

# Technical Assignment 2

Cost and Schedule Analysis

Ingleside at King Farm

Rockville, MD



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2008-2009 construction management option

AE Faculty Consultant: Dr. David Riley

Date of Submission: 10/24/2008

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## **Executive Summary**

### Key Findings:

Technical Assignment 2 focuses on a Detailed Project Schedule, Phased Site Layout Planning, Detailed Structural Systems Estimate, General Conditions Estimate, and Critical Industry Issues. A detailed schedule begins to show the sequences of work. Different phases of construction are linked to different site layouts. In short, the basic principles of this technical assignment allow students to develop an understanding of how cost and schedule are directly related.

One key element on the schedule is the tower crane erection/disassembly, which drives the completion of the superstructure on the critical path. Another key element of the schedule is the Work Breakdown Structure (WBS) showing the different phases of construction such as Finishes, Superstructure, and Mechanical/Electrical/Plumbing (MEP). Within the WBS, the activities appear to have a stacked profile and it shows the critical relationships between the different phases of construction.

It is clear that a construction site evolves throughout a project. The site layout plans show how some elements such as the Temporary Facilities remain in place for the duration of a project, while other items such as temporary transformers and tower cranes are only on site for a short period of time.

In the general conditions estimate, there is costing for the temporary facilities and project staffing. Project staffing comprises of the majority of general conditions costs since people are key in the completion of a project. Some of the staff remains on the project throughout the duration, and some of them only have a small amount of time devoted to the project. The general conditions estimate will also show how the majority of the project staff bill their time directly to the project, but some of the staff, like the project executive, never bill their time directly to the project. Their salaries are primarily budgeted out of the home office expenses. Some of this is charged to overhead such as estimators that play a part in helping companies pursue new work, but actual billing varies by company.

Pursuing work is a major undertaking right now with the current industry issues such as the energy crisis and situation with the economy, so people in positions of pursuing work are highly valuable. The critical industry issues play a major part in how companies approach work and which markets they target. The Partnership for Achieving Construction Excellence (PACE) Roundtable Meeting consists of industry professionals and aspiring professionals that discuss these issues and offer advice on how to succeed in a dry economy by investing in people.

### Technical Assignment 1 Questions with Answers:

1. What type of agreement does Turner have with Konover and how is the CM fee divided?
  - a. The Joint Venture (JV) is split; Turner earns 51% and Konover earns 49% of the fee.
2. What are the impacts of LEED tracking as far as schedule and budget are concerned?
  - a. It hasn't impacted schedule or cost. The anticipated LEED premium is nearly \$400,000. Turner-Konover has a \$200,000 contingency covering unforeseen expenses to eliminate schedule delays due to a funding issue.

## Detailed Project Schedule

The detailed project schedule shows how the work sequences overlap to accelerate the schedule. The PT slabs fall on the critical path and drive the schedule for this project. There are various relationships between activities, which makes it difficult to coordinate and implicate a schedule of this nature, especially when stacking trades on the project. A tightly stacked schedule may cause more potential for congestion of trades and may actually create a “deceleration” in the schedule. A “deceleration” should not be a major issue if continuous communication is maintained throughout the project to keep the trades on track with the schedule.

Some items have varying finish dates from what was previously anticipated, but Substantial Completion has remained the same; these are not shown for clarity. One of the major differences in finish dates is *Complete Building Watertight for Finishes*. The finishes will actually start on the lower floors before the whole building is watertight. This is possible to do and maintain a relatively consistent climate since the building has such a large footprint and there is will be less chance for trade congestion. Two large ones that vary are *Complete Structure Topped Out* and *Complete Steel Superstructure – Roof Level*, which will finish 4/9/2008 instead of the originally anticipated 1/30/2008. The concrete subcontractor is already locked into a lump sum bid so the delay will not cause an increase in cost due to the increased time that the tower cranes are on site no Change Orders will be acknowledged for this.

Other items not shown on the schedule for clarity include *Complete for Permanent Power Available (3/24/2008)*, which is complete as the First Floor Finishes are wrapping up. One concern is the anticipated delivery of some major pieces of equipment such as the Cooling Towers (August 2007). These will not be able to be set in place on the roof at time of delivery and will need to remain on the ground for approximately one year. Care must be taken to protect it from being damaged by site equipment, being vandalized, or damaged by weather. Smaller equipment can easily be staged inside the structure until they are ready for install.

## Site Layout Planning

The attached site layout planning drawings show the critical phases of construction. During the site excavation, the workflow is the same as it is during the other parts of construction starting with the southwest corner of the building and working clockwise through the footprint toward the east.

### Excavation:

The limits of the excavation are determined by the footprint of the Garage since the Garage is larger than the upper floors; see excavation line shown on attached Excavation Site Layout Plan. This site does not require deep excavation and there is adequate space to slope the edges of the excavation in order to maintain site safety. See typical Excavation Slope Detail below for areas at approximately 10’ in depth.

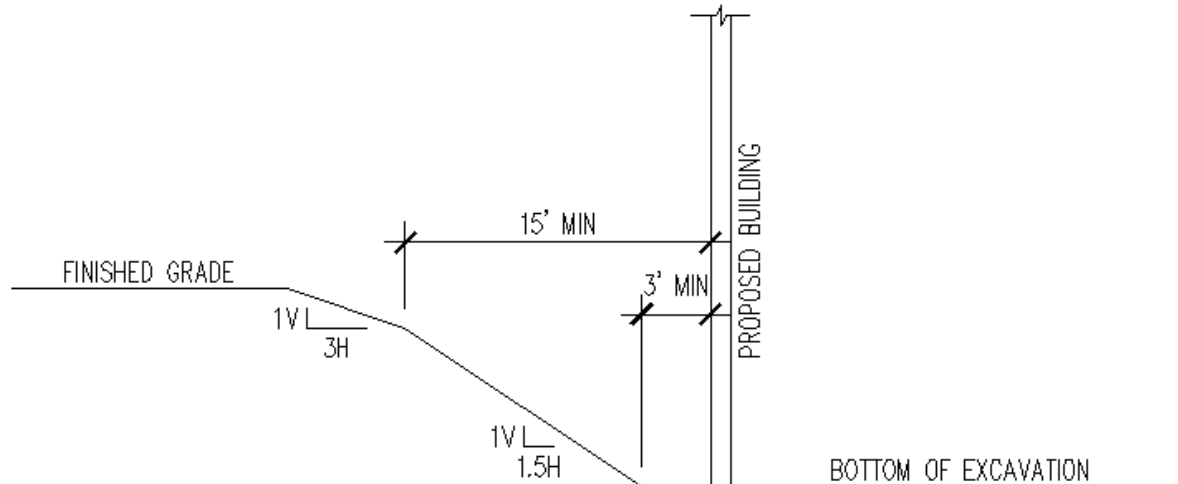


Figure 1: Excavation Slope Detail

More care is required on the south walls of the east and west wings since the south walls are near the property line and sidewalk. The elevation of the existing soil is approximately 5' deep at these locations and will require a slope of 1.5H:1V. See East & West Wing South Wall Excavation Slope Detail for areas at approximately 5' in depth.

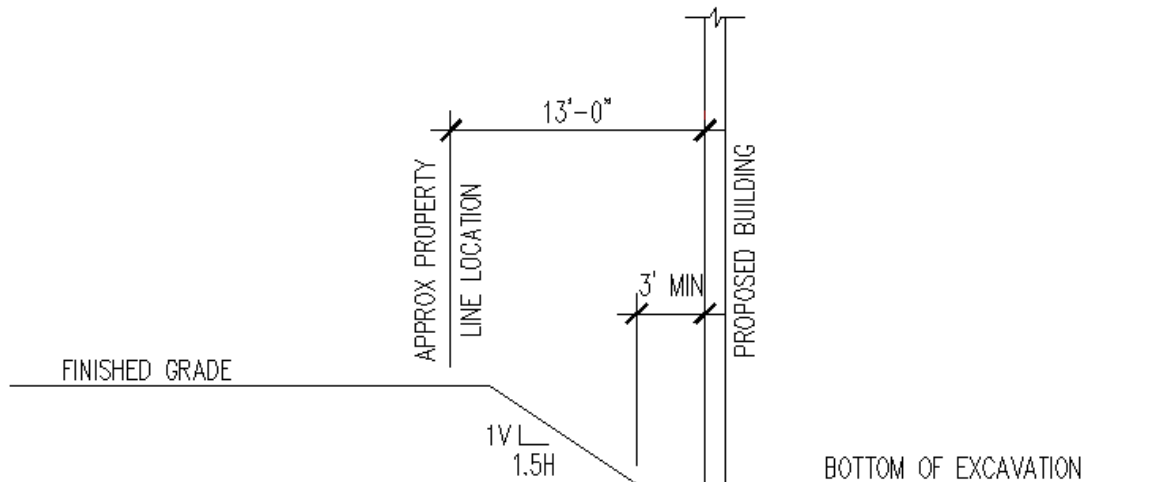


Figure 2: East & West Wing South Wall Excavation Slope Detail

#### Substructure / Superstructure:

The substructure and superstructure are both constructed with cast-in-place concrete, so the site layout planning phases is virtually the same. The major difference between the construction of the substructure compared to the superstructure is that the superstructure sequences begin to overlap with the finishes; there is some scaffolding shown on the superstructure site layout plan.

Concrete is hoisted using the cranes and a bucket. This project utilizes two Liebherr tower cranes with overlapping radii and Camlever buckets to cover the large footprint of the building. Since their radii overlap, the tower cranes are erected to different elevations to minimize the risk of collisions.

The critical lift is the determining factor in the selection of the cranes. In this case, the crane selection was driven by the desired production of the concrete superstructure, which is to place each section in one day. In order to do this, this project uses a Miller Long Batch Plant with an approximate maximum production rate of 90 loads per hour to keep up with simultaneous pours on either side of the building. Each section of the construction pours contains an approximate maximum of 360 CY of concrete, which requires a three CY bucket to meet desired production. Care must be taken in reaching toward the footprint limits and the bucket should not be filled to capacity.

Crane Selection with Justification:

<b>Liebherr 250 EC-B 12 Litronic (working radius Load Diagram 2)</b>	
Max. Lifting Capacity	25,794 lbs @ ≤ 80.1'
Max. Lifting Capacity at Max Radius	4,960 lbs @ 229'
Max Hook Height	285.8'

[www.liebherr.com/EB-250.pdf](http://www.liebherr.com/EB-250.pdf) (GmbH, 2008)



Model	Width	Width	Load	Overall	Gate	Weight	Cap
	OD	ID	Height	Height	Dia.	Lbs.	Yd.
CL-050	46"	43"	35"	51"	21"	260	1/2
CL-075	46"	43"	42"	60"	21"	325	3/4
CL-100	56"	52"	46"	63"	24"	435	1
CL-150	64"	60"	52"	72"	24"	570	1-1/2
CL-200	71"	65"	57"	80"	24"	645	2
CL-300	71"	70"	67"	90"	24"	890	3
CXL-200	71"	65"	56"	80"	32"	870	2
CXL-300	76"	70"	67"	90"	32"	1125	3
CXL-400	88"	82"	73"	108"	32"	1450	4
CXL-500	88"	82"	82"	114"	32"	1500	5

Optional Air Operated Gates

**Figure 3: Camlever Standard Buckets**

<http://www.alpind.com/Camlever-Buckets.pdf> (Development, 2004)

<b>Critical Lift Determination</b>	
Normal Weight Wet Concrete	4,050 #/CY x 3 CY = 12,150 lbs
CL-300 Bucket Weight	890 lbs
<b>Full Bucket Weight</b>	<b>13,040 lbs</b>
Gas-Fired Rooftop A/C Unit Weight	2,800 lbs
Gas-Fired Boiler Weight	735 lbs
Induced Draft Cooling Tower Weight	8,030 lbs
Emergency Generator Weight	44,000 lbs (lifted with mobile crane)

Finishes:

This site plan is somewhat bare. The tower cranes are replaced by material hoists during this phase. There is no longer a need for the batch plant, which opens the courtyard up for additional material lay down. Deliveries are unloaded near the material hoists using forklifts so the materials can be quickly moved into the building.

## Detailed Structural Systems Estimate

The attached take-offs show quantities calculated for the structural bay between Column Lines 10.2 / 11.2 and B / C, which is the most logical bay in the floor plan. R.S. Means data offers both the material and the labor cost, and since the PT structural system with relatively thin slab thickness seems to be the logical choice for this project, the estimate is provided with a combined material and labor cost with the currently designed structural system.

A detailed structural estimate resulted in a lower cost than the previously estimated cost of the structural system. It proved to be a beneficial exercise from a CM standpoint and opens the door for being awarded a project with the significant cost savings when presenting a proposal to an owner. See table, attached take-offs, and CSI Masterformat estimate for more information.

Structural Bay Cost:	\$71,443.87
Total Structural Cost:	\$8,991,380.83
Percent of Total Project Cost:	7.9%
Total Project Cost (R.S. Means Tech. 1):	\$113,922,509.37
Total Structural Cost (approx 10 % Tech. 1):	\$10,429,830.00

### Take-Off Notes:

- All sizes and quantities taken from structural drawings unless otherwise noted in spreadsheet.
- Areas calculated using distances recorded from CAD drawings.

Quantity take-offs are listed first, then the estimate is listed second.

