	1,900	31,213.20	345	5,667.66	109	1,790.65	38,671.51
W24 x 68	31	10	10.54	1,900	20,026.00	345	3,636.30	109	1,148.86	24,811.16
W24 x 76	31	8	9.424	1,900	17,905.60	345	3,251.28	109	1,027.22	22,184.10
W24 x 76	41	8	12.464	1,900	23,681.60	345	4,300.08	109	1,358.58	29,340.26
W27 x 129	18.5	8	9.546	1,900	18,137.40	345	3,293.37	109	1,040.51	22,471.28
W33 x 118	62	4	14.632	1,900	27,800.80	345	5,048.04	109	1,594.89	34,443.73
Totals for Roof Steel			**117.97**		**224,143.00**		**40,699.65**		**12,858.73**	**$277,701.38**
							Location Factor Adjustment (%)			92.9
Totals for Building Structural Steel			**14,938.25**		**9,943,919.60**		**1,675,314.92**		**421,513.58**	**$11,185,854.98**

**Note - All costs from RS Means Cost Works 2005*

Concrete Estimate for Canton Crossing Tower									
Item	**Units**	**Amt in Units**	**Material $/Unit**	**Total Material Cost ($)**	**Labor $/Unit**	**Total Labor Cost ($)**	**Equipment $/ Unit**	**Total Equipment Cost ($)**	**Total Cost ($)**
Typical Floor Concrete Slab									
10th Floor Slab - 5" thick lightweight	cy	436.14	82.00	35,763.48	13.10	5,713.43	5.35	2,333.35	43,810.26
6" x 6" - W2.9 x W2.9 WWF	csf	282.62	33.00	9,326.46	21.00	5,935.02			15,261.48
Totals for Typical Floor		**436.14**		**45,089.94**		**11,648.45**		**2,333.35**	**59,071.74**
Totals for 17 Typical Floors		**7,414.38**		**766,528.98**		**198,023.72**		**39,666.93**	**$1,004,219.63**
Foundation									
Precast Concrete Piles (20" x 20")	Piles	418.00	*4265**	1,782,723.00					1,782,723.00
**Note - Pricing for driven precast concrete piles is given as total cost per pile from the McLean Contracting Company's budget for the Canton Crossing Tower*									
Pile Caps - 5000 psi									
PC 3 (Qty - 4)	cy	12.41	99.5	1,234.80	69	856.29	0.44	5.46	2,096.55
PC 4 (Qty - 4)	cy	28.94	104	3,009.76	67.5	1,953.45	0.43	12.44	4,975.65
PC 5 (Qty - 4)	cy	14.81	104	1,540.24	67.5	999.68	0.43	6.37	2,546.28
PC 6 (Qty - 8)	cy	30.56	104	3,178.24	67.5	2,062.80	0.43	13.14	5,254.18
PC 7 (Qty - 14)	cy	44	104	4,576.00	67.5	2,970.00	0.43	18.92	7,564.92
PC 8 (Qty - 4)	cy	51.85	108	5,599.80	49	2,540.65	0.31	16.07	8,156.52
PC 15 (Qty - 2)	cy	83.33	108	8,999.64	49	4,083.17	0.31	25.83	13,108.64
PC 28 (Qty - 1)	cy	235.67	108	25,452.36	49	11,547.83	0.31	73.06	37,073.25
PC 30 (Qty - 1)	cy	266.53	108	28,785.24	49	13,059.97	0.31	82.62	41,927.83
Grade Beams (3' x 3') - 5000 psi	cy	86.67	90	7,800.30	9	780.03	0.32	27.73	8,608.06
Slab on Grade - 5" thick - 3500 psi	cy	436.14	1.56	680.38	0.67	292.21	0.01	4.36	976.95
6" x 6" - W2.9 x W2.9 WWF	csf	283	33	9,326.46	21	5,935.02			15,261.48

