Pearland Recreation Center and Natatorium
Pearland, Texas

Technical Report #2

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Submitted: October 28, 2009

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Section 1: Executive Summary

This technical report contains a detailed project schedule and structural system cost estimate, general conditions estimate, and site layout plans for four key phases of construction for the Pearland Recreation Center and Natatorium. The report concludes with an overview of the PACE Roundtable Conference.

Pearland's 11 month project schedule begins with the Notice to Proceed on April 20, 2009 and concludes with Substantial Completion on May 12, 2010. The schedule breaks the building into two portions; the recreation center and the natatorium. These halves of the building have significantly different designs, making it reasonable to separate the construction of the building. The natatorium has a glulam structural system and houses a swimming pool while the recreation center uses a steel structural system and features a competitive gym among other athletic courts and rooms.

Structural system construction cost estimate for the building is $4,427,368.67. This cost estimate was created by taking a typical bay in the recreation center and extrapolating this cost to obtain a cost for the entire building's structural system. Pricing for this estimate was obtained from RS Means 2009 Building Construction Cost Data and contractor quotes. A general conditions cost estimate of $560,314.50 was also calculated. Project Management expenses were the majority (>60%) of the general conditions cost.

Site layout plans were created for the excavation, foundations, structural framing erection, and enclosures phases of construction. Construction generally progresses from the northwest corner to the southeast corner of the building. No critical logistical issues were apparent. The site is very open with ample space for material staging and storage. Temporary utilities are easily accessible off of Bailey Road on the south side of the site.

An overview of the PACE Roundtable Conference October 14-15, 2009 and some ongoing issues in the construction industry wrap up the report. PACE Roundtable provided an excellent opportunity to interact with industry members. The conference supplied some good potential thesis research topics, such as considering why the selected project delivery method was chosen by the owner and why no sustainable design was implemented into the project.

Section 2: Detailed Project Schedule

Construction of the Pearland Recreation Center and Natatorium will begin with the Notice to Proceed on April 20, 2009 and conclude with Substantial Completion on May 12, 2010. The complete detailed schedule is available in Appendix 1. To create the construction schedule for the project the building was split into two portions: recreation center and natatorium. This was done because these two portions of the building are very different and will be constructed in a different manner due to the swimming pool and glulam structural system in the natatorium. Table 2.1 – Milestone Date Comparison compares some key construction milestone dates in the recreation center versus the natatorium.

Table 2.1 – Milestone Date Comparison

Milestone	Recreation Center	Natatorium
Notice to Proceed	4/20/2009	4/20/2009
Top Out	8/7/2009	8/30/2009
Dry-In	10/23/2009	12/9/2009
Substantial Completion	5/12/2010	4/28/2010

Structure and Enclosure:

Construction of the building's structural system and enclosure is sequenced as shown in Figure 2.2 - Structural and Enclosure Trade Construction Sequence

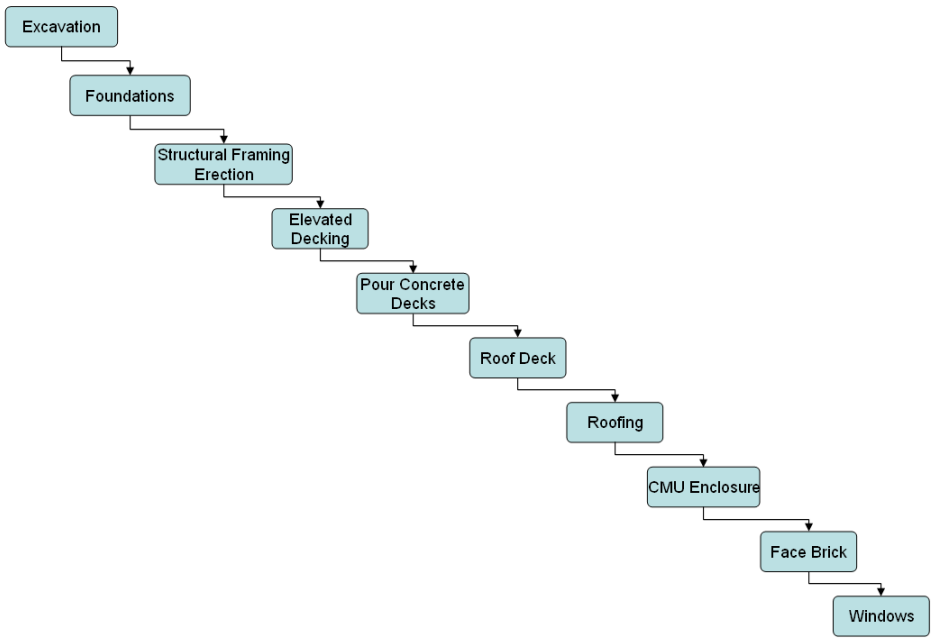


Figure 2.2 – Structural and Enclosure Trade Construction Sequence

Interiors:

Following 'Dry-In,' a 'parade of trades' construction sequence is applied; that is only one trade works in each space at a time and each trade follows the previous. Figure 2.3 - Interior Trades Construction Sequence shows the order of the interior 'parade of trades'.

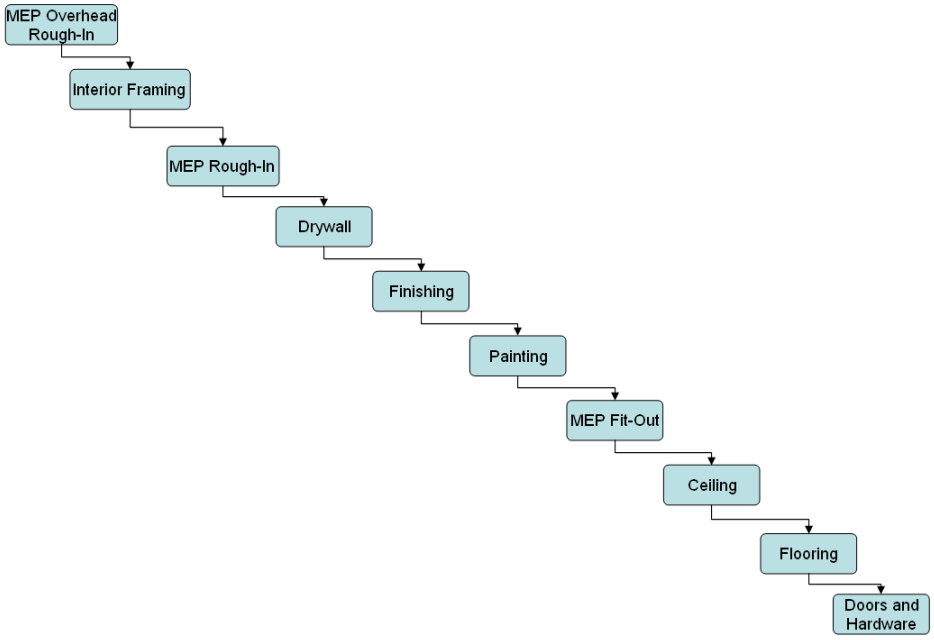


Figure 2.3 - Interior Trades Construction Sequence

Following the interior 'parade of trades' a number of specialty items are installed, such as casework, gym flooring, and gym equipment. See the detailed schedule in Appendix 1 for all activities.

Recreation Center:

Construction of the recreation center progresses counterclockwise through the building in three phases. Figure 2.4 – Recreation Center Construction Phase Locations shows the locations of these three phases.

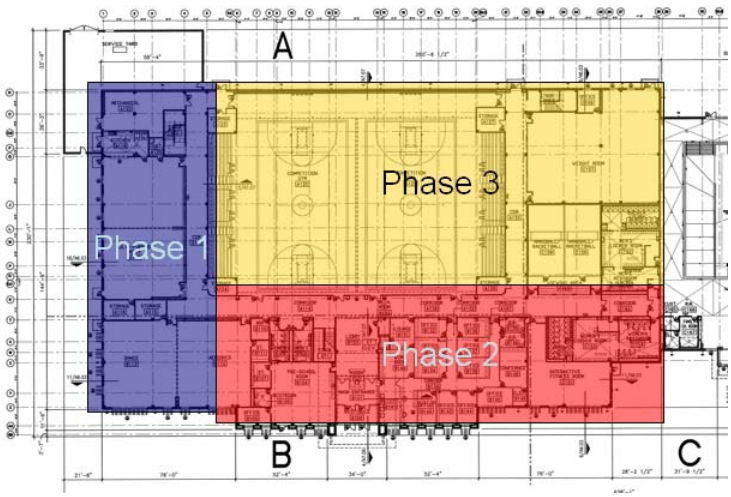


Figure 2.4 – Recreation Center Construction Phase Locations

Second floor activities only have two phases since the gym is double height and the small portion of phase three that has a second level is combined with phase 2 for the second floor.

Natatorium:

There is no phasing of construction in the natatorium as there was in the recreation center. Construction sequencing in the natatorium will revolve around the swimming pool construction. See Figure 2.5 – Swimming Pool Construction Sequence for the sequence of swimming pool construction activities.

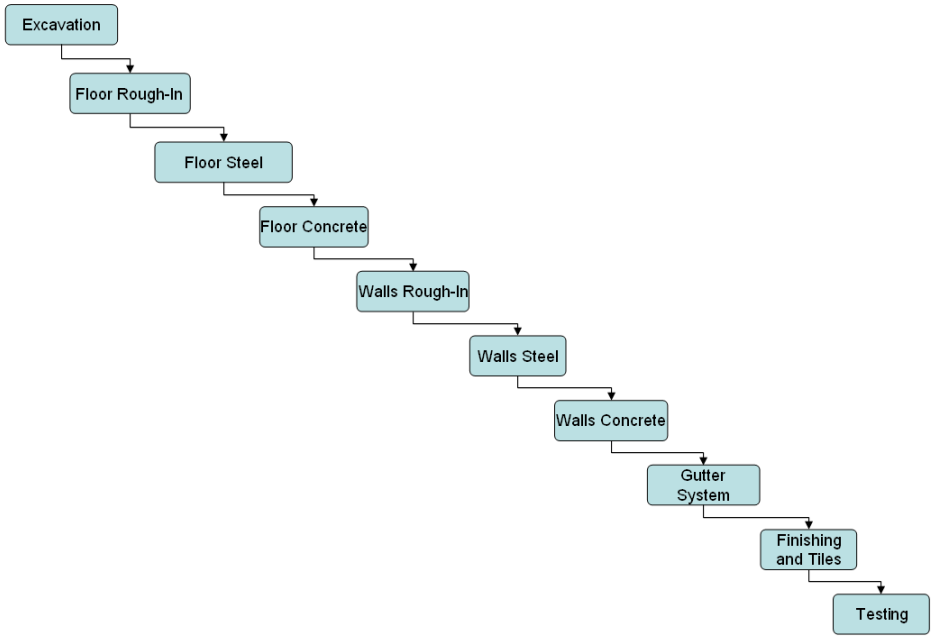


Figure 2.5 – Swimming Pool Construction Sequence

Construction of other portions of the natatorium will be occurring throughout the pool construction; however it is critical that the finishing and tiles in the swimming pool are the last activity to occur in the swimming pool area in order to protect the work. Immediately after this is completed, the pool will be filled with water and testing and chemical balancing will begin.

Section 3: Site Layout Planning

Site layout for the Pearland Recreation Center and Natatorium is greatly simplified due to a large site. Consistent across all phases of the project are the dumpsters in the northeast corner of the site with a dedicated entrance off of Bailey road for access to empty them, porta-potties in the northeast corner of the parking lot, the construction offices on the east side of the site, the temporary transformer in the southeast corner of the building, temporary utilities running to the southeast corner of the building from Bailey Rd, contractor parking on the south side of the site, and the site entrance off of Bailey road on the south side of the site.

Site layout for the excavation phase of construction is shown in Figure 3.1 – Excavation Phase Site Plan. Excavation will begin from the northwest corner of the building and proceed towards the southeast corner of the building as shown. Dump trucks will arrive and circulate through the site to remove soil as shown.

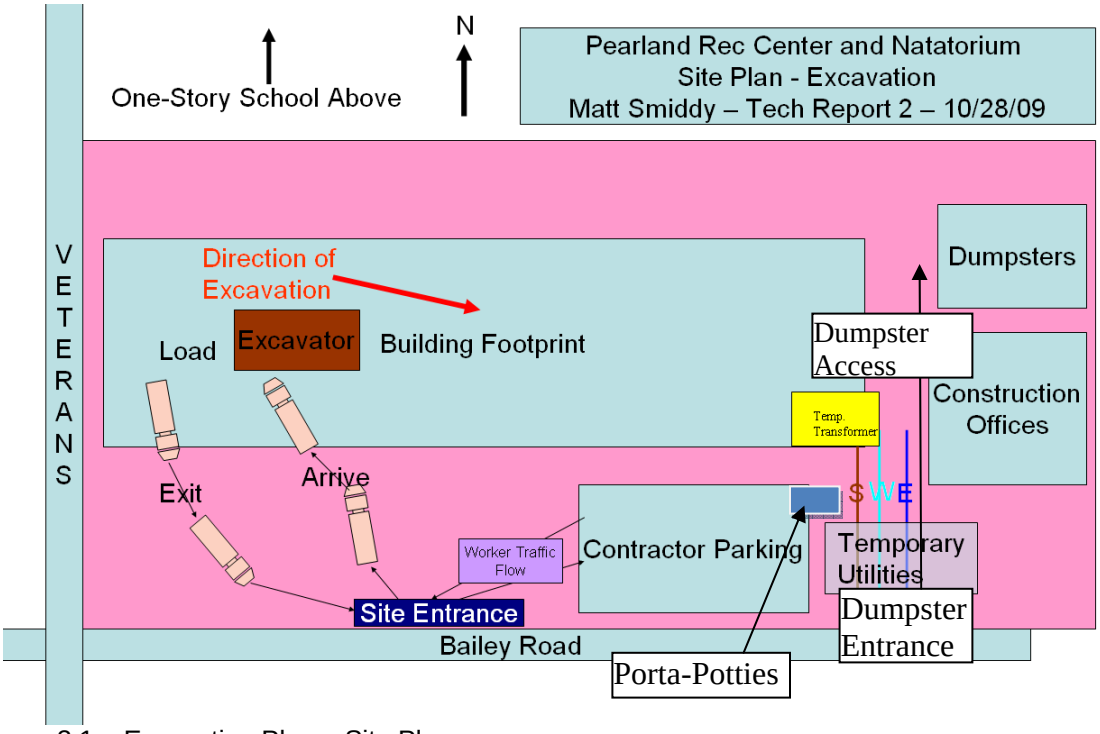


Figure 3.1 – Excavation Phase Site Plan

Figure 3.2 – Foundations Phase Site Plan shows the site layout for the foundations phase of construction. Foundations work will again progress from the northwest corner to the southeast corner of the building. A rebar yard, with access provided for flatbed rebar truck deliveries, is provided in the southwest corner of the site. The pump truck and concrete trucks will circulate as shown. They will only be present on site during concrete pours. The location of the pump truck will move eastward on the site as work progresses. A contractor material storage area is also provided in the southeast corner of the site.

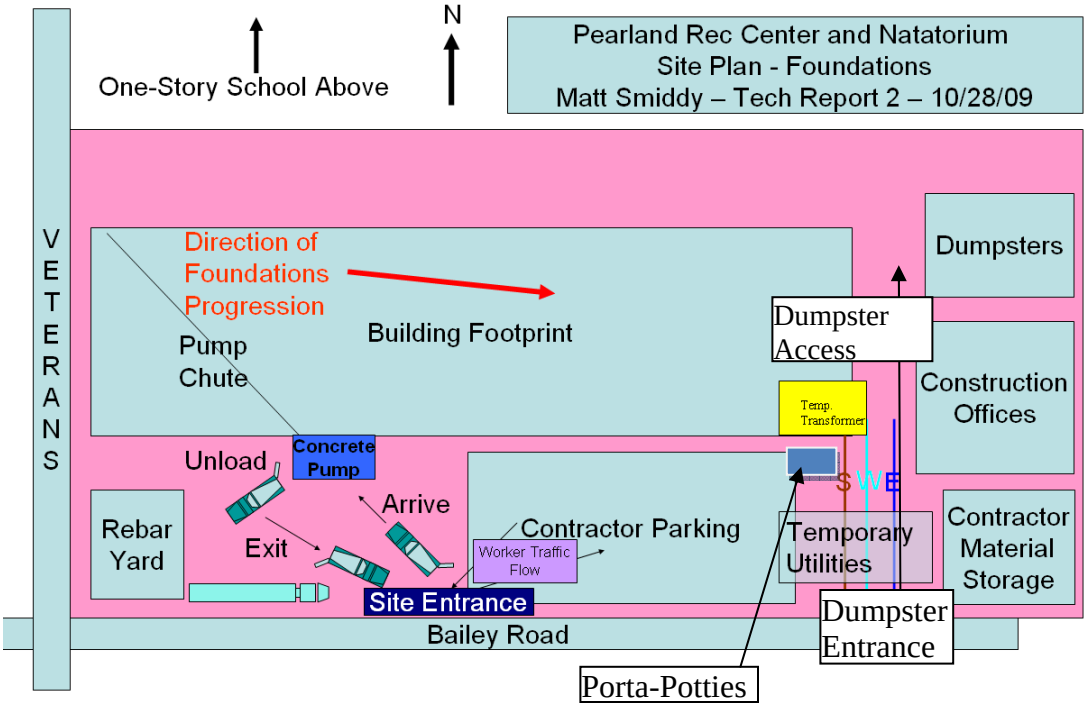


Figure 3.2 – Foundations Phase Site Plan

The project site begins to become more congested as the structural framing erection phase of construction begins. Site layout for this phase is shown in Figure 3.3 – Structural Framing Erection Phase Site Plan. Erection of the steel and glulam will proceed from the west end of the building to the east end. Steel and glulam members will be delivered and unloaded in the shake-out area in the southwest corner of the site. Two cranes will be erecting the steel and glulam on site, one on the north side and one on the south side of the building as shown. Steel joists will be delivered to this shake-out area as well, but will then be moved to the joist shake-out area on the north side of the site to be prepared for final erection. There will be an access point for stocking material to the building located at the southwest corner of the building. This will be done using front loaders.