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<b>Garage:</b>							
<b>Column Footings (Concrete):</b>							
Column Footing Designation	Length (ft)	Width (ft)	Depth (ft)	Volume (CF)	Volume (CY)		
F17T (12'-6" x 12'-6" x 35"):	12.50	12.50	2.92	455.73	16.88		
F17T (12'-6" x 12'-6" x 35"):	12.50	12.50	2.92	455.73	16.88		
F16T (12'-0" x 12'-0" x 34"):	12.00	12.00	2.83	408.00	15.11		
F16T (12'-0" x 12'-0" x 34"):	12.00	12.00	2.83	408.00	15.11		
						Total Qty (033850)	63.98
<b>Column Footings (Rebar 1 1/8" Diameter):</b>							
Column Footing Designation	Length (ft)	# of Bars	Weight (plf)	Weight (lbs)	Weight (tons)		
F17T (11#9 E.W. Top & Bottom):	275.00	11.00	3.40	935.00	0.47		
F17T (11#9 E.W. Top & Bottom):	275.00	11.00	3.40	935.00	0.47		
F16T (10#9 E.W. Top & Bottom):	240.00	11.00	3.40	816.00	0.41		
F16T (10#9 E.W. Top & Bottom):	240.00	11.00	3.40	816.00	0.41		
						Total Qty (0321300)	1.75
<b>Columns (Concrete):</b>							
Column Designation	Length (ft)	Width (ft)	Height (ft)	Volume (CF)	Volume (CY)		
B (30" x 18" x 10'):	2.50	1.50	14.25	53.44	1.98		
B (30" x 18" x 10'):	2.50	1.50	14.25	53.44	1.98		
B (30" x 18" x 10'):	2.50	1.50	14.17	53.14	1.97		
B (30" x 18" x 10'):	2.50	1.50	14.17	53.14	1.97		
						Total Qty (033920)	7.89
<b>Columns (Rebar 1" Diameter):</b>							
Column Designation	Column Height (ft)	# of Bars	Weight (plf)	Weight (lbs)	Weight (tons)		
B (10#8 E.W. Vertical)	14.25	10.00	2.67	380.48	0.19		
B (10#8 E.W. Vertical)	14.25	10.00	2.67	380.48	0.19		
B (10#8 E.W. Vertical)	14.25	10.00	2.67	380.48	0.19		
B (10#8 E.W. Vertical)	14.25	10.00	2.67	380.48	0.19		
						Total Qty (0321300)	0.76
<b>Columns (Rebar 1" Diameter):</b>							
Column Designation	Column Perimeter & Transverse (ft)	# of Bars (every 12" + 4)	Weight (plf)	Weight (lbs)	Weight (tons)		
B (12" o.c. w/4 at 3" on top Horizontal):	11.00	17.00	2.67	29.37	0.01		
B (12" o.c. w/4 at 3" on top Horizontal):	11.00	17.00	2.67	29.37	0.01		
B (12" o.c. w/4 at 3" on top Horizontal):	11.00	17.00	2.67	29.37	0.01		
B (12" o.c. w/4 at 3" on top Horizontal):	11.00	17.00	2.67	29.37	0.01		
						Total Qty (0321300)	0.06
<b>SOG Concrete (5"):</b>							
Bay	Length (ft)	Width (ft)	Area (SF)	Depth (ft)	Volume (CF)	Volume (CY)	
10.2 / 11.2 amd B / C Concrete	29.50	22.81	672.97	0.42	280.40	10.39	
10.2 / 11.2 amd B / C Concrete Finishing	29.50	22.81	672.97				
						Total Qty (03314400)	10.39
						Total Qty (03350350)	672.97
<b>SOG Reinforcing (6" x 6" W2.9 x 2.9 WWF):</b>							
Bay	Length (ft)	Width (ft)	Area (SF)	Area (CSF)			
10.2 / 11.2 amd B / C	29.50	22.81	672.97	6.73			
						Total Qty (03220300)	6.73



First through Sixth Floor (all Qty's multiplied by 6):							
Concrete Slab (8" Post-Tension):							
Bay	Length (ft)	Width (ft)	Depth (ft)	Volume (CF)	Volume (CY)		
10.2 / 11.2 and B / C	29.50	22.81	0.67	448.65	16.62		
						Total Qty (03301950)	99.70
Columns (Concrete):							
Column Designation	Length (ft)	Width (ft)	Height (ft)	Volume (CF)	Volume (CY)		
B (30" x 18" x 10"):	2.50	1.50	10.00	37.50	1.39		
B (30" x 18" x 10"):	2.50	1.50	10.00	37.50	1.39		
B (30" x 18" x 10"):	2.50	1.50	10.00	37.50	1.39		
B (30" x 18" x 10"):	2.50	1.50	10.00	37.50	1.39		
						Total Qty (03300920)	33.33
Rebar on Top of Columns (#5 333Lu + Column Width):							
Column Designation	Length (ft)	# of Bars	Weight (plf)	Weight (lbs)	Weight (tons)		
10.2-B (3 E.W.):	60.70	6.00	0.67	243.29	0.12		
11.2-B (3 E.W.):	60.70	6.00	0.67	243.29	0.12		
10.2-C (3 E.W.):	60.70	6.00	0.67	243.29	0.12		
11.2-C (3 E.W.):	60.70	6.00	0.67	243.29	0.12		
						Total Qty (03210250)	2.92
Rebar in Slab (#5 x 24-0" at 3' o.c. Bottom):							
Bay	Length (ft)	# of Bars	Weight (plf)	Weight (lbs)	Weight (tons)		
10.2 / 11.2 and B / C	192.00	8.00	1.04	1602.05	0.80		
						Total Qty (03210250)	4.81
Tendons on Columns:							
Column Designation	Length north-south (ft)	Width east-west (ft)	# of Tendons north-south	# of Tendons east-west	Total Length 7 Strands (ft)	Weight (.53 lbs/ft)	
10.2-B (#5T & 10#5T)	29.50	22.81	8.00	10.00	3248.88	1721.90	
11.2-B (#5T & 9#5T)	29.50	22.81	8.00	9.00	3089.19	1637.27	
10.2-C (#5T & 7#5T)	29.50	22.81	8.00	7.00	2769.81	1468.00	
11.2-C (#5T & 9#5T)	29.50	22.81	8.00	9.00	3089.19	1637.27	
						Total Qty (03231000)	38786.66
Tendons in Bay:							
Bay	Length north-south (ft)	# of Tendons north-south	Total Length 7 strands (ft)	Weight (.53 lbs/ft)			
10.2 / 11.2 and B / C	29.50	2.00	413.00	218.89			
						Total Qty (03231000)	1313.34
Seventh Floor:							
Concrete Slab (8" Post-Tension):							
Bay	Length (ft)	Width (ft)	Depth (ft)	Volume (CF)	Volume (CY)		
10.2 / 11.2 and B / C	29.50	22.81	0.67	448.65	16.62		
						Total Qty (03301950)	16.62
Concrete Drop Panels:							
Column Designation	Length (ft)	Width (ft)	Depth (ft)	Volume (CF)	Volume (CY)		
10.2-B (10' x 10' x 5.25")	10.00	10.00	0.44	43.75	1.62		
11.2-B (10' x 10' x 5.25")	10.00	10.00	0.44	43.75	1.62		
						Total Qty (03301950)	3.24
Rebar on Top of Columns (#5 333Lu + Column Width):							
Column Designation	Length (ft)	# of Bars	Weight (plf)	Weight (lbs)	Weight (tons)		
10.2-B (3 E.W.):	60.70	6.00	1.04	63.31	0.03		
11.2-B (3 E.W.):	60.70	6.00	1.04	63.31	0.03		
10.2-C (3 E.W.):	60.70	6.00	1.04	63.31	0.03		
11.2-C (3 E.W.):	60.70	6.00	1.04	63.31	0.03		
						Total Qty (03210250)	0.13
Rebar in Slab (#5 x 24-0" at 3' o.c. Bottom):							
Bay	Length (ft)	# of Bars	Weight (plf)	Weight (lbs)	Weight (tons)		
10.2 / 11.2 and B / C	192.00	8.00	1.04	1602.05	0.80		
						Total Qty (03210250)	0.80
Tendons on Columns:							
Column Designation	Length north-south (ft)	Width east-west (ft)	# of Tendons north-south	# of Tendons east-west	Total Length 7 Strands (ft)	Weight (.53 lbs/ft)	
10.2-B (#5T & 10#5T)	29.50	22.81	8.00	10.00	3248.88	1721.90	
11.2-B (#5T & 9#5T)	29.50	22.81	8.00	9.00	3089.19	1637.27	
10.2-C (#5T & 7#5T)	29.50	22.81	8.00	7.00	2769.81	1468.00	
11.2-C (#5T & 9#5T)	29.50	22.81	8.00	9.00	3089.19	1637.27	
						Total Qty (03231000)	6464.44
Tendons in Bay:							
Bay	Length north-south per Strand (ft)	# of Tendons north-south	Total Length 7 strands (ft)	Weight (.53 lbs/ft)			
10.2 / 11.2 and B / C	29.50	2.00	413.00	218.89			
						Total Qty (03231000)	218.89
Roof:							
Joist Designation	Length (ft)	Width (ft)	# of Joists	Total Length			
K-Joists 28K12	29.50		2.00	59.00			
						Total Qty (05210680)	59.00
Deck							
Bay (1.5" x 20 Gauge Galvanized Metal Deck)	Length (ft)	Width (ft)	Area	# of Squares over 500 Sq			
10.2 / 11.2 and B / C	29.50	22.81	672.97	6.73			
						Total Qty (05212700)	6.73

0330	Cast-In-Place Concrete	Qty	Unit Price	Total	
	3850 Footings, Spread Over 5 CY	63.98	\$230.83	\$14,768.50	
	0920 24" x 24", minimum reinforcing	13.45	\$887.50	\$11,936.88	
	1950 Elevated Slabs, flat slab with drops, 125 psf Sup. Load 30' Span	36.48	\$445.75	\$16,260.96	
					0330 Cast-In-Place Concrete
					\$42,966.34
0321	Reinforcing Steel	Qty	Unit Price	Total	
	0300 Galvanized Reinforcing #6 or over	2.57	\$735.00	\$1,888.95	
	0250 Galvanized Reinforcing #5	2.22	\$735.00	\$1,631.70	
					0321 Reinforcing Steel
					\$3,520.65
0331	Structural Concrete	Qty	Unit Price	Total	
	4400 Slab on Grade, up to 6" thick, crane and bucket	10.39	\$32.30	\$335.60	
					0331 Structural Concrete
					\$335.60
0335	Concrete Finishing	Qty	Unit Price	Total	
	0350 Power screed, bull float, machine float & trowel (ride-on)	672.97	\$0.27	\$181.70	
					0335 Concrete Finishing
					\$181.70
0322	Welded Wire Fabric Reinforcing	Qty	Unit Price	Total	
	0300 6 x 6 - W2.9 x W2.9 (6 x 6) 42 lb per CSF	6.73	\$43.50	\$292.76	
					0322 Welded Wire Fabric Reinforcing
					\$292.76
0323	Stressing Tendons	Qty	Unit Price	Total	
	1000 75' span, 42 kip	13366.66	\$1.74	\$23,257.99	
					0323 Stressing Tendons
					\$23,257.99
0521	Steel Joist Framing	Qty	Unit Price	Total	
	0680 28K12, 17.1 lb/LF	59.00	\$14.87	\$877.33	
					0521 Steel Joist Framing
					\$877.33
0531	Steel Decking	Qty	Unit Price	Total	
	2700 Roof Decking Over 500 Squares	6.73	\$1.71	\$11.51	
				\$0.00	
					0531 Steel Decking
					\$11.51

Total Detailed Structural Estimate Bay 10.2 / 11.2 and B / C \$71,443.87

Total SF Method	
SF per Bay	5383.76
Cost Per SF	\$13.27
Total SF	677.559
Total Cost	\$8,991,380.83

General Information about Post Tension Tendons:

Strand Type		0.5" (13 mm)	0.6" (15 mm)
Nominal diameter	inch	0.5	0.6
Nominal area	inch <sup>2</sup>	0.153	0.217
Nominal weight/mass	lbs/ft	0.53	0.74
Tensile strength	ksi	270	270
Min. breaking load	kips	41.3	58.6
Young's modulus	ksi	approx. 28,500	
Relaxation	%	max 2.5	

Figure 4: VSL Strand Properties

Strands Type 0.5" (270 ksi)		
Number of Strands Per Tendon	Area of tendon inch <sup>2</sup>	Min breaking load kips
1	0.15	41.3
2	0.31	82.6
3	0.46	123.9
4	0.61	165.2
5	0.77	206.5
6	0.92	247.8
7	1.07	289.1

Figure 5: VSL Tendon Properties

(VStructural, 2008)

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**Date of Submission:** 10/24/2008

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## General Conditions Estimate

The General Conditions Estimate (GCE) includes costing for all team members in the previously submitted CM project team directory except for the Project Executive, the GC Accountant, and the GC Estimator. They will have time spent on the project, but it will not be billed directly to the project. Another item that will not appear in the GCE are the tower cranes since they are used primarily for the concrete superstructure. The scaffolding is another item that falls under a subcontractor estimate so it will not appear in the GCE. Commissioning will be more feasible if done by a separate commissioning agent, especially since the owner is pursuing LEED Certification, therefore; the commissioning is also excluded from the GCE.

Cost savings is the underlying goal in developing the GCE. There are many opportunities to cut costs in general conditions, especially with larger projects. One area of potential savings is the purchase of major temporary facilities for projects with long durations. Another potential for savings is a reduction of site fencing length by enclosing a smaller area. Time on a project for the staff does not usually allow for any savings and is the largest percentage of the general conditions cost.

A total cost of \$5,107,355.09 is estimated for the general conditions on this project. See tables below for more information. Quantity take-offs are listed first, then the estimate is listed second, and then the Staff Monitor is listed last.

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Date of Submission: 10/24/2008

Title of Report: Technical Assignment 2

<b>Site Trailers:</b>						
<b>Trailer Units</b>						
Trailer Designation	Months					
Trailer 1	23.00					
Trailer 2	23.00					
Trailer 3	23.00					
Trailer 4	23.00					
Trailer 5	23.00					
					Total Qty (015213.200350)	115.00
<b>Air Conditioning</b>						
Trailer Designation	Months					
Trailer 1	23.00					
Trailer 2	23.00					
Trailer 3	23.00					
Trailer 4	23.00					
Trailer 5	23.00					
					Total Qty (015213.200700)	115.00
<b>Storage Boxes</b>						
Box Designation	Months	Qty				
20' x 8' Boxes	23.00	8.00				
					Total Qty (015213.201200)	184.00
<b>Field Office Expense</b>						
Expense Designation	Months	Qty				
Office Equipment	26.00	5.00				
					Total Qty (015213.400100)	130.00
<b>Office Supplies</b>						
Expense Designation	Months	Qty				
Office Supplies	26.00	5.00				
					Total Qty (015213.400120)	130.00
<b>Temporary Hoists:</b>						
<b>Weekly Forklift Crew</b>						
	Months	Qty				
All terrain forklift, 45' lift, 35' reach, 9,000 lb capacity	23.00	2.00				
					Total Qty (01510100)	46.00
<b>Temporary Barriers and Enclosures:</b>						
<b>Temporary Fencing</b>						
	Perimeter	Qty				
Rented Chain Link 6' High over 1,000' (up to 12 months)	2925.00	2.00				
					Total Qty (0156260200)	5850.00
<b>Proposed Building:</b>						
<b>Heat</b>						
Proposed Building:	Area (SF)	Area (CSF)	Weeks			
3 months of heating required	677559.00	6775.59	21.65			
					Total Qty (01510100)	146691.52
<b>Lighting</b>						
Proposed Building:	Area (SF)	Area (CSF)				
3 months of lighting required	677559.00	6775.59				
					Total Qty (01510350)	6775.59
<b>Water</b>						
Proposed Building:	Months					
22.5 months of water required	22.50					
					Total Qty (01510350)	22.50
<b>Cleanup</b>						
Proposed Building:	Area (SF)	Area (MSF)				
Cleanup of floor area, continuous per day, during construct.	677559.00	677.56				
					Total Qty (01740052)	677.56
<b>Final Cleanup</b>						
Proposed Building:	Area (SF)	Area (MSF)				
Final Cleanup	677559.00	677.56				
					Total Qty (01740100)	677.56

