

October 12th, 2012

TECHNICAL ASSIGNMENT TWO

PENN STATE SENIOR THESIS



REPLACEMENT HIGH SCHOOL

MARYLAND

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EXECUTIVE SUMMARY

This technical report serves to analyze the key features of this replacement high school project that affect project execution. Within this report there is a detailed project schedule, structural estimate, general conditions estimate, analysis of BIM use, and three constructability challenges encountered on this project. This is explored and illustrated through the use of photographs, figures, and tables.

The actual project schedule has been condensed into a manageable 150 line item gantt chart illustrating the critical tasks. It's difficult to directly see the critical path because of the overlap in trade work, but it goes substructure, superstructure, enclosure, rough-ins, and then finishes. The total duration for the project is 32 months; however the school needs to be completed within the first 18. With such a tight time frame it is imperative that the contractors do not fall behind.

A structural steel and concrete estimate has been provided for the building by completing quantity take offs. Because of the extreme variation throughout the building a module approach to the estimate could not be achieved with any sort of accuracy. Any discrepancies within this estimate and the actual bid price can be contributed to assumptions that were made during take offs.

The general conditions estimate yielded a 3.78% cost of the overall building which is fairly standard in construction. A large portion of this cost came from the project personnel. This can be expected because of the large staff HESS has on site. However, with such a large facility needing to be constructed in such a short period of time every individual is essential and plays a large role in making sure the project gets delivered on time.

The BIM implementation on this project was very comprehensive and covered a lot of good aspects. The use of clash detections will surely benefit the project greatly when the MEP systems start to be installed in the field. Additionally the owner will surely benefit from having an operations model that they can reference in the event of equipment interruptions.

Finally HESS did a great job of addressing some of their constructability issues. Unfortunately no pictures were provided to go along with this section to better detail what is being described.

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DETAILED PROJECT SCHEDULE

As was discussed in Technical Assignment One the schedule is a major driver of this project. With only 18 months to construct a brand new school it's imperative that the project team not fall behind. A detailed schedule of 150 line items can be seen in Appendix A. To keep the schedule concise only the most important and significant activities are listed. There are 4 major phases to this project.

Phase 1 deals with the construction of the high schools building pad, football stadium, football field house and tennis courts. This phase is schedule to start at the notice to proceed and be completed in 240 days. The building pad preparation, rough grade and utilities are on the critical path and need to be completed in order to start foundations. The rest of these items in this phase are not on the critical path and therefore not as critical to complete on time.

Phase 2 overlaps with phase 1 and relates to the construction of the school and the work associated with that task. In all this phase is scheduled to take 385 days. The erection of the sub and superstructure are on the critical path followed by the enclosure, rough-ins and finishes. Because of the size of the building there is substantial overlap between these activities during construction. That is to say that once the structure has been erected in one location the enclosure follows closely behind, chasing the progress of the structure. The same goes for the rest of the activities. Substantial completion for the new school is set for July 25th 2013, and final completion is set for September 20th 2013.

At the completion of phase 2 partial demolition of the existing school commences to make way for a new bus loop. After that is complete the rest of the existing school is abandoned and prepped for demolition. Once the building has been torn down the site it was sitting on will be turned into a new parking lot. When it is all said and done the whole project will be completed on July 25th 2014.

DETAILED STRUCTURAL ESTIMATE

The 255,000 square foot replacement high school is a steel frame building with structural decking and concrete slabs supported by spread and continuous footings. The components of the structural system are categorized under sections 03 Concrete and 05 Metals under the CSI Masterformat. Based off of a detailed structural estimate, utilizing RS Means Costworks data, the structural systems cost totaled \$5,602,193.18, which relates to \$21.97 per square foot. This value however does not incorporate any overhead or profit.

Table 1: Estimate Breakdown

Project Cost Data			
CSI Masterformat	Structural Element	Estimated Cost	Estimated Cost Per SF
03	Reinforcing	\$164,780.48	\$0.65
05	Concrete	\$2,086,502.50	\$8.18
03	Metal Deck	\$537,040.00	\$2.11
03	Structural Steel	\$2,813,870.20	\$11.03
	Total	\$5,602,193.18	\$21.97

***A detailed breakdown of costs can be found in Appendix B*

Total Building Cost = \$74,225,000.00

Percent of Cost by Structure: 7.55%

When completing the estimate for this building the modular approach was not utilized because of the degree of variation throughout the building. Instead a quantity take off was completed by referencing the structural drawings. It should be noted that lintels and shear studs are not incorporated into this estimate.

ASSUMPTION

- Any value that was not provided by RS Means Costworks was interpolated from given data.
- The cost of labor, material, and equipment is shown as one totaled value for the concrete estimate.
- Connection costs for structural steel were not considered

Estimate Accuracy

Based off of cost data provided by HESS Construction the concrete estimate (including rebar and WWF mesh) was off by 1.7 percent. Without any adjustments the steel and metal deck estimate totals \$3,350,810.20, which is 31% lower than the agreed upon contract amount. However, with a 10% allowance for connections and by adding an overhead and profit of 24% (similar to RS Means) this discrepancy in price is lowered to a difference of 5%.

Cost of Material for Steel (Excluding Deck): **\$2,556,640.39**

Cost of Labor for Steel (Excluding Deck): **\$241,958.65**

Cost of Equipment for Steel (Excluding Deck): **\$120,292.22**

NOTES

- Concrete is cast in place 4000 PSI normal weight
- SOD is 3-1/4" concrete over 2" (2VLI w/ min 3 span condition) 20 GA. Composite steel deck .
- Roof Deck is 1-1/2" 20 GA. Type B

GENERAL CONDITIONS ESTIMATE

**Reference Appendix C for detailed breakdown

The general conditions estimate for this project is \$2,805,635.43 which correlates to 3.78% of the total project cost. Table 2 provides an overview of the costs associated with this project. The estimate was produced by utilizing both RS Means Costworks data and cost information provided by HESS Construction. All costs provided include overhead and profit.

Table 2: GC Estimate Breakdown

General Conditions Cost	
Field Personnel	\$1,079,085.00
Temporary utilities	\$79,168.00
Construction Expenses	\$111,909.52
Construction Aids	\$121,132.02
Temporary barriers and Enclosures	\$80,731.21
Cleaning	\$240,760.68
Insurance and Bonds	\$1,092,849.00
Total:	\$2,805,635.43

The general conditions estimate is based off of a 32 month project schedule. Half of the field personnel will not be on the job site for the whole duration of the project. Some employees split their time between jobs. During the first and last few months they will phase out as the work load decreases as well. The Temporary facilities (I.e. the job site trailers and storage containers) for the project include both a large set up fee and a monthly rental rate. Costs for the GC items are broken down into 4 separate categories: labor costs, material costs, equipment costs, and other.

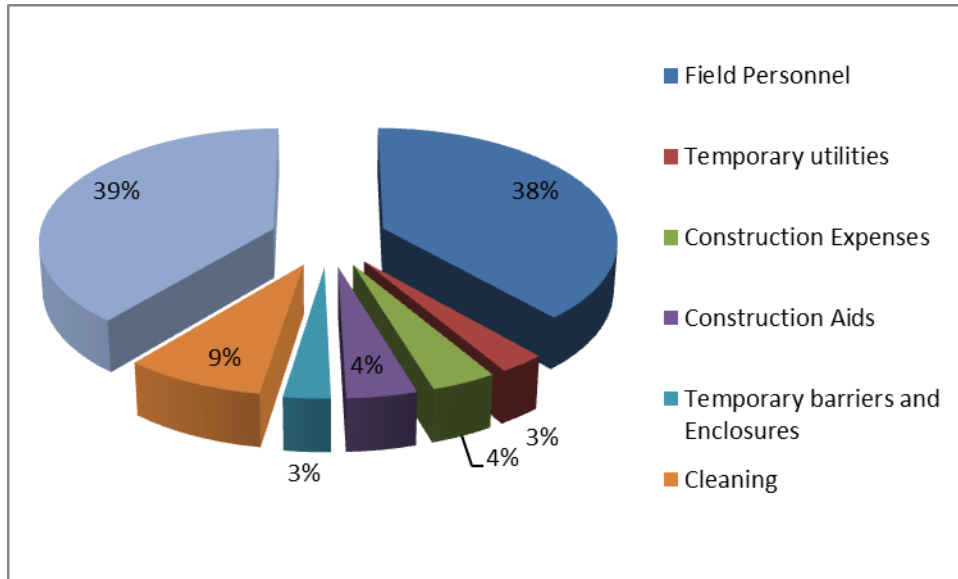


Figure 1: GC Estimate Pie Chart

The pie chart above provides a visual represent of the distribution of funds for the general conditions items. It can be seen that the Field Personnel and Insurance and Bonds are the largest expenses. In by shortening the schedule one month the project could save \$43,200 in project staffing alone.

BIM USE EVALUATION

***See Appendix D for BIM process maps related to this project.*

The Use of BIM technology is being used for the construction, as-built documentation and facilities management for this replacement high school project. The model will be constantly updated and transition from a design tool to a construction management tool and finally to an operation and maintenance tool for the owner. A BIM team amongst the subcontractors will be established and they will be responsible for modeling their respective trade work.

HESS is responsible for the management of the coordination model throughout the construction process. Additionally they are responsible for the civil model, architectural model and structural design model created from the design documents. These models will be accessible to the BIM team through an FTP site established and preserved by HESS. These compiled models will be used to coordinate and sequence work for the trade subcontractors in order to maximize efficiencies during the construction process. Conflicts within the model will be addressed during periodic BIM coordination meetings.