Rebar for Pile Caps & Grade Beams									
# 4 Stirrups	lb	2,084.16	0.42	875.35	0.29	604.41			1,479.75
# 5	lb	1,084.72	0.42	455.58	0.29	314.57			770.15
# 9	lb	14,552.00	0.42	6,111.84	0.17	2,473.84			8,585.68
#11	lb	171,918.00	0.42	72,205.56	0.17	29,226.06			101,431.62
Totals for Foundation System		**1290.91**		**1,962,554.54**		**79,699.97**		**286.02**	**$2,042,540.53**
						Location Factor Adjustment (%)			92.9
						Time Factor Adjustment (%)			1.00
Grand Totals for Building Concrete		**8,705.29**		**2,729,083.52**		**277,723.69**		**39,952.95**	**$2,830,440.19**
***Note - Unless otherwise noted, all costs from RS Means Cost Works 2005*									
Grand Total for Structural System of Building								**$14,016,295.00**	

General Conditions Estimate

An estimate of the general conditions was done for the Canton Crossing Tower and is shown on the following page. The durations are shown to reflect the impact schedule changes can have on the cost of the project. The project not being completed on time brings a lot of extra cost in the general conditions category. Many of the costs were a one time lump sum cost and are shown in unit cost form. The total calculated estimate of $2,877,534 is only 6% of the total budget for the project, which is lower than normal. A few factors that could affect this are Gilbane's fee only being 1.5%, their trailer was an existing building owned by Hale Properties which lowered the mobilization costs, as well as the home office overhead not being included.

General Conditions Estimate for Construction Phase of Canton Crossing Tower					
Category	**Description**	**Unit Cost**	**Duration**	**Monthly Cost**	**Total Cost**
Field Labor	Project Manager		18	11,500	207,000
	General Superintendent		18	10,700	192,600
	Area Superintendent		14	8,624	120,736
	MEP Superintendent		16	9,300	148,800
	Asst Project Manager		18	10,100	181,800
	Office Engineer		16	6,200	99,200
	Asst Project Engineer		18	5,500	99,000
		Total Field Labor Costs			**$1,049,136.00**
		***Note - Estimate values from RS Means Cost Works*			
Site Suppport	Trailer Complex		18	3,075	55,350
	Project Signs	2,200			5,000
	Stationery & Supplies		18	94	1,683
	Postage & Shipping		18	510	9,180
	Office Equipment		18	157	2,826
	CAD Equipment & Usage		18	84	1,512
	Telephone		18	225	4,050
	Computer Equipment	40,000			40,000
	Drinking Water		18	100	1,800
	First Aid Supplies		18	85	1,530
	Blueprinting		18	224	4,032
	Copier & Supplies		18	895	16,110
	Janitorial Services		18	266	4,788
	Progress Photos		18	256	4,608
	Small Tools	5,300			5,300
	Water & Sewage Charges		18	192	3,456
	Temporary Electric		18	1,365	24,570
	Security Systems	2,000			2,000
		Total Site Support Costs			**$187,795.00**
Site Services	Layout & Engineering	27,000			27,000
	Line & Grade Upgrades	50,000			50,000

	Fire Extinguishers	10,200			10,200
	Chemical Toilets		18	500	9,000
	Construction Fencing	28,500	16		28,500
	Temporary Electric		10	13,500	135,000
	Temporary Heat		5	18,425	92,125
	Material Hoist		9	16,667	150,003
	Temporary Roads/Parking Lots	40,000			40,000
	Temporary Walk-ways/Guard Rails	20,000			20,000
		Total Site Services Costs			**$561,828.00**
General & Excess Liability	Liability Insurance		18	15,888	**$285,984.00**
CM Fee	Fee (1.5%)	770,000			**$770,000.00**
		Total Project General Conditions			**$2,854,743.00**
**Note - Costs came from Cost Works (where applicable) and Gilbane's Original Budget Report (Dated: January 24, 2005)*					