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0131	Project Management and Coordination	Qty	Unit Price	Total	
	0220 Project Manager Field (PM maximum)	98.94	\$2,100.00	\$207,775.05	
	0220 Project Manager Engineering (PM maximum)	100.67	\$2,100.00	\$211,412.25	
	0200 GC-MEP Peer Review (PM average)	3.92	\$1,850.00	\$7,249.50	
	0280 Lead Superintendent (Sup. maximum)	97.53	\$1,950.00	\$190,189.84	
	0260 Superintendent (Sup. average)	97.43	\$1,700.00	\$165,622.50	
	0260 Exteriors Superintendent (Sup. average)	97.43	\$1,700.00	\$165,622.50	
	0260 Interiors Superintendent (Sup. average)	97.43	\$1,700.00	\$165,622.50	
	0260 MEP Superintendent (Qty 2) (Sup. average)	194.85	\$1,700.00	\$331,245.00	
	0120 Project Engineer (Eng. average)	98.29	\$1,125.00	\$110,577.38	
	0120 MEP Engineer (Eng. average)	3.92	\$1,125.00	\$4,408.48	
	0120 Interiors Engineer (Eng. average)	8.55	\$1,125.00	\$9,620.72	
	0100 Field Engineer (Qty 4) (Eng. minimum)	391.87	\$865.00	\$338,963.23	
				Subtotal-01	\$1,908,308.94
				Burden at % 25	\$477,077.24
				0131 Project Management and Coordination	\$2,385,386.18
015213.20	Field Offices and Sheds	Qty	Unit Price	Total	
	0300 Trailer, furnished, no hookups, 32' x 8' Rent (5)	115.00	\$241.00	\$27,715.00	
	0700 Air Conditioning	115.00	\$41.00	\$4,715.00	
	1200 Storage Boxes	184.00	\$73.50	\$13,524.00	
				015213.20 Field Offices and Sheds	\$45,954.00
015213.40	Field Office Expense	Qty	Unit Price	Total	
	0100 Office equipment rental average	130.00	\$150.00	\$19,500.00	
	0120 Office Supplies, average	130.00	\$95.00	\$12,350.00	
	0140 Telephones (1 per trailer + 1 fax)	6.00	\$210.00	\$1,260.00	
				015213.40 Field Office Expense	\$33,110.00
0154	Construction Aids	Qty	Unit Price	Total	
	0100 Weekly Forklift Crew	46.00	\$3,675.00	\$169,050.00	
				0154 Construction Aids	\$169,050.00
0156	Temporary Barriers and Enclosures	Qty	Unit Price	Total	
	0250 Rented Chain Link Fence	5850.00	\$3.58	\$20,943.00	
				0156 Temporary Barriers and Enclosures	\$20,943.00
0174	Cleaning and Waste Management	Qty	Unit Price	Total	
	0052 Cleanup of floor area, continuous, during construction	677.56	\$38.50	\$26,086.06	
	0100 Final cleanup by GC at end of job	677.56	\$53.61	\$36,323.99	
				0174 Cleaning and Waste Management	\$62,410.05
0151	Temporary Utilities	Qty	Unit Price	Total	
	0100 Temporary Heat	146691.52	\$13.50	\$1,980,335.52	
	0350 Lighting including service lamps, wiring & outlets	6775.59	\$13.33	\$90,318.61	
	0600 Power for job duration incl. elevator, etc.	6775.59	\$47.00	\$318,452.73	
	0700 Temporary construction water bill per mo.	22.50	\$62.00	\$1,395.00	
				01300 Temporary Utilities	\$2,390,501.86
				<b>Total General Conditions</b>	<b>\$5,107,355.09</b>

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**Staff Monitor:**

A Staff Monitor is a representation of the approximate percentage of time each team member is devoting to the project at any point during the project; the costs are reflected in the *0131 Project Management and Coordination* in the above estimate. In most cases, the general rule of thumb is that the team members spend virtually 100% of their time on the project during construction. Project Executives and Superintendents are an exception to this rule in that they devote a very small amount of time, if any, to the project during preconstruction. As the project approaches construction start, their devotion ramps up.

Projects of this magnitude offer plenty of tasks and usually demand full devotion from the PM's, Superintendents, and Field Engineers during construction. Positions such as the GC MEP Peer Review, for example, require more focus during preconstruction and then again during the MEP phases of construction. See the staff monitor for more information (full size attached in appendices).

	Preconstruction (Starts November 1, 2006)										Construction (Starts March 15, 2007)																
	Month Number										Month Number																
	1 Nov 06	2 Dec 06	3 Jan 07	4 Feb 07	5 Mar 07	6 Apr 07	7 May 07	8 June 07	9 Jul 07	10 Aug 07	10 Sep 07	11 Oct 07	12 Nov 07	13 Dec 07	14 Jan 08	15 Feb 08	16 Mar 08	17 Apr 08	18 May 08	19 June 08	20 Jul 08	21 Aug 08	22 Sep 08	23 Oct 08	24 Nov 08	25 Dec 08	26 Jan 09
Project Executive:	10%	10%	10%	10%	15%	15%	10%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Project Manager/Field Engineer:	0%	0%	0%	20%	30%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
GC-MEP Peer Review:	0%	0%	20%	20%	10%	5%	0%	0%	0%	5%	10%	10%	2%	2%	2%	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
GC Accountant:	0%	0%	0%	0%	5%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
GC Estimator:	20%	20%	20%	20%	20%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Lead Superintendent:	0%	0%	0%	0%	5%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Superintendents:	0%	0%	0%	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Estimators:	0%	0%	0%	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Interiors Superintendents:	0%	0%	0%	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
MEP Superintendents:	0%	0%	0%	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
MEP Superintendents:	0%	0%	0%	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Project Engineer:	0%	0%	5%	5%	20%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
MEP Engineer:	0%	0%	20%	20%	10%	5%	0%	0%	0%	5%	10%	10%	2%	2%	2%	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Interiors Engineer:	0%	0%	20%	20%	10%	5%	0%	0%	0%	5%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	5%	5%	5%	5%	5%	5%
Field Engineer:	0%	0%	5%	5%	5%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Field Engineer:	0%	0%	5%	5%	5%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Field Engineer:	0%	0%	5%	5%	5%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Field Engineer:	0%	0%	5%	5%	5%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

A breakdown of time on the project by week and a pay scale for each is provided below to justify the quantities listed in the GCE for the staff.

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	Weeks on Project (CSI Qty)	Pay Scale
Project Executive:	7.361	not in estimate
Project Manager Field:	98.9405	PM maximum
Project Manager Engineering:	100.6725	PM maximum
GC-MEP Peer Review:	3.91865	PM average
GC Accountant:	97.53325	not in estimate
GC Estimator:	3.897	not in estimate
Lead Superintendent:	97.53325	Sup. maximum
Superintendent:	97.425	Sup. average
Exteriors Superintendent:	97.425	Sup. average
Interiors Superintendent:	97.425	Sup. average
MEP Superintendent:	97.425	Sup. average
MEP Superintendent:	97.425	Sup. average
Project Engineer:	98.291	Eng. average
MEP Engineer:	3.91865	Eng. average
Interiors Engineer:	8.55175	Eng. average
Field Engineer:	97.96625	Eng. minimum
Field Engineer:	97.96625	Eng. minimum
Field Engineer:	97.96625	Eng. minimum
Field Engineer:	97.96625	Eng. minimum

Totals per Pay Scale	Totals per Pay Scale
MEP Superintendent Sup. average	194.85
Project Engineer Eng. minimum	391.865

## Critical Industry Issues

There were two break-out sessions attended at the Partnership for Achieving Construction Excellence (PACE) Roundtable Meeting. The discussion at the meeting was surprising because all of the industry professionals in attendance had very positive attitudes about the situation in the current economy. They are changing with the times and leveraging their knowledge of a cyclical economy to hold their ground in business.

There are few items currently affecting the completion of Ingleside at King Farm. One critical industry issue that did apply was material volatility. The asphalt contractor submitted for a \$60,000 CO due to the oil price increase. This is a large increase for that particular subcontract, but it would only cause an approximate increase of .06% and is relatively small in comparison to the overall project.

There is a seemingly larger push toward integrated projects because owners are seeing the value in the integrated approach. Coleman Walker of Haskell would be very capable of advising students interested in Design-Build (DB). DB is an integrated approach and it embraces cooperative team work between the owner, the builder, and the designer. There are many more opportunities to implement green elements in a building using an integrated project or DB delivery. Part of successful implementation is successful collaboration, which Coleman would be able to explain through Haskell's experience with DB. Another great contact to have in industry is Mark Konchar Balfour Beatty

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Construction. Mark mentioned Balfour Beatty Construction's year-long leadership decathlon as part of their initiative to invest in their people. Investing in people is important to maintaining a positive employee atmosphere, which will spark growth and development. Understanding the growth and development side of the construction industry helps in all aspects and in every industry focus. Coming from an international player, Mark can offer valuable insight in many areas of growth at an employee and a corporate level.

#### PACE Roundtable Break-Out Session I: Mixer:

The Mentorship Model for Architectural Engineering students taught a lot about the differences between what is gained by the industry professional and what is gained by the student. Some professionals view it as a learning tool and value the young perspectives that the students offer. Students bring fresh ideas and knowledge of technological advances to a firm. If the mentorship model is structured properly it positively engages the mentor and mentee in real conversations about real industry topics. There is also a certain level of development and individual growth that is gained by the mentor as they "parent" and guide the student.

It's a rewarding experience for the students because it helps students understand non-academic topics while they are finding their career paths. Once they find their career path, a mentor can help them stay on the path. The mentor provides a reliable and direct line of communication, or connection, to current industry events and current industry issues. The exposure to these experiences and development of a solid business relationship is invaluable for an aspiring young professional.

#### PACE Roundtable Break-Out Session II: Technical Training Topics-Energy & Economy:

The Energy & Economy session gave a positive outlook on an otherwise negative appearing energy crisis and economy. The current energy crisis and rising energy costs impact many industries, especially construction. The economics of the situation sometimes open new doors, but require alternative approaches to the way business is conducted. Maintaining flexibility and the ability to pursue other markets give many companies a competitive edge.

Ideas for alleviating the increasing costs include the use of European technologies. Some of the products may have a higher first cost, but are smart choices when they are evaluated for lifecycle cost. Designing more efficient systems through engineering beyond the requirements of the building codes may provide owners with short payback periods, which makes it more feasible to engage in a new project. An example is the observed energy savings as a result of upsizing electrical conductors to reduce resistance. Industry is moving toward the use of higher efficiency TP-1 transformers and also focusing more on lighting controls to reduce consumption. Again, some of these new products and designs have a higher cost, but they are quickly offset by significant energy savings. Many owners are beginning to see the real value in "getting what you pay for" and requesting these items for their projects. This transition in the way they think is making it easier to procure work with them for those companies that are experienced with implementing and delivering green projects.

Project costs are also increasing due to many product prices that are dependent on the volatile pricing of the raw materials that go into manufacturing them. Material volatility



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is not a new issue, but it is playing a major part in this industry more than it has ever played. Creativity in Construction Management through buy-up tactics, materials contracting, and futures strategies will go a long way in the success of a project. An example of a buy-up tactic is the purchase of co-ops by electrical contractors. The upfront purchase of power can provide savings costs for the electrical contractor and offer new opportunities of selling a portion of their purchased megawatts for a profit. Any opportunity of locking in long term pricing should be taken advantage of wherever possible. Another strategy is for contractors and subcontractors to negotiate futures contracts in the preconstruction phases to purchase certain materials at a future date at a predetermined price. These strategies will help keep prices steady during spikes in the economy and during periods of energy crisis.

Although the current economic situation is not necessarily healthy, there are still many opportunities for companies to be flexible and maintain growth. Success is partially based on knowing the right markets to pursue; Data Centers, Federal Projects, Public Private Partnerships (PPP's), Higher Education, and Healthcare are good markets at this time. Data centers consist of advanced technologies that may not be understood by smaller companies, which opens the opportunity for experienced companies to win a high profile project even in an economic downfall. Federal projects are typically more abundant due to the availability of the public sector funds. Base Realignment and Closure (BRAC) Commission projects are a great area of focus when considering the numerous Department of Defense (DoD) properties in need of major renovation or reuse because the funds are more readily available, which means the projects are less likely to be postponed or cancelled during construction. PPP's are another good market because they are typically funded by the public sector (government sources) and completed through a partnership between the public sector and a private sector company. These projects are also less likely to be postponed or cancelled during construction. Higher education is a key focus during economic hardships as well. State schools in particular receive more federal assistance. This means that these owners have money to spend on new projects and renovations of outdated buildings. Renovations are more important now due to increasing energy costs. Many of these owners are investing in energy savings programs and presenting the opportunity to bid on many high value guaranteed-energy-savings projects. These are sometimes performed by Energy Savings Companies (ESCO) at no expense to the owner. The owner then pays the ESCO a certain percentage with the money they save in energy for a given length of time. Healthcare is a good market to be in because it is another industry that is partially supported by government. It also consists of very complex projects and results in many coordination issues, but the rewards are also higher than they are in the construction of a spec office building.

A combination of strategies and knowledge of the strong markets will allow companies to prevail during a downward swing in the economy. If companies stay rigid in their business models they may suffer. Ultimately, flexible companies will be more likely to maintain steady growth during these times. If proper investments in a company's current employees, the people of the company; are made the company will still earn a profit. Some companies believe in training their current employees at times like this and making them experts in their fields. They have found that new talents and new expertise can even emerge from training their current employees.

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## **Works Cited**

Development, B. D. (2004). *ALP Buckets*. Retrieved October 21, 2008, from ALP Industries: [http://www.alpind.com/pdf\\_files/2007/BTH%20Cc%20Bu.pdf](http://www.alpind.com/pdf_files/2007/BTH%20Cc%20Bu.pdf)

GmbH, L.-I. D. (2008, October 21). *250 EC-B 12 Litronic*. Retrieved 10 21, 2008, from Liebherr USA Home: [http://www.liebherr.us/us-cc/en/products\\_us-cc.asp?menuID=106307!7601-0](http://www.liebherr.us/us-cc/en/products_us-cc.asp?menuID=106307!7601-0)

VStructural, L. -A. (2008, 10 21). Retrieved 10 21, 2008, from VSL: <http://www.vsl.net/>

# Appendices

## 01 21 Allowances

### 01 21 63 – Taxes

01 21 63.10 Taxes		Crew	Daily Output	Labor Hours	Unit	Material	2008 Bare Costs		Total
							Labor	Equipment	
0010	<b>TAXES</b>								
0020	Sales tax, State, average				%	4.87%			
0050	Maximum					7.25%			
0200	Social Security, on first \$97,500 of wages						7.65%		
0300	Unemployment, combined Federal and State, minimum						.80%		
0350	Average						6.20%		
0400	Maximum						11.76%		

## 01 31 Project Management and Coordination

### 01 31 13 – Project Coordination

#### 01 31 13.20 Field Personnel

01 31 13.20 Field Personnel									
0010	<b>FIELD PERSONNEL</b>								
0020	Clerk, average				Week		365		365
0100	Field engineer, minimum						865		865
0120	Average						1,125		1,125
0140	Maximum						1,300		1,300
0160	General purpose laborer, average						1,200		1,200
0180	Project manager, minimum						1,600		1,600
0200	Average						1,850		1,850
0220	Maximum						2,100		2,100
0240	Superintendent, minimum						1,550		1,550
0260	Average						1,700		1,700
0280	Maximum						1,950		1,950
0290	Timekeeper, average						1,005		1,005

#### 01 31 13.30 Insurance

01 31 13.30 Insurance									
0010	<b>INSURANCE</b>								
0020	Builders risk, standard, minimum	R013113-40			Job				
0050	Maximum	R013113-60							
0200	All-risk type, minimum								
0250	Maximum								
0400	Contractor's equipment floater, minimum				Value				
0450	Maximum				"				
0800	Workers' compensation & employer's liability, average								
0850	by trade, carpentry, general				Payroll		18.31%		
0900	Clerical						.68%		
0950	Concrete						15.22%		
1000	Electrical						6.66%		
1050	Excavation						10.46%		
1100	Glazing						14.15%		
1150	Insulation						15.12%		
1200	Lathing						11.04%		
1250	Masonry						14.80%		
1300	Painting & decorating						12.86%		
1350	Pile driving						21.48%		
1400	Plastering						14.39%		
1450	Plumbing						8.11%		
1500	Roofing						32.94%		
1550	Sheet metal work (HVAC)						11.88%		
1600	Steel erection, structural						40.12%		
1650	Tile work, interior ceramic						9.47%		