Each Trade contractor will be required to produce a fabrication model. These models will be linked together to perform tasks such as clash detections and trade sequencing. Once all clashes are resolved the model will then be used to generate shop drawings. Models are to be updated on a weekly basis or as directed by the project information manager.

At the completion of the model subcontractors will have to submit technical data and warranty information for equipment they are responsible for in an excel template. They will also need to submit the O&M manuals that the owner requires. These files will then be taken by HESS and used to populate the facilities management software. This database will then be synced with the as built model so that the owner can use it to manage their new school. HESS is also required to train the owner's facility managers how to use the model.

Table 3: Bim Goal Description

PRIORITY (HIGH/ MED/ LOW)	GOAL DESCRIPTION	POTENTIAL BIM USES
High	Eliminate Field Conflicts	3D Modeling Clash Detection Design Review
High	BIM to produce accurate shop drawings for fabrication	Used to create construction dwgs
High	Provide Model for Facilities operations and maintenance	Record Modeling, Building maintenance, warranty information, equipment data
High	Clash Detection of MEP and Structural	3D Modeling
Med	As Built Documentation	As built model

Table 4: BIM Uses

X	PLAN	X	DESIGN	X	CONSTRUCT	X	OPERATE
	PROGRAMMING	X	DESIGN AUTHORIZING		SITE UTILIZATION PLANNING	X	BUILDING MAINTENANCE SCHEDULING
	SITE ANALYSIS		DESIGN REVIEWS	X	CONSTRUCTION SYSTEM DESIGN		BUILDING SYSTEM ANALYSIS
		X	3D COORDINATION	X	3D COORDINATION		ASSET MANAGEMENT
			STRUCTURAL ANALYSIS		DIGITAL FABRICATION		SPACE MANAGEMENT / TRACKING
			LIGHTING ANALYSIS		3D CONTROL AND PLANNING		DISASTER PLANNING
			ENERGY ANALYSIS	X	RECORD MODELING	X	RECORD MODELING
			MECHANICAL ANALYSIS				
			OTHER ENG. ANALYSIS				
			SUSTAINABILITY (LEED) EVALUATION				
			CODE VALIDATION				
	PHASE PLANNING (4D MODELING)		PHASE PLANNING (4D MODELING)		PHASE PLANNING (4D MODELING)		PHASE PLANNING (4D MODELING)
	COST ESTIMATION		COST ESTIMATION		COST ESTIMATION		COST ESTIMATION
	EXISTING CONDITIONS MODELING	X	Drawing Generation		EXISTING CONDITIONS MODELING		EXISTING CONDITIONS MODELING

Analysis

In my opinion BIM was used very well on this project. However, I believe it would have been beneficial if it had been utilized more during the planning stages of this project. I believe it would have had value as a programming tool to assess design performances. I think it would have also been beneficial to use the model to perform energy and system analyses because of the goal to achieve a LEED rating. Had this been done during the design it's possible that the building would have been able to achieve more points at a minimal cost impact. With that being said I would say that the overall use is very logical. BIM is obviously a very good tool for clash detections and generating construction drawings. This will undoubtedly save time and headaches when it comes time to install the MEP systems. This is especially important on this project because with such a small construction window, an unforeseen clash in the field could really impact an already tight schedule.

I also think that it's good that they have in their contract language that HESS will teach the facility managers how to use the model after they turn it over. Otherwise it's very likely that it would have been wasted on them.

CONSTRUCTABILITY CHALLENGES

The soil that the proposed replacement school will sit on had been found to be unsuitable material by the geotechnical engineer. The entire footprint of the building sat on moderately compressible fill that had been placed during the construction of the existing school. This meant that all of the existing soil had to be undercut and controlled fill had to be brought on site. Based on the geotechnical engineers recommendations the new fill had to be compacted to 95 percent of the maximum dry density as determined by ASTM D-1557. The way HESS overcame this was by monitoring the settlement with the use of settlement plates to insure that the soil would not settle excessively. This was a huge concern because even with the new fill, it was expected that the soil underneath it would still settle. The settlement plates were installed prior to fill placement and were monitored every day before and during fill placement and for three weeks after the completion of new fill. Foundations were not allowed to be placed during this time.

Another constructability challenge was that HESS was given a later than expected notice to proceed date. On top of that S.A. Halac the structural subcontractor showed up on site two weeks late, which further impacted the schedule. This was extremely important to overcome, because they were already working on a tight schedule, in which they had to get a 255,000 square foot high school built and occupied in 18 months. This required them to find ways to shorten the critical path because 7 months into the project they were behind schedule by a month and a half. The way they overcame this was by accelerating their steel contractor by requiring them to bring a second crane on site. This allowed for them to set steel in two different sections of the building simultaneously.

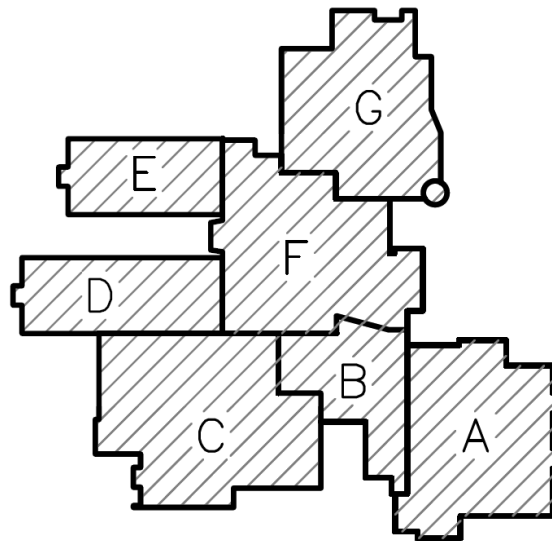


Figure 2: BLDG Layout

A third constructability challenge had to do with poor sequencing. When the schedule was originally created not enough consideration was taken concerning school functions and the summer school timetable. Operations such as temporary utility shut downs, road closures and specific construction activities had to be re-sequenced. The project staff overcame this by regularly meeting with the school to find times when they would be allowed to complete the necessary work outside of the original time frame.

