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Construction Management Option



Murur Mixed Use Complex
Ajman, United Arab Emirates

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Project Team:

Owner: **Ajman Traffic Department**
A/E: **AJ Design**
G/C: **Ali Moosa & Sons Contracting**
HVAC: **AMS Contracting-MEP Division**
Super-Structure Designer: **Freysinnet**
Landscaping Works: **Lea**

The Buildings:

The project has a shopping mall and 2 towers
The residential tower is 20 floors + penthouse
The office tower is 26 floors
The shopping mall is 3 floors
Total parking spaces are 1,357 spaces
3 Basement Parking + 2 upper level parking

The Project:

History: The Site was previously occupied by Ajman Traffic Department, and this is where the name comes from, since Murur means Traffic.

Size: 2,300,000 Square Feet

Delivery: Design-Bid-Build

Cost: 600 million AED = 164.4 million USD

Structural and MEP Systems:

Structure: Reinforced Concrete Building, 280 mm slabs, columns range from 300 mm to 1600 mm

Foundation: 2000 mm thick R.C.C. raft on friction pile foundation

MEP Systems: Power delivered by FEWA at 240/415V, 3 phase, 4 wires, 50 Hz.

Chilled water HVAC system



A. Executive Summary:

Technical Report 2 addresses the Murur Mixed-use Complex in more details than Technical Report 1. This report includes a detailed schedule, a site layout plan, a detailed structural system estimate and a general conditions estimate, and a summary of the PACE Roundtable event.

The detailed schedule shows the activities of each of the 3 sections of the project in detail. There is also a detailed schedule of the first floor of the Office tower to clarify the work on each floor. The project has started on June 9, 2008 and will be completed on November 8, 2011.

The site layout planning section discusses the superstructure phase of the project. The site plan used in this section is developed from the site plan in Technical Report 1. The developed site plan clarifies how the site is planned during the superstructure phase, particularly the trucks access and the unloading operation.

The structural system estimate is calculated using the RS Means Cost Data. The \$42.5 million is not an accurate estimate for this particular project since the cost of concrete construction differs noticeably between the United Arab Emirates and the USA. The estimate is sectioned by the 3 sections of the building, the Office tower, the Residential tower, and the Mall area.

\$14 million was the estimated cost of the general conditions for the Murur Mixed-use Complex. This estimate was also determined by the RS Means Cost Data.

Finally, the critical industry issues section is mainly about the PACE Roundtable event which a number of the construction industry professionals attended to discuss the latest issues in the construction industry. The section summarizes the Business and Networking session which I attended.

B. Detailed Project Schedule:

The detailed project schedule attached in **Appendix A** is developed from the schedule summary created for Technical Report 1. The detailed schedule separates the work done in each of the 3 sections of the project, the Office Tower, the Residential Tower, and the Mall section. One particular part of the schedule shows the work and durations of each job done in the first floor of the Office tower, to provide an example of time needed to finish each floor and the sequence of the different jobs done on each of them.

The total project is 1,248 days, starting on June 9, 2008 and to be completed on November 8, 2011. In the United Arab Emirates the typical working schedule on construction sites is 6 days a week, with Fridays off, which makes the actual working day 1,070 days.

C. Site Layout Planning:

The Murur Mixed-use Complex site is a big site covering 1 whole block. There are 2 busy main roads on the East and the South sides of the site, and 2 less active streets on the North and West sides. With the building covering the whole construction site, there is no space for material storage or delivery truck at all. This makes planning the site a very complex job due to many factors like safety of the pedestrians and vehicles, finding a place for delivery trucks to unload, and having the crane ready to finish unloading as fast as it can.

The site plan in **Appendix B** is showing the superstructure phase. In this phase of the project, the site will experience an extensive number of unloading due to the huge quantities of material needed to complete the job. Ali Moosa and Sons requested permits to close the streets on both the West and the North sides of the site to be able to get a private access for delivery trucks. The street in the West side is completely closed to public and is a perfect place for unloading material. The street on the North side is a two way two lanes' street, with an island in the middle, only the two lanes closer to the site are closed to public, while the other two lanes are used one lane each way by the public vehicles.