## 01 45 Quality Control

### 01 45 23 – Testing and Inspecting Services

01 45 23.50 Testing		Crew	Daily Output	Labor Hours	Unit	Material	2008 Bare Costs		Total
							Labor	Equipment	
4735	Soil density, nuclear method, ASTM D2922				Ea.				35
4740	Sand cone method ASTM D1556								27
4750	Moisture content, ASTM D 2216								9
4780	Permeability test, double ring infiltrometer								500
4800	Permeability, var. or constant head, undist., ASTM D 2434								227
4850	Recompacted								250
4900	Proctor compaction, 4" standard mold, ASTM D 698								123
4950	6" modified mold								68
5100	Shear tests, triaxial, minimum								409
5150	Maximum								545
5300	Direct shear, minimum, ASTM D 3080								318
5350	Maximum								409
5550	Technician for inspection, per day, earthwork								210
5570	Concrete								245
5650	Bolting								268
5750	Roofing								244
5790	Welding								257
5820	Non-destructive metal testing, dye penetrant				Day				310
5840	Magnetic particle								310
5860	Radiography								450
5880	Ultrasonic								309
6000	Welding certification, minimum				Ea.				91
6100	Maximum				"				250
7000	Underground storage tank								
7500	Volumetric tightness test, <=12,000 gal				Ea.				435
7510	<=30,000 gal				"				613
7600	Vadose zone (soil gas) sampling, 10-40 samples, min.				Day				1,364
7610	Maximum				"				2,273
7700	Ground water monitoring incl. drilling 3 wells, min.				Total				4,545
7710	Maximum				"				6,364
8000	X-ray concrete slabs				Ea.				182

## 01 51 Temporary Utilities

### 01 51 13 – Temporary Electricity

#### 01 51 13.80 Temporary Utilities

01 51 13.80 Temporary Utilities		Crew	Daily Output	Labor Hours	Unit	Material	2008 Bare Costs		Total
							Labor	Equipment	
0010	<b>TEMPORARY UTILITIES</b>								
0100	Heat, incl. fuel and operation, per week, 12 hrs. per day	1 Skwk	100	.080	CSF Ftr	10.35	3.15		13.50
0200	24 hrs. per day	"	60	.133		19.95	5.25		25.20
0350	Lighting, incl. service lamps, wiring & outlets, minimum	1 Elec	34	.235		2.63	10.70		13.33
0360	Maximum	"	17	.471		5.70	21.50		27.20
0400	Power for temp lighting only, per month, min/month 6.6 KWH								.75
0450	Maximum/month 23.6 KWH								2.85
0600	Power for job duration incl. elevator, etc., minimum								47
0650	Maximum								110
0700	Temporary construction water bill per mo. average				Month	62			62
1000	Toilet, portable, see Equip. Rental 01 54 33 in Reference Section								

## 01 52 Construction Facilities

### 01 52 13 – Field Offices and Sheds

01 52 13.20 Office and Storage Space		Daily Crew	Output	Labor-Hours	Unit	Material	2008 Bare Costs		Total
							Labor	Equipment	
0010	<b>OFFICE AND STORAGE SPACE</b>								
0020	Trailer, furnished, no hookups, 20' x 8', buy	2 Skwk	1	16	Ea.	7,975	630		8,605
0250	Rent per month					201			201
0300	32' x 8', buy	2 Skwk	.70	22.857		11,900	900		12,800
0350	Rent per month					241			241
0400	50' x 10', buy	2 Skwk	.60	26.667		22,500	1,050		23,550
0450	Rent per month					330			330
0500	50' x 12', buy	2 Skwk	.50	32		27,600	1,250		28,850
0550	Rent per month					375			375
0700	For air conditioning, rent per month, add					41			41
0800	For delivery, add per mile				Mile	4.50			4.50
1000	Portable buildings, prefab, on skids, economy, 8' x 8'	2 Corp	265	.060	S.F.	85	2.30		87.30
1100	Deluxe, 8' x 12'	"	150	.107	"	95	4.06		99.06
1200	Storage boxes, 20' x 8', buy	2 Skwk	1.80	8.889	Ea.	4,275	350		4,625
1250	Rent per month					73.50			73.50
1300	40' x 8', buy	2 Skwk	1.40	11.429		5,925	450		6,375
1350	Rent per month					97.50			97.50
5000	Air supported structures, see Div. 13 31 13.13								

### 01 52 13.40 Field Office Expense

0010	<b>FIELD OFFICE EXPENSE</b>								
0100	Office equipment rental average				Month	150			150
0120	Office supplies, average				"	95			95
0125	Office trailer rental, see Div. 01 52 13.20								
0140	Telephone bill; avg. bill/month incl. long dist.				Month	210			210
0160	Lights & HVAC				"	110			110

## 01 54 Construction Aids

### 01 54 09 – Protection Equipment

#### 01 54 09.50 Personnel Protective Equipment

0010	<b>PERSONNEL PROTECTIVE EQUIPMENT</b>								
0015	Hazardous waste protection								
0020	Respirator mask only, full face, silicone				Ea.	219			219
0030	Half face, silicone					32			32
0040	Respirator cartridges, 2 req'd/mask, dust or asbestos					5.30			5.30
0050	Chemical vapor					4.55			4.55
0060	Combination vapor and dust					9.45			9.45
0100	Emergency escape breathing apparatus, 5 min					455			455
0110	10 min					525			525
0150	Self contained breathing apparatus with full face piece, 30 min					1,900			1,900
0160	60 min					3,025			3,025
0200	Encapsulating suits, limited use, level A					890			890
0210	Level B					209			209
0300	Over boots, latex				Pr.	4.11			4.11
0310	PVC					14.40			14.40
0320	Neoprene					51			51
0400	Gloves, nitrile/PVC					5.70			5.70
0410	Neoprene coated					26.50			26.50

#### 01 54 09.60 Safety Nets

0010	<b>SAFETY NETS</b>								
0020	No supports, stock sizes, nylon, 4" mesh				S.F.	1.10			1.10

## 01 52 Construction Facilities

### 01 52.13 – Field Offices and Sheds

01 52 13.20 Office and Storage Space		Crew	Daily Output	Labor-Hours	Unit	Material	2008 Bare Costs		Total	Total Incl O&P
							Labor	Equipment		
0010	<b>OFFICE AND STORAGE SPACE</b>									
0020	Trailer, furnished, no hookups, 20' x 8', buy	2 Skwk	1	16	Ea.	7,975	630		8,605	9,775
0250	Rent per month					201			201	221
0300	32' x 8', buy	2 Skwk	.70	22.857		11,900	900		12,800	14,500
0350	Rent per month					241			241	265
0400	50' x 10', buy	2 Skwk	.60	26.667		22,500	1,050		23,550	26,500
0450	Rent per month					330			330	365
0500	50' x 12', buy	2 Skwk	.50	32		27,600	1,250		28,850	32,400
0550	Rent per month					375			375	410
0700	For air conditioning, rent per month, add					41			41	45
0800	For delivery, add per mile				Mile	4.50			4.50	4.95
1000	Portable buildings, prefab, on skids, economy, 8' x 8'	2 Carp	265	.060	S.F.	85	2.30		87.30	97.50
1100	Deluxe, 8' x 12'	"	150	.107	"	95	4.06		99.06	112
1200	Storage boxes, 20' x 8', buy	2 Skwk	1.80	8.889	Ea.	4,275	350		4,625	5,275
1250	Rent per month					73.50			73.50	80.50
1300	40' x 8', buy	2 Skwk	1.40	11.429		5,925	450		6,375	7,225
1350	Rent per month					97.50			97.50	107
5000	Air supported structures, see Div. 13 31 13.13									

### 01 52 13.40 Field Office Expense

0010	<b>FIELD OFFICE EXPENSE</b>									
0100	Office equipment rental average				Month	150			150	165
0120	Office supplies, average				"	95			95	105
0125	Office trailer rental, see Div. 01 52 13.20									
0140	Telephone bill; avg. bill/month incl. long dist.				Month	210			210	231
0160	Lights & HVAC				"	110			110	121

## 01 54 Construction Aids

### 01 54 09 – Protection Equipment

#### 01 54 09.50 Personnel Protective Equipment

0010	<b>PERSONNEL PROTECTIVE EQUIPMENT</b>									
0015	Hazardous waste protection									
0020	Respirator mask only, full face, silicone				Ea.	219			219	241
0030	Half face, silicone					32			32	35.50
0040	Respirator cartridges, 2 req'd/mask, dust or asbestos					5.30			5.30	5.85
0050	Chemical vapor					4.55			4.55	5
0060	Combination vapor and dust					9.45			9.45	10.40
0100	Emergency escape breathing apparatus, 5 min					455			455	500
0110	10 min					525			525	575
0150	Self contained breathing apparatus with full face piece, 30 min					1,900			1,900	2,075
0160	60 min					3,025			3,025	3,325
0200	Encapsulating suits, limited use, level A					890			890	980
0210	Level B					209			209	230
0300	Over boots, latex				Pr.	4.11			4.11	4.52
0310	PVC					14.40			14.40	15.85
0320	Neoprene					51			51	56.50
0400	Gloves, nitrile/PVC					5.70			5.70	6.25
0410	Neoprene coated					26.50			26.50	29

#### 01 54 09.60 Safety Nets

0010	<b>SAFETY NETS</b>									
0020	No supports, stock sizes, nylon, 4" mesh				S.F.	1.10			1.10	1.21

15

## 01 56 Temporary Barriers and Enclosures

### 01 56 13 – Temporary Air Barriers

01 56 13.90 Winter Protection		Crew	Daily Output	Labor-Hours	Unit	Material	2008 Bare Costs		Total	Total Ind O&P
							Labor	Equipment		
0100	Framing to close openings	2 Clab	750	.021	S.F.	.39	.65		1.04	1.50
0200	Tarpaulins hung over scaffolding, 8 uses, not incl. scaffolding		1500	.011		.25	.32		.57	.81
0250	Tarpaulin polyester reinf. w/ integral fastening system 11 mils thick		1600	.010		.80	.30		1.10	1.38
0300	Prefab fiberglass panels, steel frame, 8 uses		1200	.013		.85	.40		1.25	1.61

### 01 56 23 – Temporary Barricades

#### 01 56 23.10 Barricades

01 56 23.10 BARRICADES		Crew	Daily Output	Labor-Hours	Unit	Material	2008 Bare Costs		Total	Total Ind O&P
							Labor	Equipment		
0010	<b>BARRICADES</b>									
0020	5' high, 3 rail @ 2" x 8", fixed	2 Carp	20	.800	L.F.	5.35	30.50		35.85	56.50
0150	Movable	"	30	.533	"	4.40	20.50		24.90	38.50
0300	Stack units, 6' high, 8' wide, plain, buy				Ea.	435			435	480
0350	With reflective tape, buy				"	525			525	580
0400	Break-a-way 3" PVC pipe barricade									
0410	with 3 ea. 1' x 4' reflectorized panels, buy				Ea.	305			305	335
0500	Plywood with steel legs, 32" wide					72			72	79
0600	Telescoping Christmas tree, 9' high, 5 flags, buy					122			122	134
0800	Traffic cones, PVC, 18" high					7.20			7.20	7.90
0850	28" high					14.35			14.35	15.80
1000	Guardrail, wooden, 3' high, 1" x 6", on 2" x 4" posts	2 Carp	200	.080	L.F.	1.09	3.05		4.14	6.25
1100	2" x 6", on 4" x 4" posts	"	165	.097		2.29	3.69		5.98	8.60
1200	Portable metal with base pads, buy					13.15			13.15	14.50
1250	Typical installation, assume 10 reuses	2 Carp	600	.027		1.31	1.02		2.33	3.12
1300	Barricade tape, polyethylene, 7 mil, 3" wide x 500' long roll				Ea.	25			25	27.50
5000	Barricades, see Div. 01 54 33.40									

### 01 56 26 – Temporary Fencing

#### 01 56 26.50 Temporary Fencing

01 56 26.50 TEMPORARY FENCING		Crew	Daily Output	Labor-Hours	Unit	Material	2008 Bare Costs		Total	Total Ind O&P
							Labor	Equipment		
0010	<b>TEMPORARY FENCING</b>									
0020	Chain link, 11 ga, 5' high	2 Clab	400	.040	L.F.	6.50	1.21		7.71	9.15
0100	6' high		300	.053		7	1.61		8.61	10.35
0200	Rented chain link, 6' high, to 1000' (up to 12 mo.)		400	.040		1.79	1.21		3	3.97
0250	Over 1000' (up to 12 mo.)		300	.053		1.97	1.61		3.58	4.84
0350	Plywood, painted, 2" x 4" frame, 4' high	A-4	135	.178		5.30	6.50		11.80	16.55
0400	4" x 4" frame, 8' high	"	110	.218		10.70	8		18.70	25
0500	Wire mesh on 4" x 4" posts, 4' high	2 Carp	100	.160		10.20	6.10		16.30	21.50
0550	8' high	"	80	.200		15.45	7.60		23.05	29.50

### 01 56 29 – Temporary Protective Walkways

#### 01 56 29.50 Protection

01 56 29.50 PROTECTION		Crew	Daily Output	Labor-Hours	Unit	Material	2008 Bare Costs		Total	Total Ind O&P
							Labor	Equipment		
0010	<b>PROTECTION</b>									
0020	Stair tread, 2" x 12" planks, 1 use	1 Carp	75	.107	Tread	3.73	4.06		7.79	10.85
0100	Exterior plywood, 1/2" thick, 1 use		65	.123		1.56	4.69		6.25	9.45
0200	3/4" thick, 1 use		60	.133		2.61	5.10		7.71	11.25
2200	Sidewalks, 2" x 12" planks, 2 uses		350	.023	S.F.	.62	.87		1.49	2.12
2300	Exterior plywood, 2 uses, 1/2" thick		750	.011		.26	.41		.67	.96
2500	3/4" thick		600	.013		.44	.51		.95	1.32

### 01 56 32 – Temporary Security

#### 01 56 32.50 Watchman

01 56 32.50 WATCHMAN		Crew	Daily Output	Labor-Hours	Unit	Material	2008 Bare Costs		Total	Total Ind O&P
							Labor	Equipment		
0010	<b>WATCHMAN</b>									
0020	Service, monthly basis, uniformed person, minimum				Hr.				25	27.50
0100	Maximum								45.45	50
0200	Person and command dog, minimum								31	34
0300	Maximum								54.55	60

## 01 56 Temporary Barriers and Enclosures

### 01 56 32 – Temporary Security

01 56 32.50 Watchman		Crew	Daily Output	Labor-Hours	Unit	Material	2008 Base Costs		Total	Total Ind O&P
							Labor	Equipment		
0500	Sentry dog, leased, with job patrol (yard dog), 1 dog				Week				290	319
0600	2 dogs				"				390	429
0800	Purchase, trained sentry dog, minimum				Ea.				1,364	1,500
0900	Maximum				"				2,727	3,000

## 01 58 Project Identification

### 01 58 13 – Temporary Project Signage

#### 01 58 13.50 Signs

0010	<b>SIGNS</b>									
0020	High intensity reflectorized, no posts, buy				S.F.	17.90			17.90	19.70

## 01 71 Examination and Preparation

### 01 71 23 – Field Engineering

#### 01 71 23.13 Construction Layout

0010	<b>CONSTRUCTION LAYOUT</b>									
1100	Crew for layout of building, trenching or pipe laying, 2 person crew	A-6	1	16	Day		615	69	684	1,075
1200	3 person crew	A-7	1	24	↓		1,000	69	1,069	1,700
1400	Crew for roadway layout, 4 person crew	A-8	1	32	↓		1,300	69	1,369	2,175

#### 01 71 23.19 Surveyor Stakes

0010	<b>SURVEYOR STAKES</b>									
0020	Hardwood, 1" x 1" x 48" long				C	54			54	59.50
0100	2" x 2" x 18" long				↓	68.50			68.50	75
0150	2" x 2" x 24" long				↓	80			80	88
0200	2" x 2" x 30" long				↓	74			74	81.50