APPENDIX A: Project Schedule

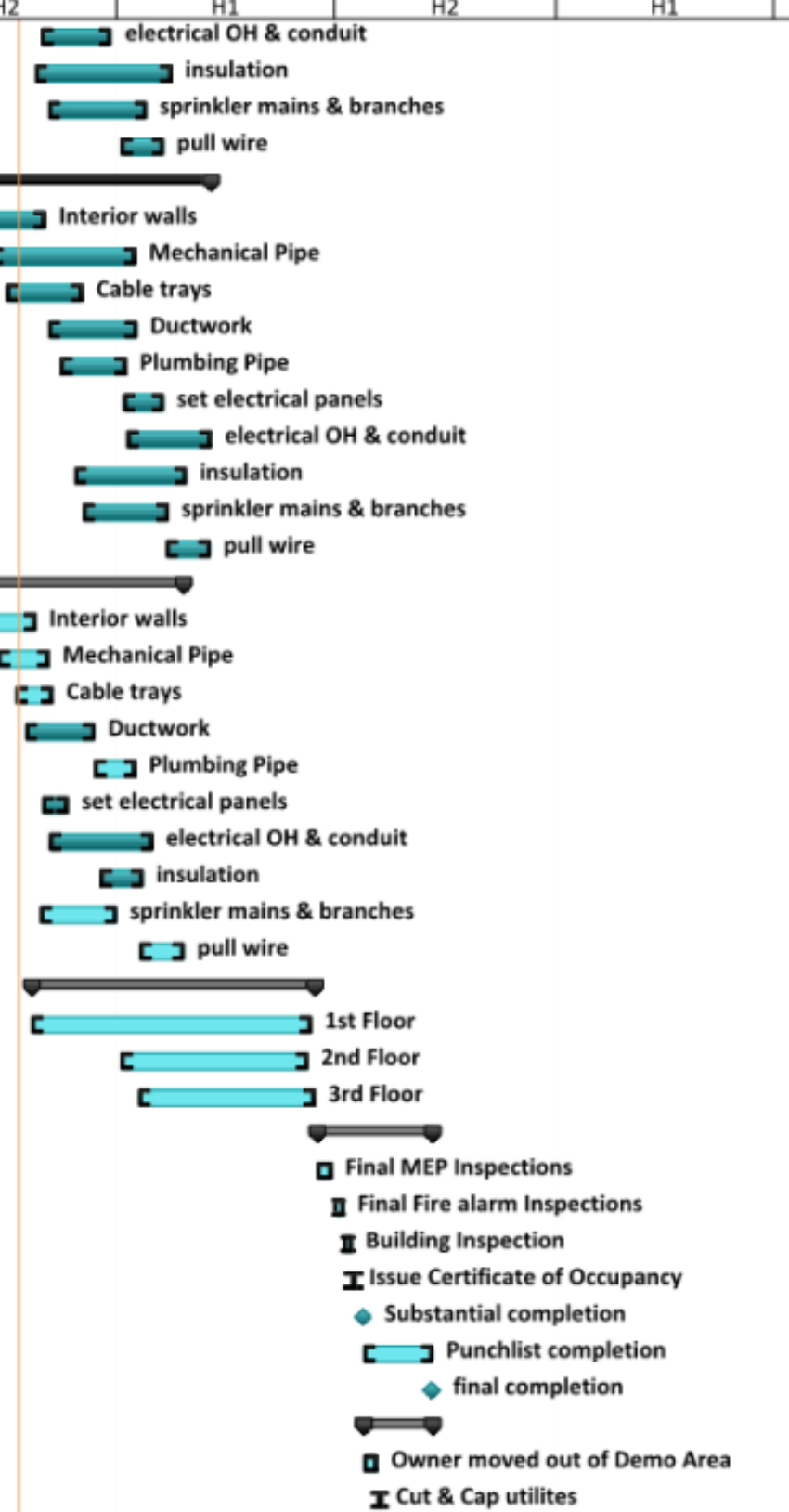
ID	Task Name	Duration	Start	Finish	2012		2013		2014		2015					
					H2	H1	H2	H1	H2	H1	H2	H1				
1	PH 1 BLDG Pad/FB Stadium/Field House/ Tennis CTS	240 days	Thu 12/1/11	Wed 10/31/12												
2	Notice to proceed	0 days	Thu 12/1/11	Thu 12/1/11	◆ Notice to proceed											
3	Site Work	239 days	Thu 12/1/11	Tue 10/30/12												
4	layout of silt fence & inlet protection	9 days	Thu 12/1/11	Tue 12/13/11	■ layout of silt fence & inlet protection											
5	Inspection for S&EC	1 day	Thu 12/15/11	Thu 12/15/11	■ Inspection for S&EC											
6	BLDG pad Preparation	65 days	Fri 12/16/11	Thu 3/15/12												
7	selective clearing	6 days	Fri 12/16/11	Fri 12/23/11	■ selective clearing											
8	install storm drain basin & trap	23 days	Tue 12/27/11	Thu 1/26/12	■ install storm drain basin & trap											
9	Ex. SD Demo/Remaining clearing	8 days	Fri 1/27/12	Tue 2/7/12	■ Ex. SD Demo/Remaining clearing											
10	complete 1st half building pad	0 days	Fri 3/2/12	Fri 3/2/12	◆ complete 1st half building pad											
11	undercut & remove unsuitable soils	19 days	Thu 2/9/12	Tue 3/6/12	■ undercut & remove unsuitable soils											
12	fill and grade	20 days	Fri 2/17/12	Thu 3/15/12	■ fill and grade											
13	complete 2nd half building pad	0 days	Thu 3/15/12	Thu 3/15/12	◆ complete 2nd half building pad											
14	Rough Grade & Utilities @ East Side of Site	56 days	Tue 12/27/11	Tue 3/13/12												
15	selective clearing	8 days	Tue 12/27/11	Thu 1/5/12	■ selective clearing											
16	install storm drain basin & trap	45 days	Fri 1/6/12	Thu 3/8/12	■ install storm drain basin & trap											
17	rough grading	3 days	Fri 3/9/12	Tue 3/13/12	■ rough grading											
18	rough grading and utilites complete	0 days	Tue 3/13/12	Tue 3/13/12	◆ rough grading and utilites complete											
19	Geothermal Fields	144 days	Wed 3/14/12	Mon 10/1/12												
20	Drill Wells and pipe wells for field 1 & 2	55 days	Wed 3/14/12	Tue 5/29/12	■ Drill Wells and pipe wells for field 1 & 2											
21	Set Vault #1 / Connect Pipes	10 days	Wed 5/30/12	Tue 6/12/12	■ Set Vault #1 / Connect Pipes											
22	Drill Wells and pipe wells for field 3 & 4	77 days	Tue 5/15/12	Wed 8/29/12	■ Drill Wells and pipe wells for field 3 & 4											
23	Set Vault #2 / Connect Pipes	11 days	Thu 8/30/12	Thu 9/13/12	■ Set Vault #2 / Connect Pipes											
24	S&R pipes from vaults to new BLDG	8 days	Fri 9/14/12	Tue 9/25/12	■ S&R pipes from vaults to new BLDG											
25	Geothermal Complete	0 days	Mon 10/1/12	Mon 10/1/12	◆ Geothermal Complete											
26	Tennis Courts	73 days	Fri 6/8/12	Tue 9/18/12												
27	Install Tennis Courts	73 days	Fri 6/8/12	Tue 9/18/12	■ Install Tennis Courts											
28	Tennis Courts Complete	0 days	Tue 9/18/12	Tue 9/18/12	◆ Tennis Courts Complete											
29	Football Field	109 days	Thu 5/31/12	Tue 10/30/12												
30	Rough Grade	6 days	Thu 5/31/12	Thu 6/7/12	■ Rough Grade											
31	Construct Field	103 days	Fri 6/8/12	Tue 10/30/12	■ Construct Field											
32	Substantial completion	0 days	Tue 10/30/12	Tue 10/30/12	◆ Substantial completion											
33	Field House	104 days	Fri 6/8/12	Wed 10/31/12												
34	Building pad & footings	11 days	Fri 6/8/12	Fri 6/22/12	■ Building pad & footings											
35	U/G plumbing and Electric	9 days	Mon 6/18/12	Thu 6/28/12	■ U/G plumbing and Electric											
36	SOG & masonry bearing walls	20 days	Fri 6/29/12	Thu 7/26/12	■ SOG & masonry bearing walls											
37	Plumbing/Electrical rough in	7 days	Fri 8/3/12	Mon 8/13/12	■ Plumbing/Electrical rough in											
38	Roof	20 days	Mon 8/6/12	Fri 8/31/12	■ Roof											
39	overhead rough in and Equipment installation	15 days	Tue 9/4/12	Mon 9/24/12	■ overhead rough in and Equipment installation											
40	interior finishes	32 days	Tue 9/18/12	Wed 10/31/12	■ interior finishes											
41	PH 1 Substantial Completion	0 days	Wed 10/31/12	Wed 10/31/12	◆ PH 1 Substantial Completion											

Project: Detailed Schedule Date: Fri 10/12/12	Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	
	Split		External Tasks		Inactive Summary		Manual Summary		Progress	
	Milestone		External Milestone		Manual Task		Start-only			
	Summary		Inactive Task		Duration-only		Finish-only			

ID	Task Name	Duration	Start	Finish	2012		2013		2014		2015
					H2	H1	H2	H1	H2	H1	H2
42	PH 2A: New School & Associated Work	385 days	Mon 4/2/12	Fri 9/20/13							
43	Structure	167 days	Mon 4/2/12	Tue 11/20/12							
44	Building EXCV/FRP Footings	92 days	Mon 4/2/12	Tue 8/7/12							
45	Underground Elec. & plumbing Rough in	88 days	Thu 4/26/12	Sat 8/25/12							
46	Building SOG	89 days	Sat 5/5/12	Wed 9/5/12							
47	Area F	59 days	Tue 7/10/12	Sun 9/30/12							
48	Erect Steel & Decking	43 days	Tue 7/10/12	Thu 9/6/12							
49	MEP Prep For SOD	21 days	Mon 7/30/12	Mon 8/27/12							
50	CMU Bearing Walls	11 days	Tue 8/21/12	Tue 9/4/12							
51	SOD	2 days	Fri 9/28/12	Sun 9/30/12							
52	Area E	28 days	Fri 8/10/12	Tue 9/18/12							
53	Erect Steel & Decking	24 days	Fri 8/10/12	Wed 9/12/12							
54	MEP Prep For SOD	7 days	Wed 8/29/12	Thu 9/6/12							
55	SOD	4 days	Thu 9/13/12	Tue 9/18/12							
56	Area D	31 days	Tue 8/21/12	Tue 10/2/12							
57	Erect Steel & Decking	27 days	Tue 8/21/12	Wed 9/26/12							
58	MEP Prep For SOD	7 days	Wed 9/12/12	Thu 9/20/12							
59	SOD	4 days	Thu 9/27/12	Tue 10/2/12							
60	Area G	86 days	Tue 7/24/12	Tue 11/20/12							
61	CMU Bearing Walls	44 days	Tue 7/24/12	Fri 9/21/12							
62	Erect Steel & Decking	37 days	Mon 10/1/12	Tue 11/20/12							
63	MEP Prep For SOD	3 days	Fri 10/26/12	Tue 10/30/12							
64	SOD	2 days	Wed 10/31/12	Thu 11/1/12							
65	Area C	57 days	Fri 8/3/12	Mon 10/22/12							
66	CMU Bearing Walls	21 days	Fri 8/3/12	Fri 8/31/12							
67	Erect Steel & Decking	34 days	Wed 9/5/12	Mon 10/22/12							
68	Area B & A	56 days	Tue 8/21/12	Tue 11/6/12							
69	CMU Bearing Walls	27 days	Tue 8/21/12	Wed 9/26/12							
70	Erect Steel & Decking	22 days	Mon 10/8/12	Tue 11/6/12							
71	Enclosure	105 days	Wed 9/5/12	Tue 1/29/13							
72	Ground Face CMU	78 days	Wed 9/5/12	Fri 12/21/12							
73	Glazing & Windows	104 days	Wed 9/5/12	Mon 1/28/13							
74	Ext Wall Panels	77 days	Wed 9/26/12	Thu 1/10/13							
75	Roofing	105 days	Wed 9/5/12	Tue 1/29/13							
76	1st Floor Rough-Ins	118 days	Wed 9/5/12	Fri 2/15/13							
77	Interior walls	47 days	Wed 9/5/12	Thu 11/8/12							
78	Mechanical Pipe	110 days	Mon 9/10/12	Fri 2/8/13							
79	Cable trays	60 days	Fri 9/28/12	Thu 12/20/12							
80	Ductwork	88 days	Fri 9/28/12	Tue 1/29/13							
81	Plumbing Pipe	66 days	Tue 10/16/12	Tue 1/15/13							
82	set electrical panels	65 days	Fri 10/26/12	Thu 1/24/13							