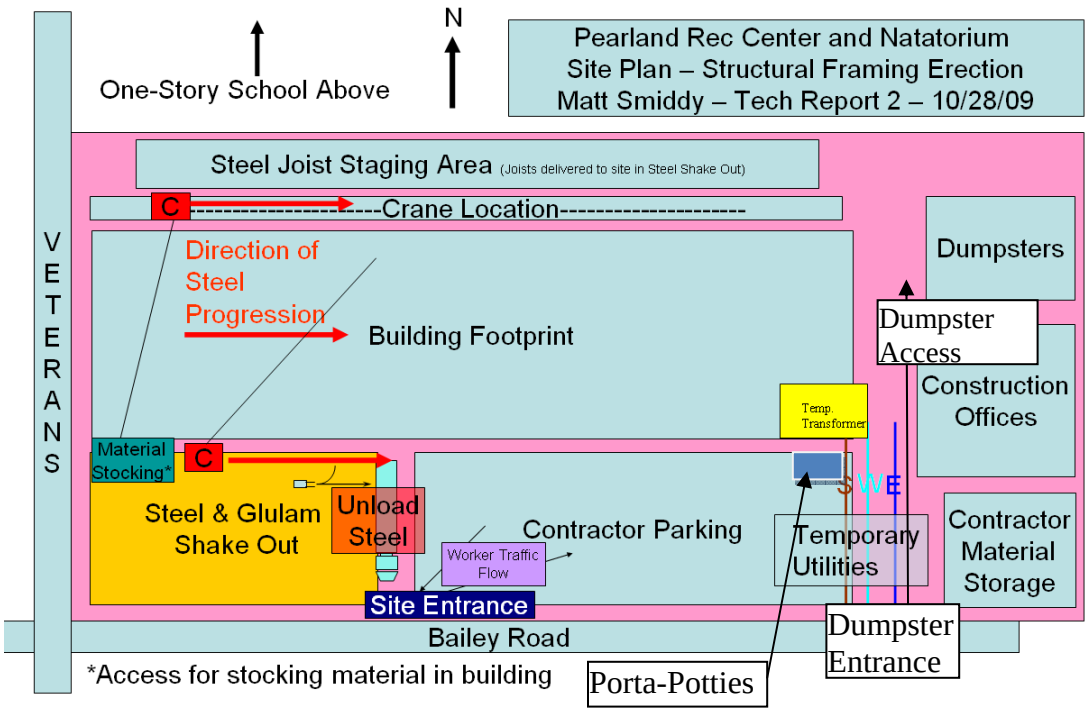


Figure 3.3 – Structural Framing Erection Phase Site Plan

Enclosures is the final phase of construction. Work in this phase will progress in a clockwise direction, first around the recreation center than proceeding to go around the natatorium. There will be a contractor material staging area in the southwest corner of the site. This area will be used by contractors to unload materials from trucks as shown. There are also material storage areas on the north side and in the southeast corner of the site. Materials will again be stocked to the building through the access point at the southwest corner of the building using front loaders. Figure 3.4 – Enclosure Phase Site Plan shows the site layout for this phase of construction.

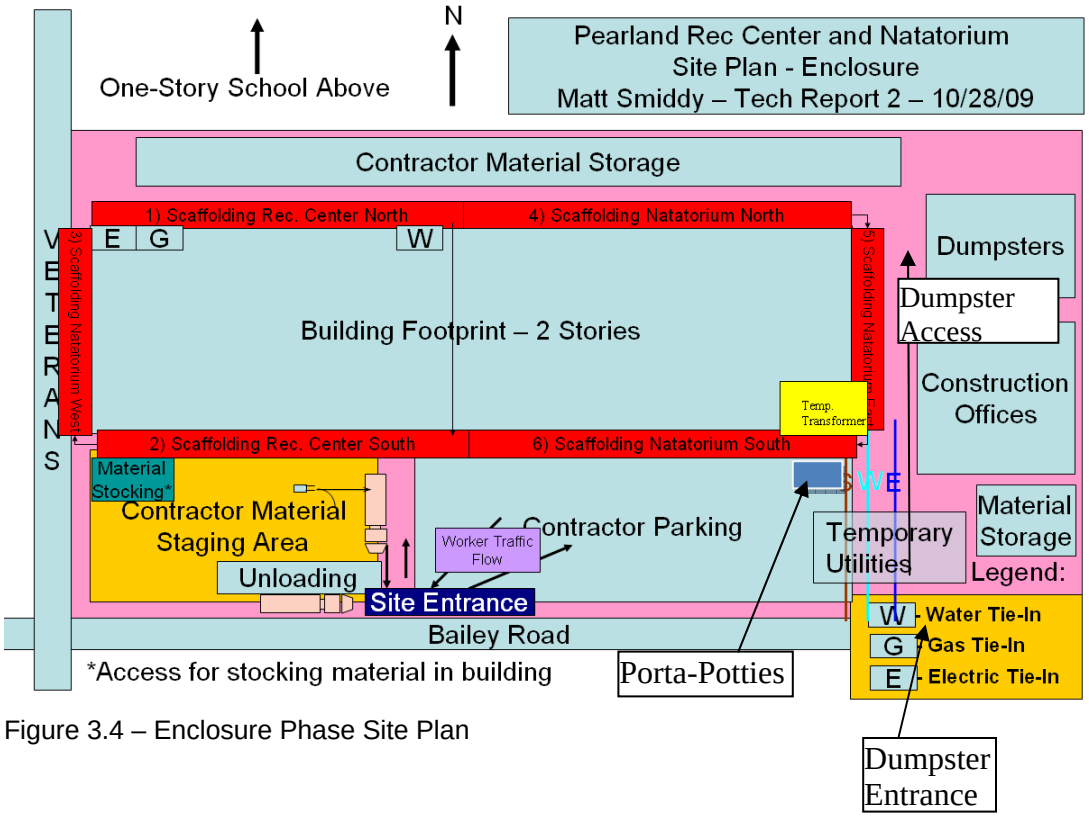


Figure 3.4 – Enclosure Phase Site Plan

Section 4: Detailed Structural Systems Estimate

A detailed structural system construction cost estimate for the Pearland Recreation Center and Natatorium project yielded just over $4,425,000, or about $42/SF. This cost includes all labor, equipment, and material required for construction of the caissons, concrete, structural steel, steel decking, joists, trusses, wood decking, and glulam structural framing. A break-down of the cost estimate is shown in Table 4.1 – Detailed Structural System Estimate Summary. The complete estimate is available in Appendix 2.

Table 4.1 – Detailed Structural System Estimate Summary

Cost Breakdown Summary

Dev.	Item	Total Cost
02465	Caissons	$526,841.25
03220	Rebar	$60,681.51
03221	WWF	$18,041.18
03310	3000 psi concrete	$145,747.62
03311	3500 psi concrete	$36,687.77
03312	Concrete Finishing	$15,161.58
03313	Concrete Forming	$471,115.84
03314	Vapor Barrier	$123,562.53
03315	5" Concrete Edge Form	$2,729.14
03316	3" Pour Stop	$821.42
03500	Roof Deck	$626,272.50
05100	Structural Steel	$702,167.12
05200	Steel Floor Joists	$390,755.16
05300	Metal Deck	$66,784.03
06100	Wood Trusses	$170,000.00
06110	Glulam (Decking, Purlins, and Columns)	$1,070,000.00
	Total Cost	**$4,427,368.67**

Pricing for the estimate was obtained using RS Means 2009 Building Construction Cost Data and contractor information. RM Rodgers provided the glulam pricing and Tectum Inc. provided pricing for the Tectum E roof decking system over the recreation center. All other pricing information came from RS Means.

The estimate was created by doing a detailed take-off of a typical bay of the building and extrapolating. Figure 4.2 – Location of Typical Bay Used for Estimate shows the 2520 SF (both levels) area, between gridlines G-J and 1-2, which was used.

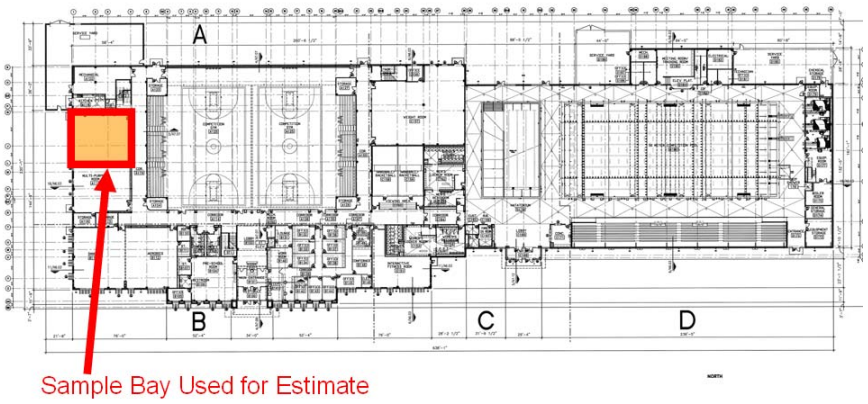


Figure 4.2 – Location of Typical Bay Used for Estimate

Recreation Center:

Using the total cost estimate obtained from this bay, a cost/SF value was calculated and multiplied by the square footage of the recreation center. This cost/SF did not include the Tectum 'E' roof decking or roof trusses. The cost of these two items were estimated for the entire recreation center then added to the extrapolated cost estimate. See Appendix 2 for the complete detailed cost estimate and Appendix 3 for the hand take-off quantities used to develop this detailed estimate.

Natatorium:

Modifications had to be made to the cost/SF value to estimate the natatorium's structural system cost since the structural system is glulam instead of steel, like the recreation center. Additionally, there are no elevated slabs in the natatorium. To account for these differences the structural steel and elevated deck costs were subtracted from the recreation center's cost/SF. This new cost/SF was then multiplied by the total square footage of the natatorium. This extrapolated value was added to the glulam columns, purlins, and decking value provided by RM Rodgers for the total natatorium structural system construction cost. See Appendix 2 for the complete detailed cost estimate and Appendix 3 for the hand take-off quantities used to develop this detailed estimate.

Pricing sheets for all RS Means values are available in Appendix 4. These costs include all waste factors.

Section 5: General Conditions Estimate

A general conditions cost of just over under $2 million was estimated for the Pearland Recreation Center and Natatorium project. This estimate was obtained using pricing from RS Means and EMJ Corporation. See Appendix 5 for the complete estimate.

The general conditions estimate contains 5 portions: project management, temporary facilities, temporary utilities, cleaning, and miscellaneous. Project management and insurance, bond, and O&P are the primary costs in the general conditions, totaling almost $1.9 million. Temporary facilities includes items such as job office trailers, temporary sanitary facilities, and barricades. All material hoisting (lifts, cranes etc.) and heavy equipment are to be provided by the contractors so it was not necessary to include these items. Temporary utilities consists of costs for temporary electric, water, and telephone during construction. The cleaning section will pay for weekly site clean-up and final building clean-up. A miscellaneous section with items such as hand tools, safety, and blue prints is also included. A 2% bond, 3% insurance, and 10% overhead and profit are also included in the estimate. These percentages are of the total project cost ($16,786,542 as per Tech #1 estimate).

Appendix 4 contains RS Means cost data that was used for the estimate.

Section 6: Critical Industry Issues

PACE Roundtable 2010 was a great opportunity to hear what is happening in the construction industry. Some of the key topics that were discussed during the conference were energy efficiency in buildings, building information modeling (BIM), and business and networking. There were also panel discussions with industry members regarding some interesting developments in the construction market and with students about communication opportunities in emerging technology. I was unfortunately only able to attend the morning session of the conference on Thursday due to another commitment.

PACE Roundtable 2010 kicked off with a networking reception and dinner on Wednesday, October 14, 2009. The reception was a great opportunity to catch up with the industry members. I was able to have a lengthy conversation with Keith Mondock from Turner Construction, who I will be having a second interview with in a few weeks. We discussed my thesis project and how it was progressing. It was a great conversation to lead into my interview.

At dinner I sat beside John Bechtel, of Pennsylvania State University Office of the Physical Plant. Our dinner conversation included a discussion about the construction of the Millennium Science Complex and some upcoming projects at Penn State. Following dinner, Dr. Riley wrapped up the evening with a brief preview of Thursday's schedule.

Thursday morning began with an industry panel discussion of current construction industry issues. Some interesting topics that were discussed during this session included active market sectors, BIM developments, and strategies contractors were using to cope with the economic conditions. The entire industry is seeing far less work than a year ago and backlog is shrinking. The few projects that are being put out for bid are seeing many more bidders. This large influx of bidders on projects has driven down bid amounts. It was pointed out that these low bidders are frequently small firms getting in over their heads and there will likely be a significant increase in failure among construction companies. Some of the active industry sectors include healthcare, senior living, and energy retrofits. Residential projects were cited as being the most inactive due to the tightened credit markets.

During this panel discussion there was also an interesting discussion about how companies are coping with the downturn in available work. The larger companies stated that the reduction in work has allowed them to spend more resources on research, particularly in BIM. On the contrary, the small firms said they have reduced their progressions in BIM implementation due to shrinking resources and an increased need to focus on marketing and obtaining work. Employee training has also been more active. Firms are seizing the opportunity to educate their employees during the lull. Most importantly, companies have ramped up their marketing efforts. They have not only been marketing to past

and current clients, but also have started seeking out potential clients that they have never worked with before.

Following the industry panel there were three break-out groups with different focus topics: energy and the construction industry, business and networking, and BIM executive planning. I attended the business and networking session facilitated by Chris Magent because I have already been exposed to BIM and energy in buildings in academic classes, however business and networking is a topic I have not had much exposure to.

In the business and networking session the need for diversity in market sectors was emphasized. I found it interesting that one of the methods being used to achieve this was joint-ventures. Joint-ventures have allowed companies that haven't worked in a certain sector to team up with a firm that is established in that sector and obtain experience in the new type of project. At the same time, these joint-ventures have been created to increase bonding capacity and other project requirements such as minority company involvement in project teams. A question was posed regarding the difficulty in obtaining cooperation from both firms in a joint-venture; however from experience it has been noted that as long as both companies have similar values there are no problems because both project teams can focus on the same goal: providing the owner with a quality project.

Another topic that was brought up in the business and networking session was trends in project delivery methods. The industry members all reported that they were seeing a rise in the number of lump sum bids coming in. It was acknowledged that this increase can be primarily attributed to repeat clients no longer having projects, resulting in a shift of the types of clients. It was also mentioned, primarily by Balfour Beatty, that there has been an increase in Design-Build projects due to the increased government work that has been created by the stimulus act. Integrated Project Delivery (IPD) was also discussed during this time. Rob Leicht from DPR Construction joined our discussion at this time to act as an 'expert' in this area since he has done significant research on the topic and DPR is a leader in this delivery method. There was confusion surrounding the definition of IPD. Rob defined this as an 'integrated design-bid-build' contract that is signed by the owner, designer, construction manager, and subcontractor and allocated risk between all parties. The best definition was from Southland Industries: 'A Design-Build project done right.'

Attending the PACE Roundtable gave me some ideas of potential thesis topics. The first idea I may want to pursue would be regarding LEED/Sustainability. My project is completely state funded; however there are no sustainable aspects in the building. I may want to speak with the owner and first determine if there was a reason for this and if not, possibly analyze the implementation of some sustainable aspects into the design as well as the construction. I want to also try

to apply some BIM applications, such as 3-D coordination, into my research; however this may be very difficult since I still have not been able to obtain the 2-D CAD drawings for the project.

Two other issues I may want to investigate involve the project delivery method. It is currently being delivered via a Design-Bid-Build method. I may want to look at what an adjustment in the delivery method may do to the project. The project is also being funded by 3 different sources, however only one of the parties are overseeing the construction of the project. There may be some interesting issues to look at with this 'joint-venture' as well.

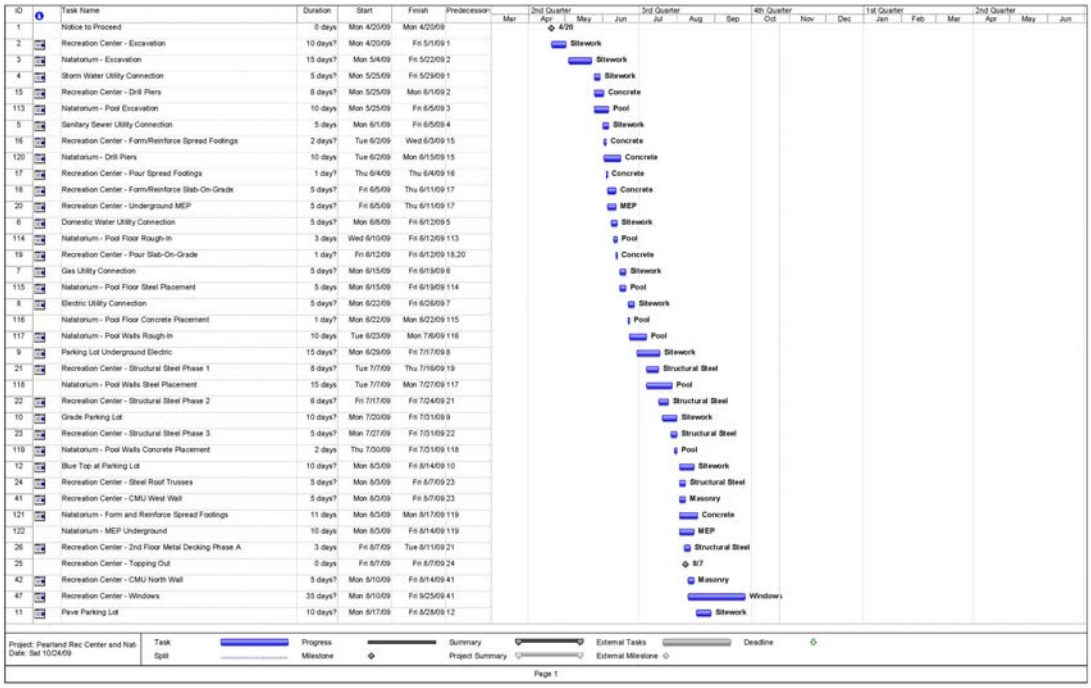
The PACE Roundtable was a great opportunity for me to not only interact on an interpersonal level with key industry members, but also learn first hand about important developing issues in the construction industry. Without this conference, coming up with ideas for my thesis research would have been much more difficult.