D. Detailed Structural Systems Estimate:

Table 1 shows a detailed structural system estimate for the Murur Mixed-use Complex project. The table shows the cost of the structural system of each of the project sections separately.

Here are a couple of notes about the items in the table:

- The columns' cost includes average reinforcing, placement and finishing of the columns
- The elevated slabs' formwork is a 4-use formwork

The total cost of the structural system is \$42,477,792. The estimate was calculated using 2010 RS Means Building Construction Cost Data. This estimate makes the structural system about 26% of the total estimated project cost. But since the project is being built in the United Arab Emirates, the cost of constructing concrete buildings over there will be less than the predicted cost in the USA, with labor playing the biggest role in changing the cost.

The office tower's typical slab depth is 250 mm. The residential tower's slab is 280 mm. And the mall building's slab depth is either between 260 mm and 350 mm. **Appendix C** has the main structural elements of the Murur Mixed-use Complex.

Table 1. Structural System Estimate

Description	Quantity	Cost	Total
Foundation			
2000mm Foundation raft Material	35,217 CY	\$130/CY	\$4,578,303
2000mm Foundation raft Labor	35,217 CY	\$76/CY	\$2,465,240
2000mm Foundation raft Equipment	35,217 CY	\$0.45/CY	\$15,847
SOG Over foundation Material	146,389 SF	\$8.15/SF	\$1,193,070
SOG Over foundation Labor	146,389 SF	\$5.05/SF	\$739,264
SOG Over foundation Equipment	146,389 SF	\$0.46/SF	\$67,338
Mall and Parking floors			

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Columns Material	2,727 CY	\$505	\$1,377,135
Columns Labor	2,727 CY	\$345	\$940,815
Columns Equipment	2,727 CY	\$33	\$89,991
Elevated Slabs Material	39,666 CY	\$130	\$5,156,580
Elevated Slabs Labor	39,666 CY	\$70	\$2,776,620
Elevated Slabs Equipment	39,666 CY	\$21.5	\$852,819
Elevated Slabs Formwork Material	1,187,033 SF	\$1.47	\$1,744,938
Elevated Slabs Formwork Labor	1,187,033 SF	\$3.33	\$3,952,819
Elevated Slabs Reinforcing Material	233 Tons	\$1,650	\$384,730
Elevated Slabs Reinforcing Labor	233 Tons	\$490	\$114,253
Residential Tower			
Columns Material	637 CY	\$505	\$321,685
Columns Labor	637 CY	\$345	\$219,765
Columns Equipment	637 CY	\$33	\$21,021
Elevated Slabs Material	29,668 CY	\$130	\$3,856,840
Elevated Slabs Labor	29,668 CY	\$70	\$2,076,760
Elevated Slabs Equipment	29,668 CY	\$21.5	\$637,862
Elevated Slabs Formwork Material	736,703 SF	\$1.47	\$1,082,953
Elevated Slabs Formwork Labor	736,703 SF	\$3.33	\$2,453,220
Elevated Slabs Reinforcing Material	144.7 Tons	\$1,650	\$238,755
Elevated Slabs Reinforcing Labor	144.7 Tons	\$490	\$70,903
Office Tower			
Columns Material	382 CY	\$570	\$217,740
Columns Labor	382 CY	\$455	\$173,810
Columns Equipment	382 CY	\$43	\$16,426
Elevated Slabs Material	12,052 CY	\$130	\$1,566,740
Elevated Slabs Labor	12,052 CY	\$70	\$843,640
Elevated Slabs Equipment	12,052 CY	\$21.5	\$259,118
Elevated Slabs Formwork Material	377,501 SF	\$1.47	\$554,926
Elevated Slabs Formwork Labor	377,501 SF	\$3.33	\$1,257,078
Elevated Slabs Reinforcing Material	74.2 Tons	\$1,650	\$122,430
Elevated Slabs Reinforcing Labor	74.2 Tons	\$490	\$36,358
Total Cost			\$42,477,792

E. General Conditions Estimate:

The general conditions estimate was broken up into different categories as shown in **Table 2**. The estimate was determined by using 2010 RS Means Building Construction Cost Data. The total cost estimate of the general conditions was \$14,029,582 which is about 8.5% of the total project cost.