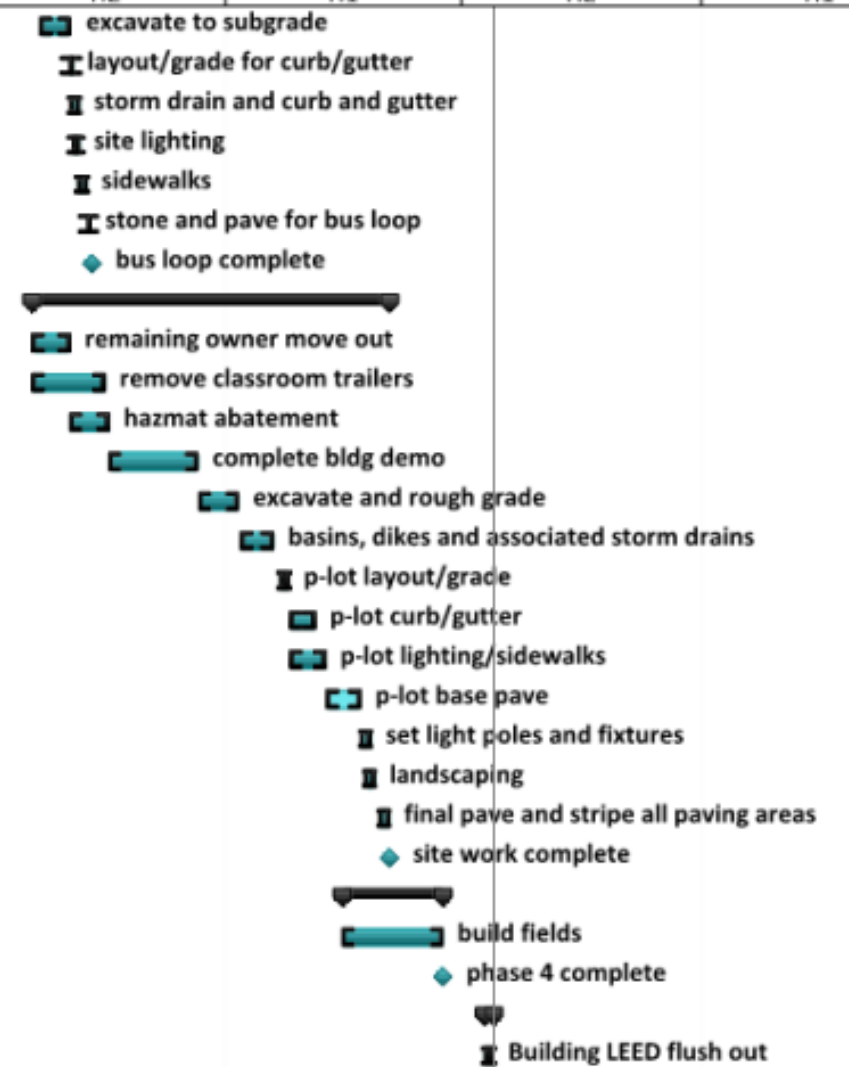
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	Milestone		External Milestone		Manual Task		Start-only			
	Summary		Inactive Task		Duration-only		Finish-only			

ID	Task Name	Duration	Start	Finish	2012		2013		2014		2015	
					H2	H1	H2	H1	H2	H1	H2	H1
83	electrical OH & conduit	41 days	Wed 10/31/12	Wed 12/26/12								
84	insulation	81 days	Fri 10/26/12	Fri 2/15/13								
85	sprinkler mains & branches	59 days	Tue 11/6/12	Fri 1/25/13								
86	pull wire	26 days	Sat 1/5/13	Fri 2/8/13								
87	2nd Floor Rough-Ins	138 days	Mon 9/10/12	Wed 3/20/13								
88	Interior walls	40 days	Mon 9/10/12	Fri 11/2/12								
89	Mechanical Pipe	85 days	Thu 9/20/12	Wed 1/16/13								
90	Cable trays	45 days	Tue 10/2/12	Mon 12/3/12								
91	Ductwork	53 days	Tue 11/6/12	Thu 1/17/13								
92	Plumbing Pipe	38 days	Fri 11/16/12	Tue 1/8/13								
93	set electrical panels	25 days	Mon 1/7/13	Fri 2/8/13								
94	electrical OH & conduit	50 days	Thu 1/10/13	Wed 3/20/13								
95	insulation	66 days	Wed 11/28/12	Wed 2/27/13								
96	sprinkler mains & branches	50 days	Wed 12/5/12	Tue 2/12/13								
97	pull wire	26 days	Tue 2/12/13	Tue 3/19/13								
98	3rd Floor Rough-Ins	119 days	Wed 9/12/12	Mon 2/25/13								
99	Interior walls	32 days	Wed 9/12/12	Thu 10/25/12								
100	Mechanical Pipe	30 days	Tue 9/25/12	Mon 11/5/12								
101	Cable trays	22 days	Wed 10/10/12	Thu 11/8/12								
102	Ductwork	41 days	Thu 10/18/12	Thu 12/13/12								
103	Plumbing Pipe	24 days	Fri 12/14/12	Wed 1/16/13								
104	set electrical panels	15 days	Thu 11/1/12	Wed 11/21/12								
105	electrical OH & conduit	61 days	Wed 11/7/12	Wed 1/30/13								
106	insulation	25 days	Wed 12/19/12	Tue 1/22/13								
107	sprinkler mains & branches	45 days	Tue 10/30/12	Mon 12/31/12								
108	pull wire	26 days	Mon 1/21/13	Mon 2/25/13								
109	Finishes	169 days	Tue 10/23/12	Fri 6/14/13								
110	1st Floor	166 days	Tue 10/23/12	Tue 6/11/13								
111	2nd Floor	112 days	Sat 1/5/13	Sat 6/8/13								
112	3rd Floor	106 days	Sun 1/20/13	Fri 6/14/13								
113	Building Close-Out	70 days	Mon 6/17/13	Fri 9/20/13								
114	Final MEP Inspections	10 days	Mon 6/17/13	Fri 6/28/13								
115	Final Fire alarm Inspections	6 days	Mon 7/1/13	Mon 7/8/13								
116	Building Inspection	5 days	Tue 7/9/13	Mon 7/15/13								
117	Issue Certificate of Occupancy	3 days	Tue 7/16/13	Thu 7/18/13								
118	Substantial completion	0 days	Thu 7/25/13	Thu 7/25/13								
119	Punchlist completion	41 days	Fri 7/26/13	Fri 9/20/13								
120	final completion	0 days	Fri 9/20/13	Fri 9/20/13								
121	Phase 2B: Drive Isle	41 days	Fri 7/26/13	Fri 9/20/13								
122	Owner moved out of Demo Area	7 days	Fri 7/26/13	Mon 8/5/13								
123	Cut & Cap utilites	4 days	Tue 8/6/13	Fri 8/9/13								



Project: Detailed Schedule Date: Fri 10/12/12	Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	
	Split		External Tasks		Inactive Summary		Manual Summary		Progress	
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	Summary		Inactive Task		Duration-only		Finish-only			

ID	Task Name	Duration	Start	Finish	2012		2013		2014		2015	
					H2	H1	H2	H1	H2	H1	H2	H1
124	excavate to subgrade	17 days	Mon 8/12/13	Tue 9/3/13								
125	layout/grade for curb/gutter	2 days	Wed 9/4/13	Thu 9/5/13								
126	storm drain and curb and gutter	5 days	Wed 9/4/13	Tue 9/10/13								
127	site lighting	3 days	Fri 9/6/13	Tue 9/10/13								
128	sidewalks	5 days	Tue 9/10/13	Mon 9/16/13								
129	stone and pave for bus loop	3 days	Tue 9/17/13	Thu 9/19/13								
130	bus loop complete	0 days	Fri 9/20/13	Fri 9/20/13								
131	Phase 3: BLDG DEMO/NEW PKG LOT	196 days	Tue 8/6/13	Tue 5/6/14								
132	remaining owner move out	21 days	Tue 8/6/13	Tue 9/3/13								
133	remove classroom trailers	40 days	Tue 8/6/13	Mon 9/30/13								
134	hazmat abatement	22 days	Wed 9/4/13	Thu 10/3/13								
135	complete bldg demo	48 days	Fri 10/4/13	Tue 12/10/13								
136	excavate and rough grade	22 days	Thu 12/12/13	Fri 1/10/14								
137	basins, dikes and associated storm drains	19 days	Mon 1/13/14	Thu 2/6/14								
138	p-lot layout/grade	5 days	Wed 2/12/14	Tue 2/18/14								
139	p-lot curb/gutter	13 days	Thu 2/20/14	Mon 3/10/14								
140	p-lot lighting/sidewalks	19 days	Thu 2/20/14	Tue 3/18/14								
141	p-lot base pave	18 days	Thu 3/20/14	Mon 4/14/14								
142	set light poles and fixtures	6 days	Tue 4/15/14	Tue 4/22/14								
143	landscaping	6 days	Fri 4/18/14	Fri 4/25/14								
144	final pave and stripe all paving areas	6 days	Tue 4/29/14	Tue 5/6/14								
145	site work complete	0 days	Tue 5/6/14	Tue 5/6/14								
146	Phase 4: Baseball & Softball Fields	55 days	Tue 4/1/14	Mon 6/16/14								
147	build fields	55 days	Tue 4/1/14	Mon 6/16/14								
148	phase 4 complete	0 days	Mon 6/16/14	Mon 6/16/14								
149	Close Out	5 days	Sat 7/19/14	Fri 7/25/14								
150	Building LEED flush out	6 days	Sat 7/19/14	Fri 7/25/14								