Key Contacts:
Robert Leicht – DPR Construction – Integrated Project Delivery
John Bechtel – Penn State OPP – Integrated Project Delivery/Owner's Perspective of Delivery Method

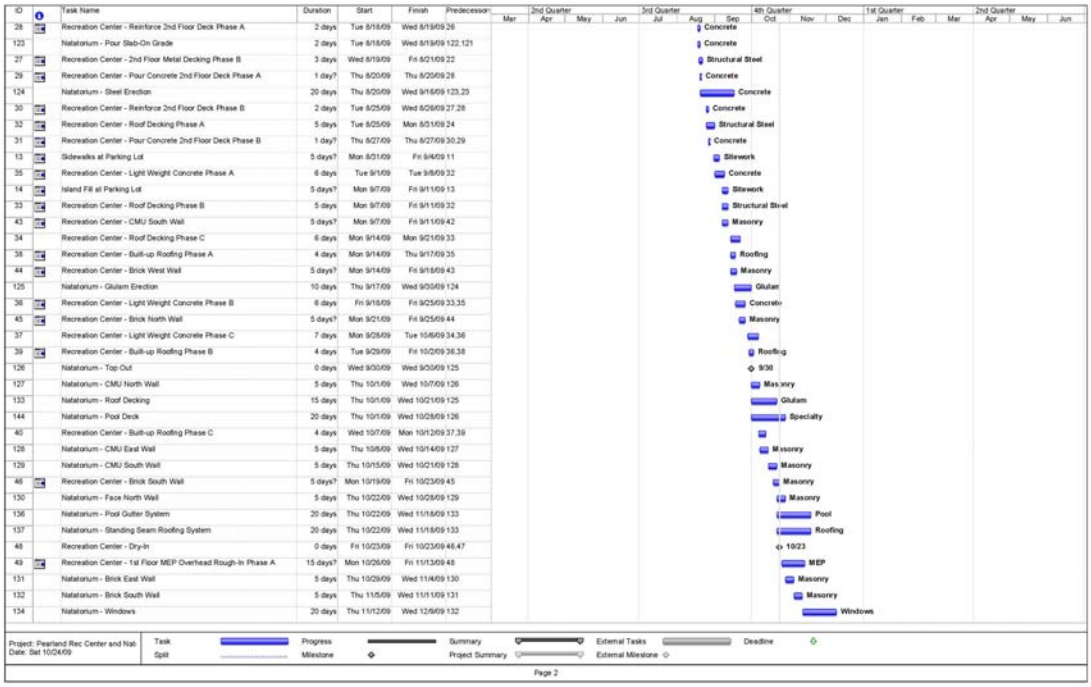
Appendix 1

Detailed Project Schedule

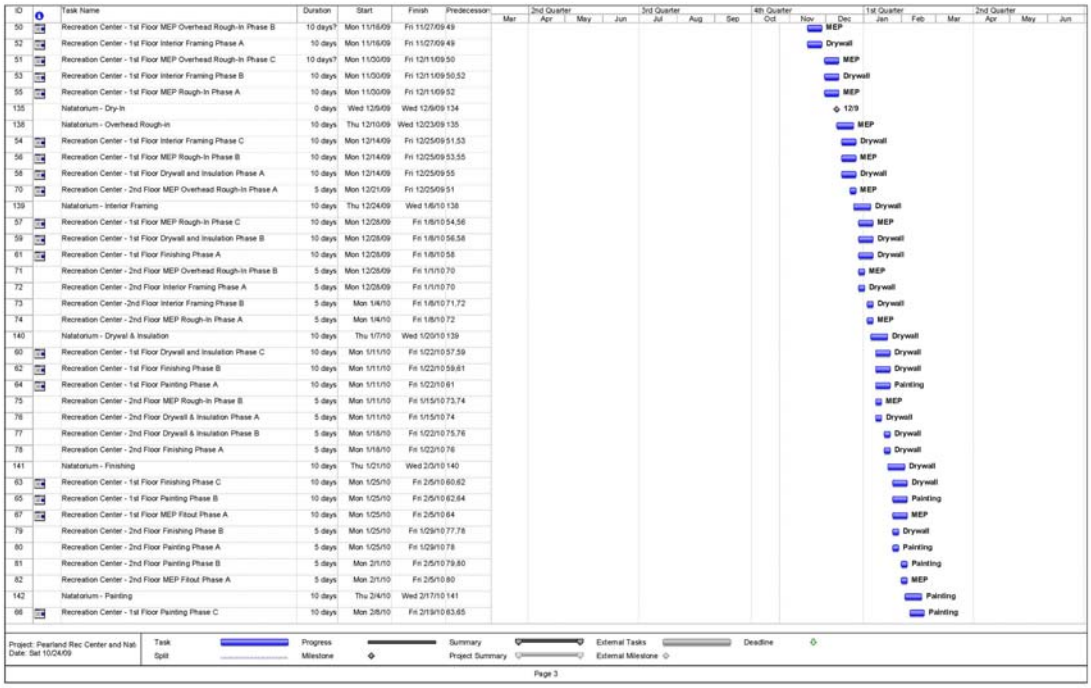
Detailed Project Schedule



ID	Task Name	Duration	Start	Finish	Predecessors
1	Notice to Proceed	0 days	Mon 4/20/09	Mon 4/20/09	
2	Recreation Center - Excavation	10 days?	Mon 4/20/09	Fri 5/1/09	1
3	Natatorium - Excavation	15 days?	Mon 5/4/09	Fri 5/22/09	2
4	Storm Water Utility Connection	5 days?	Mon 5/25/09	Fri 5/29/09	1
15	Recreation Center - Drill Piers	6 days?	Mon 5/25/09	Mon 6/1/09	2
113	Natatorium - Pool Excavation	10 days	Mon 5/25/09	Fri 6/5/09	3
5	Sanitary Sewer Utility Connection	5 days	Mon 6/1/09	Fri 6/5/09	4
16	Recreation Center - Form/Reinforce Spread Footings	2 days?	Tue 6/2/09	Wed 6/3/09	15
120	Natatorium - Drill Piers	10 days	Tue 6/2/09	Mon 6/15/09	15
17	Recreation Center - Pour Spread Footings	1 day?	Thu 6/4/09	Thu 6/4/09	16
18	Recreation Center - Form/Reinforce Slab-On-Grade	5 days?	Fri 6/5/09	Thu 6/11/09	17
20	Recreation Center - Underground MEP	5 days?	Fri 6/5/09	Thu 6/11/09	17
6	Domestic Water Utility Connection	5 days?	Mon 6/8/09	Fri 6/12/09	5
114	Natatorium - Pool Floor Rough-In	3 days	Wed 6/10/09	Fri 6/12/09	113
19	Recreation Center - Pour Slab-On-Grade	1 day?	Fri 6/12/09	Fri 6/12/09	18,20
7	Gas Utility Connection	5 days?	Mon 6/15/09	Fri 6/19/09	6
115	Natatorium - Pool Floor Steel Placement	5 days	Mon 6/15/09	Fri 6/19/09	114
8	Electric Utility Connection	5 days?	Mon 6/22/09	Fri 6/26/09	7
116	Natatorium - Pool Floor Concrete Placement	1 day?	Mon 6/22/09	Mon 6/22/09	115
117	Natatorium - Pool Walls Rough-In	10 days	Tue 6/23/09	Mon 7/6/09	116
9	Parking Lot Underground Electric	15 days?	Mon 6/29/09	Fri 7/17/09	8
21	Recreation Center - Structural Steel Phase 1	8 days?	Tue 7/7/09	Thu 7/16/09	19
118	Natatorium - Pool Walls Steel Placement	15 days	Tue 7/7/09	Mon 7/27/09	117
22	Recreation Center - Structural Steel Phase 2	6 days?	Fri 7/17/09	Fri 7/24/09	21
10	Grade Parking Lot	10 days?	Mon 7/20/09	Fri 7/31/09	9
23	Recreation Center - Structural Steel Phase 3	5 days?	Mon 7/27/09	Fri 7/31/09	22
119	Natatorium - Pool Walls Concrete Placement	2 days	Thu 7/30/09	Fri 7/31/09	118
12	Blue Top at Parking Lot	10 days?	Mon 8/3/09	Fri 8/14/09	10
24	Recreation Center - Steel Roof Trusses	5 days?	Mon 8/3/09	Fri 8/7/09	23
41	Recreation Center - CMU West Wall	5 days?	Mon 8/3/09	Fri 8/7/09	23
121	Natatorium - Form and Reinforce Spread Footings	11 days	Mon 8/3/09	Mon 8/17/09	119
122	Natatorium - MEP Underground	10 days	Mon 8/3/09	Fri 8/14/09	119
26	Recreation Center - 2nd Floor Metal Decking Phase A	3 days	Fri 8/7/09	Tue 8/11/09	21
25	Recreation Center - Topping Out	0 days	Fri 8/7/09	Fri 8/7/09	24
42	Recreation Center - CMU North Wall	5 days?	Mon 8/10/09	Fri 8/14/09	41
47	Recreation Center - Windows	35 days?	Mon 8/10/09	Fri 9/25/09	41
11	Pave Parking Lot	10 days?	Mon 8/17/09	Fri 8/28/09	12



ID	Task Name	Duration	Start	Finish	Predecessors
28	Recreation Center - Reinforce 2nd Floor Deck Phase A	2 days	Tue 8/18/09	Wed 8/19/09	26
123	Natatorium - Pour Slab-On Grade	2 days	Tue 8/18/09	Wed 8/19/09	122,121
27	Recreation Center - 2nd Floor Metal Decking Phase B	3 days	Wed 8/19/09	Fri 8/21/09	22
29	Recreation Center - Pour Concrete 2nd Floor Deck Phase A	1 day?	Thu 8/20/09	Thu 8/20/09	28
124	Natatorium - Steel Erection	20 days	Thu 8/20/09	Wed 9/16/09	123,23
30	Recreation Center - Reinforce 2nd Floor Deck Phase B	2 days	Tue 8/25/09	Wed 8/26/09	27,28
32	Recreation Center - Roof Decking Phase A	5 days	Tue 8/25/09	Mon 8/31/09	24
31	Recreation Center - Pour Concrete 2nd Floor Deck Phase B	1 day?	Thu 8/27/09	Thu 8/27/09	30,29
13	Sidewalks at Parking Lot	5 days?	Mon 8/31/09	Fri 9/4/09	11
35	Recreation Center - Light Weight Concrete Phase A	6 days	Tue 9/1/09	Tue 9/8/09	32
14	Island Fill at Parking Lot	5 days?	Mon 9/7/09	Fri 9/11/09	13
33	Recreation Center - Roof Decking Phase B	5 days	Mon 9/7/09	Fri 9/11/09	32
43	Recreation Center - CMU South Wall	5 days?	Mon 9/7/09	Fri 9/11/09	42
34	Recreation Center - Roof Decking Phase C	6 days	Mon 9/14/09	Mon 9/21/09	33
36	Recreation Center - Built-up Roofing Phase A	4 days	Mon 9/14/09	Thu 9/17/09	35
44	Recreation Center - Brick West Wall	5 days?	Mon 9/14/09	Fri 9/18/09	43
125	Natatorium - Glulam Erection	10 days	Thu 9/17/09	Wed 9/30/09	124
38	Recreation Center - Light Weight Concrete Phase B	6 days	Fri 9/18/09	Fri 9/25/09	33,35
45	Recreation Center - Brick North Wall	5 days?	Mon 9/21/09	Fri 9/25/09	44
37	Recreation Center - Light Weight Concrete Phase C	7 days	Mon 9/28/09	Tue 10/6/09	34,36
39	Recreation Center - Built-up Roofing Phase B	4 days	Tue 9/29/09	Fri 10/2/09	36,38
126	Natatorium - Top Out	0 days	Wed 9/30/09	Wed 9/30/09	125
127	Natatorium - CMU North Wall	5 days	Thu 10/1/09	Wed 10/7/09	126
133	Natatorium - Roof Decking	15 days	Thu 10/1/09	Wed 10/21/09	125
144	Natatorium - Pool Deck	20 days	Thu 10/1/09	Wed 10/28/09	126
40	Recreation Center - Built-up Roofing Phase C	4 days	Wed 10/7/09	Mon 10/12/09	37,39
128	Natatorium - CMU East Wall	5 days	Thu 10/8/09	Wed 10/14/09	127
129	Natatorium - CMU South Wall	5 days	Thu 10/15/09	Wed 10/21/09	128
46	Recreation Center - Brick South Wall	5 days?	Mon 10/19/09	Fri 10/23/09	45
130	Natatorium - Face North Wall	5 days	Thu 10/22/09	Wed 10/28/09	129
136	Natatorium - Pool Gutter System	20 days	Thu 10/22/09	Wed 11/18/09	133
137	Natatorium - Standing Seam Roofing System	20 days	Thu 10/22/09	Wed 11/18/09	133
48	Recreation Center - Dry-In	0 days	Fri 10/23/09	Fri 10/23/09	46,47
49	Recreation Center - 1st Floor MEP Overhead Rough-In Phase A	15 days?	Mon 10/26/09	Fri 11/13/09	48
131	Natatorium - Brick East Wall	5 days	Thu 10/29/09	Wed 11/4/09	130
132	Natatorium - Brick South Wall	5 days	Thu 11/5/09	Wed 11/11/09	131
134	Natatorium - Windows	20 days	Thu 11/12/09	Wed 12/9/09	132



ID	Task Name	Duration	Start	Finish	Predecessors
50	Recreation Center - 1st Floor MEP Overhead Rough-In Phase B	10 days?	Mon 11/16/09	Fri 11/27/09	49
52	Recreation Center - 1st Floor Interior Framing Phase A	10 days	Mon 11/16/09	Fri 11/27/09	49
51	Recreation Center - 1st Floor MEP Overhead Rough-In Phase C	10 days?	Mon 11/30/09	Fri 12/11/09	50
53	Recreation Center - 1st Floor Interior Framing Phase B	10 days	Mon 11/30/09	Fri 12/11/09	50,52
55	Recreation Center - 1st Floor MEP Rough-In Phase A	10 days	Mon 11/30/09	Fri 12/11/09	52
135	Natatorium - Dry-In	0 days	Wed 12/9/09	Wed 12/9/09	134
136	Natatorium - Overhead Rough-in	10 days	Thu 12/10/09	Wed 12/23/09	135
54	Recreation Center - 1st Floor Interior Framing Phase C	10 days	Mon 12/14/09	Fri 12/25/09	51,53
56	Recreation Center - 1st Floor MEP Rough-In Phase B	10 days	Mon 12/14/09	Fri 12/25/09	53,55
58	Recreation Center - 1st Floor Drywall and Insulation Phase A	10 days	Mon 12/14/09	Fri 12/25/09	55
70	Recreation Center - 2nd Floor MEP Overhead Rough-In Phase A	5 days	Mon 12/21/09	Fri 12/25/09	51
139	Natatorium - Interior Framing	10 days	Thu 12/24/09	Wed 1/6/10	138
57	Recreation Center - 1st Floor MEP Rough-In Phase C	10 days	Mon 12/28/09	Fri 1/8/10	54,56
59	Recreation Center - 1st Floor Drywall and Insulation Phase B	10 days	Mon 12/28/09	Fri 1/8/10	56,58
61	Recreation Center - 1st Floor Finishing Phase A	10 days	Mon 12/28/09	Fri 1/8/10	58
71	Recreation Center - 2nd Floor MEP Overhead Rough-In Phase B	5 days	Mon 12/28/09	Fri 1/1/10	70
72	Recreation Center - 2nd Floor Interior Framing Phase A	5 days	Mon 12/28/09	Fri 1/1/10	70
73	Recreation Center -2nd Floor Interior Framing Phase B	5 days	Mon 1/4/10	Fri 1/8/10	71,72
74	Recreation Center - 2nd Floor MEP Rough-In Phase A	5 days	Mon 1/4/10	Fri 1/8/10	72
140	Natatorium - Dryval & Insulation	10 days	Thu 1/7/10	Wed 1/20/10	139
60	Recreation Center - 1st Floor Drywall and Insulation Phase C	10 days	Mon 1/11/10	Fri 1/22/10	57,59
62	Recreation Center - 1st Floor Finishing Phase B	10 days	Mon 1/11/10	Fri 1/22/10	59,61
64	Recreation Center - 1st Floor Painting Phase A	10 days	Mon 1/11/10	Fri 1/22/10	61
75	Recreation Center - 2nd Floor MEP Rough-In Phase B	5 days	Mon 1/11/10	Fri 1/15/10	73,74
76	Recreation Center - 2nd Floor Drywall & Insulation Phase A	5 days	Mon 1/11/10	Fri 1/15/10	74
77	Recreation Center - 2nd Floor Drywall & Insulation Phase B	5 days	Mon 1/18/10	Fri 1/22/10	75,76
78	Recreation Center - 2nd Floor Finishing Phase A	5 days	Mon 1/18/10	Fri 1/22/10	76
141	Natatorium - Finishing	10 days	Thu 1/21/10	Wed 2/3/10	140
63	Recreation Center - 1st Floor Finishing Phase C	10 days	Mon 1/25/10	Fri 2/5/10	60,62
65	Recreation Center - 1st Floor Painting Phase B	10 days	Mon 1/25/10	Fri 2/5/10	62,64
67	Recreation Center - 1st Floor MEP Fitout Phase A	10 days	Mon 1/25/10	Fri 2/5/10	64
79	Recreation Center - 2nd Floor Finishing Phase B	5 days	Mon 1/25/10	Fri 1/29/10	77,78
80	Recreation Center - 2nd Floor Painting Phase A	5 days	Mon 1/25/10	Fri 1/29/10	78
81	Recreation Center - 2nd Floor Painting Phase B	5 days	Mon 2/1/10	Fri 2/5/10	79,80
82	Recreation Center - 2nd Floor MEP Fitout Phase A	5 days	Mon 2/1/10	Fri 2/5/10	80
142	Natatorium - Painting	10 days	Thu 2/4/10	Wed 2/17/10	141
66	Recreation Center - 1st Floor Painting Phase C	10 days	Mon 2/8/10	Fri 2/19/10	63,65

Project: Pearland Rec Center and Nat. Date: Sat 10/24/09 — Task, Split, Progress, Milestone, Summary, Project Summary, External Tasks, External Milestone, Deadline

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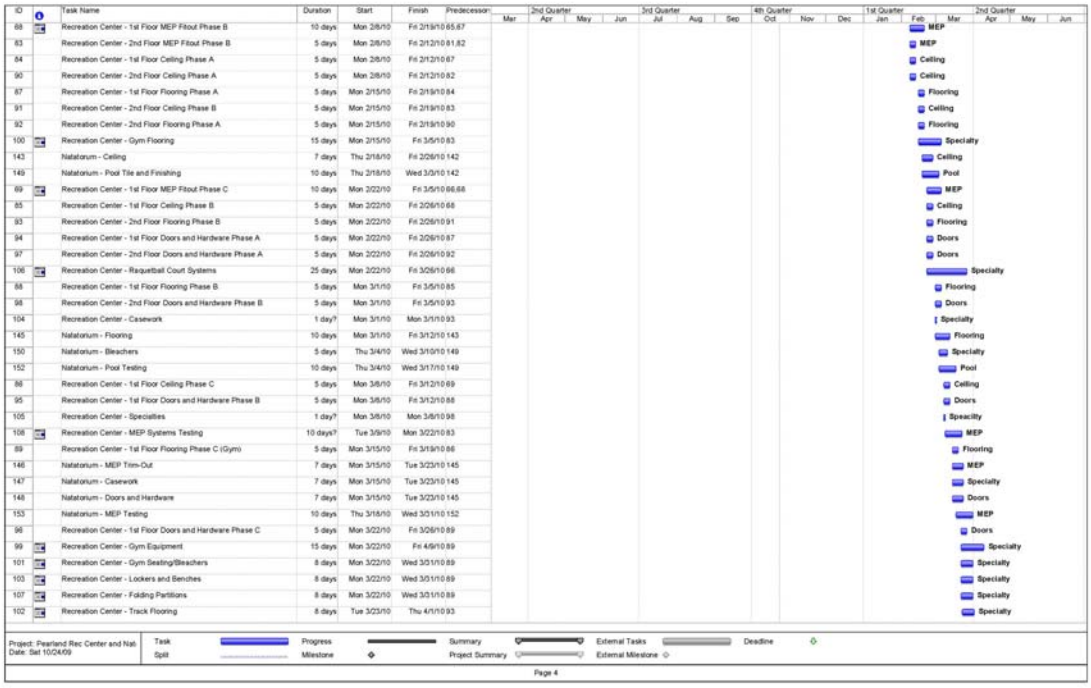