Table 2. General Conditions Estimate

Description	Cost	Total
Temporary Utilities		
Lighting, Wiring and Outlets	\$40/CSF-floor	\$58556
Power for temp. Light	\$3.14/CSF-floor/Month	\$188475
Power for job Duration	\$100/CSF-floor	\$146390
Field Office Expenses		
Equipment rental	\$171/Month	\$7,011
Office supplies	\$93/Month	\$3813
Telephone bill	\$88/Month	\$3608
Lights and HVAC	\$165/Month	\$6765
Cleaning and Waste Management		
Clean up floor area per day during construction	\$40.50/1,000SF	\$93,150
Clean up after job completion	\$84/1,000SF	\$193,200
Final cleaning by GC at end of job	1%	\$23,012
Field Personnel		
Clerk	\$380/Week	\$67,640
Project manager	\$1,925/Week	\$342,650
2 x Superintendent	\$1,775/Week	\$631,900
2 x Site Supervisor	\$1,450/Week	\$516,200
2 x Safety Inspector	\$1,200/Week	\$427,200
Other Fees		
Main Office Expenses	4%	\$6,560,000
Protection and Safety	\$3,000/Month	\$123,000
Temporary Hoists and Cranes	\$2,000/Day/each	\$2,140,000
Temporary Fencing	\$23.5/LF	\$37,012
Permits	0.5%	\$820,000
Insurance	0.5%	\$820,000
Commissioning	0.5%	\$820,000
Total		\$14,029,582

F. Critical Industry Issues:

The Partnership for Achieving Construction Excellence, better known as PACE, roundtable took place in the Penn Stater Hotel Conference Center on October 15, 2009. A number of the construction industry professionals were invited to the event to share their experiences about the major issues in the construction industry. In the first session, the discussion was about how construction companies can handle the economic downfall; two particular markets were mentioned in the discussion, the energy market and the healthcare industry market. Construction in those two markets will always continue even if there was an economic crisis occurring.

Later in the day, 3 different topics were being discussed in 3 separate rooms. The topics were:

- BIM Executive Planning
- Energy and the Construction Industry
- Business and Networking

Due to my lack of networking skills, and knowing how critical networking is in any business, I decided to attend the Business and Networking sessions.

Here are some of the ideas that were discussed in the two sessions:

1) **Shifts in delivery methods:**

*Negotiated (GMP) projects are usually design-bid-build

*Federal projects are usually design -build

*Combination of owners switching methods and/or stopping work

2) **How do relationships change with the market?**

- *Take risk away from owner > joint ventures split risk and pool bonding capacity.
- *Joint ventures are great for companies since it strengthens their resumes, help them expand geographically, and will make a team with competition for a better project.
- * Local contact has a relationship with owner, but not the capacity.
- * Recognize that the goal is the owner. He is the most benefited party.
- * Interactions and success factors for joint ventures.
- * Joint venture should appear as a one entity for owner.
- * Align corporate cultures in joint venture.
- * Small-business joint venture.
- * expand into new markets

3) **Techniques to develop relationships:**

- *Chase clients and not projects.
- *Meeting with architects/designers to identify opportunities
- *Look 5-10 years to the future
- *Identify future market trends.
- *How do you chase clients?
 - a) demonstrate performance on a smaller job
 - b) relationship with design team
 - c) always focus on relationships (community service, referrals, adding value)
- *Trade contractors
 - a) teaming with known contractors
 - b) getting familiar with new contractors (more resources, visits) Emails don't work for building relations.
 - c) face to face meetings
 - d) teaming prior to award

4) **Integrated Project Delivery IPD:**

- *Integrated design build project: working with the design team to try to get the project to the budget that was set by somebody.
- *Public don't do IPD contracts
- *No insurances
- *Shared risk between owner, contractor and designer.
- *Requires trust in the team.
- *Similar to design build, with difference in risk allocation.
- *Current market does not favor IPD
- *Everybody signs the contract before starting anything. They all work together and help each other and no one sues any other party.