Project: Detailed Schedule
Date: Fri 10/12/12

Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	
Split		External Tasks		Inactive Summary		Manual Summary		Progress	
Milestone		External Milestone		Manual Task		Start-only			
Summary		Inactive Task		Duration-only		Finish-only			

APPENDIX B: STRUCTURAL ESTIMATE

Truss Members							
Member	Quantity	Unit	Material	Labor	Equipment	Total	Total Cost
10K1	838.83	LF	\$4.02	\$3.30	\$1.51	\$8.83	\$7,406.87
12K1	315.41	LF	\$4.36	\$2.60	\$1.16	\$8.12	\$2,561.13
14K1	417.33	LF	\$4.59	\$2.60	\$1.16	\$8.35	\$3,484.71
14K3	12	LF	\$4.59	\$2.60	\$1.16	\$8.35	\$100.20
14K4	30	LF	\$4.59	\$2.60	\$1.16	\$8.35	\$250.50
16K2	58.25	LF	\$4.70	\$2.45	\$1.16	\$8.31	\$484.06
16K3	565.75	LF	\$4.82	\$2.17	\$1.16	\$8.15	\$4,610.86
16K4	72.25	LF	\$6.20	\$2.17	\$0.97	\$9.34	\$674.82
18K3	2123.75	LF	\$4.50	\$1.95	\$0.87	\$7.32	\$15,545.85
18K4	589	LF	\$5.20	\$1.95	\$0.87	\$8.02	\$4,723.78
18K5	75	LF	\$5.90	\$1.95	\$0.87	\$8.72	\$654.00
18K7	50	LF	\$6.40	\$1.95	\$0.87	\$9.22	\$461.00
20K3	1088	LF	\$5.80	\$1.95	\$0.87	\$8.62	\$9,378.56
20K4	1312.25	LF	\$5.95	\$1.95	\$0.87	\$8.77	\$11,508.43
20K5	191.25	LF	\$6.15	\$1.95	\$0.87	\$8.97	\$1,715.51
20K6	70.25	LF	\$6.50	\$1.95	\$0.87	\$9.32	\$654.73
20K7	87	LF	\$7.60	\$1.95	\$0.87	\$10.42	\$906.54
20K10	116.25	LF	\$8.10	\$1.95	\$0.87	\$10.92	\$1,269.45
22K4	499	LF	\$6.30	\$1.95	\$0.87	\$9.12	\$4,550.88
22K5	364.25	LF	\$6.60	\$1.95	\$0.87	\$9.42	\$3,431.24
22K6	119.33	LF	\$7.10	\$1.95	\$0.87	\$9.92	\$1,183.75
22K7	480	LF	\$7.90	\$1.95	\$0.87	\$10.72	\$5,145.60
22K10	64.25	LF	\$8.50	\$1.95	\$0.87	\$11.32	\$727.31
24K4	530.41	LF	\$6.80	\$1.77	\$0.79	\$9.36	\$4,964.64
24K5	460.5	LF	\$7.30	\$1.77	\$0.79	\$9.86	\$4,540.53
24K7	131.58	LF	\$8.10	\$1.77	\$0.79	\$10.66	\$1,402.64
24K8	28.75	LF	\$8.95	\$1.77	\$0.79	\$11.51	\$330.91
24K10	321.66	LF	\$9.85	\$1.77	\$0.79	\$12.41	\$3,991.80
26K7	748.25	LF	\$7.95	\$1.77	\$0.79	\$10.51	\$7,864.11
26K9	395.75	LF	\$10.35	\$1.77	\$0.79	\$12.91	\$5,109.13
28K7	357	LF	\$8.85	\$1.63	\$0.72	\$11.20	\$3,998.40
28K8	395	LF	\$9.55	\$1.63	\$0.72	\$11.90	\$4,700.50
28K10	155.75	LF	\$11.25	\$1.63	\$0.72	\$13.60	\$2,118.20
28K12	78.25	LF	\$12.85	\$1.63	\$0.72	\$15.20	\$1,189.40
30K11	1507.33	LF	\$12.10	\$1.63	\$0.72	\$14.45	\$21,780.92
30K12	1372.5	LF	\$13.20	\$1.63	\$0.72	\$15.55	\$21,342.38

14KCS1	102.5	LF	\$4.59	\$2.60	\$1.16	\$8.35	\$855.88
30KCS4	311	LF	\$9.90	\$1.63	\$0.72	\$12.25	\$3,809.75
18LHo3	33	LF	\$10.15	\$2.79	\$1.24	\$14.18	\$467.94
32LHo6	149.75	LF	\$12.20	\$2.17	\$0.97	\$15.34	\$2,297.17
32LHo7	29.66	LF	\$14.40	\$2.17	\$0.97	\$17.54	\$520.24
32LHo9	986.25	LF	\$19.80	\$2.17	\$0.97	\$22.94	\$22,624.58
32LH12	592	LF	\$25.50	\$2.17	\$0.97	\$28.64	\$16,954.88
44LHo9	637.75	LF	\$18.65	\$1.77	\$0.79	\$21.21	\$13,526.68
48LH16	1534.5	LF	\$35.50	\$1.77	\$0.79	\$38.06	\$58,403.07
Total:							\$284,223.50

Miscellaneous								
Member	Quantity	Unit	Lbs/Lf	Material \$/lb	Labor \$/lb	Equip. \$/lb	Total \$/lb	Total Cost
HSS20X12X3/8	155	LF	81.67	\$1.25	\$0.24	\$0.13	\$1.62	\$20,507.34
HSS20X8X3/8	155	LF	8	\$1.25	\$0.24	\$0.13	\$1.62	\$2,008.80
HSS18X6X5/16	49	LF	51.04	\$1.25	\$0.24	\$0.13	\$1.62	\$4,051.56
HSS12X12X5/8	166	LF	102.08	\$1.25	\$0.24	\$0.13	\$1.62	\$27,451.35
HSS12X8X3/8	280.25	LF	51.04	\$1.25	\$0.24	\$0.13	\$1.62	\$23,172.42
HSS12X4X1/4	66.5	LF	27.22	\$1.25	\$0.24	\$0.13	\$1.62	\$2,932.41
HSS10X10X5/8	128.25	LF	85.07	\$1.25	\$0.24	\$0.13	\$1.62	\$17,674.57
hss10X10X1/2	276.75	LF	68.06	\$1.25	\$0.24	\$0.13	\$1.62	\$30,513.68
HSS8X8X1/2	202.5	LF	54.4	\$1.25	\$0.24	\$0.13	\$1.62	\$17,845.92
HSS7X7X1/2	172.33	LF	47.64	\$1.25	\$0.24	\$0.13	\$1.62	\$13,299.88
HSS6X6X1/2	80	LF	40.83	\$1.25	\$0.24	\$0.13	\$1.62	\$5,291.57
HSS6X4X1/4	58	LF	17.01	\$1.25	\$0.24	\$0.13	\$1.62	\$1,598.26
HSS6X2X1/4	205.5	LF	13.61	\$1.25	\$0.24	\$0.13	\$1.62	\$4,530.91
HSS4X2X1/4	218.16	LF	10.21	\$1.25	\$0.24	\$0.13	\$1.62	\$3,608.41
HSS2X2X1/4	127.225	LF	6.81	\$1.25	\$0.24	\$0.13	\$1.62	\$1,403.57
L6X6X3/8	19.25	LF	15.31	\$1.25	\$0.24	\$0.13	\$1.62	\$477.44
L3X3X5/16	159.75	LF	6.38	\$1.25	\$0.24	\$0.13	\$1.62	\$1,651.11
L2X1.5X1/8	104.5	LF	1.5	\$1.25	\$0.24	\$0.13	\$1.62	\$253.94
WT8x13	96	LF	13	\$1.25	\$0.24	\$0.13	\$1.62	\$2,021.76
WT7X21.5	96	LF	21.5	\$1.25	\$0.24	\$0.13	\$1.62	\$3,343.68
C15X50	234.5	LF	50	\$1.25	\$0.24	\$0.13	\$1.62	\$18,994.50
C15X33.9	142.32	LF	33.9	\$1.25	\$0.24	\$0.13	\$1.62	\$7,815.93
C12X30	116	LF	30	\$1.25	\$0.24	\$0.13	\$1.62	\$5,637.60
C12X20.7	497.66	LF	20.7	\$1.25	\$0.24	\$0.13	\$1.62	\$16,688.53
C8X11.5	1325.75	LF	11.5	\$1.25	\$0.24	\$0.13	\$1.62	\$24,698.72
MC12X30.9	64	LF	30.9	\$1.25	\$0.24	\$0.13	\$1.62	\$3,203.71
Total:							\$260,677.56	