## 01 74 Cleaning and Waste Management

### 01 74 13 – Progress Cleaning

#### 01 74 13.20 Cleaning Up

0010	<b>CLEANING UP</b>									
0020	After job completion, allow, minimum				Job					30%
0040	Maximum				"					1%
0042	Rubbish removal, see Div. 02 41 19.23									
0052	Cleanup of floor area, continuous, per day, during const.	A-5	16	1,125	M.S.F.	1.70	34	2.80	38.50	61
0100	Final by GC at end of job	"	11.50	1,565	"	2.71	47	3.90	53.61	85.50

## 01 91 Commissioning

### 01 91 13 – General Commissioning Requirements

#### 01 91 13.50 Commissioning

0010	<b>COMMISSIONING</b> Including documentation of design intent									
0100	performance verification, O&M, training, minimum				Project					50%
0150	Maximum				"					75%



## 03 21 Reinforcing Steel

### 03 21 13 – Galvanized Reinforcing Steel

03 21 13.10 Galvanized Reinforcing		Daily Crew	Output	Labor-Hours	Unit	Material	2008 Labor	Bare Costs Equipment	Total	Total Incl O&P
0010	<b>GALVANIZED REINFORCING</b>									
0150	Galvanized, #3				Ton	750			750	825
0200	#4					750			750	825
0250	#5					735			735	810
0300	#6 or over					735			735	810
1000	For over 20 tons, #6 or larger, minimum					680			680	750
1500	Maximum					815			815	900

### 03 21 16 – Epoxy-Coated Reinforcing Steel

#### 03 21 16.10 Epoxy-Coated Reinforcing

03 21 16.10 Epoxy-Coated Reinforcing		Daily Crew	Output	Labor-Hours	Unit	Material	2008 Labor	Bare Costs Equipment	Total	Total Incl O&P
0010	<b>EPOXY-COATED REINFORCING</b>									
0100	Epoxy coated, A775				Ton	400			400	440

## 03 22 Welded Wire Fabric Reinforcing

### 03 22 05 – Uncoated Welded Wire Fabric

#### 03 22 05.50 Welded Wire Fabric

03 22 05.50 Welded Wire Fabric		Daily Crew	Output	Labor-Hours	Unit	Material	2008 Labor	Bare Costs Equipment	Total	Total Incl O&P
0010	<b>WELED WIRE FABRIC ASTM A185</b>									
0050	Sheets									
0100	6 x 6 - W1.4 x W1.4 (10 x 10) 21 lb. per C.S.F.	CN	2 Rodm	35	.457	C.S.F.	13.25	19.65	32.90	47
0200	6 x 6 - W2.1 x W2.1 (8 x 8) 30 lb. per C.S.F.			31	.516		15.65	22	37.65	53.50
0300	6 x 6 - W2.9 x W2.9 (6 x 6) 42 lb. per C.S.F.			29	.552		20	23.50	43.50	61
0400	6 x 6 - W4 x W4 (4 x 4) 58 lb. per C.S.F.			27	.593		29	25.50	54.50	74
0500	4 x 4 - W1.4 x W1.4 (10 x 10) 31 lb. per C.S.F.			31	.516		20	22	42	59
0600	4 x 4 - W2.1 x W2.1 (8 x 8) 44 lb. per C.S.F.			29	.552		26.50	23.50	50	68
0650	4 x 4 - W2.9 x W2.9 (6 x 6) 61 lb. per C.S.F.			27	.593		31.50	25.50	57	76.50
0700	4 x 4 - W4 x W4 (4 x 4) 85 lb. per C.S.F.			25	.640		47	27.50	74.50	97
0750	Rolls									
0800	2 x 2 - #14 galv., 21 lb./C.S.F., beam & column wrap		2 Rodm	6.50	2.462	C.S.F.	33	106	139	211
0900	2 x 2 - #12 galv. for gunite reinforcing		"	6.50	2.462	"	39.50	106	145.50	218

## 03 23 Stressing Tendons

### 03 23 05 – Prestressing Tendons

#### 03 23 05.50 Prestressing Steel

03 23 05.50 Prestressing Steel		Daily Crew	Output	Labor-Hours	Unit	Material	2008 Labor	Bare Costs Equipment	Total	Total Incl O&P	
0010	<b>PRESTRESSING STEEL</b>										
0100	Grouted strand, post-tensioned in field, 50' span, 100 kip		C-3	1200	.053	Lb.	2.08	2.10	.08	4.26	5.75
0150	300 kip			2700	.024		.91	.93	.04	1.88	2.54
0300	100' span, 100 kip			1700	.038		2.08	1.48	.06	3.62	4.75
0350	300 kip			3200	.020		1.79	.79	.03	2.61	3.27
0500	200' span, 100 kip			2700	.024		2.08	.93	.04	3.05	3.83
0550	300 kip			3500	.018		1.79	.72	.03	2.54	3.16
0800	Grouted bars, 50' span, 42 kip			2600	.025		.91	.97	.04	1.92	2.60
0850	143 kip			3200	.020		.87	.79	.03	1.69	2.26
1000	75' span, 42 kip			3200	.020		.92	.79	.03	1.74	2.31
1050	143 kip			4200	.015		.78	.60	.02	1.40	1.86
1200	Ungouted strand, 50' span, 100 kip		C-4	1275	.025		.51	1.09	.02	1.62	2.37
1250	300 kip			1475	.022		.51	.94	.02	1.47	2.13
1400	100' span, 100 kip			1500	.021		.51	.93	.02	1.46	2.10
1450	300 kip			1650	.019		.51	.84	.02	1.37	1.96
1600	200' span, 100 kip			1500	.021		.51	.93	.02	1.46	2.10

# 03 35 Concrete Finishing

## 03 35 29 – Tooled Concrete Finishing

03 35 29.30 Finishing Floors		Crew	Daily Output	Labor-Hours	Unit	Material	2008 Bare Costs			Total	Total Incl O&P
							Labor	Equipment			
0010	<b>FINISHING FLOORS</b>										
0020	Manual screed finish	C-10	4800	.005	S.F.		.17			.17	.26
0100	Manual screed and bull float		4000	.006			.21			.21	.31
0125	Manual screed, bull float, manual float		2000	.012			.42			.42	.62
0150	Manual screed, bull float, manual float & broom finish		1850	.013			.45			.45	.67
0200	Manual screed, bull float, manual float, manual steel trowel		1265	.019			.66			.66	.98
0250	Manual screed, bull float, machine float & trowel (walk-behind)	C-10C	1715	.014			.49	.02		.51	.76
0300	Power screed, bull float, machine float & trowel (walk-behind)	C-10D	2400	.010			.35	.04		.39	.57
0350	Power screed, bull float, machine float & trowel (ride-on)	C-10E	4000	.006			.21	.06		.27	.37
0400	Integral topping and finish, using 1:1:2 mix, 3/16" thick	C-10B	1000	.040		.08	1.32	.23		1.63	2.34
0450	1/2" thick		950	.042		.21	1.39	.24		1.84	2.60
0500	3/4" thick		850	.047		.32	1.55	.27		2.14	3
0600	1" thick		750	.053		.43	1.76	.31		2.50	3.47
0800	Granolithic topping, laid after, 1:1:1-1/2 mix, 1/2" thick		590	.068		.24	2.23	.39		2.86	4.08
0820	3/4" thick		580	.069		.36	2.27	.40		3.03	4.29
0850	1" thick		575	.070		.48	2.29	.40		3.17	4.45
0950	2" thick		500	.080		.96	2.64	.46		4.06	5.55
1200	Heavy duty, 1:1:2, 3/4" thick, presthrunk, gray, 20 MSF		320	.125		.32	4.12	.72		5.16	7.40
1300	100 MSF		380	.105		.32	3.47	.60		4.39	6.25
1600	Exposed local aggregate finish, minimum	1 Cefi	625	.013		.21	.47			.68	.93
1650	Maximum		465	.017		.31	.64			.95	1.27
1800	Floor abrasives, .25 psf, aluminum oxide		850	.009		.35	.35			.70	.90
1850	Silicon carbide		850	.009		.49	.35			.84	1.05
2000	Floor hardeners, metallic, light service, .50 psf, add		850	.009		.48	.35			.83	1.04
2050	Medium service, .75 psf		750	.011		.72	.39			1.11	1.38
2100	Heavy service, 1.0 psf		650	.012		.96	.46			1.42	1.73
2150	Extra heavy, 1.5 psf		575	.014		1.45	.51			1.96	2.35
2300	Non-metallic, light service, .50 psf		850	.009		.17	.35			.52	.70
2350	Medium service, .75 psf		750	.011		.26	.39			.65	.87
2400	Heavy service, 1.00 psf		650	.012		.35	.46			.81	1.05
2450	Extra heavy, 1.50 psf		575	.014		.52	.51			1.03	1.33
2800	Trap rock wearing surface for monolithic floors										
2810	2.0 psf	C-10B	1250	.032	S.F.	.03	1.05	.18		1.26	1.83
3000	Floor coloring, dusted on, minimum (0.6 psf), add to above	1 Cefi	1300	.006		.39	.23			.62	.76
3050	Maximum (1.0 psf), add to above	"	625	.013		.65	.47			1.12	1.42
3100	Colored powder only				Lb.	.65				.65	.72
3600	1/2" topping using 0.6 psf powdered color	C-10B	590	.068	S.F.	5.05	2.23	.39		7.67	9.35
3650	1/2" topping using 1.0 psf powdered color	"	590	.068		5.30	2.23	.39		7.92	9.65
3800	Dustproofing, solvent-based, 1 coat	1 Cefi	1900	.004		.16	.16			.32	.40
3850	2 coats		1300	.006		.56	.23			.79	.95
4000	Epoxy-based, 1 coat		1500	.005		.12	.20			.32	.42
4050	2 coats		1500	.005		.25	.20			.45	.56
4400	Stair finish, float		275	.029			1.08			1.08	1.58
4500	Steel trowel finish		200	.040			1.48			1.48	2.17
4600	Silicon carbide finish, .25 psf		150	.053		.35	1.97			2.32	3.29
<b>03 35 29.35 Control Joints, Saw Cut</b>											
0010	<b>CONTROL JOINTS, SAW CUT</b>										
0100	Sawcut in green concrete										
0120	1" depth	C-27	2000	.008	L.F.	.06	.30	.07		.43	.57
0140	1-1/2" depth		1800	.009		.10	.33	.08		.51	.67
0160	2" depth		1600	.010		.13	.37	.08		.58	.77
0200	Clean out control joint of debris	C-28	6000	.001			.05			.05	.07

## 03 24 Fibrous Reinforcing

### 03 24 05 – Reinforcing Fibers

03 24 05.30 Synthetic Fibers		Crew	Daily Output	Labor-Hours	Unit	Material	2008 Bare Costs		Total	Total Incl O&P
SYNTHETIC FIBERS							Labor	Equipment		
0010	Synthetic fibers, add to concrete				Lb.	3.98			3.98	4.38
0100	1-1/2 lb. per C.Y.				C.Y.	6.15			6.15	6.75
03 24 05.70 Steel Fibers										
STEEL FIBERS										
0010	Steel fibers, add to concrete				Lb.	.46			.46	.51
0150	25 lb. per C.Y.				C.Y.	11.50			11.50	12.65
0160	50 lb. per C.Y.					23			23	25.50
0170	75 lb. per C.Y.					35.50			35.50	39
0180	100 lb. per C.Y.					46			46	50.50

## 03 30 Cast-In-Place Concrete

### 03 30 53 – Miscellaneous Cast-In-Place Concrete

03 30 53.40 Concrete In Place										
CONCRETE IN PLACE										
0010	Including forms (4 uses), reinforcing steel, concrete, placement, and finishing unless otherwise indicated	R033053-50								
0050	Beams, 5 kip per L.F., 10' span	C-14A	15.62	12.804	C.Y.	315	490	48.50	853.50	1,225
0350	25' span	"	18.55	10.782		325	415	40.50	780.50	1,100
0500	Chimney foundations, industrial, minimum	C-14C	32.22	3.476		145	127	.76	272.76	370
0510	Maximum	"	23.71	4.724		172	173	1.04	346.04	475
0700	Columns, square, 12" x 12", minimum reinforcing	C-14A	11.96	16.722		335	640	63	1,038	1,525
0720	Average reinforcing		10.13	19.743		530	755	74.50	1,359.50	1,925
0740	Maximum reinforcing		9.03	22.148		795	850	83.50	1,728.50	2,375
0800	16" x 16", minimum reinforcing		16.22	12.330		269	475	46.50	790.50	1,125
0820	Average reinforcing		12.57	15.911		455	610	60	1,125	1,600
0840	Maximum reinforcing		10.25	19.512		700	750	73.50	1,523.50	2,100
0900	24" x 24", minimum reinforcing		23.66	8.453		231	325	32	588	830
0920	Average reinforcing		17.71	11.293		410	435	42.50	887.50	1,225
0940	Maximum reinforcing		14.15	14.134		645	540	53.50	1,238.50	1,675
1000	36" x 36", minimum reinforcing		33.69	5.936		205	228	22.50	455.50	630
1020	Average reinforcing		23.32	8.576		360	330	32.50	722.50	975
1040	Maximum reinforcing		17.82	11.223		605	430	42.50	1,077.50	1,425
1200	16" diameter, minimum reinforcing		31.49	6.351		268	244	24	536	725
1220	Average reinforcing		19.12	10.460		465	400	39.50	904.50	1,225
1240	Maximum reinforcing		13.77	14.524		695	555	55	1,305	1,750
1300	20" diameter, minimum reinforcing		41.04	4.873		265	187	18.35	470.35	620
1320	Average reinforcing		24.05	8.316		445	320	31.50	796.50	1,050
1340	Maximum reinforcing		17.01	11.758		695	450	44.50	1,189.50	1,575
1400	24" diameter, minimum reinforcing		51.85	3.857		251	148	14.55	413.55	540
1420	Average reinforcing		27.06	7.391		445	284	28	757	990
1440	Maximum reinforcing		18.29	10.935		685	420	41	1,146	1,500
1500	36" diameter, minimum reinforcing		75.04	2.665		254	102	10.05	366.05	460
1520	Average reinforcing		37.49	5.335		425	205	20	650	830
1540	Maximum reinforcing		22.84	8.757		665	335	33	1,033	1,325
1900	Elevated slabs, flat slab with drops, 125 psf Sup. Load, 20' span	C-14B	38.45	5.410		263	207	19.60	489.60	655
1950	30' span		50.99	4.079		275	156	14.75	445.75	575
2100	Flat plate, 125 psf Sup. Load, 15' span		30.24	6.878		242	264	25	531	730
2150	25' span		49.60	4.194		249	161	15.20	425.20	555
2300	Waffle const., 30" domes, 125 psf Sup. Load, 20' span		37.07	5.611		375	215	20.50	610.50	790
2350	30' span		44.07	4.720		335	181	17.10	533.10	685

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# 03 30 Cast-In-Place Concrete