Research Potential:

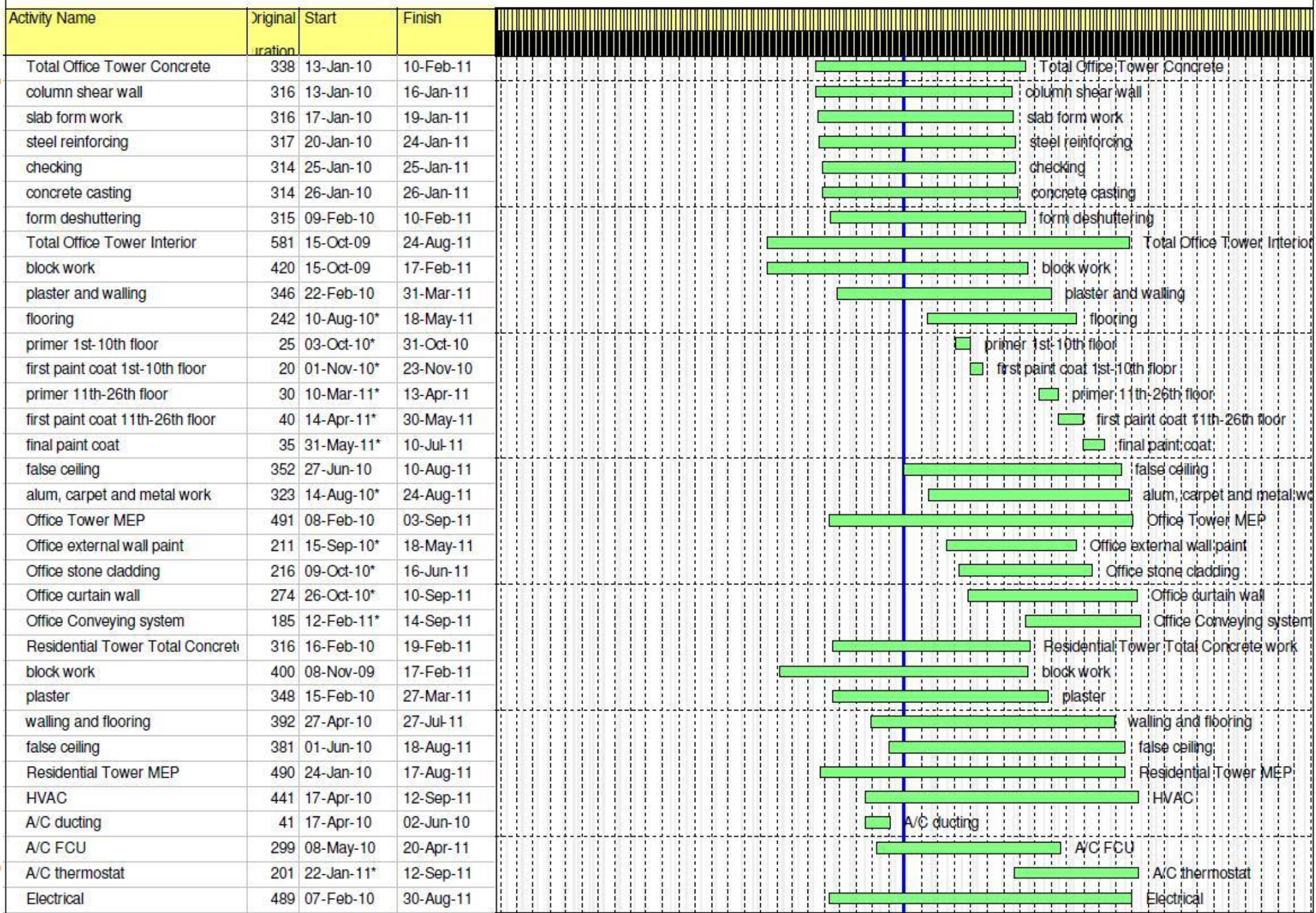
A few ideas with research potential were obtained from the PACE roundtable discussions. One of them was about the new generation communication patterns which was discussed between the students and the industry professionals in the last session of the event. Twitter and emails are being used much more by the younger generation than phones to communicate, and the discussion was about if it could be professionally used at work. A few more ideas are:

- How the green buildings are going and what is the long term impact of them.
- The use of new and better materials like: lighting, photovoltaics and insulation
- The benefits of BIM for the whole team of a project

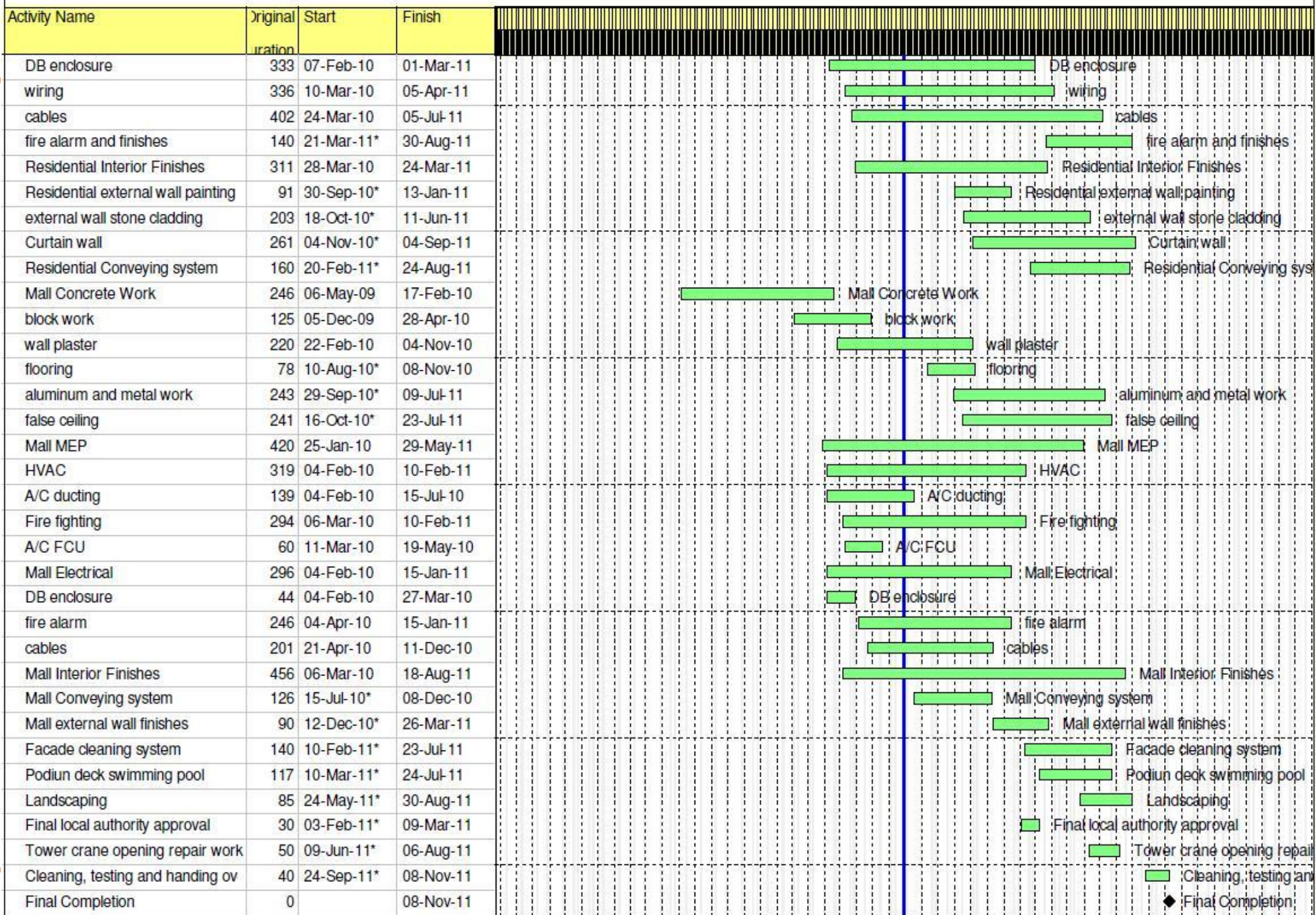
Appendix A
Detailed Project Schedule

Activity Name	Original Duration	Start	Finish	
construction start day	0	09-Jun-08		◆ construction start day
General Conditions	0	09-Jun-08	09-Jun-08	General Conditions
site mobilization	26	09-Jun-08	08-Jul-08	■ site mobilization
fencing	20	11-Jun-08	03-Jul-08	■ fencing
offices	20	11-Jun-08	03-Jul-08	■ offices
temporary parking	20	11-Jun-08	03-Jul-08	■ temporary parking
tower crane installation	20	02-May-09	24-May-09	■ tower crane installation
temp lifts installation	15	28-Dec-09	13-Jan-10	■ temp lifts installation
temp lifts removal	15	12-Feb-11*	28-Feb-11	■ temp lifts removal
tower crane removal	50	12-Apr-11*	08-Jun-11	■ tower crane removal
demobilization	18	19-Oct-11*	08-Nov-11	■ demobilization
Shoring, Earthwork and Foundat	299	09-Jul-08	29-Jun-09	■ Shoring, Earthwork and Foundations
excavation	99	10-Jul-08	04-Nov-08	■ excavation