Wide Flange Beams							
Member	Quantity	Unit	Material	Labor	Equipment	Total	Total Cost
W8x10	648.9	LF	\$14.30	\$4.58	\$2.54	\$21.42	\$13,899.44
W8x18	78.75	LF	\$25.75	\$4.58	\$2.54	\$32.87	\$2,588.51
W8x24	27.8	LF	\$34.50	\$4.99	\$2.77	\$42.26	\$1,174.83
W8x28	4.5	LF	\$40.00	\$4.99	\$2.77	\$47.76	\$214.92
W8x31	137.6	LF	\$44.50	\$4.99	\$2.77	\$52.26	\$7,190.98
W10x12	3691.25	LF	\$17.15	\$4.58	\$2.54	\$24.27	\$89,586.64
W10x15	86.25	LF	\$21.50	\$4.58	\$2.54	\$28.62	\$2,468.48
W10x17	112	LF	\$24.00	\$4.58	\$2.54	\$31.12	\$3,485.44
W10x22	88	LF	\$31.50	\$4.58	\$2.54	\$38.62	\$3,398.56
W10x39	134.5	LF	\$54.50	\$4.99	\$2.77	\$62.26	\$8,373.97
W12x14	1250.5	LF	\$19.50	\$3.12	\$1.73	\$24.35	\$30,449.68
W12x16	468.4	LF	\$23.00	\$3.12	\$1.73	\$27.85	\$13,044.94
W12x19	179	LF	\$27.25	\$3.12	\$1.73	\$32.10	\$5,745.90
W12x22	35.33	LF	\$31.50	\$3.12	\$1.73	\$36.35	\$1,284.25
W12x26	19.33	LF	\$37.00	\$3.12	\$1.73	\$41.85	\$808.96
W14x16	23.8	LF	\$23.00	\$2.77	\$1.54	\$27.31	\$649.98
W14x22	2921.33	LF	\$34.50	\$2.77	\$1.54	\$38.81	\$113,376.82
W14x26	76.66	LF	\$37.00	\$2.77	\$1.54	\$41.31	\$3,166.82
W14x30	82.5	LF	\$43.00	\$3.05	\$1.69	\$47.74	\$3,938.55
W16x26	3362	LF	\$37.00	\$2.75	\$1.52	\$41.27	\$138,749.74
W16x31	1361	LF	\$44.50	\$3.05	\$1.69	\$49.24	\$67,015.64
W16x36	89	LF	\$50.50	\$3.43	\$1.91	\$55.84	\$4,969.76
W16x40	21.5	LF	\$57.00	\$3.43	\$1.91	\$62.34	\$1,340.31
W16x50	156.8	LF	\$71.50	\$3.43	\$1.91	\$76.84	\$12,048.51

W18x35	6981.33	LF	\$50.00	\$4.13	\$1.74	\$55.87	\$390,046.91
W18x40	1572.75	LF	\$57.00	\$4.13	\$1.74	\$62.87	\$98,878.79
W18x46	108	LF	\$66.00	\$4.13	\$1.74	\$71.87	\$7,761.96
W18x50	400.5	LF	\$71.50	\$4.35	\$1.83	\$77.68	\$31,110.84
W18x55	231.25	LF	\$78.50	\$4.35	\$1.83	\$84.68	\$19,582.25
W18x60	113.75	LF	\$85.75	\$4.35	\$1.83	\$91.93	\$10,457.04
W18x65	158	LF	\$93.00	\$4.40	\$1.85	\$99.25	\$15,681.50
W18x71	233.5	LF	\$101.00	\$4.40	\$1.85	\$107.25	\$25,042.88
W18x76	152.75	LF	\$109.00	\$4.40	\$1.85	\$115.25	\$17,604.44
W18x97	32.33	LF	\$137.50	\$4.40	\$1.85	\$143.75	\$4,647.44
W21x44	1148.75	LF	\$63.00	\$3.73	\$1.57	\$68.30	\$78,459.63
W21x48	31	LF	\$68.50	\$3.73	\$1.57	\$73.80	\$2,287.80
W21x50	648.75	LF	\$71.50	\$3.73	\$1.57	\$76.80	\$49,824.00
W21x55	84	LF	\$80.50	\$3.73	\$1.57	\$85.80	\$7,207.20
W21x62	39.5	LF	\$88.50	\$3.83	\$1.61	\$93.94	\$3,710.63
W21x73	85	LF	\$104.50	\$3.83	\$1.67	\$110.00	\$9,350.00
W21x111	39.75	LF	\$159.00	\$3.96	\$1.67	\$164.63	\$6,544.04
W21x122	119	LF	\$174.00	\$3.96	\$1.67	\$179.63	\$21,375.97
W24x55	1224.75	LF	\$78.50	\$3.57	\$1.50	\$83.57	\$102,352.36
W24x62	386.25	LF	\$88.50	\$3.57	\$1.50	\$93.57	\$36,141.41
W24x68	77.25	LF	\$97.00	\$3.57	\$1.50	\$102.07	\$7,884.91
W24x76	163.5	LF	\$109.00	\$3.57	\$1.50	\$114.07	\$18,650.45
W24x84	31	LF	\$120.00	\$3.67	\$1.55	\$125.22	\$3,881.82
W27x76	54.5	LF	\$109.00	\$3.33	\$1.40	\$113.73	\$6,198.29
W27x84	45.5	LF	\$120.00	\$3.33	\$1.40	\$124.73	\$5,675.22
W30x90	88.5	LF	\$139.00	\$3.30	\$1.39	\$143.69	\$12,716.57
W30x99	36.5	LF	\$142.00	\$3.30	\$1.39	\$146.69	\$5,354.19
W30x124	48.5	LF	\$177.50	\$3.42	\$1.44	\$182.36	\$8,844.46
W30x173	44	LF	\$247.00	\$3.54	\$1.49	\$252.03	\$11,089.32
W40x167	30	LF	\$243.00	\$3.45	\$1.45	\$247.90	\$7,437.00
W40x503	45	LF	\$785.00	\$4.40	\$2.25	\$791.65	\$35,624.25
					Total:		\$1,590,395.14

HSS Columns								
Member	Quantity	Unit	Lbs/Lf	Material \$/lb	Labor \$/lb	Equip. \$/lb	Total \$/lb	Total Cost
HSS12x12x5/8	93.75	LF	102.08	\$1.25	\$0.24	\$0.13	\$1.62	\$15,503.40
HSS12x12x3/8	30.5	LF	61.25	\$1.25	\$0.24	\$0.13	\$1.62	\$3,026.36
HSS10x10x5/16	99	LF	42.53	\$1.25	\$0.24	\$0.13	\$1.62	\$6,820.96
HSS9x9x5/8	47	LF	76.56	\$1.25	\$0.24	\$0.13	\$1.62	\$5,829.28
HSS8x8x5/8	421	LF	68.05	\$1.25	\$0.24	\$0.13	\$1.62	\$46,411.46
HSS8x8x3/8	538.5	LF	40.83	\$1.25	\$0.24	\$0.13	\$1.62	\$35,618.87
HSS8x8x5/16	1177	LF	34.03	\$1.25	\$0.24	\$0.13	\$1.62	\$64,886.36
HSS6x6x3/8	48	LF	30.63	\$1.25	\$0.24	\$0.13	\$1.62	\$2,381.79
HSS6x6x5/16	269	LF	25.52	\$1.25	\$0.24	\$0.13	\$1.62	\$11,121.11
HSS8.625x0.322	128	LF	37.8	\$1.25	\$0.24	\$0.13	\$1.62	\$7,838.21
HSS6.625x0.5	81	LF	45.09	\$1.25	\$0.24	\$0.13	\$1.62	\$5,916.71
HSS6.625x0.25	32	LF	22.54	\$1.25	\$0.24	\$0.13	\$1.62	\$1,168.47
HSS10.75x0.5	194	LF	73.16	\$1.25	\$0.24	\$0.13	\$1.62	\$22,992.72
HSS14x0.5	46.75	LF	95.28	\$1.25	\$0.24	\$0.13	\$1.62	\$7,216.03
							Total	\$236,731.73

Columns							
Member	Quantity	Unit	Material	Labor	Equipment	Total	Total Cost
W8x24	625	LF	\$34.50	\$4.99	\$2.77	\$42.26	\$26,412.50
W8x28	252.5	LF	\$40.00	\$4.99	\$2.77	\$47.76	\$12,059.40
W8x31	194	LF	\$42.50	\$2.50	\$1.39	\$46.39	\$8,999.66
W8x35	206	LF	\$50.50	\$3.43	\$1.91	\$55.84	\$11,503.04
W8x40	791	LF	\$57.00	\$4.13	\$1.74	\$62.87	\$49,730.17
W8x48	1000	LF	\$66.00	\$2.62	\$1.45	\$70.07	\$70,070.00
W8x58	365.5	LF	\$85.75	\$4.35	\$1.83	\$91.93	\$33,600.42
W8x67	34	LF	\$92.00	\$2.75	\$1.52	\$96.27	\$3,273.18
W10x33	204.5	LF	\$44.50	\$3.05	\$1.69	\$49.24	\$10,069.58
W10x39	112	LF	\$54.50	\$4.99	\$2.77	\$62.26	\$6,973.12
W10x45	77	LF	\$62.00	\$2.62	\$1.45	\$66.07	\$5,087.39
W10x49	185	LF	\$71.50	\$3.43	\$1.91	\$76.84	\$14,215.40
W10x54	128.25	LF	\$78.50	\$4.35	\$1.83	\$84.68	\$10,860.21
W10x60	96	LF	\$85.75	\$4.35	\$1.83	\$91.93	\$8,825.28
W10x68	62.5	LF	\$93.50	\$2.75	\$1.52	\$97.77	\$6,110.63
W14x99	180	LF	\$142.00	\$3.30	\$1.39	\$146.69	\$26,404.20
W14x109	90	LF	\$165.00	\$2.82	\$1.56	\$169.38	\$15,244.20
W14x145	90	LF	\$223.00	\$3.45	\$1.45	\$227.90	\$20,511.00
W14x193	180	LF	\$287.00	\$3.54	\$1.49	\$292.03	\$52,565.40
w14x211	45	LF	\$310.00	\$3.54	\$1.49	\$315.03	\$14,176.35
w14x311	45	LF	\$422.00	\$3.54	\$1.49	\$427.03	\$19,216.35
Total:							\$425,907.47