ID	Task Name	Duration	Start	Finish	Predecessors
68	Recreation Center - 1st Floor MEP Fitout Phase B	10 days	Mon 2/8/10	Fri 2/19/10	65,67
83	Recreation Center - 2nd Floor MEP Fitout Phase B	5 days	Mon 2/8/10	Fri 2/12/10	81,82
84	Recreation Center - 1st Floor Ceiling Phase A	5 days	Mon 2/8/10	Fri 2/12/10	67
90	Recreation Center - 2nd Floor Ceiling Phase A	5 days	Mon 2/8/10	Fri 2/12/10	82
87	Recreation Center - 1st Floor Flooring Phase A	5 days	Mon 2/15/10	Fri 2/19/10	84
91	Recreation Center - 2nd Floor Ceiling Phase B	5 days	Mon 2/15/10	Fri 2/19/10	83
92	Recreation Center - 2nd Floor Flooring Phase A	5 days	Mon 2/15/10	Fri 2/19/10	90
100	Recreation Center - Gym Flooring	15 days	Mon 2/15/10	Fri 3/5/10	83
143	Natatorium - Ceiling	7 days	Thu 2/18/10	Fri 2/26/10	142
149	Natatorium - Pool Tile and Finishing	10 days	Thu 2/18/10	Wed 3/3/10	142
69	Recreation Center - 1st Floor MEP Fitout Phase C	10 days	Mon 2/22/10	Fri 3/5/10	86,68
85	Recreation Center - 1st Floor Ceiling Phase B	5 days	Mon 2/22/10	Fri 2/26/10	68
93	Recreation Center - 2nd Floor Flooring Phase B	5 days	Mon 2/22/10	Fri 2/26/10	91
94	Recreation Center - 1st Floor Doors and Hardware Phase A	5 days	Mon 2/22/10	Fri 2/26/10	87
97	Recreation Center - 2nd Floor Doors and Hardware Phase A	5 days	Mon 2/22/10	Fri 2/26/10	92
106	Recreation Center - Raquetball Court Systems	25 days	Mon 2/22/10	Fri 3/26/10	68
88	Recreation Center - 1st Floor Flooring Phase B	5 days	Mon 3/1/10	Fri 3/5/10	85
98	Recreation Center - 2nd Floor Doors and Hardware Phase B	5 days	Mon 3/1/10	Fri 3/5/10	93
104	Recreation Center - Casework	1 day?	Mon 3/1/10	Mon 3/1/10	93
145	Natatorium - Flooring	10 days	Mon 3/1/10	Fri 3/12/10	143
150	Natatorium - Bleachers	5 days	Thu 3/4/10	Wed 3/10/10	149
152	Natatorium - Pool Testing	10 days	Thu 3/4/10	Wed 3/17/10	149
89	Recreation Center - 1st Floor Ceiling Phase C	5 days	Mon 3/8/10	Fri 3/12/10	69
95	Recreation Center - 1st Floor Doors and Hardware Phase B	5 days	Mon 3/8/10	Fri 3/12/10	88
105	Recreation Center - Specialties	1 day?	Mon 3/8/10	Mon 3/8/10	98
108	Recreation Center - MEP Systems Testing	10 days?	Tue 3/9/10	Mon 3/22/10	83
89	Recreation Center - 1st Floor Flooring Phase C (Gym)	5 days	Mon 3/15/10	Fri 3/19/10	86
146	Natatorium - MEP Trim-Out	7 days	Mon 3/15/10	Tue 3/23/10	145
147	Natatorium - Casework	7 days	Mon 3/15/10	Tue 3/23/10	145
148	Natatorium - Doors and Hardware	7 days	Mon 3/15/10	Tue 3/23/10	145
153	Natatorium - MEP Testing	10 days	Thu 3/18/10	Wed 3/31/10	152
96	Recreation Center - 1st Floor Doors and Hardware Phase C	5 days	Mon 3/22/10	Fri 3/26/10	89
99	Recreation Center - Gym Equipment	15 days	Mon 3/22/10	Fri 4/9/10	89
101	Recreation Center - Gym Seating/Bleachers	8 days	Mon 3/22/10	Wed 3/31/10	89
103	Recreation Center - Lockers and Benches	8 days	Mon 3/22/10	Wed 3/31/10	89
107	Recreation Center - Folding Partitions	8 days	Mon 3/22/10	Wed 3/31/10	89
102	Recreation Center - Track Flooring	8 days	Tue 3/23/10	Thu 4/1/10	93

Project: Pearland Rec Center and Nat. Date: Sat 10/24/09 — Task, Split, Progress, Milestone, Summary, Project Summary, External Tasks, External Milestone, Deadline

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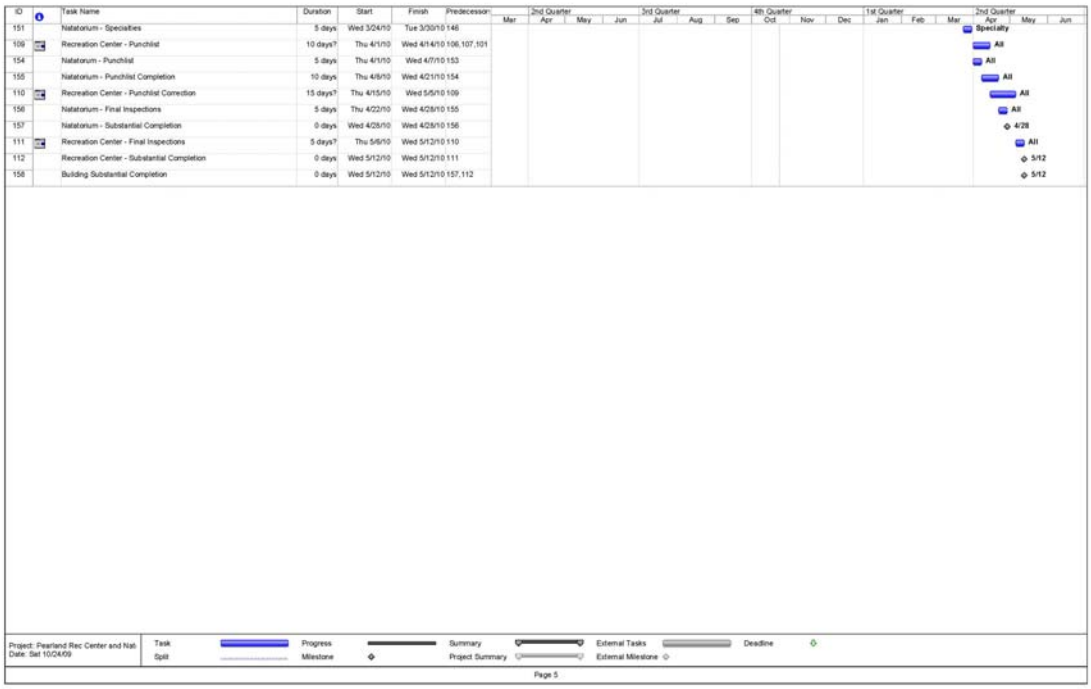


ID	Task Name	Duration	Start	Finish	Predecessors
151	Natatorium - Specialties	5 days	Wed 3/24/10	Tue 3/30/10	146
109	Recreation Center - Punchlist	10 days?	Thu 4/1/10	Wed 4/14/10	106,107,101
154	Natatorum - Punchlist	5 days	Thu 4/1/10	Wed 4/7/10	153
155	Natatorium - Punchlist Completion	10 days	Thu 4/8/10	Wed 4/21/10	154
110	Recreation Center - Punchlist Correction	15 days?	Thu 4/15/10	Wed 5/5/10	109
156	Natatorum - Final Inspections	5 days	Thu 4/22/10	Wed 4/28/10	155
157	Natatorium - Substantial Completion	0 days	Wed 4/28/10	Wed 4/28/10	156
111	Recreation Center - Final Inspections	5 days?	Thu 5/6/10	Wed 5/12/10	110
112	Recreation Center - Substantial Completion	0 days	Wed 5/12/10	Wed 5/12/10	111
158	Building Substantial Completion	0 days	Wed 5/12/10	Wed 5/12/10	157,112

Appendix 2

Detailed Structural System Estimate

Detailed Structural System Estimate

Recreation Center: Gridlines G-J and 1/2 (2520 SF)

Item	Units	Quantity	Labor ($/unit)	Material ($/unit)	Equipment ($/unit)	Total ($/unit)	Labor	Material	Equipment	Total	RS Means
Caissons											
9' Bell diameter, 48" shaft	EA	5.00	$975.00	$450.00	$1,100.00	$1,430.00	$4,875.00	$2,250.00	$5,500.00	$12,625.00	Page 592
Footings											
Concrete - 3000 psi	CYD	1.48	$33.50	$101.00	$123.15	$257.65	$49.58	$149.48	$182.26	$381.32	Page 64, 65
Concrete Forming	SFCA	80.00	$2.93	$0.70	$124.15	$127.78	$234.40	$56.00	$9,932.00	$10,222.40	Page 46
Reinforcing Steel	TON	0.04	$680.00	$1,475.00	$125.15	$2,280.15	$27.20	$59.00	$5.01	$91.21	Page 59
Grade Beams											
Concrete - 3000 psi	CYD	6.00	$12.05	$101.00	$4.39	$117.44	$72.30	$606.00	$26.34	$704.64	Page 64, 65
Concrete Forming	SFCA	294.00	$2.93	$0.70	$0.00	$3.63	$861.42	$205.80	$0.00	$1,067.22	Page 46
Reinforcing Steel	TON	0.40	$890.00	$2,440.00	$0.00	$3,330.00	$358.67	$983.32	$0.00	$1,341.99	Page 58
Slab-On-Grade											
Concrete - 3000 psi	CYD	19.44	$16.70	$101.00	$6.10	$123.80	$324.65	$1,963.44	$118.58	$2,406.67	Page 64, 65
Concrete Finishing	SF	1260.00	$0.18	$0.00	$0.00	$0.18	$226.80	$0.00	$0.00	$226.80	Page 66
5" Concrete Edge Form	LF	27.25	$2.02	$0.38	$0.00	$2.40	$55.05	$10.36	$0.00	$65.40	Page 47
Vapor Barrier	SF	1260.00	$1.15	$1.20	$0.00	$2.35	$1,449.00	$1,512.00	$0.00	$2,961.00	Page 192
Reinforcing Steel	TON	0.01	$620.00	$1,475.00	$0.00	$2,095.00	$6.20	$14.75	$0.00	$20.95	Page 59
Elevated Slab											
Concrete - 3500 psi	CYD	11.67	$15.50	$104.00	$5.65	$125.15	$180.89	$1,213.68	$65.94	$1,460.50	Page 64
Concrete Finishing	CYD	1260.00	$0.18	$0.00	$0.00	$0.18	$226.80	$0.00	$0.00	$226.80	Page 66
3" Pour Stop	SF	6.81	$3.33	$1.47	$0.00	$4.80	$22.69	$10.01	$0.00	$32.70	Page 44
6 X 6 WWF Reinforcing	CSF	12.60	$24.50	$32.50	$0.00	$57.00	$308.70	$409.50	$0.00	$718.20	Page 60
9/16" Metal Decking	SF	1260.00	$0.36	$1.72	$0.03	$2.11	$453.60	$2,167.20	$37.80	$2,658.60	Page 124
Steel Columns											
TS 10x10x3/8"x16'	LF	6.75	$51.00	$1,625.00	$36.50	$1,712.50	$344.25	$10,968.75	$246.38	$11,559.38	Page 110
TS 8x8x3/8"x14'	LF	1.93	$49.00	$880.00	$35.00	$964.00	$94.50	$1,697.14	$67.50	$1,859.14	Page 110
Steel Beams											
W 27x84	LF	54.50	$2.96	$139.00	$1.58	$143.54	$161.32	$7,575.50	$86.11	$7,822.93	Page 114
W 16x26	LF	45.50	$2.44	$43.00	$1.74	$47.18	$111.02	$1,956.50	$79.17	$2,146.69	Page 114
W 30x90	LF	27.25	$2.94	$163.00	$1.56	$167.50	$80.12	$4,441.75	$42.51	$4,564.38	Page 114
Floor Joists											
28LH12	LF	500.50	$1.96	$28.00	$1.12	31.08	980.98	14,014.00	560.56	$15,555.54	Page 121
Total Structural System Cost*:										**$80,719.45**	
Total Cost/SF*:										**$32.03**	

Recreation Center Structural System (Except Roof Deck and Trusses)											
Structural System	SF	63300	$32.03							$2,027,499.00	NA
Roof Deck											
7 1/4" Tectum E Roof Deck	SF	59645.00	$3.50	$7.00	$0.00	$10.50	$208,757.50	$417,515.00	$0.00	$626,272.50	NA
Wood Trusses											
130' LHSP Wood Joist Trusses	EA	68	$500.00	$1,500.00	$500.00	$2,500.00	$34,000.00	$102,000.00	$34,000.00	$170,000.00	NA
Total Recreation Center Structural System Cost:										**$2,823,771.50**	

*Note: This cost does not include the Roof Deck and Wood Trusses

Natatorium (2520 SF)

Item	Units	Quantity	Labor ($/unit)	Material ($/unit)	Equipment ($/unit)	Total ($/unit)	Labor	Material	Equipment	Total	RS Means
Caissons											
9' Bell diameter, 48" shaft	EA	5.00	$975.00	$450.00	$1,100.00	$1,430.00	$4,875.00	$2,250.00	$5,500.00	$12,625.00	Page 592
Footings											
Concrete - 3000 psi	CYD	1.48	$33.50	$101.00	$123.15	$257.65	$49.58	$149.48	$182.26	$381.32	Page 64, 65
Concrete Forming	SFCA	80.00	$2.93	$0.70	$124.15	$127.78	$234.40	$56.00	$9,932.00	$10,222.40	Page 46
Reinforcing Steel	TON	0.04	$680.00	$1,475.00	$125.15	$2,280.15	$27.20	$59.00	$5.01	$91.21	Page 59
Grade Beams											
Concrete - 3000 psi	CYD	6.00	$12.05	$101.00	$4.39	$117.44	$72.30	$606.00	$26.34	$704.64	Page 64, 65
Concrete Forming	SFCA	294.00	$2.93	$0.70	$0.00	$3.63	$861.42	$205.80	$0.00	$1,067.22	Page 46
Reinforcing Steel	TON	0.40	$890.00	$2,440.00	$0.00	$3,330.00	$358.67	$983.32	$0.00	$1,341.99	Page 58
Slab-On-Grade											
Concrete - 3000 psi	CYD	19.44	$16.70	$101.00	$6.10	$123.80	$324.65	$1,963.44	$118.58	$2,406.67	Page 64, 65
Concrete Finishing	SF	1260.00	$0.18	$0.00	$0.00	$0.18	$226.80	$0.00	$0.00	$226.80	Page 66
5" Concrete Edge Form	LF	27.25	$2.02	$0.38	$0.00	$2.40	$55.05	$10.36	$0.00	$65.40	Page 47
Vapor Barrier	SF	1260.00	$1.15	$1.20	$0.00	$2.35	$1,449.00	$1,512.00	$0.00	$2,961.00	Page 192
Reinforcing Steel	TON	0.01	$620.00	$1,475.00	$0.00	$2,095.00	$6.20	$14.75	$0.00	$20.95	Page 59
Total Structural System Cost*:										**$32,114.60**	
Total Cost/SF*:										**$12.74**	

Natatorium Structural Costs (Except Glulam Materials											
Structural System	SF	41817	$12.74							$532,911.20	NA
Glulam											
Glulam Framing	SF	41230.00	$7.34	$15.90	$0.00	$25.95	$302,485.00	$655,725.00	$0.00	$1,070,000.00	NA
Wood Deck	SF	41230.00		$2.71	$0.00			$111,790.00	$0.00		NA
Total Natatorium Structural System Cost:										**$1,602,911.20**	

*Note: This cost does not include Glulam Products

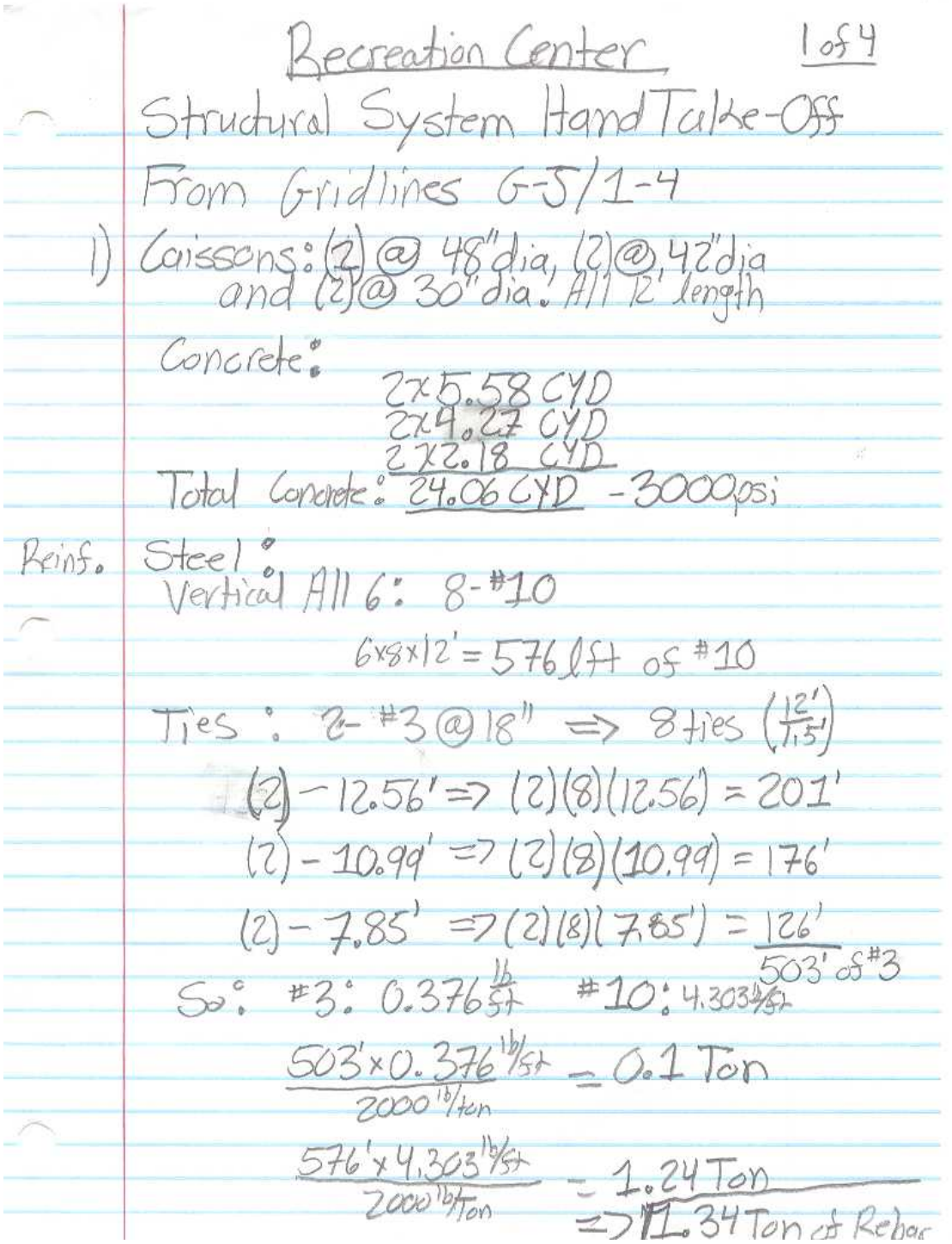
Total Structural Costs

Natatorium Structural Cost	$1,602,911.20
Recreation Center Structural Cost	$2,823,771.50
Total Structural Cost	**$4,427,368.67**
Total Structural Cost/SF	**$42.12**