shoring system	51	19-Jul-08	15-Sep-08	■ shoring system
dewatering	400	16-Sep-08	23-Oct-09	■ dewatering
piling work	64	05-Nov-08	22-Jan-09	■ piling work
cutting off piles heads	57	06-Dec-08	12-Feb-09	■ cutting off piles heads
piling loading test	42	25-Dec-08	12-Feb-09	■ piling loading test
Office Tower	0	13-Jan-10	13-Jan-10	Office Tower
Level 1 Concrete Work	25	13-Jan-10	10-Feb-10	■ Level 1 Concrete Work
column shear wall	3	13-Jan-10	16-Jan-10	column shear wall
slab form work	3	17-Jan-10	19-Jan-10	slab form work
steel reinforcing	4	20-Jan-10	24-Jan-10	■ steel reinforcing
checking	1	25-Jan-10	25-Jan-10	checking
concrete casting	1	26-Jan-10	26-Jan-10	concrete casting
form deshuttering	2	09-Feb-10	10-Feb-10	form deshuttering
Level 1 Interior Work	126	23-Mar-10	16-Aug-10	■ Level 1 Interior Work
block work	11	23-Mar-10	04-Apr-10	■ block work
plaster and walling	18	03-May-10	23-May-10	■ plaster and walling
flooring	19	24-May-10	14-Jun-10	■ flooring
primer	6	20-Jun-10	26-Jun-10	primer
first paint coat	6	07-Sep-10*	13-Sep-10	first paint coat
false ceiling	44	27-Jun-10*	16-Aug-10	■ false ceiling
final paint coat	5	27-Apr-11*	02-May-11	final paint coat