Spread Footings Area A&B

Footing Size	Total Length (LF)	Reinforcing Rebar	Total Concrete (CY)	Total Rebar Wt. (tons)
3' x 1'	851	(3) #5 bars & #4's @ 18" o.c.	94.6	1.900
2.5' x 1'	233	(3) #5 bars & #4's @ 18" o.c.	21.6	0.494
Total			116.1	2.394

Spread Footings Area C

Footing Size	Total Length (LF)	Reinforcing Rebar	Total Concrete (CY)	Total Rebar Wt. (tons)
3' x 1'	1600	(3) #5 bars & #4's @ 18" o.c.	177.8	3.572
3' x 9"	139	(5) #4 bars & #4's @ 16" o.c.	11.6	0.337
Total			189.4	3.909

Spread Footings Area D

Footing Size	Total Length (LF)	Reinforcing Rebar	Total Concrete (CY)	Total Rebar Wt. (tons)
3' x 1'	314	(3) #5 bars & #4's @ 18" o.c.	34.9	0.701
4' x 1'	78	(4) #5 bars & #4's @ 18" o.c.	11.6	0.232
16" x 24" (Grade Beam)	166	(8) #4 bars & #4's @ 18" o.c.	16.4	0.665
Total			62.8	1.599

Spread Footings Area D

Footing Size	Total Length (LF)	Reinforcing Rebar	Total Concrete (CY)	Total Rebar Wt. (tons)
3' x 1'	314	(3) #5 bars & #4's @ 18" o.c.	34.9	0.701
4' x 1'	78	(4) #5 bars & #4's @ 18" o.c.	11.6	0.232
16" x 24" (Grade Beam)	166	(8) #4 bars & #4's @ 18" o.c.	16.4	0.665
Total			62.8	1.599

Spread Footings Area E

Footing Size	Total Length (LF)	Reinforcing Rebar	Total Concrete (CY)	Total Rebar Wt. (tons)
3' x 1'	316.5	(3) #5 bars & #4's @ 18" o.c.	35.2	0.707
16" x 24" (Grade Beam)	148	(8) #4 bars & #4's @ 18" o.c.	14.6	0.593
Total			49.7	1.300

Spread Footings Area F

Footing Size	Total Length (LF)	Reinforcing Rebar	Total Concrete (CY)	Total Rebar Wt. (tons)
3' x 1'	644.5	(3) #5 bars & #4's @ 18" o.c.	71.6	1.439
16" x 24" (Grade Beam)	364	(10) #4 bars & #4's @ 18" o.c.	35.9	1.702
Total			107.5	3.141

Spread Footings Area G

Footing Size	Total Length (LF)	Reinforcing Rebar	Total Concrete (CY)	Total Rebar Wt. (tons)
3' x 1'	1065.5	(3) #5 bars & #4's @ 18" o.c.	118.4	2.379
4' x 1.5'	119.5	(5) #5 bars & #5's @ 12" o.c.	26.6	0.561
3'-4" x 16"	93.5	(3) #5 bars & #5's @ 12" o.c.	15.4	0.309
2.5' x 1'	435	(3) #5 bars & #5's @ 18" o.c.	40.3	1.059
2' x 1'	236.5	(2) #5 bars & #4's @ 18" o.c.	17.5	0.352
		Total	218.1	4.659

SOG Foundations 5" 4000PSI

Location	Area (SF)	Total Concrete (CY)	Reinforcing (W.W.F. 6x6 W2.1xW2.1)
Area A & B	16960	261.7	16960
Area C	33253	513.2	33253
Area D	17990	277.6	17990
Area E	14130	218.1	14130
Area F	34064	525.7	34064
Area G	28000	432.1	28000

Elevated Slabs 2nd Floor 3-1/4" NW concrete

Location	Area (SF)	Total Concrete (CY)	2VLI Metal Deck (SF)	Reinforcing (W.W.F. 6x6)
Area D	17990	236.0	17990	17990
Area E	14130	185.3	14130	14130
Area F	22795	299.0	22795	22795

Elevated Slabs 3rd Floor 3-1/4" NW concrete

Location	Area (SF)	Total Concrete (CY)	2VLI Metal Deck (SF)	Reinforcing (W.W.F. 6x6)
Area D	17990	236.0	17990	17990
Area E	14130	185.3	14130	14130
Area F	7230	94.8	7230	7230

Individual Footings

Footing Size	quantity	Depth (in)	Reinforcing rebar		Total Concrete (CY)	Total Rebar Wt (tons)
			Quantity (E.W.)	Size		
4x4	28	18	5	#6	16.0	0.841
4.5x4.5	3	18	5	#6	20.3	0.101
5x5	10	18	6	#6	25.0	0.451
5.5x5.5	9	18	6	#6	30.3	0.446
6x6	19	18	6	#6	36.0	1.027
6.5x6.5	11	18	7	#6	42.3	0.752
7x7	9	18	8	#6	49.0	0.757
7.5x7.5	24	18	8	#6	56.3	2.163
8x8	27	20	9	#6	79.0	2.920
8.5x8.5	7	20	10	#6	89.2	0.894
9x9	9	22	10	#7	121.0	1.656
9.5x9.5	3	22	10	#7	134.8	0.583
10x10	8	36	11	#8	400.0	2.350
10.5x10.5	5	24	11	#7	196.0	1.180
12x12	23	48	13	#9	1024.0	12.199
14x14	4	36	13	#8	784.0	1.944
15x15	1	48	20	#9	1600.0	1.020
16x16	2	36	17	#8	1024.0	1.452
17x17	1	36	18	#8	1156.0	0.817
19x19	1	36	20	#8	1444.0	1.015
16x14	1	48	18	#9	1592.9	0.918
14x8	1	24	9	#7	199.1	0.202
22.5x10	1	48	18	#9	1600.0	0.995
Totals:					11719.0	36.682

Total Deck & Concrete Costs

Material	Quantity	Unit	Cost	Total
REBAR	53.683	Ton	\$980.00	\$52,609.34
CONCRETE	15927.5	C.Y.	\$131.00	\$2,086,502.50
WWF	238662	S.F.	\$47.00	\$112,171.14
Metal Deck	94265	S.F.	\$2.30	\$216,809.50
Roof Deck	156210	S.F.	\$2.05	\$320,230.50

Project Cost Data

CSI Masterformat	Structural Element	Estimated Cost	Estimated Cost Per SF
03	Reinforcing	\$164,780.48	\$0.65
05	Concrete	\$2,086,502.50	\$8.18
03	Metal Deck	\$537,040.00	\$2.11
03	Structural Steel	\$2,813,870.20	\$11.03
	Total	\$5,602,193.18	\$21.97

APPENDIX C: GENERAL CONDITIONS ESTIMATE

General Conditions Cost Estimate								
Description	Quantity	Unit	Labor Cost	Material Cost	Equipment Cost	Other Cost	Total Cost	Grand Total
Field Personnel								
Site Superintendent	20	mo	\$8,465.00				\$8,465.00	\$169,300.00
MEP superintendent	20	mo	\$8,465.00				\$8,465.00	\$169,300.00
General Superintendent	32	mo	\$8,465.00				\$8,465.00	\$270,880.00
Field Engineer	32	mo	\$5,570.00				\$5,570.00	\$178,240.00
Project Manager	21	mo	\$9,105.00				\$9,105.00	\$191,205.00
Project Administrator	32	mo	\$3,130.00				\$3,130.00	\$100,160.00
							Total:	\$1,079,085.00
Temporary Utilities								
generator	12	mo		\$185.00		\$435.00	\$620.00	\$14,880.00
temp heat	8	mo	\$1,375.00	\$637.00			\$2,012.00	\$16,096.00
temp power and lighting	32	mo	\$628.00	\$628.00			\$1,256.00	\$40,192.00
monthly water bill	32	mo				\$250.00	\$250.00	\$8,000.00
							Total:	\$79,168.00
Construction Expenses								
office trailers 32'x8' rent per month	86	ea		\$325.00			\$325.00	\$73,950.00
storage boxes 20'x8' rent per month	80	ea		\$105.25			\$105.25	\$16,420.00
office equipment rental	32	mo		\$174.23			\$174.23	\$5,575.36
office supplies	32	mo		\$108.24			\$108.24	\$3,463.68
telephone bill	32	mo		\$266.53			\$266.53	\$8,528.96
field office lights and HVAC	32	mo		\$124.11			\$124.11	\$3,971.52
							Total:	\$111,909.52
Construction Aids								
Peronal Protective Equipment	32	ea		\$247.11			\$247.11	\$7,907.52
Portable toilets rent per month	225	ea			\$503.22		\$503.22	\$113,224.50
							Total:	\$121,132.02
Temporary Barriers and Enclosures								
winter protection, tarpaulins	6	mo	\$600.00	\$1,232.00			\$1,832.00	\$10,992.00
snow removal	7	ea	\$5,258.57	\$563.22	\$775.81		\$6,597.60	\$46,183.20
fence	1	ea	\$2,589.55	\$6,054.25	\$800.00		\$9,443.80	\$9,443.80
silt fence	1	ea	\$2,851.35	\$7,245.22	\$800.00		\$10,896.57	\$10,896.57
signage	1	ea		\$3,215.64			\$3,215.64	\$3,215.64
							Total:	\$80,731.21
Cleaning								
clean up field office	32	mo	\$834.64	\$78.88	\$2.51		\$916.03	\$29,312.96
street sweeper	18	mo				\$1,987.24	\$1,987.24	\$35,770.32
dumpsters, per pull	218	ea		\$512.00			\$512.00	\$111,616.00
site staging and restoration	1	ea				\$55,800.00	\$55,800.00	\$55,800.00
final clean	1	ea	\$5,324.78	\$654.78	\$2,281.84		\$8,261.40	\$8,261.40
							Total:	\$240,760.68
Insurance and Bonds								
General Liability insurance	1	ea				\$468,364.00	\$468,364.00	\$468,364.00
Builders risk insurance	1	ea				\$265,406.00	\$265,406.00	\$265,406.00
Performance payment bond	1	ea				\$359,079.00	\$359,079.00	\$359,079.00
							Total:	\$1,092,849.00