Appendix 3

Detailed Structural System Cost Estimate Hand Take-Offs

Detailed Structural System Cost Estimate
Hand Take-Offs



Recreation Center 1 of 4

Structural System Hand Take-Off

From Gridlines G-5/1-4

1) Caissons: (2) @ 48" dia, (2) @ 42" dia and (2) @ 30" dia. All 12' length

Concrete:

2 x 5.58 CYD
2 x 4.27 CYD
2 x 2.18 CYD

Total Concrete: 24.06 CYD - 3000psi

Reinf. Steel:

Vertical All 6: 8-#10

6 x 8 x 12' = 576 lft of #10

Ties: 2-#3 @ 18" => 8 ties ($\frac{12'}{1.5'}$)

(2) - 12.56' => (2)(8)(12.56) = 201'

(2) - 10.99' => (2)(8)(10.99) = 176'

(2) - 7.85' => (2)(8)(7.85') = 126'

503' of #3

So: #3: 0.376 lb/ft #10: 4.303 lb/ft

$\frac{503' \times 0.376\ lb/ft}{2000\ lb/ton} = 0.1\ Ton$

$\frac{576' \times 4.303\ lb/ft}{2000\ lb/Ton} = 1.24\ Ton$

=> 1.34 Ton of Rebar

2 of 4

2) Footings: (5) 2'x2'x2' FTGs

Concrete: $\frac{40}{27} = 1.48$ CYDs - 3000psi

Forming: 16 SFCA x 5 = 80 SFCA

Steel: 2-#7 T+B

5x(4)(2') = 40 lft of #7

#7: 2.044 lb/ft

$\frac{40 \times 2.044}{2000} = 0.04$ Ton

3) Grade Beam:

Total Length: 73.5'

Concrete: 2' x 1.1' x 73.5' = 161.7 CF

6 CYDs - 3000psi

Forming: 4' x 73.5' = 294 SFCA

Steel: 2-#7 T+B

4 x 73.5' = 294 lft of #7

#3 Stirrups @ 10" o.c. = 88 Stirrups

6.2' x 88 = 546' of #3

$\frac{0.376 \times 546 + 294 \times 2.044}{2000} = 0.403$ Tons

3 of 4

4) Slab-on Grade: Area = 27.25' x 46.25' = 1260 SF

Concrete: 1260 SF x 5/12 = 525/27 = 19.44 CYD -3000psi

Vapor Barrier: 1260 SF

5" Edge Form: 27.25'

Steel: #3 @ 14" o.c. EW
↳ 1.17'

27.25/1.17 + 46.25/1.17 = 24 + 40 = 64 lft of #3

(0.376 * 64)/2000 = 0.01 Ton

Finishing: 1260 SF

5) Elevated Slab: 1260 SF

Concrete: 1260 x 3/12 = 11.67 CYD - 3500psi

9/16" Deck: 1260 SF

3" Pour Stop: 27.25 lf

Finishing: 1260 SF

Reinforcing: 1260 SF of 6x6 WWF

*Note: These are for entire bldg. (Rec Center) 4054

*6) Roof Deck: 319'x181' = 57,739 SF x 1.033 = 59,645 SF (3/12)

7/4" Tectum E Roof Deck: 59,645 SF

*7) Wood Trusses: 68 LHSP@5' o.c

8) Steel:

Columns: (4) TS 10x10x3/8" - 27'
(1) TS 8x8x3/16" - 27'

Beams: (2) W 27x84 - 27.25'
(1) W 16x26 - 45.5'
(1) W 30x90 - 27.25'

Floor Joists: (11) 28LH12 - 45.5'

Appendix 4

RS Means 2009 Building Construction Cost Data Sheets

RS Means 2009 Building Construction Cost Data Sheets

01 21 Allowances

01 21 61 – Cost Indexes

01 21 61.50 Material Index		Crew	Daily Output	Labor-Hours	Unit	Material	2009 Bare Costs Labor	Equipment	Total	Total Incl O&P
0010 **MATERIAL INDEX** (Reference) For over 930 zip code locations in										
0020 the U.S. and Canada, minimum (Elizabethtown, KY)					%	90.10%				
0040 Average						100%				
0060 Maximum (Ketchikan, AK)						139.60%				

01 21 63 – Taxes

01 21 63.10 Taxes

0010 **TAXES**	R012909-80									
0020 Sales tax, State, average					%	4.91%				
0050 Maximum	R012909-85					7.25%				
0200 Social Security, on first $102,000 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

0010 **FIELD PERSONNEL**										
0020 Clerk, average					Week		380		380	590
0100 Field engineer, minimum							895		895	1,375
0120 Average							1,165		1,165	1,800
0140 Maximum							1,350		1,350	2,100
0160 General purpose laborer, average							1,250		1,250	1,925
0180 Project manager, minimum							1,650		1,650	2,550
0200 Average							1,925		1,925	2,975
0220 Maximum							2,175		2,175	3,375
0240 Superintendent, minimum							1,600		1,600	2,475
0260 Average							1,775		1,775	2,750
0280 Maximum							2,025		2,025	3,125
0290 Timekeeper, average							1,040		1,040	1,600

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01 31 13.30 Insurance

0010 **INSURANCE**	R013113-40									
0020 Builders risk, standard, minimum					Job					.24
0050 Maximum	R013113-50									.64
0200 All-risk type, minimum										.25
0250 Maximum	R013113-60									.62
0400 Contractor's equipment floater, minimum					Value					.50
0450 Maximum					"					1.50
0600 Public liability, average					Job					2.02
0800 Workers' compensation & employer's liability, average										
0850 by trade, carpentry, general					Payroll		17.80%			
0900 Clerical							.58%			
0950 Concrete							14.58%			
1000 Electrical							6.46%			
1050 Excavation							10.01%			
1100 Glazing							13.89%			
1150 Insulation							14.44%			
1200 Lathing							10.63%			
1250 Masonry							14.37%			
1300 Painting & decorating							12.49%			

03 11 Concrete Forming

03 11 13 – Structural Cast-In-Place Concrete Forming

	03 11 13.25 Forms In Place, Columns		Crew	Daily Output	Labor-Hours	Unit	Material	2009 Bare Costs Labor	Equipment	Total	Total incl O&P
3300	48" diameter	G	C-1	50	.640	L.F.	68	24		92	113
3350	60" diameter	G	"	45	.711	"	42	27		69	88
4500	For second and succeeding months, deduct						50%				
5000	Job-built plywood, 8" x 8" columns, 1 use		C-1	185	.194	SFCA	2.41	7.35		9.76	14.05
5050	2 use			195	.164		1.37	6.20		7.57	11.15
5100	3 use			210	.152		.96	5.75		6.71	10
5150	4 use			215	.149		.79	5.65		6.44	9.60
5500	12" x 12" columns, 1 use			180	.178		2.27	6.75		9.02	12.95
5550	2 use			210	.152		1.25	5.75		7	10.30
5600	3 use			220	.145		.91	5.50		6.41	9.55
5650	4 use			225	.142		.74	5.40		6.14	9.15
6000	16" x 16" columns, 1 use			185	.173		2.24	6.55		8.79	12.60
6050	2 use			215	.149		1.19	5.65		6.84	10.05
6100	3 use			230	.139		.90	5.25		6.15	9.15
6150	4 use			235	.136		.73	5.15		5.88	8.80
6500	24" x 24" columns, 1 use			190	.168		2.49	6.40		8.89	12.65
6550	2 use			216	.148		1.37	5.60		6.97	10.20
6600	3 use			230	.139		.99	5.25		6.24	9.25
6650	4 use			238	.134		.81	5.10		5.91	8.80
7000	36" x 36" columns, 1 use			200	.160		1.81	6.05		7.86	11.40
7050	2 use			230	.139		1.03	5.25		6.28	9.30
7100	3 use			245	.131		.73	4.94		5.67	8.45
7150	4 use			250	.128		.59	4.85		5.44	8.15
7400	Steel framed plywood, based on 50 uses of purchased										
7420	forms, and 4 uses of bracing lumber										
7500	8" x 8" column		C-1	340	.094	SFCA	4.53	3.56		8.09	10.55
7550	10" x 10"			350	.091		3.99	3.46		7.45	9.75
7600	12" x 12"			370	.086		3.38	3.27		6.65	8.80
7650	16" x 16"			400	.080		2.63	3.03		5.66	7.60
7700	20" x 20"			420	.076		2.35	2.88		5.23	7.05
7750	24" x 24"			440	.073		1.67	2.75		4.42	6.10
7755	30" x 30"			440	.073		2.14	2.75		4.89	6.60
7760	36" x 36"			460	.070		1.90	2.63		4.53	6.15

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03 11 13.30 Forms In Place, Culvert

0010	FORMS IN PLACE, CULVERT	R031113-40									
0015	5' to 8' square or rectangular, 1 use		C-1	170	.188	SFCA	6.10	7.15		13.25	17.75
0050	2 use	R031113-60		180	.178		3.90	6.75		10.65	14.75
0100	3 use			190	.168		3.16	6.40		9.56	13.40
0150	4 use			200	.160		2.79	6.05		8.84	12.45

03 11 13.35 Forms In Place, Elevated Slabs

0010	FORMS IN PLACE, ELEVATED SLABS	R031113-40									
1000	Flat plate, job-built plywood, to 15' high, 1 use	R031113-60	C-2	470	.102	S.F.	4.53	3.97		8.50	11.15
1050	2 use			520	.092		2.49	3.59		6.08	8.30
1100	[illegible]			[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]
1150	4 use			560	.086		1.47	3.33		4.80	6.75
1500	15' to 20' high ceilings, 4 use			493	.097		1.67	3.77		5.44	7.70
1600	21' to 35' high ceilings, 4 use			450	.107		2.55	4.15		6.70	9.25
2000	Flat slab, drop panels, job-built plywood, to 15' high, 1 use			449	.107		4.77	4.16		8.93	11.70
2050	2 use			509	.094		2.62	3.67		6.29	8.60
2100	3 use			532	.090		1.91	3.51		5.42	7.55
2150	4 use			544	.088		1.55	3.43		4.98	7
2250	15' to 20' high ceilings, 4 use			480	.100		5.10	3.89		8.99	11.65

03 11 Concrete Forming

03 11 13 – Structural Cast-In-Place Concrete Forming

Line	Description		Crew	Daily Output	Labor-Hours	Unit	Material	2009 Bare Costs Labor	Equipment	Total	Total Incl O&P
	03 11 13.45 Forms In Place, Footings										
1500	Keyway, 4 use, tapered wood, 2" x 4"		1 Carp	530	.015	L.F.	.16	.60		.76	1.10
1550	2" x 6"			500	.016		.26	.64		.90	1.28
2000	Tapered plastic			530	.015		.53	.60		1.13	1.51
2250	For keyway hung from supports, add			150	.053		.65	2.13		2.78	4.02
3000	Pile cap, square or rectangular, job-built plywood, 1 use		C-1	290	.110	SFCA	2.46	4.18		6.64	9.20
3050	2 use			346	.092		1.35	3.50		4.85	6.95
3100	3 use			371	.086		.99	3.27		4.26	6.15
3150	4 use			383	.084		.80	3.16		3.96	5.80
4000	Triangular or hexagonal, 1 use			225	.142		2.86	5.40		8.26	11.50
4050	2 use			280	.114		1.58	4.33		5.91	8.45
4100	3 use			305	.105		1.15	3.97		5.12	7.40
4150	4 use			315	.102		.93	3.85		4.78	6.95
5000	Spread footings, job-built lumber, 1 use			305	.105		2.16	3.97		6.13	8.55
5050	2 use			371	.086		1.20	3.27		4.47	6.35
5100	[illegible]			401	.080		[illegible]	[illegible]		[illegible]	5.65
5150	4 use			414	.077		.70	2.93		3.63	5.30
6000	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
6050	4' x 4' footing			22	1.455		10.80	55		65.80	97.50
6100	8' x 8' footing			20	1.600		21.50	60.50		82	118
6150	12' x 12' footing			17	1.882		26	71.50		97.50	140
7000	Plinths, job-built plywood, 1 use			250	.128	SFCA	2.73	4.85		7.58	10.50
7100	4 use			270	.119	"	.90	4.49		5.39	7.95
	03 11 13.47 Forms In Place, Gas Station Forms										
0010	**FORMS IN PLACE, GAS STATION FORMS**										
0050	Curb fascia, with template, 12 ga. steel, left in place, 9" high	G	1 Carp	50	.160	L.F.	15.70	6.40		22.10	27
1000	Sign or light bases, 18" diameter, 9" high	G		9	.889	Ea.	99	35.50		134.50	164
1050	30" diameter, 13" high	G		8	1		157	40		197	235
2000	Island forms, 10' long, 9" high, 3'-6" wide	G	C-1	10	3.200		440	121		561	675
2050	4' wide	G		9	3.556		455	135		590	710
2500	20' long, 9" high, 4' wide	G		6	5.333		730	202		932	1,125
2550	5' wide	G		5	6.400		760	242		1,002	1,200
	03 11 13.50 Forms In Place, Grade Beam										
0010	**FORMS IN PLACE, GRADE BEAM**	R031113-40									
0020	Job-built plywood, 1 use		C-2	530	.091	SFCA	3.25	3.52		6.77	9.05
0050	2 use	R031113-60		580	.083		1.79	3.22		5.01	6.95
0100	[illegible]			[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]
0150	4 use			605	.079		1.06	3.09		4.15	5.95
	03 11 13.55 Forms In Place, Mat Foundation										
0010	**FORMS IN PLACE, MAT FOUNDATION**	R031113-40									
0020	Job-built plywood, 1 use		C-2	290	.166	SFCA	2.94	6.45		9.39	13.25
0050	2 use	R031113-60		310	.155		1.19	6		7.19	10.65
0100	3 use			330	.145		.75	5.65		6.40	9.60
0120	4 use			350	.137		.70	5.35		6.05	9
	03 11 13.65 Forms In Place, Slab On Grade										
0010	**FORMS IN PLACE, SLAB ON GRADE**	R031113-40									
1000	Bulkhead forms w/keyway, wood, 6" high, 1 use		C-1	510	.063	L.F.	.84	2.38		3.22	4.60
1050	2 uses	R031113-60		400	.080		.46	3.03		3.49	5.20
1100	4 uses			350	.091		.27	3.46		3.73	5.65
1400	Bulkhead form for slab, 4-1/2" high, exp metal, incl keyway & stakes	G		1200	.027		2.78	1.01		3.79	4.63
1410	5-1/2" high	G		1100	.029		3.23	1.10		4.33	5.25
1420	7-1/2" high	G		960	.033		4.26	1.26		5.52	6.65
1430	9-1/2" high	G		840	.038		4.84	1.44		6.28	7.55

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03 11 Concrete Forming

03 11 13 – Structural Cast-In-Place Concrete Forming

	03 11 13.65 Forms In Place, Slab On Grade		Crew	Daily Output	Labor-Hours	Unit	2009 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
2000	Curb forms, wood, 6" to 12" high, on grade, 1 use		C-1	215	.149	SFCA	2.83	5.65		8.48	11.85
2050	2 use			250	.128		1.57	4.85		6.42	9.25
2100	3 use			265	.121		1.13	4.57		5.70	8.35
2150	4 use			275	.116		.92	4.41		5.33	7.85
3000	Edge forms, wood, 4 use, on grade, to 6" high			600	.053	L.F.	.38	2.02		2.40	3.55
3050	7" to 12" high										
3500	For depressed slabs, 4 use, to 12" high			300	.107	L.F.	.56	4.04		4.60	6.85
3550	To 24" high			175	.183		.76	6.90		7.66	11.60
4000	For slab blockouts, to 12" high, 1 use			200	.160		.63	6.05		6.68	10.10
4050	To 24" high, 1 use			120	.267		.80	10.10		10.90	16.55
4100	Plastic (extruded), to 6" high, multiple use, on grade			800	.040		5.50	1.51		7.01	8.40
5000	Screed, 24 ga. metal key joint, see Div. 03 15 05.25										
5020	Wood, incl. wood stakes, 1" x 3"		C-1	900	.036	L.F.	.68	1.35		2.03	2.84
5050	2" x 4"			900	.036	"	.63	1.35		1.98	2.78
6000	Trench forms in floor, wood, 1 use			160	.200	SFCA	1.48	7.55		9.03	13.35
6050	2 use			175	.183		.81	6.90		7.71	11.65
6100	3 use			180	.178		.59	6.75		7.34	11.10
6150	4 use			185	.173		.48	6.55		7.03	10.70
8760	Void form, corrugated fiberboard, 6" x 12", 10' long	G		240	.133	S.F.	.84	5.05		5.89	8.75

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	03 11 13.85 Forms In Place, Walls										
0010	FORMS IN PLACE, WALLS	R031113-10									
0100	Box out for wall openings, to 16" thick, to 10 S.F.		C-2	24	2	Ea.	21.50	78		99.50	145
0150	Over 10 S.F. (use perimeter)	R031113-40	"	280	.171	L.F.	1.78	6.65		8.43	12.30
0250	Brick shelf, 4" w, add to wall forms, use wall area abv shelf										
0260	1 use	R031113-60	C-2	240	.200	SFCA	1.87	7.80		9.67	14.10
0300	2 use			275	.175		1.03	6.80		7.83	11.70
0350	4 use			300	.160		.75	6.20		6.95	10.45
0500	Bulkhead, wood with keyway, 1 use, 2 piece			265	.181	L.F.	1.68	7.05		8.73	12.75
0600	Bulkhead forms with keyway, 1 piece expanded metal, 8" wall	G	C-1	1000	.032		4.26	1.21		5.47	6.55
0610	10" wall	G		800	.040		4.84	1.51		6.35	7.65
0620	12" wall	G		525	.061		5.80	2.31		8.11	10
0700	Buttress, to 8' high, 1 use		C-2	350	.137	SFCA	7.05	5.35		12.40	16
0750	2 use			430	.112		3.89	4.34		8.23	11.05
0800	3 use			460	.104		2.83	4.06		6.89	9.40
0850	4 use			480	.100		2.33	3.89		6.22	8.60
1000	Corbal or haunch, to 12" wide, add to wall forms, 1 use			150	.320	L.F.	1.95	12.45		14.40	21.50
1050	2 use			170	.282		1.07	11		12.07	18.25
1100	3 use			175	.274		.78	10.65		11.43	17.40
1150	4 use			180	.267		.63	10.35		10.98	16.80
2000	Wall, job-built plywood, to 8' high, 1 use			370	.130	SFCA	2.62	5.05		7.67	10.70
2050	2 use			435	.110		1.61	4.29		5.90	8.40
2100	3 use			495	.097		1.17	3.77		4.94	7.15
2150	4 use			505	.095		.95	3.70		4.65	6.80
2400	Over 8' to 16' high, 1 use			280	.171		9.40	6.65		16.05	20.50
2450	2 use			345	.139		1.34	5.40		6.74	9.85
2500	3 use			375	.128		.96	4.98		5.94	8.75
2550	4 use			395	.122		.78	4.73		5.51	8.20
2700	Over 16' high, 1 use			235	.204		2.71	7.95		10.66	15.30
2750	2 use			290	.166		1.49	6.45		7.94	11.65
2800	3 use			315	.152		1.08	5.95		7.03	10.40
2850	4 use			330	.145		.88	5.65		6.53	9.70
3000	For architectural finish, add			1820	.026		2.72	1.03		3.75	4.58