## 03 30 53 – Miscellaneous Cast-In-Place Concrete

03 30 53.40 Concrete In Place		Crew	Daily Output	Labor-Hours	Unit	Material	2008 Bare Costs			Total	Total Incl O&P
							Labor	Equipment			
2500	One way joists, 30" pans, 125 psf Sup. Load, 15' span	C-14B	27.38	7.597	C.Y.	450	291	27.50	768.50	1,000	
2550	25' span		31.15	6.677		410	256	24	690	905	
2700	One way beam & slab, 125 psf Sup. Load, 15' span		20.59	10.102		264	385	36.50	685.50	970	
2750	25' span		28.36	7.334		246	281	26.50	553.50	765	
2900	Two way beam & slab, 125 psf Sup. Load, 15' span		24.04	8.652		253	330	31.50	614.50	865	
2950	25' span		35.87	5.799		216	222	21	459	630	
3100	Elevated slabs including finish, not including forms or reinforcing										
3110	Regular concrete, 4" slab	C-8	2613	.021	S.F.	1.36	.73	.28	2.37	2.98	
3200	6" slab		2585	.022		2.02	.73	.28	3.03	3.71	
3250	2-1/2" thick floor fill		2685	.021		.87	.71	.27	1.85	2.40	
3300	Lightweight, 110# per C.F., 2-1/2" thick floor fill		2585	.022		1.19	.73	.28	2.20	2.80	
3400	Cellular concrete, 1-5/8" fill, under 5000 S.F.		2000	.028		.79	.95	.36	2.10	2.80	
3450	Over 10,000 S.F.		2200	.025		.76	.86	.33	1.95	2.58	
3500	Add per floor for 3 to 6 stories high		31800	.002			.06	.02	.08	.13	
3520	For 7 to 20 stories high		21200	.003			.09	.03	.12	.18	
3540	Equipment pad, 3' x 3' x 6" thick	C-14H	45	1.067	Ea.	45.50	40.50	.55	86.55	117	
3550	4' x 4' x 6" thick		30	1.600		67	60.50	.83	128.33	174	
3560	5' x 5' x 8" thick		18	2.667		116	101	1.39	218.39	296	
3570	6' x 6' x 8" thick		14	3.429		157	129	1.78	287.78	390	
3580	8' x 8' x 10" thick		8	6		330	227	3.12	560.12	745	
3590	10' x 10' x 12" thick		5	9.600		560	365	4.99	929.99	1,225	
3800	Footings, spread under 1 C.Y.	C-14C	28	4	C.Y.	173	146	.88	319.88	435	
3825	1 C.Y. to 5 C.Y.		43	2.605		192	95.50	.57	288.07	370	
3850	Over 5 C.Y.		75	1.493		176	54.50	.33	230.83	285	
3900	Footings, strip, 18" x 9", unreinforced	C-14L	40	2.400		119	85.50	.62	205.12	273	
3920	18" x 9", reinforced	C-14C	35	3.200		142	117	.70	259.70	350	
3925	20" x 10", unreinforced	C-14L	45	2.133		117	76	.55	193.55	254	
3930	20" x 10", reinforced	C-14C	40	2.800		135	103	.62	238.62	320	
3935	24" x 12", unreinforced	C-14L	55	1.745		115	62	.45	177.45	228	
3940	24" x 12", reinforced	C-14C	48	2.333		133	85.50	.51	219.01	290	
3945	36" x 12", unreinforced	C-14L	70	1.371		112	49	.36	161.36	204	
3950	36" x 12", reinforced	C-14C	60	1.867		128	68.50	.41	196.91	254	
4000	Foundation mat, under 10 C.Y.		38.67	2.896		197	106	.64	303.64	395	
4050	Over 20 C.Y.		56.40	1.986		173	72.50	.44	245.94	310	
4200	Grade walls, 8" thick, 8' high	C-14D	45.83	4.364		177	166	16.45	359.45	485	
4250	14' high		27.26	7.337		228	279	27.50	534.50	740	
4260	12" thick, 8' high		64.32	3.109		158	118	11.70	287.70	380	
4270	14' high		40.01	4.999		179	190	18.85	387.85	535	
4300	15" thick, 8' high		80.02	2.499		149	95	9.40	253.40	330	
4350	12' high		51.26	3.902		158	148	14.70	320.70	435	
4500	18' high		48.85	4.094		175	155	15.45	345.45	465	
4520	Handicap access ramp, railing both sides, 3' wide	C-14H	14.58	3.292	L.F.	251	124	1.71	376.71	485	
4525	5' wide		12.22	3.928		259	148	2.04	409.04	530	
4530	With 6" curb and rails both sides, 3' wide		8.55	5.614		259	212	2.92	473.92	640	
4535	5' wide		7.31	6.566		264	248	3.41	515.41	705	
4650	Slab on grade, not including finish, 4" thick	C-14E	60.75	1.449	C.Y.	122	55	.41	177.41	226	
4700	6" thick	"	92	.957	"	117	36	.27	153.27	190	
4751	Slab on grade, incl. troweled finish, not incl. forms or reinforcing, over 10,000 S.F., 4" thick	C-14F	3425	.021	S.F.	1.34	.74	.01	2.09	2.65	
4820	6" thick		3350	.021		1.95	.75	.01	2.71	3.36	
4840	8" thick		3184	.023		2.67	.79	.01	3.47	4.21	
4900	12" thick		2734	.026		4.01	.92	.01	4.94	5.90	

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### 03 31 Structural Concrete

#### 03 31 05 - Normal Weight Structural Concrete

03 31 05.70 Placing Concrete		Crew	Daily Output	Labor Hours	Unit	Material	2008 Base Costs			Total	Total Ind O&P
							Labor	Equipment			
3800	With crane and bucket	C-7	80	.900	C.Y.		29.50	14.85		44.35	64.50
3850	Pile cap, 5 C.Y. to 10 C.Y., direct chute	C-6	175	.274			8.70	.28		8.98	14.55
3900	Pumped	C-20	200	.320			10.40	3.89		14.29	21.50
3950	With crane and bucket	C-7	150	.480			15.75	7.90		23.65	34
4000	Over 10 C.Y., direct chute	C-6	215	.223			7.10	.23		7.33	11.95
4050	Pumped	C-20	240	.267			8.70	3.24		11.94	17.70
4100	With crane and bucket	C-7	185	.389			12.80	6.40		19.20	28
4300	Slab on grade, up to 6" thick, direct chute	C-6	110	.436			13.85	.45		14.30	23
4350	Pumped	C-20	130	.492			16	6		22	32.50
4400	With crane and bucket	C-7	110	.655			21.50	10.80		32.30	47
4600	Over 6" thick, direct chute	C-6	165	.291			9.20	.30		9.50	15.45
4650	Pumped	C-20	185	.346			11.25	4.20		15.45	23
4700	With crane and bucket	C-7	145	.497			16.30	8.20		24.50	35.50
4900	Walls, 8" thick, direct chute	C-6	90	.533			16.90	.55		17.45	28
4950	Pumped	C-20	100	.640			21	7.80		28.80	42.50
5000	With crane and bucket	C-7	80	.900			29.50	14.85		44.35	64.50
5050	12" thick, direct chute	C-6	100	.480			15.20	.49		15.69	25.50
5100	Pumped	C-20	110	.582			18.95	7.05		26	39
5200	With crane and bucket	C-7	90	.800			26.50	13.20		39.70	57
5300	15" thick, direct chute	C-6	105	.457			14.50	.47		14.97	24.50
5350	Pumped	C-20	120	.533			17.35	6.50		23.85	35.50
5400	With crane and bucket	C-7	95	.758			25	12.50		37.50	54.50
5600	Wheeled concrete dumping, add to placing costs above										
5610	Walking cart, 50' haul, add	C-18	32	.281	C.Y.		8.55	1.76		10.31	16.15
5620	150' haul, add		24	.375			11.45	2.35		13.80	21.50
5700	250' haul, add		18	.500			15.25	3.14		18.39	28.50
5800	Riding cart, 50' haul, add	C-19	80	.113			3.43	1.06		4.49	6.85
5810	150' haul, add		60	.150			4.57	1.41		5.98	9.10
5900	250' haul, add		45	.200			6.10	1.88		7.98	12.15
9000	Minimum labor/equipment charge	C-6	2	.24	Job		760	24.50		784.50	1,275

### 03 35 Concrete Finishing

#### 03 35 29 - Tooled Concrete Finishing

##### 03 35 29.30 Finishing Floors

0010 FINISHING FLOORS		Crew	Daily Output	Labor Hours	Unit	Material	2008 Base Costs			Total	Total Ind O&P
							Labor	Equipment			
0020	Manual screed finish	C-10	4800	.005	S.F.		.17			.17	.28
0100	Manual screed and bull float		4000	.006			.21			.21	.33
0125	Manual screed, bull float, manual float		2080	.012			.42			.42	.66
0150	Manual screed, bull float, manual float & broom finish		1850	.013			.45			.45	.72
0200	Manual screed, bull float, manual float, manual steel trowel		1265	.019			.66			.66	1.05
0250	Manual screed, bull float, machine float & trowel (walk-behind)	C-10C	1715	.014			.49	.02		.51	.80
0300	Power screed, bull float, machine float & trowel (walk-behind)	C-10D	2400	.010			.35	.04		.39	.60
0350	Power screed, bull float, machine float & trowel (ride-on)	C-10E	4000	.006			.21	.06		.27	.39
0370	Minimum labor/equipment charge	C-10	2	.12	Job		415			415	665
0400	Integral topping and finish, using 1:1:2 mix, 3/16" thick	C-10B	1000	.040	S.F.	.08	1.32	.23		1.63	2.47
0450	1/2" thick		950	.042			.21	1.39	.24	1.84	2.74
0500	3/4" thick		850	.047		.32	1.55	.27		2.14	3.16
0600	1" thick		750	.053		.43	1.76	.31		2.50	3.65
0800	Granolithic topping, laid after, 1:1:1-1/2 mix, 1/2" thick		590	.068		.24	2.23	.39		2.86	4.30
0820	3/4" thick		580	.069		.36	2.27	.40		3.03	4.51
0850	1" thick		575	.070		.46	2.29	.40		3.17	4.68

# 05 21 Steel Joist Framing

## 05 21 19 – Open Web Steel Joist Framing

05 21 19.10 Open Web Joists		Crew	Daily Output	Labor-Hours	Unit	Material	2008 Bare Costs		Total	Total Incl O&P
							Labor	Equipment		
0020	K series, 40-ton lots, horiz. bridging, spans to 30', shop primer, minimum	E-7	15	5.333	Ton	1,350	226	122	1,698	2,025
0050	Average		12	6.667		1,500	283	153	1,936	2,325
0080	Maximum		9	8.889		1,825	375	203	2,403	2,900
0130	8K1, 5.1 Lb/LF		1200	.067	L.F.	3.85	2.83	1.53	8.21	11.05
0140	10K1, 5.0 Lb/LF		1200	.067		3.78	2.83	1.53	8.14	11
0160	12K3, 5.7 Lb/LF		1500	.053		4.31	2.26	1.22	7.79	10.20
0180	14K3, 6.0 Lb/LF		1500	.053		4.53	2.26	1.22	8.01	10.45
0200	16K3, 6.3 Lb/LF		1800	.044		4.76	1.88	1.02	7.66	9.80
0220	16K6, 8.1 Lb/LF		1800	.044		6.10	1.88	1.02	9	11.30
0240	18K5, 7.7 Lb/LF		2000	.040		5.80	1.70	.92	8.42	10.50
0260	18K9, 10.2 Lb/LF		2000	.040		7.70	1.70	.92	10.32	12.55
0410	Span 30' to 50', minimum		17	4.706	Ton	1,325	200	108	1,633	1,925
0440	Average		17	4.706		1,475	200	108	1,783	2,100
0460	Maximum		10	8		1,575	340	183	2,098	2,550
0500	20K5, 8.2 Lb/LF		2000	.040	L.F.	6.10	1.70	.92	8.72	10.80
0520	20K9, 10.8 Lb/LF		2000	.040		8	1.70	.92	10.62	12.90
0540	22K5, 8.8 Lb/LF		2000	.040		6.55	1.70	.92	9.17	11.30
0560	22K9, 11.3 Lb/LF		2000	.040		8.40	1.70	.92	11.02	13.30
0580	24K6, 9.7 Lb/LF		2200	.036		7.20	1.54	.83	9.57	11.65
0600	24K10, 13.1 Lb/LF		2200	.036		9.70	1.54	.83	12.07	14.45
0620	26K6, 10.6 Lb/LF		2200	.036		7.85	1.54	.83	10.22	12.40
0640	26K10, 13.8 Lb/LF		2200	.036		10.25	1.54	.83	12.62	15
0660	28K8, 12.7 Lb/LF		2400	.033		9.40	1.41	.76	11.57	13.75
0680	28K12, 17.1 Lb/LF		2400	.033		12.70	1.41	.76	14.87	17.35
0700	30K8, 13.2 Lb/LF		2400	.033		9.80	1.41	.76	11.97	14.15
0720	30K12, 17.6 Lb/LF		2400	.033		13.05	1.41	.76	15.22	17.75
0800	For less than 40-ton job lots									
0802	For 30 to 39 tons, add					10%				
0804	20 to 29 tons, add					20%				
0806	10 to 19 tons, add					30%				
0807	5 to 9 tons, add					50%	25%			
0808	1 to 4 tons, add					75%	50%			
0809	Less than 1 ton, add					100%	100%			
1010	CS series, 40-ton job lots, horizontal bridging, shop primer									
1020	Spans to 30', minimum	E-7	15	5.333	Ton	1,400	226	122	1,748	2,075
1040	Average		12	6.667		1,550	283	153	1,986	2,375
1060	Maximum		9	8.889		1,825	375	203	2,403	2,900
1100	10CS2, 7.5 Lb/LF		1200	.067	L.F.	5.80	2.83	1.53	10.16	13.25
1120	12CS2, 8.0 Lb/LF		1500	.053		6.20	2.26	1.22	9.68	12.25
1140	14CS2, 8.0 Lb/LF		1500	.053		6.20	2.26	1.22	9.68	12.25
1160	16CS2, 8.5 Lb/LF		1800	.044		6.60	1.88	1.02	9.50	11.80
1180	16CS4, 14.5 Lb/LF		1800	.044		11.25	1.88	1.02	14.15	16.90
1200	18CS2, 9.0 Lb/LF		2000	.040		7	1.70	.92	9.62	11.75
1220	18CS4, 15.0 Lb/LF		2000	.040		11.65	1.70	.92	14.27	16.90
1240	20CS2, 9.5 Lb/LF		2000	.040		7.35	1.70	.92	9.97	12.20
1260	20CS4, 16.5 Lb/LF		2000	.040		12.80	1.70	.92	15.42	18.15
1280	22CS2, 10.0 Lb/LF		2000	.040		7.75	1.70	.92	10.37	12.65
1300	22CS4, 16.5 Lb/LF		2000	.040		12.80	1.70	.92	15.42	18.15
1320	24CS2, 10.0 Lb/LF		2200	.036		7.75	1.54	.83	10.12	12.30
1340	24CS4, 16.5 Lb/LF		2200	.036		12.80	1.54	.83	15.17	17.80
1360	26CS2, 10.0 Lb/LF		2200	.036		7.75	1.54	.83	10.12	12.30
1380	26CS4, 16.5 Lb/LF		2200	.036		12.80	1.54	.83	15.17	17.80
1400	28CS2, 10.5 Lb/LF		2400	.033		8.15	1.41	.76	10.32	12.35