■ Actual Work
 ■ Critical Remaining Work
 ▼ Sum...
■ Remaining Work
 ◆ Milestone

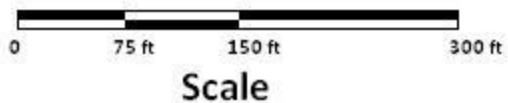
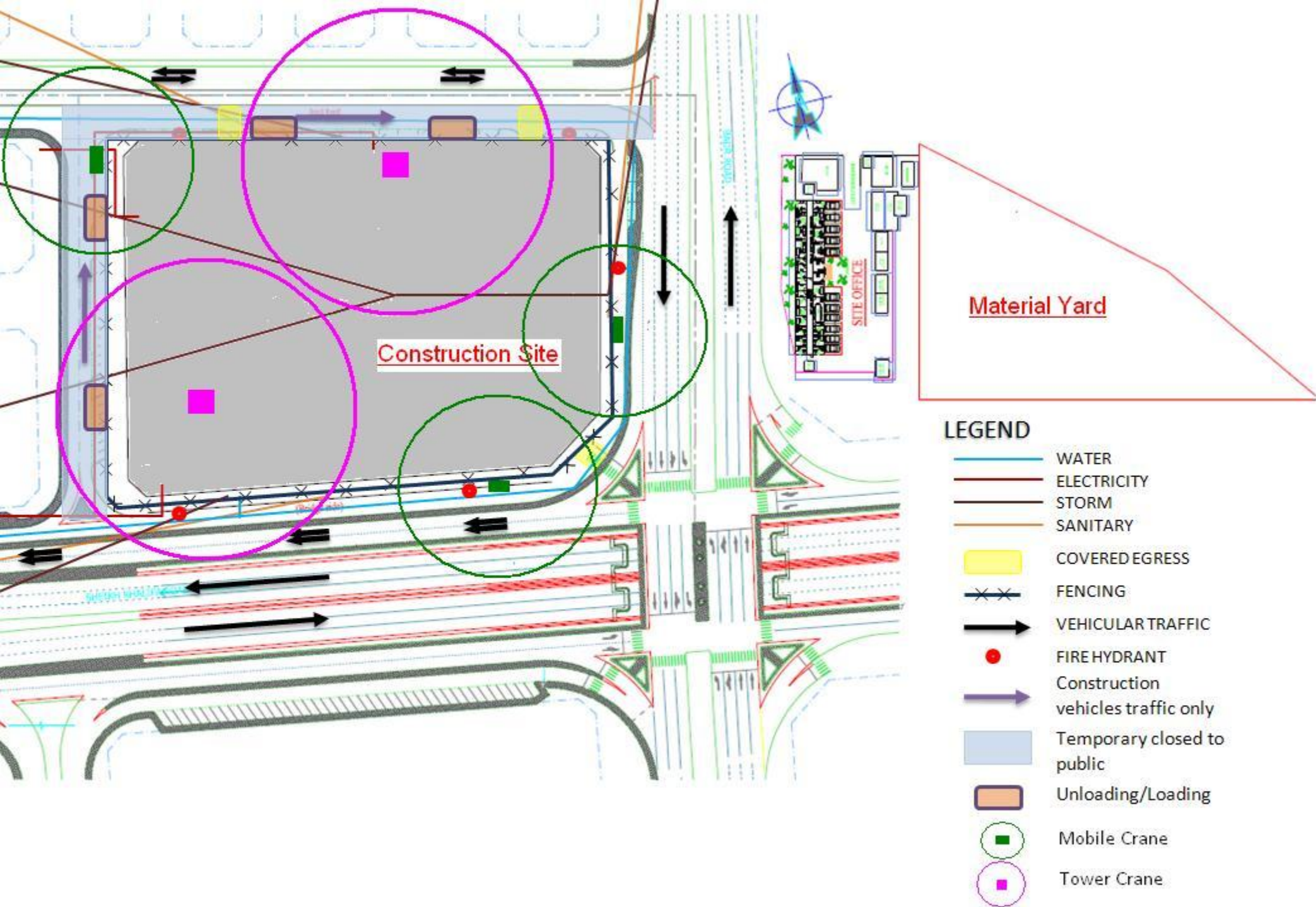


█ Actual Work
 █ Critical Remaining Work
 █ Remaining Work
 ◆ Milestone
 Sum...