03 21 Reinforcing Steel

03 21 05 – Reinforcing Steel Accessories

03 21 05.75 Splicing Reinforcing Bars		Crew	Daily Output	Labor-Hours	Unit	2009 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0550 #10-9	G	C-5	95	.589	Ea.	22	25.50	8.30	55.80	74
0560 #9-8	G	C-25	105	.305		21	10.65		31.65	40.50
0580 #8-7	G		115	.278		19.55	9.75		29.30	37.50
0590 #7-6	G		130	.246		19.05	8.60		27.65	35
0600 Position coupler for curved bars, taper threaded, #4 bars	G		160	.200		22	7		29	35.50
0610 #5 bars	G		145	.221		23	7.70		30.70	38
0620 #6 bars	G		130	.246		26	8.60		34.60	43
0630 #7 bars	G		110	.291		38.50	10.15		48.65	59.50
0640 #8 bars	G	▼	100	.320		40	11.20		51.20	62.50
0650 #9 bars	G	C-5	90	.622		43.50	27	8.75	79.25	101
0660 #10 bars	G		80	.700		47	30.50	9.85	87.35	111
0670 #11 bars	G		70	.800		49	35	11.30	95.30	122
0680 #14 bars	G		55	1.018		61	44	14.35	119.35	154
0690 #18 bars	G		40	1.400		88	61	19.75	168.75	216
0700 Transition position coupler for curved bars, taper threaded, #18-14	G		40	1.400		111	61	19.75	191.75	241
0710 #18-11	G		40	1.400		112	61	19.75	192.75	242
0720 #14-11	G		55	1.018		95	44	14.35	153.35	191
0730 #11-10	G		70	.800		54.50	35	11.30	100.80	128
0740 #10-9	G	▼	80	.700		52	30.50	9.85	92.35	116
0750 #9-8	G	C-25	90	.356		48	12.45		60.45	73.50
0760 #8-7	G		100	.320		44	11.20		55.20	67
0770 #7-6	G		110	.291		42.50	10.15		52.65	64
0800 Sleeve type w/ grout filler, for precast concrete, #6 bars	G		72	.444		23.50	15.55		39.05	51.50
0802 #7 bars	G		64	.500		25.50	17.50		43	57
0805 #8 bars	G		56	.571		29	19.95		48.95	65
0807 #9 bars	G	▼	48	.667		31.50	23.50		55	73.50
0810 #10 bars	G	C-5	40	1.400		41	61	19.75	121.75	165
0900 #11 bars	G		32	1.750		49	76	24.50	149.50	203
0920 #14 bars	G	▼	24	2.333		79.50	101	33	213.50	286
1000 Sleeve type w/ ferrous filler, for critical structures, #6 bars	G	C-25	72	.444		41	15.55		56.55	71
1210 #7 bars	G		64	.500		42	17.50		59.50	75
1220 #8 bars	G	▼	56	.571		44	19.95		63.95	81.50
1230 #9 bars	G	C-5	48	1.167		45	50.50	16.45	111.95	149
1240 #10 bars	G		40	1.400		48	61	19.75	128.75	172
1250 #11 bars	G		32	1.750		58	76	24.50	158.50	213
1260 #14 bars	G		24	2.333		73	101	33	207	278
1270 #18 bars	G	▼	16	3.500		106	152	49.50	307.50	415
2000 Weldable half coupler, taper threaded, #4 bars	G	E-16	120	.133		7.10	6.10	1.12	14.32	19.95
2100 #5 bars	G		112	.143		8.40	6.55	1.20	16.15	22
2200 #6 bars	G		104	.154		13.35	7.05	1.29	21.69	28.50
2300 #7 bars	G		96	.167		15.50	7.60	1.40	24.50	32
2400 #8 bars	G		88	.182		16.15	8.30	1.53	25.98	34.50
2500 #9 bars	G		80	.200		17.80	9.15	1.68	28.63	37.50
2600 #10 bars	G		72	.222		18.20	10.15	1.86	30.21	40
2700 #11 bars	G		64	.250		19.45	11.45	2.10	33	44.50
2800 #14 bars	G		56	.286		22.50	13.05	2.40	37.95	50.50
2900 #18 bars	G	▼	48	.333	▼	36.50	15.25	2.80	54.55	70

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03 21 10 – Uncoated Reinforcing Steel

03 21 10.60 Reinforcing In Place

0015	**REINFORCING IN PLACE** A615 Grade 60, incl. access. labor	R032110-10									
0100	Beams & Girders, #3 to #7 CN	G	4 Rodm	1.60	20	Ton	1,550	890		2,440	3,150

03 21 Reinforcing Steel

03 21 10 – Uncoated Reinforcing Steel

03 21 10.60 Reinforcing In Place			Crew	Daily Output	Labor-Hours	Unit	2009 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0150 #8 to #18	R032110-20	G	4 Rodm	2.70	11.852	Ton	1,550	530		2,080	2,575
0200 Columns, #3 to #7		G		1.50	21.333		1,550	950		2,500	3,250
0250 #8 to #18		G		2.30	13.913		1,550	620		2,170	2,725
0300 Spirals, hot rolled, 8" to 15" diameter		G		2.20	14.545		2,000	650		2,650	3,250
0320 15" to 24" diameter	R032110-40	G		2.20	14.545		1,925	650		2,575	3,150
0330 24" to 36" diameter		G		2.30	13.913		1,825	620		2,445	3,025
0340 36" to 48" diameter	R032110-50	G		2.40	13.333		1,725	595		2,320	2,875
0360 48" to 64" diameter		G		2.50	12.800		1,925	570		2,495	3,025
0380 64" to 84" diameter	R032110-70	G		2.60	12.308		2,000	550		2,550	3,100
0390 84" to 96" diameter		G		2.70	11.852		2,100	530		2,630	3,175
[redacted]		G		[redacted]			[redacted]			[redacted]	[redacted]
0500 Footings, #4 to #7		G		2.10	15.238		1,475	680		2,155	2,725
[redacted]				[redacted]			[redacted]			[redacted]	[redacted]
0600 Slab on grade, #3 to #7		G		2.30	13.913		1,475	620		[redacted]	[redacted]
[redacted]		G		[redacted]			[redacted]			[redacted]	[redacted]
0750 #8 to #18		G		4	8		1,475	355		1,830	2,200
0900 Use the following for a rough estimate guide											
1000 Typical in place, average, under 10 ton job, #3 to #7		G	4 Rodm	1.80	17.778	Ton	1,600	790		2,390	3,075
1010 #8 to #18		G		2.70	11.852		1,625	530		2,155	2,675
1050 10 – 50 ton job, #3 to #7		G		2.10	15.238		1,575	680		2,255	2,825
1060 #8 to #18		G		3	10.667		1,600	475		2,075	2,550
1100 50 – 100 ton job, #3 - #7		G		2.20	14.545		1,525	650		2,175	2,750
1110 #8 to #18		G		3.10	10.323		1,575	460		2,035	2,475
1150 Over 100 ton job, #3 - #7		G		2.30	13.913		1,525	620		2,145	2,700
1160 #8 - #18		G		3.20	10		1,550	445		1,995	2,425
1200 High strength steel, Grade 75, #14 bars only, add		G					153			153	168
2000 Unloading & sorting, add to above			G-5	100	.560			24.50	7.90	32.40	47.50
2200 Crane cost for handling, add to above, minimum				135	.415			18	5.85	23.85	35.50
2210 Average				92	.609			26.50	8.60	35.10	52
2220 Maximum				35	1.600			69.50	22.50	92	136
2400 Dowels, 2 feet long, deformed, #3		G	2 Rodm	520	.031	Ea.	.64	1.37		2.01	2.95
2410 #4		G		480	.033		1.14	1.48		2.62	3.68
2420 #5		G		435	.037		1.78	1.64		3.42	4.64
2430 #6		G		360	.044		2.56	1.98		4.54	6.05
2450 Longer and heavier dowels, add		G		725	.022	Lb.	.85	.98		1.83	2.55
2500 Smooth dowels, 12" long, 1/4" or 3/8" diameter		G		140	.114	Ea.	1.21	5.10		6.31	9.70
2520 5/8" diameter		G		125	.128		2.11	5.70		7.81	11.60
2530 3/4" diameter		G		110	.145		2.62	6.50		9.12	13.50
2600 Dowel sleeves for CIP concrete, 2-part system											
2610 Sleeve base, plastic, for 5/8" smooth dowel sleeve, fasten to edge form			1 Rodm	200	.040	Ea.	.52	1.78		2.30	3.48
2615 Sleeve, plastic, 12" long, for 5/8" smooth dowel, snap onto base				400	.020		1.03	.89		1.92	2.59
2620 Sleeve base, for 3/4" smooth dowel sleeve				175	.046		.49	2.04		2.53	3.87
2625 Sleeve, 12" long, for 3/4" smooth dowel				350	.023		1.08	1.02		2.10	2.86
2630 Sleeve base, for 1" smooth dowel sleeve				150	.053		.64	2.38		3.02	4.59
2635 Sleeve, 12" long, for 1" smooth dowel				300	.027		1.84	1.19		3.03	3.96
2700 Dowel caps, visual warning only, plastic, #3 to #8			2 Rodm	800	.020		.51	.89		1.40	2.02
2720 #8 to #18				750	.021		1.08	.95		2.03	2.74
2750 Impalement protective, plastic, #4 to #9				800	.020		1.95	.89		2.84	3.61

03 21 10.70 Glass Fiber Reinforced Polymer Bars

0010 **GLASS FIBER REINFORCED POLYMER BARS**											
0050 #2 bar, .043 lbs/ ft.						L.F.	.35			.35	.39
0100 #3 bar, .092 lbs/ ft.							.48			.48	.53

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03 21 Reinforcing Steel

03 21 10 – Uncoated Reinforcing Steel

	03 21 10.70 Glass Fiber Reinforced Polymer Bars	Crew	Daily Output	Labor-Hours	Unit	2009 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0150	#4 bar, .160 lbs./ft.				L.F.	.70			.70	.77
0200	#5 bar, .258 lbs./ft.					.98			.98	1.08
0250	#6 bar, .372 lbs./ft.					1.35			1.35	1.49
0300	#7 bar, .497 lbs./ft.					1.70			1.70	1.87
0350	#8 bar, .620 lbs./ft.					2.25			2.25	2.48
0400	#9 bar, .800 lbs./ft.					2.90			2.90	3.19
0450	#10 bar, 1.08 lbs./ft.				▼	3.45			3.45	3.80
0500	For Bends, add per bend				Ea.	1			1	1.10

03 21 13 – Galvanized Reinforcing Steel

03 21 13.10 Galvanized Reinforcing

0010	**GALVANIZED REINFORCING**									
0150	Add to uncoated reinforcing price for galvanizing				Ton	1,150			1,150	1,250

03 21 16 – Epoxy-Coated Reinforcing Steel

03 21 16.10 Epoxy-Coated Reinforcing

0010	**EPOXY-COATED REINFORCING**									
0100	Add to uncoated reinforcing price for coating with epoxy				Ton	865			865	950

03 22 Welded Wire Fabric Reinforcing

03 22 05 – Uncoated Welded Wire Fabric

03 22 05.50 Welded Wire Fabric

0010	**WELDED WIRE FABRIC** ASTM A185	R032205-30										
0030	Made from recycled materials											
0050	Sheets											
0100	6 x 6 - W1.4 x W1.4 (10 x 10) 21 lb. per C.S.F. CN	G	2 Rodm	35	.457	C.S.F.	18.05	20.50		38.55	53.50
0300	6 x 6 - W2.9 x W2.9 (6 x 6) 42 lb. per C.S.F.	G		29	.552		32.50	24.50		57	76
0400	4 x 4 - W4 x W4 (4 x 4) 58 lb. per C.S.F.	G		27	.593		46.50	28.50		75	94
0500	4 x 4 - W1.4 x W1.4 (10 x 10) 31 lb. per C.S.F.	G		31	.516		26.50	23		49.50	67
0600	4 x 4 - W2.1 x W2.1 (8 x 8) 44 lb. per C.S.F.	G		29	.552		38	24.50		62.50	81.50
0650	4 x 4 - W2.9 x W2.9 (6 x 6) 61 lb. per C.S.F.	G		27	.593		50.50	26.50		77	98.50
0700	4 x 4 - W4 x W4 (4 x 4) 85 lb. per C.S.F.	G	▼	25	.640	▼	65.50	28.50		94	119
0750	Rolls											
0800	2 x 2 - #14 galv., 21 lb./C.S.F., beam & column wrap	G	2 Rodm	6.50	2.462	C.S.F.	66	110		176	252
0900	2 x 2 - #12 galv. for gunite reinforcing	G	"	6.50	2.462	"	65.50	110		175.50	252

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03 23 Stressing Tendons

03 23 05 – Prestressing Tendons

03 23 05.50 Prestressing Steel

0010	**PRESTRESSING STEEL**	R034136-90										
0100	Grouted strand, post-tensioned in field, 50' span, 100 kip	G	C-3	1200	.053	Lb.	2.33	2.18	.09	4.60	6.15
0150	300 kip	G		2700	.024		1.05	.97	.04	2.06	2.75
0300	100' span, 100 kip	G		1700	.038		2.33	1.54	.06	3.93	5.10
0350	300 kip	G		3200	.020		2.02	.82	.03	2.87	3.57
0500	200' span, 100 kip	G		2700	.024		2.32	.97	.04	3.33	4.15
0550	300 kip	G		3500	.018		2.01	.75	.03	2.79	3.44
0800	Grouted bars, 50' span, 42 kip	G		2600	.025		1.25	1.01	.04	2.30	3.03
0850	143 kip	G		3200	.020		1.21	.82	.03	2.06	2.68
1000	75' span, 42 kip	G	▼	3200	.020	▼	1.26	.82	.03	2.11	2.74

03 31 Structural Concrete

03 31 05 – Normal Weight Structural Concrete

Code	Description	Ref.	Crew	Daily Output	Labor-Hours	Unit	2009 Bare Costs Material	2009 Bare Costs Labor	2009 Bare Costs Equipment	Total	Total Incl O&P
03 31 05.30 Concrete, Field Mix											
0010	**CONCRETE, FIELD MIX**	R033105-65									
0015	FOB forms 2250 psi					C.Y.	90			90	99
0020	3000 psi					"	94			94	103
03 31 05.35 Normal Weight Concrete, Ready Mix											
0010	**NORMAL WEIGHT CONCRETE, READY MIX**, delivered	R033105-10									
0012	Includes local aggregate, sand, portland cement, and water										
0015	Excludes all additives and treatments	R033105-20									
0020	2000 psi					C.Y.	97			97	107
0100	2500 psi	R033105-30					98.50			98.50	108
0150	3000 psi	CN					101			101	111
0200	3500 psi	R033105-40					104			104	114
0300	4000 psi						[illegible]			[illegible]	[illegible]
0350	4500 psi	R033105-50					109			109	120
0400	5000 psi	CN					111			111	122
0411	6000 psi						127			127	139
0412	8000 psi						206			206	227
0413	10,000 psi						293			293	320
0414	12,000 psi						355			355	390
1000	For high early strength cement, add						10%				
1010	For structural lightweight with regular sand, add						25%				
1300	For winter concrete (hot water), add						5.25			5.25	5.80
1400	For hot weather concrete (ice), add						7.20			7.20	7.90
1410	For mid-range water reducer, add						3.95			3.95	4.35
1420	For high-range water reducer/superplasticizer, add						5.85			5.85	6.40
1430	For retarder, add						2			2	2.20
1440	For non-Chloride accelerator, add						4.75			4.75	5.25
1450	For Chloride accelerator, per 1%, add						2.75			2.75	3.03
1460	For fiber reinforcing, synthetic (1 Lb./C.Y.), add						6			6	6.60
1500	For Saturday delivery, add						5.50			5.50	6.05
1510	For truck holding/waiting time past 1st hour per load, add					Hr.	92			92	101
1520	For short load (less than 4 C.Y.), add per load					Ea.	100			100	110
2000	For all lightweight aggregate, add					C.Y.	45%				
03 31 05.70 Placing Concrete											
0010	**PLACING CONCRETE**	R033105-70									
0020	Includes labor and equipment to place and vibrate										
0050	Beams, elevated, small beams, pumped		C-20	60	1.067	C.Y.		36	13.15	49.15	70
0100	With crane and bucket		C-7	45	1.600			55	26.50	81.50	113
0200	Large beams, pumped		C-20	90	.711			24	8.80	32.80	46.50
0250	With crane and bucket		C-7	65	1.108			38	18.40	56.40	78.50
0400	Columns, square or round, 12" thick, pumped		C-20	60	1.067			36	13.15	49.15	70
0450	With crane and bucket		C-7	40	1.800			61.50	30	91.50	127
0600	18" thick, pumped		C-20	90	.711			24	8.80	32.80	46.50
0650	With crane and bucket		C-7	55	1.309			45	22	67	92.50
0800	24" thick, pumped		C-20	92	.696			23.50	8.60	32.10	45.50
0850	With crane and bucket		C-7	70	1.029			35	17.10	52.10	73
1000	36" thick, pumped		C-20	140	.457			15.50	5.65	21.15	29.50
1050	With crane and bucket							24.50	11.85	36.45	50
1400	Elevated slabs, less than 6" thick, pumped		C-20	140	.457			15.50	5.65	21.15	29.50
1450	With crane and bucket		C-7	95	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]
1500	6" to 10" thick, pumped		C-20	160	.400			13.55	4.94	18.49	26.50
1550	With crane and bucket		C-7	110	.655			22.50	10.90	33.40	46
1600	Slabs over 10" thick, pumped		C-20	180	.356			12.05	4.39	16.44	23.50