## 05 31 Steel Decking

### 05 31 13 – Steel Floor Decking

05 31 13.50 Floor Decking		Crew	Daily Output	Labor-Hours	Unit	Material	2008 Bare Costs		Total
							Labor	Equipment	
4700	14 gauge	E-4	1490	.021	S.F.	8.05	.93	.09	9.07
4800	For painted instead of galvanized, deduct					2%			
5000	For acoustical perforated, with fiberglass, add				S.F.	1.09			1.09
5200	Non-cellular composite deck, galv., 2" deep, 22 gauge	E-4	3860	.008		1.53	.36	.03	1.92
5300	20 gauge		3600	.009		1.69	.39	.04	2.12
5400	18 gauge		3380	.009		2.15	.41	.04	2.60
5500	16 gauge		3200	.010		2.69	.44	.04	3.17
5700	3" deep, galv., 22 gauge		3200	.010		1.67	.44	.04	2.15
5800	20 gauge		3000	.011		1.86	.46	.04	2.36
5900	18 gauge		2850	.011		2.29	.49	.05	2.83
6000	16 gauge		2700	.012		3.06	.52	.05	3.63
9000	Minimum labor/equipment charge	1 Swk	1	8	Job		345		345

### 05 31 23 – Steel Roof Decking

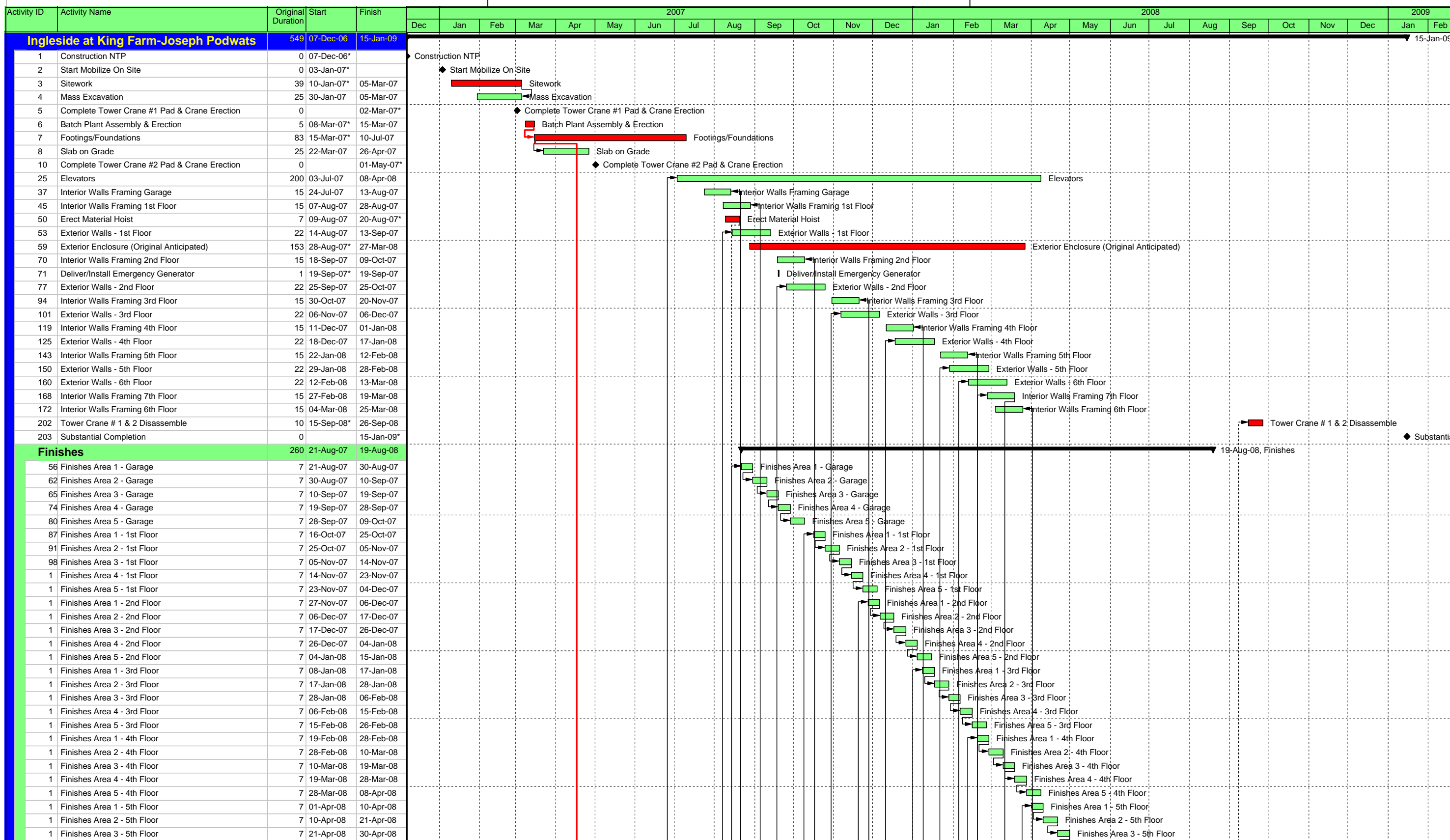
#### 05 31 23.50 Roof Decking

0010 ROOF DECKING		Crew	Daily Output	Labor-Hours	Unit	Material	2008 Bare Costs		Total
							Labor	Equipment	
2100	Open type, galv., 1-1/2" deep wide rib, 22 gauge, under 50 squares	E-4	4500	.007	S.F.	1.61	.31	.03	1.95
2400	Over 500 squares		5100	.006		1.16	.27	.03	1.46
2600	20 gauge, under 50 squares		3865	.008		1.89	.36	.03	2.28
2700	Over 500 squares		4300	.007		1.36	.32	.03	1.71
2900	18 gauge, under 50 squares		3800	.008		2.45	.37	.03	2.85
3000	Over 500 squares		4300	.007		1.76	.32	.03	2.11
3050	16 gauge, under 50 squares		3700	.009		3.30	.38	.04	3.72
3100	Over 500 squares		4200	.008		2.37	.33	.03	2.73

### 05 31 33 – Steel Form Decking

#### 05 31 33.50 Form Decking

0010 FORM DECKING		Crew	Daily Output	Labor-Hours	Unit	Material	2008 Bare Costs		Total
							Labor	Equipment	
6100	Slab form, steel, 28 gauge, 9/16" deep, uncoated	E-4	4000	.008	S.F.	1.07	.35	.03	1.45
6200	Galvanized		4000	.008		.95	.35	.03	1.33
6220	24 gauge, 1" deep, uncoated		3900	.008		1.17	.36	.03	1.56
6240	Galvanized		3900	.008		1.38	.36	.03	1.77
6300	24 gauge, 1-5/16" deep, uncoated		3800	.008		1.25	.37	.03	1.65
6400	Galvanized		3800	.008		1.47	.37	.03	1.87
6500	22 gauge, 1-5/16" deep, uncoated		3700	.009		1.57	.38	.04	1.99
6600	Galvanized		3700	.009		1.60	.38	.04	2.02
6700	22 gauge, 2" deep uncoated		3600	.009		2.05	.39	.04	2.48
6800	Galvanized		3600	.009		2.01	.39	.04	2.44
7000	Sheet metal edge closure form, 12" wide with 2 bends, galv								
7100	18 gauge	E-14	360	.022	L.F.	3.32	1	.37	4.69
7200	16 gauge	"	360	.022	"	4.50	1	.37	5.87



█ Actual Work   
 █ Critical Remaining Work   
 ▼ Summary  
█ Remaining Work   
 ◆ Milestone

Joseph Podwats

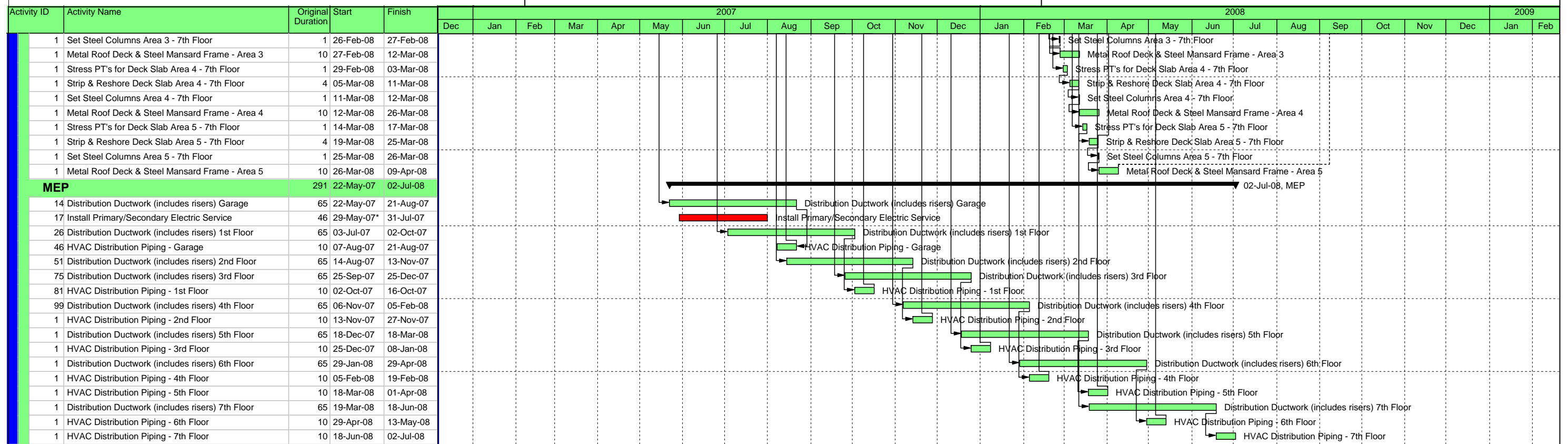
Ingleside at King Farm - Rockville, MD

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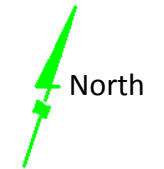
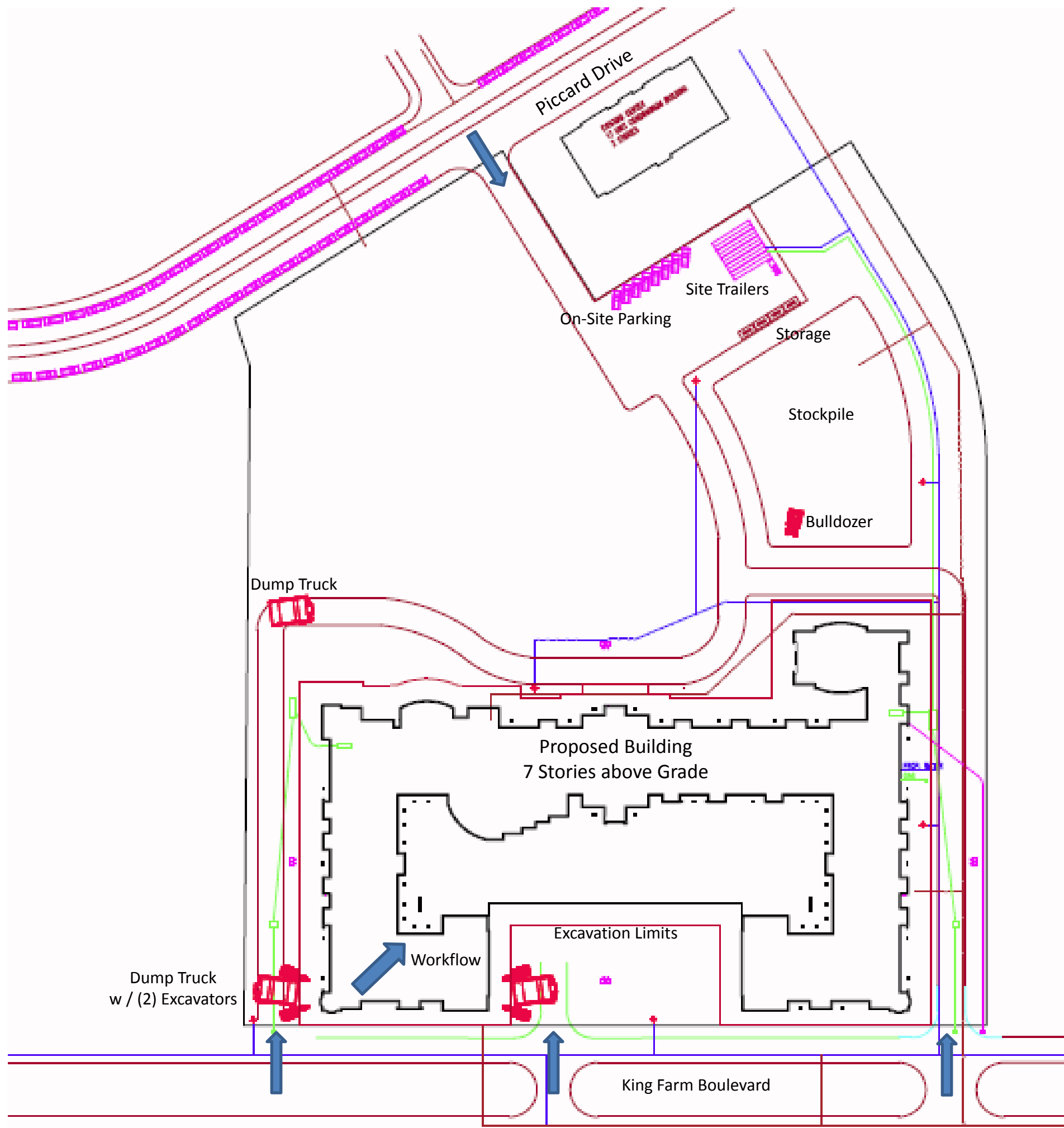


Actual Work    Critical Remaining Work    Summary  
 Remaining Work    Milestone

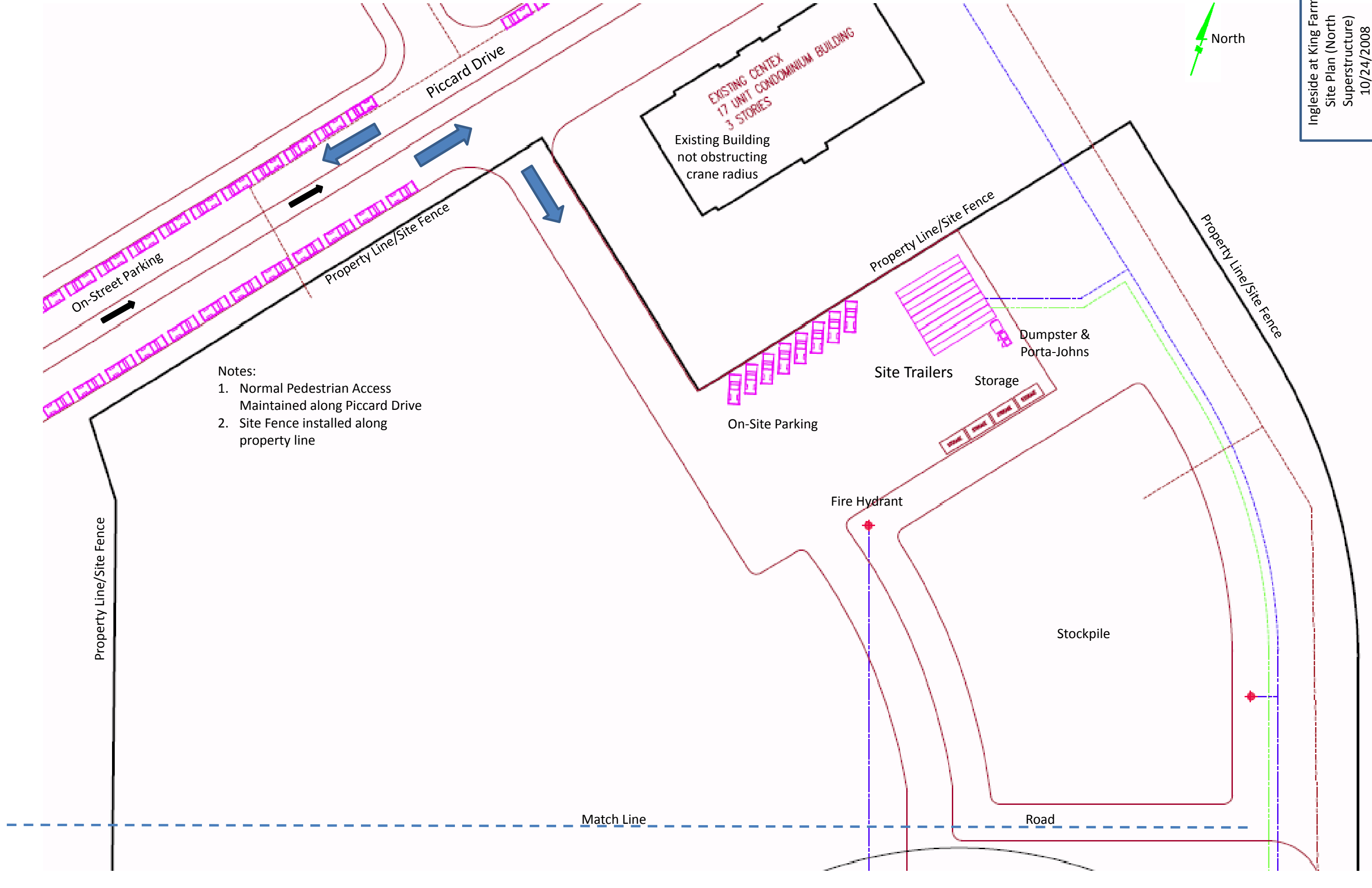
Joseph Podwats

Ingleside at King Farm - Rockville, MD

© Primavera Systems, Inc.