█ Actual Work
 █ Critical Remaining Work
 ▶ Sum...
█ Remaining Work
 ◆ Milestone

Appendix B
Site Layout Planning



**Murur Mixed-use Complex
Superstructure Phase Site Plan**

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Appendix C
Structural Elements Schedule

Item Number	Typ. Floor Quantity	Total Quantity	Length (mm)	Width (mm)	Vert. Reinf. Quantity	Vert. Reinf. Size
Residential Tower						
Columns						
Column 12	3	66	1600	500	30	#8
Column 7	2	44	700	700	20	#8
Column 14	1	22	1600	900	36	#8
Column 13	2	44	1200	1200	80	#10
Column 16	2	44	1600	600	32	#8
Column 9	7	154	800	1200	44	#10
Column 21	2	44	1400	800	32	#10
Column 23	4	88	1000	1000	24	#10
Column 20	1	22	1500	1000	34	#10
Column 10	1	22	1900	1000	46	#8
Walls						
Wall 10	7	154	3000	600	66	#8
Wall 1	1	22	3000	400	32,20	#8,#6
Wall 14	2	44	2000	300	36	#6
Wall 5	2	44	3400	800	122	#10
Wall 2	2	44	3000	500	60	#10
Wall 4	3	66	5500	500	60,50	#10,#8
Wall 8	3	66	3300	500	32,32	#8,#6
Wall 9	3	66	3100	600	70	#10
Wall 3	2	44	2200	600	48	#10
Wall 6	1	22	2300	600	40	#8
Wall 11	1	22	2300	500	40	#6
Office Tower						
Columns						
Column 27	6	156	1250	1250	32	#8
Column 28	2	52	1000	1000	28	#8
Column 29	4	104	1100	1100	28	#8
Walls						
Wall 14	5	130	3500	600	70	#6
Wall 18	2	52	2700	600	58	#6
Wall 15	1	26	5000	850	60,48	#8,#5
Wall 16	1	26	6000	850	84,42	#8,#5

Item Number	Typ. Floor Quantity	Total Quantity	Length (mm)	Width (mm)	Vert. Reinf. Quantity	Vert. Reinf. Size
Mall Building						
Columns						
Column 1	1	8	800	1550	34	#8
Column 2	1	8	1600	1450	46	#10
Column 3	51	408	800	800	24	#10
Column 4	1	8	1600	1675	52	#10
Column 5	4	32	1100	100	34	#8
Column 7	1	8	800	1200	26	#8
Column 8	14	112	1000	Round	22	#8
Column 9	6	48	800	1700	38	#10
Column 10	1	8	2600	1000	60	#10
Column 11	1	8	1600	1200	48	#10
Column 12	1	8	2000	600	44	#10
Column 13	2	16	1200	1200	40	#10
Column 15	1	8	1500	800	40	#10
Column 16	1	8	1600	800	38	#10
Column 17	1	8	2000	600	44	#10
Column 18	1	8	1800	600	36	#8
Column 21	2	16	1600	1000	32	#10
Column 26	1	8	1000	1040	31	#8
Column 27	5	40	1400	1400	44	#10
Column 28	2	16	1200	1200	36	#10
Column 29	4	32	1300	1300	36	#10
Column 30	48	384	600	1000	20	#10
Column 37	4	32	600	1500	32	#10
Walls						
Wall 1	3	24	3000	600	40,24	#8,#6
Wall 2	1	8	3000	700	74	#10
Wall 3	2	16	5700	600	70,46	#10,#6
Wall 4	3	24	5500	600	64,50	#10,#6
Wall 5	2	16	3500	800	77	#10
Wall 6	1	8	3400	800	40,24	#8,#6
Wall 7	1	8	3000	700	40,24	#8,#6
Wall 8	1	8	3300	600	36,34	#8,#6
Wall 9	3	24	3600	700	78	#10
Wall 10	3	24	3300	700	72	#10
Wall 11	1	8	3500	600	40,24	#8,#6
Wall 12	2	16	3300	900	68	#10
Wall 13	4	32	3000	700	62	#10
Wall 14	7	56	3500	600	72	#10
Wall 15	1	8	5000	850	60,48	#10,#6