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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	2009 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
1650	With crane and bucket	C-7	130	.554	C.Y.		18.95	9.20	28.15	39
1900	Footings, continuous, shallow, direct chute	C-6	120	.400			13.20	.43	13.63	21
1950	Pumped	C-20	150	.427			14.45	5.25	19.70	28
2000	With crane and bucket	C-7	90	.800			27.50	13.30	40.80	56.50
2100	Footings, continuous, deep, direct chute	C-6	140	.343			11.35	.37	11.72	17.80
2150	Pumped	C-20	160	.400			13.55	4.94	18.49	26.50
2200	With crane and bucket	C-7	110	.655			22.50	10.90	33.40	46
2400	Footings, spread, under 1 C.Y., direct chute									
2450	Pumped	C-20	65	.985			33.50	12.15	45.65	64.50
2500	With crane and bucket									
2600	Over 5 C.Y., direct chute	C-6	120	.400			13.20	.43	13.63	21
2650	Pumped	C-20	150	.427			14.45	5.25	19.70	28
2700	With crane and bucket	C-7	100	.720			24.50	11.95	36.45	50.50
2900	Foundation mats, over 20 C.Y., direct chute	C-6	350	.137			4.53	.15	4.68	7.10
2950	Pumped	C-20	400	.160			5.45	1.97	7.42	10.45
3000	With crane and bucket	C-7	300	.240			8.20	3.99	12.19	16.95
3200	Grade beams, direct chute									
3250	Pumped	C-20	180	.356			12.05	4.39	16.44	23.50
3300	With crane and bucket									
3500	High rise, for more than 5 stories, pumped, add per story	C-20	2100	.030			1.03	.38	1.41	1.99
3510	With crane and bucket, add per story	C-7	2100	.034			1.17	.57	1.74	2.42
3700	Pile caps, under 5 C.Y., direct chute	C-6	90	.533			17.65	.58	18.23	27.50
3750	Pumped	C-20	110	.582			19.75	7.20	26.95	38
3800	With crane and bucket	C-7	80	.900			31	14.95	45.95	63.50
3850	Pile cap, 5 C.Y. to 10 C.Y., direct chute	C-6	175	.274			9.05	.30	9.35	14.25
3900	Pumped	C-20	200	.320			10.85	3.95	14.80	21
3950	With crane and bucket	C-7	150	.480			16.45	8	24.45	34
4000	Over 10 C.Y., direct chute	C-6	215	.223			7.40	.24	7.64	11.55
4050	Pumped	C-20	240	.267			9.05	3.29	12.34	17.45
4100	With crane and bucket	C-7	185	.389			13.30	6.45	19.75	27.50
4300	Slab on grade, up to 6" thick, direct chute									
4350	Pumped	C-20	130	.492			16.70	6.10	22.80	32
4400	With crane and bucket									
4600	Over 6" thick, direct chute	C-6	165	.291			9.60	.31	9.91	15.10
4650	Pumped	C-20	185	.346			11.75	4.27	16.02	22.50
4700	With crane and bucket	C-7	145	.497			17	8.25	25.25	35
4900	Walls, 8" thick, direct chute	C-6	90	.533			17.65	.58	18.23	27.50
4950	Pumped	C-20	100	.640			21.50	7.90	29.40	41.50
5000	With crane and bucket	C-7	80	.900			31	14.95	45.95	63.50
5050	12" thick, direct chute	C-6	100	.480			15.85	.52	16.37	25
5100	Pumped	C-20	110	.582			19.75	7.20	26.95	38
5200	With crane and bucket	C-7	90	.800			27.50	13.30	40.80	56.50
5300	15" thick, direct chute	C-6	105	.457			15.10	.49	15.59	23.50
5350	Pumped	C-20	120	.533			18.10	6.60	24.70	35
5400	With crane and bucket	C-7	95	.758			26	12.60	38.60	53.50
5600	Wheeled concrete dumping, add to placing costs above									
5610	Walking cart, 50' haul, add	C-18	32	.281	C.Y.		8.95	1.72	10.67	15.80
5620	150' haul, add		24	.375			11.95	2.30	14.25	21
5700	250' haul, add		18	.500			15.90	3.07	18.97	28
5800	Riding cart, 50' haul, add	C-19	80	.113			3.58	1.08	4.66	6.75
5810	150' haul, add		50	.150			4.77	1.44	6.21	9
5900	250' haul, add		45	.200			6.35	1.92	8.27	11.95

03 35 Concrete Finishing

03 35 29 – Tooled Concrete Finishing

	03 35 29.30 Finishing Floors	Crew	Daily Output	Labor-Hours	Unit	Material	2009 Bare Costs Labor	Equipment	Total	Total Incl O&P
0010	**FINISHING FLOORS**									
0020	Manual screed finish	G-10	4800	.005	S.F.		.18		.18	.27
0100	[illegible]		[illegible]	[illegible]			[illegible]		[illegible]	[illegible]
0125	Manual screed, bull float, manual float		2000	.012			.43		.43	.64
0150	Manual screed, bull float, manual float & broom finish		1850	.013			.47		.47	.70
0200	Manual screed, bull float, manual float, manual steel trowel		1265	.019			.68		.68	1.02
0250	Manual screed, bull float, machine float & trowel (walk-behind)	G-10C	1715	.014			.50	.02	.52	.78
0300	Power screed, bull float, machine float & trowel (walk-behind)	G-10D	2400	.010			.36	.05	.41	.59
0350	Power screed, bull float, machine float & trowel (ride-on)	G-10E	4000	.006			.22	.06	.28	.39
0400	Integral topping and finish, using 1:1:2 mix, 3/16" thick	G-10B	1000	.040		.10	1.37	.24	1.71	2.44
0450	1/2" thick		950	.042		.26	1.44	.25	1.95	2.74
0500	3/4" thick		850	.047		.39	1.61	.28	2.28	3.18
0600	1" thick		750	.053		.52	1.83	.32	2.67	3.68
0800	Granolithic topping, laid after, 1:1:1-1/2 mix, 1/2" thick		590	.068		.29	2.32	.41	3.02	4.28
0820	3/4" thick		580	.069		.43	2.36	.41	3.20	4.50
0850	1" thick		575	.070		.57	2.38	.42	3.37	4.70
0950	2" thick		500	.080		1.15	2.74	.48	4.37	5.95
1200	Heavy duty, 1:1:2, 3/4" thick, preshrunk, gray, 20 MSF		320	.125		.73	4.29	.75	5.77	8.15
1300	100 MSF		380	.105		.39	3.61	.63	4.63	6.55
1600	Exposed local aggregate finish, minimum	1 Cefi	625	.013		.22	.49		.71	.97
1650	Maximum		465	.017		.66	.66		1.32	1.69
1800	Floor abrasives, .25 psf, aluminum oxide		850	.009		.44	.36		.80	1.01
1850	Silicon carbide		850	.009		.61	.36		.97	1.20
2000	Floor hardeners, metallic, light service, .50 psf, add		850	.009		.51	.36		.87	1.09
2050	Medium service, .75 psf		750	.011		.76	.41		1.17	1.43
2100	Heavy service, 1.0 psf		650	.012		1.01	.47		1.48	1.80
2150	Extra heavy, 1.5 psf		575	.014		1.52	.53		2.05	2.45
2300	Non-metallic, light service, .50 psf		850	.009		.23	.36		.59	.78
2350	Medium service, .75 psf		750	.011		.34	.41		.75	.98
2400	Heavy service, 1.00 psf		650	.012		.45	.47		.92	1.19
2450	Extra heavy, 1.50 psf		575	.014		.68	.53		1.21	1.53
2800	Trap rock wearing surface for monolithic floors									
2810	2.0 psf	C-10B	1250	.032	S.F.	.03	1.10	.19	1.32	1.90
3000	Floor coloring, dusted on, minimum (0.6 psf), add to above	1 Cefi	1300	.006		.43	.24		.67	.81
3050	Maximum (1.0 psf), add to above	"	625	.013		.71	.49		1.20	1.50
3100	Colored powder only				Lb.	.71			.71	.78
3600	1/2" topping using 0.6 psf powdered color	C-10B	590	.068	S.F.	4.86	2.32	.41	7.59	9.30
3650	1/2" topping using 1.0 psf powdered color	"	590	.068		5.15	2.32	.41	7.88	9.60
3800	Dustproofing, solvent-based, 1 coat	1 Cefi	1900	.004		.17	.16		.33	.43
3850	2 coats		1300	.006		.61	.24		.85	1.02
4000	Epoxy-based, 1 coat		1500	.005		.15	.20		.35	.46
4050	2 coats		1500	.005		.29	.20		.49	.62
4400	Stair finish, float		275	.029			1.11		1.11	1.63
4500	Steel trowel finish		200	.040			1.53		1.53	2.24
4600	Silicon carbide finish, .25 psf		150	.053		.44	2.04		2.48	3.47

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03 35 29.35 Control Joints, Saw Cut

0010	**CONTROL JOINTS, SAW CUT**									
0100	Sawcut in green concrete									
0120	1" depth	C-27	2000	.008	L.F.	.07	.31	.07	.45	.60
0140	1-1/2" depth		1800	.009		.10	.34	.08	.52	.70
0160	2" depth		1600	.010		.13	.38	.09	.60	.81
0200	Clean out control joint of debris	C-28	6000	.001			.05		.05	.07

05 12 Structural Steel Framing

05 12 23 – Structural Steel for Buildings

			Crew	Daily Output	Labor-Hours	Unit	Material	2009 Bare Costs Labor	Equipment	Total	Total Incl O&P
05 12 23.05 Canopy Framing											
0010	**CANOPY FRAMING**										
0020	6" and 8" members, shop fabricated	G	E-4	3000	.011	Lb.	1.80	.48	.04	2.32	2.89
05 12 23.10 Ceiling Supports											
0010	**CEILING SUPPORTS**										
1000	Entrance door/folding partition supports, shop fabricated	G	E-4	60	.533	L.F.	30	24	2.23	56.23	78.50
1100	Linear accelerator door supports	G		14	2.286		137	103	9.60	249.60	345
1200	Lintels or shelf angles, hung, exterior hot dipped galv.	G		267	.120		20.50	5.40	.50	26.40	32.50
1250	Two coats primer paint instead of galv.	G		267	.120	"	17.75	5.40	.50	23.65	29.50
1400	Monitor support, ceiling hung, expansion bolted	G		4	8	Ea.	475	360	33.50	868.50	1,200
1450	Hung from pre-set inserts	G		6	5.333		510	241	22.50	773.50	1,025
1600	Motor supports for overhead doors	G		4	8	"	242	360	33.50	635.50	950
1700	Partition support for heavy folding partitions, without pocket	G		24	1.333	L.F.	68.50	60.50	5.60	134.60	188
1750	Supports at pocket only	G		12	2.667		137	121	11.15	269.15	375
2000	Rolling grilles & fire door supports	G		34	.941		58.50	42.50	3.94	104.94	145
2100	Spider-leg light supports, expansion bolted to ceiling slab	G		8	4	Ea.	195	181	16.75	392.75	555
2150	Hung from pre-set inserts	G		12	2.667	"	210	121	11.15	342.15	460
2400	Toilet partition support	G		36	.889	L.F.	68.50	40	3.72	112.22	151
2500	X-ray travel gantry support	G		12	2.667	"	234	121	11.15	366.15	485
05 12 23.15 Columns, Lightweight											
0010	**COLUMNS, LIGHTWEIGHT**										
1000	Lightweight units (lally), 3-1/2" diameter		E-2	780	.072	L.F.	6.10	3.13	2.23	11.46	14.50
1050	4" diameter		"	900	.062	"	8.95	2.71	1.93	13.59	16.55
5800	Adjustable jack post, 8' maximum height, 2-3/4" diameter	G				Ea.	33			33	36.50
5850	4" diameter	G				"	53			53	58
05 12 23.17 Columns, Structural											
0010	**COLUMNS, STRUCTURAL**	R051223-10									
0015	Made from recycled materials										
0020	Shop fab'd for 100-ton, 1-2 story project, bolted connections										
0800	Steel, concrete filled, extra strong pipe, 3-1/2" diameter		E-2	660	.085	L.F.	49.50	3.70	2.64	55.84	63.50
0830	4" diameter			780	.072		55	3.13	2.23	60.36	68.50
0890	5" diameter			1020	.055		65.50	2.39	1.71	69.60	78.50
0930	6" diameter			1200	.047		87	2.03	1.45	90.48	101
0940	8" diameter			1100	.051		87	2.22	1.58	90.80	102
1100	For galvanizing, add					Lb.	.40			.40	.44
1300	For web ties, angles, etc., add per added lb.		1 Sswk	945	.008		1.50	.38		1.88	2.32
1500	Steel pipe, extra strong, no concrete, 3" to 5" diameter	G	E-2	16000	.004		1.50	.15	.11	1.76	2.03
1600	6" to 12" diameter	G		14000	.004		1.50	.17	.12	1.79	2.09
1700	Steel pipe, extra strong, no concrete, 3" diameter x 12'-0"	G		60	.933	Ea.	185	40.50	29	254.50	305
1750	4" diameter x 12'-0"	G		58	.966		270	42	30	342	400
1800	6" diameter x 12'-0"	G		54	1.037		515	45	32	592	680
1850	8" diameter x 14'-0"	G		50	1.120		910	49	35	994	1,125
1900	10" diameter x 16'-0"	G		48	1.167		1,325	51	36.50	1,412.50	1,575
1950	12" diameter x 18'-0"	G		45	1.244		1,775	54	38.50	1,867.50	2,075
3300	Structural tubing, square, A500GrB, 4" to 6" square, light section	G		11270	.005	Lb.	1.50	.22	.15	1.87	2.19
3600	Heavy section	G		32000	.002	"	1.50	.08	.05	1.63	1.84
4000	Concrete filled, add					L.F.	4.04			4.04	4.45
4500	Structural tubing, sq, 4" x 4" x 1/4" x 12'-0"	G	E-2	58	.966	Ea.	248	42	30	320	375
4550	6" x 6" x 3/8" x 12'-0"	G		54	1.037		405	45	32	482	560
4600	8" x 8" x 3/8" x 14'-0"	G		50	1.120		880	49	35	964	1,075
4650	10" x 10" x 1/2" x 16'-0"	G		48	1.167		1,625	51	36.50	1,712.50	1,925
5100	Structural tubing, rect, 3" to 6" wide, light section	G		12000	.005		1.50	.20	.15	1.85	2.16
5200	Heavy section	G									

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05 12 Structural Steel Framing

05 12 23 – Structural Steel for Buildings

05 12 23.75 Structural Steel Members		Crew	Daily Output	Labor-Hours	Unit	2009 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
1500 x 26	G	E-2	880	.064	L.F.	43	2.77	1.98	47.75	54
1520 x 35	G		810	.069		58	3.01	2.15	63.16	71
1560 x 50	G		750	.075		82.50	3.25	2.32	88.07	99
1580 x 58	G		750	.075		95.50	3.25	2.32	101.07	113
1700 x 72	G		640	.088		119	3.81	2.72	125.53	140
1740 x 87	G		640	.088		144	3.81	2.72	150.53	167
1900 W 14 x 26	G		990	.057		43	2.46	1.76	47.22	53
2100 x 30	G		900	.062		49.50	2.71	1.93	54.14	61.50
2300 x 34	G		810	.069		56	3.01	2.15	61.16	69
2320 x 43	G		810	.069		71	3.01	2.15	76.16	85.50
2340 x 53	G		800	.070		87.50	3.05	2.18	92.73	104
2360 x 74	G		760	.074		122	3.21	2.29	127.50	142
2380 x 90	G		740	.076		149	3.30	2.35	154.65	171
[illegible]	G		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	203.81	226
2700 W 16 x 26	G		1000	.056		43	2.44	1.74	47.18	53
2900 x 31	G		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3100 x 40	G		800	.070		66	3.05	2.18	71.23	80
3120 x 50	G		800	.070		82.50	3.05	2.18	87.73	98.50
3140 x 67	G		760	.074		111	3.21	2.29	116.50	130
3300 W 18 x 35	G	E-5	960	.083		58	3.67	1.95	63.62	72
3500 x 40	G		960	.083		66	3.67	1.95	71.62	81
3520 x 46	G		960	.083		76	3.67	1.95	81.62	92
3700 x 50	G		912	.088		82.50	3.87	2.06	88.43	100
3900 x 55	G		912	.088		91	3.87	2.06	96.93	109
3920 x 65	G		900	.089		107	3.92	2.08	113	127
3940 x 76	G		900	.089		125	3.92	2.08	131	147
3960 x 86	G		900	.089		142	3.92	2.08	148	165
3980 x 106	G		900	.089		175	3.92	2.08	181	201
4100 W 21 x 44	G		1064	.075		72.50	3.32	1.76	77.58	87.50
4300 x 50	G		1064	.075		82.50	3.32	1.76	87.58	98.50
4500 x 62	G		1036	.077		102	3.41	1.81	107.22	121
4700 x 68	G		1036	.077		112	3.41	1.81	117.22	131
4720 x 83	G		1000	.080		137	3.53	1.88	142.41	159
4740 x 93	G		1000	.080		153	3.53	1.88	158.41	177
4760 x 101	G		1000	.080		167	3.53	1.88	172.41	191
4780 x 122	G		1000	.080		201	3.53	1.88	206.41	229
4900 W 24 x 55	G		1110	.072		91	3.18	1.69	95.87	107
5100 x 62	G		1110	.072		102	3.18	1.69	106.87	120
5300 x 68	G		1110	.072		112	3.18	1.69	116.87	130
5500 x 76	G		1110	.072		125	3.18	1.69	129.87	145
5700 x 84	G		1080	.074		139	3.27	1.74	144.01	160
5720 x 94	G		1080	.074		155	3.27	1.74	160.01	179
5740 x 104	G		1050	.076		172	3.36	1.79	177.15	197
5760 x 117	G		1050	.076		193	3.36	1.79	198.15	220
5780 x 146	G		1050	.076		241	3.36	1.79	246.15	273
5800 W 27 x 84	G		1190	.067		139	2.96	1.58	143.54	159
[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5920 x 114	G		1150	.070		188	3.07	1.63	192.70	214
5940 x 146	G		1150	.070		241	3.07	1.63	245.70	272
[illegible]	G		1150	.070		266	3.07	1.63	270.70	299
6100 W 30 x 99	G		1200	.067		163	2.94	1.56	167.50	187
[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6500 x 116	G		1160	.069		191	3.04	1.62	195.66	218

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05 21 Steel Joist Framing

05 21 16 – Longspan Steel Joist Framing

05 21 16.50 Longspan Joists		Crew	Daily Output	Labor-Hours	Unit	2009 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
2340	28LH11, 25 Lb/LF	G	1800	.044		28	1.96	1.12	31.08	35.50
2380	32LH13, 30 Lb/LF	G	1800	.044		34	1.96	1.12	37.08	42
2400	36LH09, 21 Lb/LF	G	1800	.044		23.50	1.96	1.12	26.58	30.50
2420	36LH14, 36 Lb/LF	G	1800	.044		40.50	1.96	1.12	43.58	49
2440	40LH10, 21 Lb/LF	G	2200	.036		23.50	1.60	.91	26.01	30
2460	40LH15, 36 Lb/LF	G	2200	.036		40.50	1.60	.91	43.01	48.50
2480	44LH11, 22 Lb/LF	G	2200	.036		25	1.60	.91	27.51	31.50
2500	44LH16, 42 Lb/LF	G	2200	.036		47.50	1.60	.91	50.01	56
2520	48LH11, 22 Lb/LF	G	2200	.036		25	1.60	.91	27.51	31.50
2540	48LH16, 42 Lb/LF	G	2200	.036		47.50	1.60	.91	50.01	56
2600	For less than 40-ton job lots									
2602	For 30 to 39 tons, add					10%				
2604	20 to 29 tons, add					20%				
2606	10 to 19 tons, add					30%				
2607	5 to 9 tons, add					50%	25%			
2608	1 to 4 tons, add					75%	50%			
2609	Less than 1 ton, add					100%	100%			
6000	For welded cross bridging, add						30%			

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05 21 19 – Open Web Steel Joist Framing