Ingleside at King Farm  
Site Plan (Excavation)  
10/24/2008  
Joseph Podwats



- Notes:
- 1. Normal Pedestrian Access Maintained along Piccard Drive
  - 2. Site Fence installed along property line

Match Line

Ingleside at King Farm  
Site Plan (South  
Superstructure)  
10/24/2008  
Joseph Podwats



Road

Storage

Road

Porta-Johns

Temporary Transformer

Recycling/Trash

Proposed Building  
7 Stories above Grade

Area 2

Area 3

Area 4

PROP. WATER  
GAS

Property Line/Site Fence

Tower Crane # 2

Tower Crane # 1

Tower Crane

Delivery Area  
w / Trucks

Batch Plant

Area 1

Area 5

Workflow

Scaffolding

Property Line/Site Fence

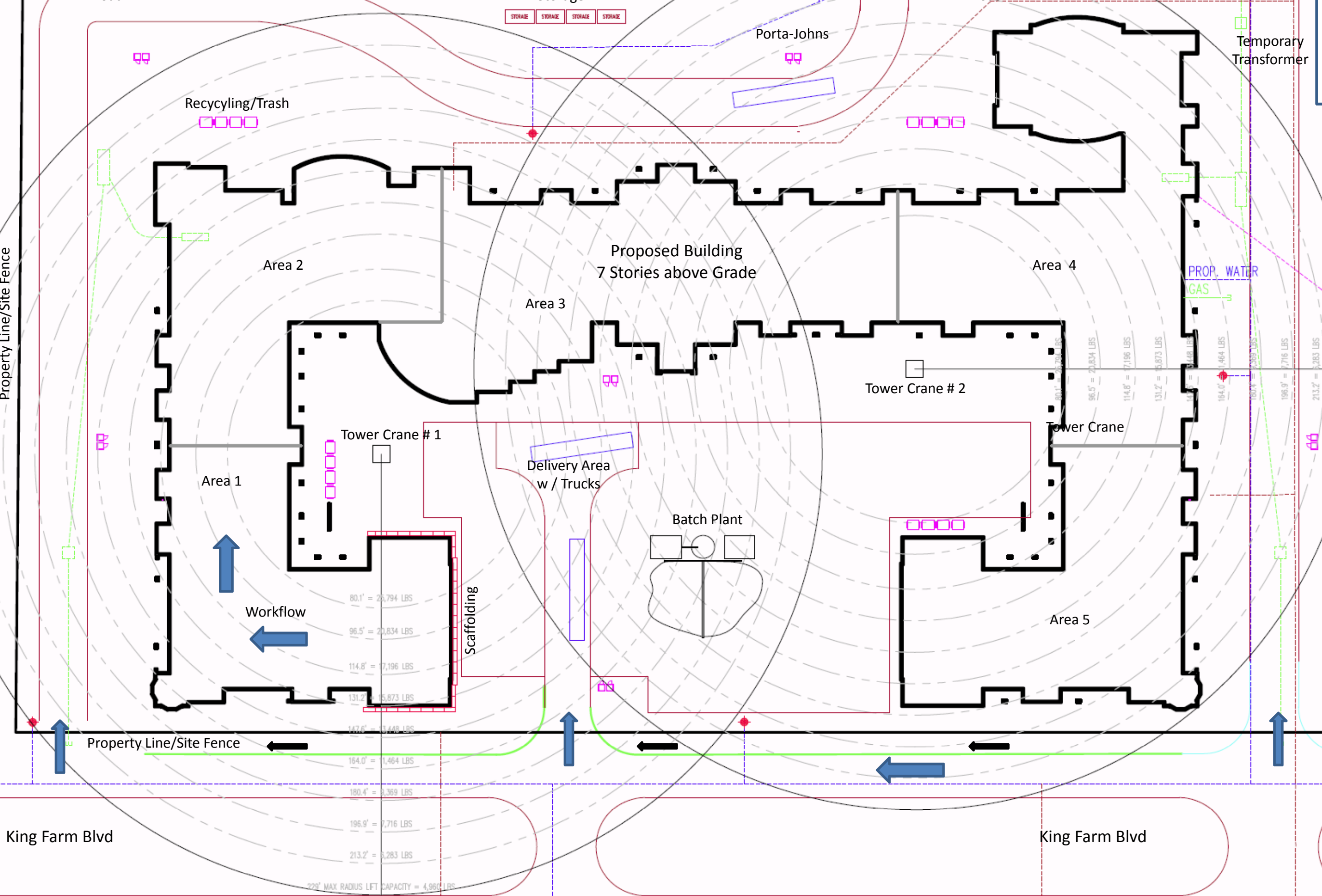
Property Line/Site Fence

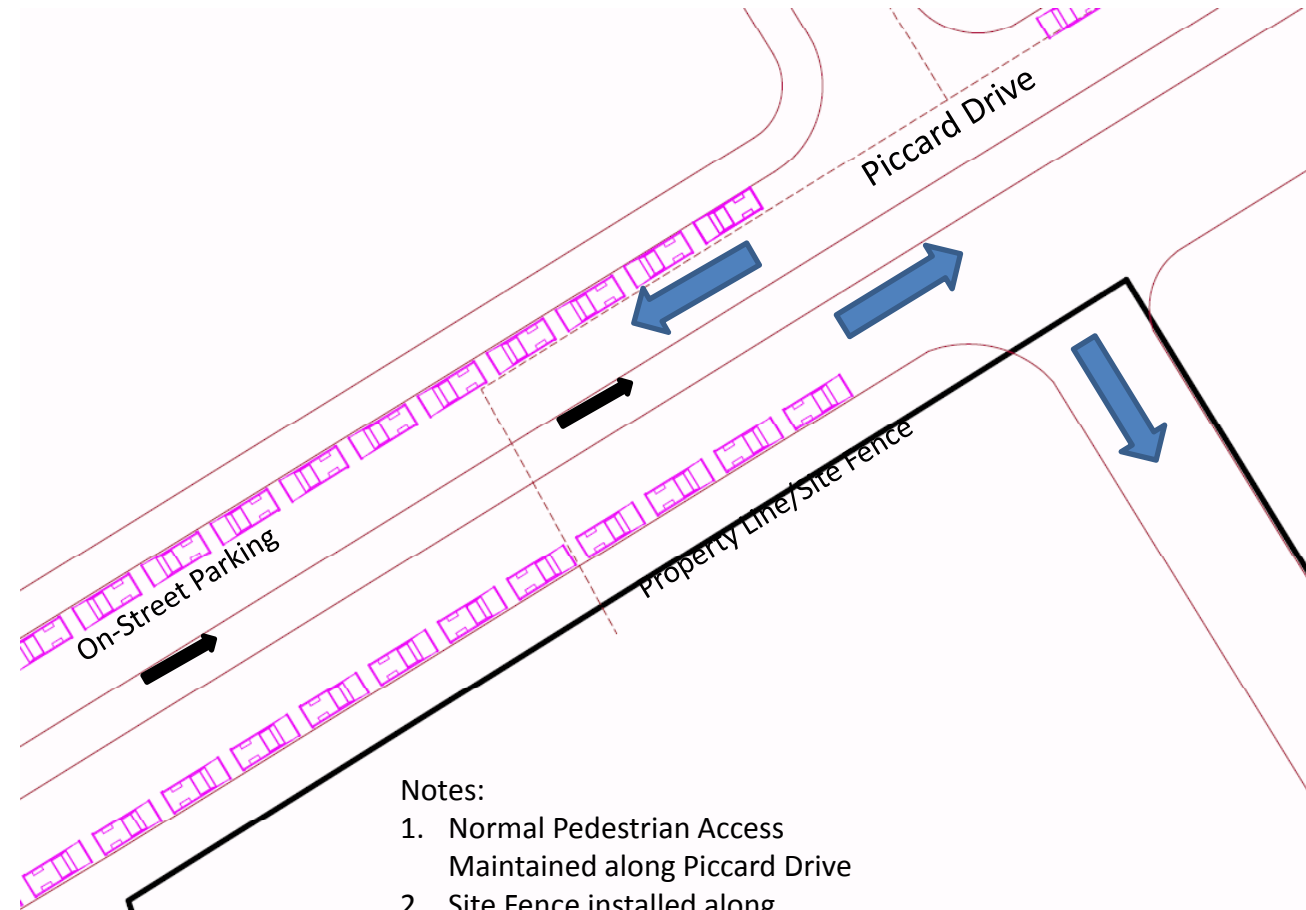
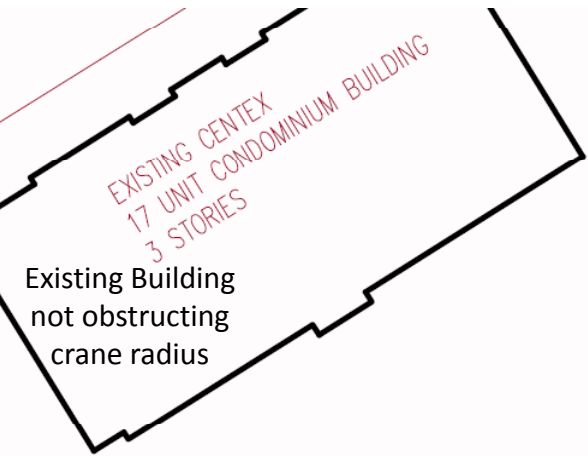
King Farm Blvd

King Farm Blvd

229' MAX RADIUS LIFT CAPACITY = 4,960 LBS

80.1' = 26,794 LBS  
 96.5' = 20,834 LBS  
 114.8' = 7,196 LBS  
 131.2' = 15,873 LBS  
 147.6' = 13,446 LBS  
 164.0' = 1,464 LBS  
 180.4' = 9,369 LBS  
 196.9' = 7,716 LBS  
 213.2' = 5,283 LBS





- Notes:
- 1. Normal Pedestrian Access Maintained along Piccard Drive
  - 2. Site Fence installed along property line



Fire Hydrant

Stockpile

Match Line

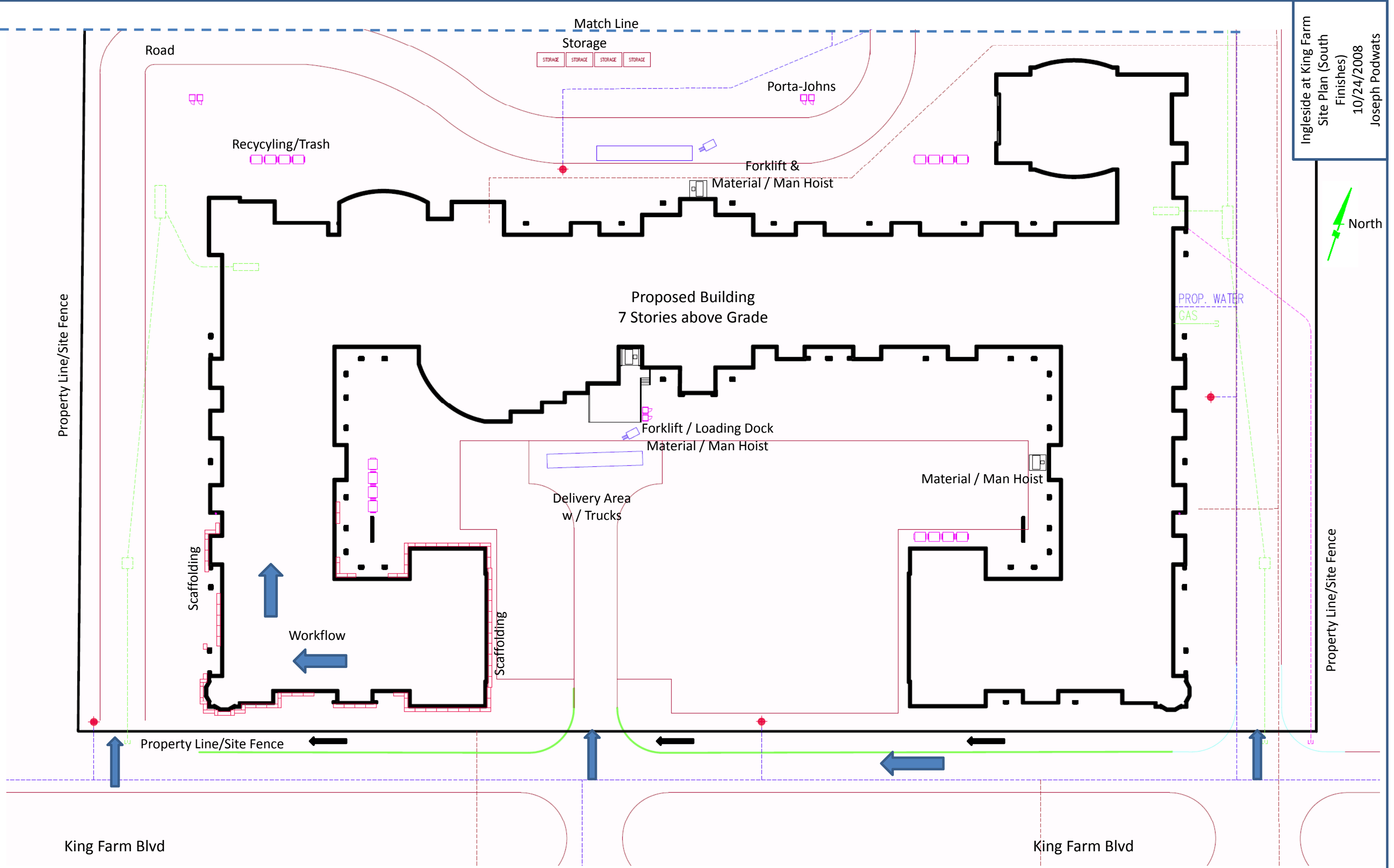
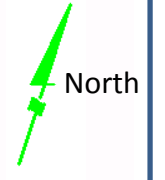
Road

Property Line/Site Fence

Property Line/Site Fence

Property Line/Site Fence

Property Line/Site Fence



Property Line/Site Fence

Property Line/Site Fence

King Farm Blvd

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