05 21 19.10 Open Web Joists										
0010	**OPEN WEB JOISTS**									
0015	Made from recycled materials									
0020	K series, 40-ton lots, horiz. bridging, spans to 30', shop primer, minimum	G	E-7	15	5.333	Ton	1,825	235	134	2,194	2,550
0050	Average	G		12	6.667		2,050	294	167	2,511	2,950
0080	Maximum	G		9	8.889		2,450	390	223	3,063	3,625
0120	8K1, 5.1 Lb/LF	G		1200	.067	L.F.	5.20	2.94	1.67	9.81	12.65
0140	10K1, 5.0 Lb/LF	G		1200	.067		5.10	2.94	1.67	9.71	12.55
0160	12K3, 5.7 Lb/LF	G		1500	.053		5.80	2.35	1.34	9.49	11.95
0180	14K3, 6.0 Lb/LF	G		1500	.053		6.10	2.35	1.34	9.79	12.30
0200	16K3, 6.3 Lb/LF	G		1800	.044		6.40	1.96	1.12	9.48	11.65
0220	16K6, 8.1 Lb/LF	G		1800	.044		8.25	1.96	1.12	11.33	13.70
0240	18K5, 7.7 Lb/LF	G		2000	.040		7.85	1.76	1	10.61	12.80
0260	18K9, 10.2 Lb/LF	G		2000	.040		10.40	1.76	1	13.16	15.60
0410	Span 30' to 50', minimum	G		17	4.706	Ton	1,775	208	118	2,101	2,450
0440	Average	G		17	4.706		2,000	208	118	2,326	2,700
0460	Maximum	G		10	8		2,125	355	201	2,681	3,150
0500	20K5, 8.2 Lb/LF	G		2000	.040	L.F.	8.20	1.76	1	10.96	13.15
0520	20K9, 10.8 Lb/LF	G		2000	.040		10.80	1.76	1	13.56	16.05
0540	22K5, 8.8 Lb/LF	G		2000	.040		8.80	1.76	1	11.56	13.85
0560	22K9, 11.3 Lb/LF	G		2000	.040		11.30	1.76	1	14.06	16.60
0580	24K6, 9.7 Lb/LF	G		2200	.036		9.70	1.60	.91	12.21	14.45
0600	24K10, 13.1 Lb/LF	G		2200	.036		13.10	1.60	.91	15.61	18.20
0620	26K6, 10.6 Lb/LF	G		2200	.036		10.60	1.60	.91	13.11	15.45
0640	26K10, 13.8 Lb/LF	G		2200	.036		13.80	1.60	.91	16.31	19
0660	28K8, 12.7 Lb/LF	G		2400	.033		12.70	1.47	.84	15.01	17.40
0680	28K12, 17.1 Lb/LF	G		2400	.033		17.10	1.47	.84	19.41	22.50
0700	30K8, 13.2 Lb/LF	G		2400	.033		13.20	1.47	.84	15.51	17.95
0720	30K12, 17.6 Lb/LF	G		2400	.033		17.60	1.47	.84	19.91	23
0800	For less than 40-ton job lots										
0802	For 30 to 39 tons, add						10%				

CN

05 31 Steel Decking

05 31 23 – Steel Roof Decking

05 31 23.50 Roof Decking			Crew	Daily Output	Labor Hours	Unit	Material	2009 Bare Costs Labor	Equipment	Total	Total Incl O&P
2200	50-500 squares CN	G	E-4	4900	.007	S.F.	2	.30	.03	2.33	2.76
2400	Over 500 squares	G		5100	.006		1.85	.28	.03	2.16	2.58
2600	20 gauge, under 50 squares	G		3865	.008		3.03	.37	.03	3.43	4.04
2650	50-500 squares	G		4170	.008		2.42	.35	.03	2.80	3.32
2700	Over 500 squares	G		4300	.007		2.18	.34	.03	2.55	3.03
2900	18 gauge, under 50 squares	G		3800	.008		3.91	.38	.04	4.33	5.05
2950	50-500 squares	G		4100	.008		3.13	.35	.03	3.51	4.11
3000	Over 500 squares	G		4300	.007		2.82	.34	.03	3.19	3.73
3050	16 gauge, under 50 squares	G		3700	.009		5.25	.39	.04	5.68	6.55
3060	50-500 squares	G		4000	.008		4.21	.36	.03	4.60	5.30
3100	Over 500 squares	G		4200	.008		3.79	.34	.03	4.16	4.82
3150	For intermediate rib instead of wide rib, deduct	G					.04			.04	.05
3160	For narrow rib instead of wide rib, add	G					.79			.79	.87

05 31 33 – Steel Form Decking

05 31 33.50 Form Decking

0010	FORM DECKING										
6100	Slab form, steel, 28 gauge, 9/16" deep, uncoated	G	E-4	4000	.008	S.F.	1.72	.36	.03	2.11	2.57
6220	24 gauge, 1" deep, uncoated	G		3900	.008		1.87	.37	.03	2.27	2.76
6240	Galvanized	G		3900	.008		2.20	.37	.03	2.60	3.12
6300	24 gauge, 1-5/16" deep, uncoated	G		3800	.008		1.99	.35	.04	2.38	2.91
6400	Galvanized	G		3800	.008		2.34	.38	.04	2.76	3.29
6500	22 gauge, 1-5/16" deep, uncoated	G		3700	.009		2.50	.39	.04	2.93	3.49
6600	Galvanized	G		3700	.009		2.55	.39	.04	2.98	3.55
6700	22 gauge, 2" deep uncoated	G		3600	.009		3.28	.40	.04	3.72	4.37
6800	Galvanized	G		3600	.009		3.22	.40	.04	3.66	4.30
7000	Sheet metal edge closure form, 12" wide with 2 bends, gale										
7100	18 gauge	G	E-14	360	.022	L.F.	5.30	1.04	.37	6.71	8.10
7200	16 gauge	G	"	360	.022	"	7.20	1.04	.37	8.61	10.15

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05 35 Raceway Decking Assemblies

05 35 13 – Steel Cellular Decking

05 35 13.50 Cellular Decking

0010	CELLULAR DECKING										
0015	Made from recycled materials										
0200	Cellular units, galv, 2" deep, 20-20 gauge, over 15 squares	G	E-4	1460	.022	S.F.	10.20	.99	.09	11.28	13.10
0250	18-20 gauge	G		1420	.023		11.60	1.02	.09	12.71	14.70
0300	18-18 gauge	G		1390	.023		11.95	1.04	.10	13.09	15.10
0320	16-18 gauge	G		1360	.024		14.20	1.06	.10	15.36	17.60
0340	16-16 gauge	G		1330	.024		15.85	1.09	.10	17.04	19.45
0400	3" deep, galvanized, 20-20 gauge	G		1375	.023		11.25	1.05	.10	12.40	14.35
0500	18-20 gauge	G		1350	.024		13.60	1.07	.10	14.77	16.95
0600	18-18 gauge	G		1290	.025		13.55	1.12	.10	14.77	17.05
0700	16-18 gauge	G		1230	.026		15.25	1.18	.11	16.54	19
0800	16-16 gauge	G		1150	.028		16.65	1.26	.12	18.03	20.50
1000	4-1/2" deep, galvanized, 20-18 gauge	G		1100	.029		15.70	1.31	.12	17.13	19.70
1100	18-18 gauge	G		1040	.031		15.60	1.39	.13	17.12	19.75
1200	16-18 gauge	G		980	.033		17.55	1.48	.14	19.17	22
1300	16-16 gauge	G		935	.034		19.15	1.55	.14	20.84	24

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07 12 Built-up Bituminous Waterproofing

07 12 13 – Built-Up Asphalt Waterproofing

07 12 13.20 Membrane Waterproofing	Crew	Daily Output	Labor-Hours	Unit	2009 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0010 **MEMBRANE WATERPROOFING**									
0012 On slabs, 1 ply, felt, mopped	G1	3000	.019	S.F.	.34	.60	.15	1.09	1.55
0100 On slabs, 1 ply, glass fiber fabric, mopped		2100	.027		.36	.85	.21	1.42	2.06
0300 On slabs, 2 ply, felt, mopped		2500	.022		.69	.72	.18	1.59	2.16
0400 On slabs, 2 ply, glass fiber fabric, mopped		1650	.034		.79	1.09	.27	2.15	2.95
0600 On slabs, 3 ply, felt, mopped		2100	.027		1.03	.85	.21	2.09	2.81
0700 On slabs, 3 ply, glass fiber fabric, mopped		1550	.036		1.07	1.16	.28	2.51	3.44
0710 Asphaltic hardboard protection board, 1/8" thick	2 Rofc	500	.032		.40	1.10		1.50	2.29
1000 1/4" EPS membrane protection board		3500	.005		.21	.16		.37	.49
1050 3/8" thick		3500	.005		.23	.16		.39	.51
1060 1/2" thick		3500	.005		.26	.16		.42	.55
1070 Fiberglass fabric, black, 20/10 mesh		116	.138	Sq.	18	4.72		22.72	28
1080 White, 20/10 mesh		116	.138	"	18	4.72		22.72	28

07 13 Sheet Waterproofing

07 13 53 – Elastomeric Sheet Waterproofing

07 13 53.10 Elastomeric Sheet Waterproofing and Access.									
0010 **ELASTOMERIC SHEET WATERPROOFING AND ACCESS.**									
0090 EPDM, plain, 45 mils thick	2 Rofc	580	.028	S.F.	1.19	.95		2.14	2.90
0100 60 mils thick		570	.028		1.25	.96		2.21	2.99
0300 Nylon reinforced sheets, 45 mils thick		580	.028		1.16	.95		2.11	2.86
0400 60 mils thick		570	.028		1.47	.96		2.43	3.23
0600 Vulcanizing splicing tape for above, 2" wide				C.L.F.	43.50			43.50	47.50
0700 4" wide				"	99.50			99.50	109
0900 Adhesive, bonding, 60 SF per gal				Gal.	16.50			16.50	18.15
1000 Splicing, 75 SF per gal				"	32			32	35
1200 Neoprene sheets, plain, 45 mils thick	2 Rofc	580	.028	S.F.	1.68	.95		2.63	3.44
1300 60 mils thick		570	.028		2.86	.96		3.82	4.77
1500 Nylon reinforced, 45 mils thick		580	.028		1.75	.95		2.70	3.52
1600 60 mils thick		570	.028		2.46	.96		3.42	4.33
1800 120 mils thick		500	.032		4	1.10		5.10	6.25
1900 Adhesive, splicing, 150 S.F. per gal. per coat				Gal.	17.50			17.50	19.25
2100 Fiberglass reinforced, fluid applied, 1/8" thick	2 Rofc	500	.032	S.F.	1.88	1.10		2.98	3.92
2200 Polyethylene and rubberized asphalt sheets, 1/8" thick		550	.029		.73	1		1.73	2.48
2210 Asphaltic hardboard protection board, 1/8" thick		500	.032		.40	1.10		1.50	2.29
2220 1/4" thick		450	.036		.68	1.22		1.90	2.80
2400 Polyvinyl chloride sheets, plain, 10 mils thick		580	.028		.17	.95		1.12	1.74
2500 20 mils thick		570	.028		.28	.96		1.24	1.95
2700 30 mils thick		560	.029		.39	.98		1.37	2.05
3000 Adhesives, trowel grade, 40-100 SF per gal				Gal.	27			27	29.50
3100 Brush grade, 100-250 SF per gal.				"	27			27	29.50
3300 Polyurethane, fluid applied, .55 mils thick	2 Rofc	665	.024	S.F.	1.40	.83		2.23	3.01
3600 Vinyl plastic, sprayed on, 25 to 40 mils thick	"	475	.034	"	1.20	1.15		2.35	3.26

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31 63 Bored Piles

31 63 26 – Drilled Caissons

31 63 26.13 Fixed End Cassion Piles		Crew	Daily Output	Labor-Hours	Unit	Material	2009 Bare Costs Labor	Equipment	Total	Total Incl O&P
0010	FIXED END CASSION PILES R316326-60									
0015	Including excavation, concrete, 50 lbs reinforcing									
0020	per C.Y., not incl. mobilization, boulder removal, disposal									
0100	Open style, machine drilled, to 50' deep, in stable ground, no									
0110	casings or ground water, 18" diam., 0.065 C.Y./L.F.	B-43	200	.240	V.L.F.	9.05	8.30	12.65	30	36.50
0200	24" diameter, 0.116 C.Y./L.F.		190	.253		16.20	8.75	13.35	38.30	46
0300	30" diameter, 0.182 C.Y./L.F.		150	.320		25.50	11.10	16.90	53.50	63.50
0400	36" diameter, 0.262 C.Y./L.F.		125	.384		36.50	13.30	20.50	70.30	83
0500	48" diameter, 0.465 C.Y./L.F.		100	.480		65	16.60	25.50	107.10	125
0600	60" diameter, 0.727 C.Y./L.F.		90	.533		102	18.45	28	148.45	172
0700	72" diameter, 1.05 C.Y./L.F.		80	.600		147	21	31.50	199.50	229
0800	84" diameter, 1.43 C.Y./L.F.		75	.640		200	22	34	256	291
1000	For bell excavation and concrete, add									
1020	4' bell diameter, 24" shaft, 0.444 C.Y.	B-43	20	2.400	Ea.	45	83	127	255	315
1040	6' bell diameter, 30" shaft, 1.57 C.Y.		5.70	8.421		159	292	445	896	1,100
1060	8' bell diameter, 36" shaft, 3.72 C.Y.		2.40	20		375	695	1,050	2,120	2,625
1080	9' bell diameter, 48" shaft, 4.48 C.Y.		2	24		450	830	1,275	2,555	3,175
1100	10' bell diameter, 60" shaft, 5.24 C.Y.		1.70	28.235		530	980	1,500	3,010	3,725
1120	12' bell diameter, 72" shaft, 8.74 C.Y.		1	48		885	1,650	2,525	5,060	6,300
1140	14' bell diameter, 84" shaft, 13.6 C.Y.		.70	68.571		1,375	2,375	3,625	7,375	9,125
1200	Open style, machine drilled, to 50' deep, in wet ground, pulled									
1300	casing and pumping, 18" diameter, 0.065 C.Y./L.F.	B-48	160	.350	V.L.F.	9.05	[illegible]	17.90	39.30	48.50
[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1500	30" diameter, 0.182 C.Y./L.F.		[illegible]	[illegible]		25.50	23	[illegible]	82	[illegible]
1600	36" diameter, 0.262 C.Y./L.F.		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	117	[illegible]
1700	48" diameter, 0.465 C.Y./L.F.	B-49	55	1.600		65	[illegible]	66.50	[illegible]	235
[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1900	72" diameter, 1.05 C.Y./L.F.		30	2.933		147	108	122	377	460
2000	84" diameter, 1.43 C.Y./L.F.		25	3.520		200	129	146	475	580
2100	For bell excavation and concrete, add									
[illegible]	[illegible]	B-48	19.80	[illegible]	Ea.	[illegible]	99.50	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		2.40	23.333		375	825	1,200	2,400	2,975
2180	9' bell diameter, 48" shaft, 4.48 C.Y.	B-49	3.30	26.667		450	975	1,100	2,525	[illegible]
2200	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	2,980	[illegible]
2220	12' bell diameter, 72" shaft, 8.74 C.Y.		1.60	55		885	2,025	2,275	5,185	6,575
2240	14' bell diameter, 84" shaft, 13.6 C.Y.		1	88		1,375	3,225	3,650	8,250	10,500
2300	Open style, machine drilled, to 50' deep, in soft rocks and									
2400	medium hard shales, 18" diameter, 0.065 C.Y./L.F.	B-49	50	1.760	V.L.F.	9.05	64.50	73	146.55	190
2500	24" diameter, 0.116 C.Y./L.F.		30	2.933		16.20	108	122	246.20	320
2600	30" diameter, 0.182 C.Y./L.F.		20	4.400		25.50	161	183	369.50	480
2700	36" diameter, 0.262 C.Y./L.F.		15	5.867		36.50	215	243	494.50	640
2800	48" diameter, 0.465 C.Y./L.F.		10	8.800		65	325	365	755	965
2900	60" diameter, 0.727 C.Y./L.F.		7	12.571		102	460	520	1,082	1,400
3000	72" diameter, 1.05 C.Y./L.F.		6	14.667		147	540	610	1,297	1,650
3100	84" diameter, 1.43 C.Y./L.F.		5	17.600		200	645	730	1,575	2,025
3200	For bell excavation and concrete, add									
3220	4' bell diameter, 24" shaft, 0.444 C.Y.	B-49	10.90	8.073	Ea.	45	296	335	676	875
3240	6' bell diameter, 30" shaft, 1.57 C.Y.		3.10	28.387		159	1,050	1,175	2,384	3,075
3260	8' bell diameter, 36" shaft, 3.72 C.Y.		1.30	67.692		375	2,475	2,800	5,650	7,350
3280	9' bell diameter, 48" shaft, 4.48 C.Y.		1.10	80		450	2,925	3,325	6,700	8,675
3300	10' bell diameter, 60" shaft, 5.24 C.Y.		.90	97.778		530	3,575	4,050	8,155	10,600
3320	12' bell diameter, 72" shaft, 8.74 C.Y.		.60	146		885	5,375	6,075	12,335	15,900

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Appendix 5

General Conditions Estimate

General Conditions Estimate

General Conditions Estimate

Item	Unit	Unit Cost	Quantity	Total Cost
General Contractor Personnel (RS Means Page 10)				
Admin/Secretary	MTH	$3,200.00	5	$2,555.00
Assistant Superintendant	MTH	$7,600.00	13	$98,800.00
Superintendant	MTH	$8,227.00	13	$106,951.00
Project Engineer	MTH	$7,145.00	13	$92,885.00
Project Manager	MTH	$8,346.00	6.5	$54,249.00
Senior Project Manager	MTH	$8,660.00	1.5	$12,990.00
Temporary Facilities (EMJ Corporation)				
Jobsite Office	MTH	$486.67	15	$7,300.00
Temporary Toilets	MTH	$513.33	15	$7,700.00
Barricades	MTH	$66.67	15	$1,000.00
Construction Signs	MTH	$60.00	15	$900.00
Dumpsters	MTH	$133.33	15	$2,000.00
Temporary Utilities (EMJ Corporation)				
Temporary Electric	MTH	$1,000.00	15	$15,000.00
Temporary Water	MTH	$46.67	15	$700.00
Temporary Telephone	MTH	$646.67	15	$9,700.00
Cleaning (EMJ Corporation)				
Misc. Clean-up	MTH	$233.33	15	$3,500.00
Site Clean-up	LS	$2,500.00	1	$2,500.00
Final Building Clean-up	LS	$37,000.00	1	$37,000.00
Miscellaneous (EMJ Corporation)				
Trash Removal	MTH	$966.67	15	$14,500.00
Blueprints	LS	$3,500.00	1	$3,500.00
Safety (Drug Testing, Equipment, etc.)	LS	$1,500.00	1	$1,500.00
Hand Tools	LS	$6,000.00	1	$6,000.00
Engineering and Layout	LS	$2,000.00	1	$2,000.00
Incidentals	LS	$4,000.00	1	$4,000.00
Insurance	% of Contract	$16,786,542.00	3%	$503,596.26
Bonds	% of Contract	$16,786,542.00	2%	$335,730.84
O&P	% of Contract	$16,786,542.00	4%	$671,461.68
Total				$1,998,018.78