Total General Conditions Cost \$2,805,635.43

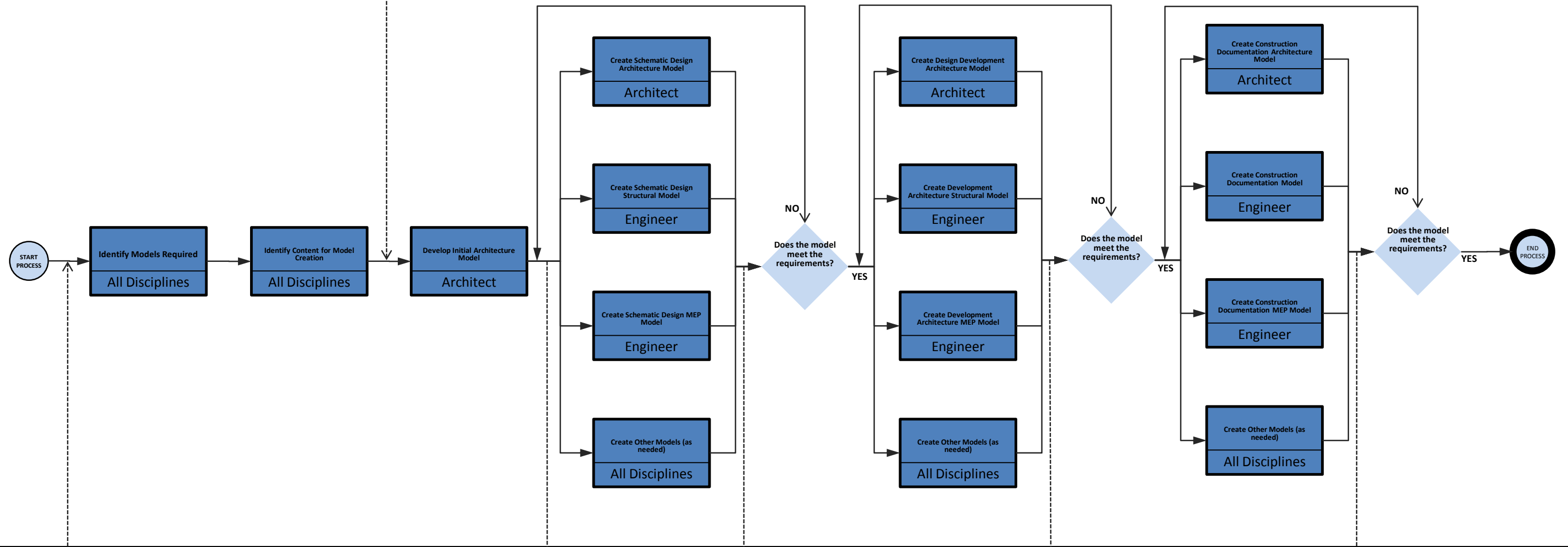
APPENDIX D: BIM PROCESS MAPS

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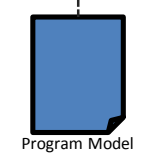
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PROCESS



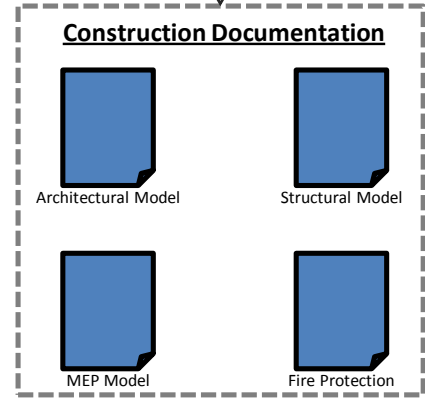
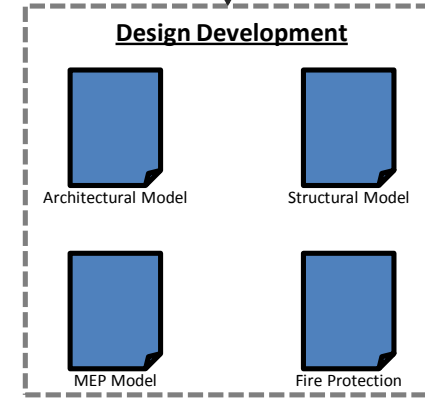
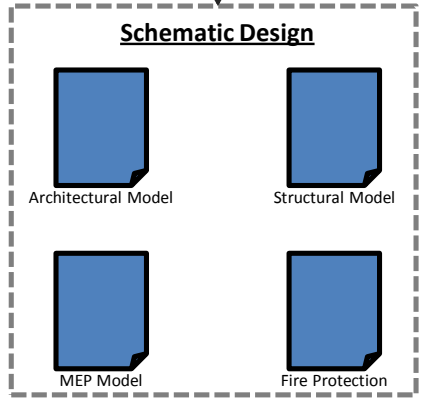
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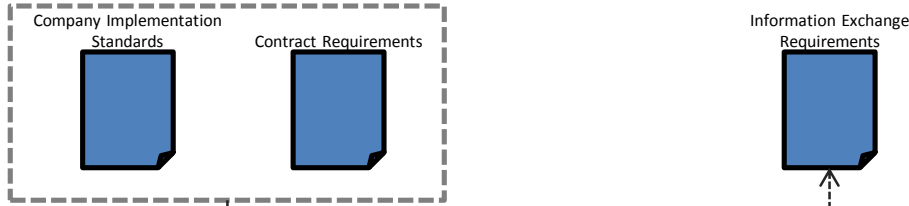
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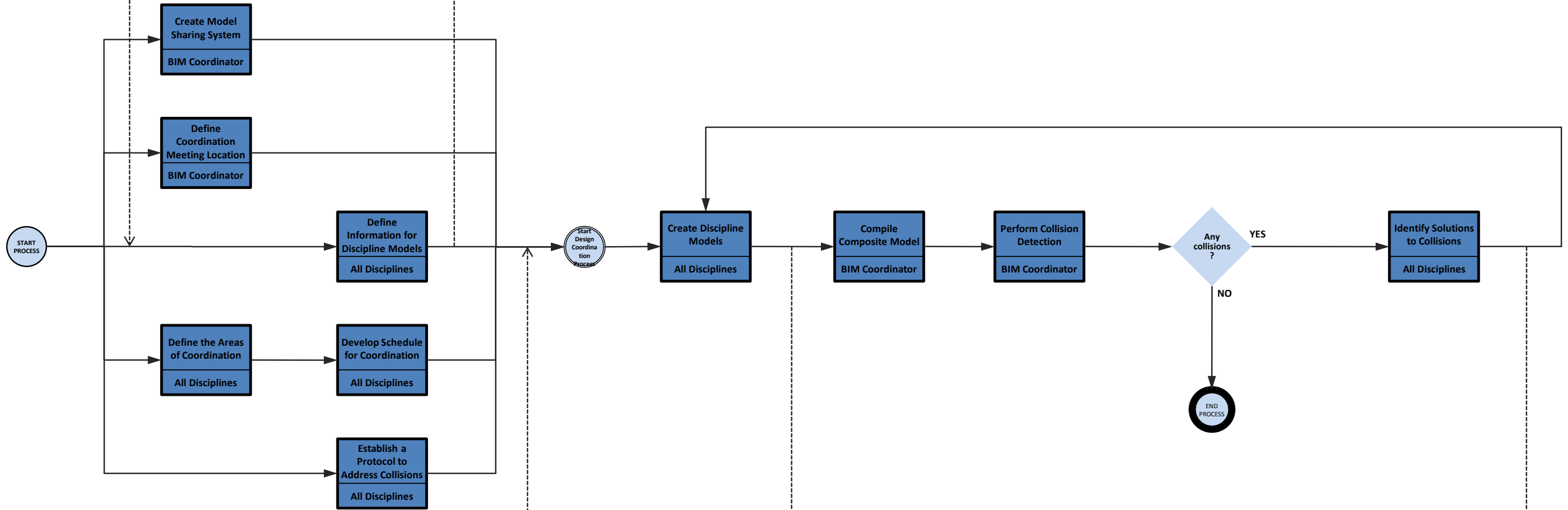
Preliminary Architecture Model



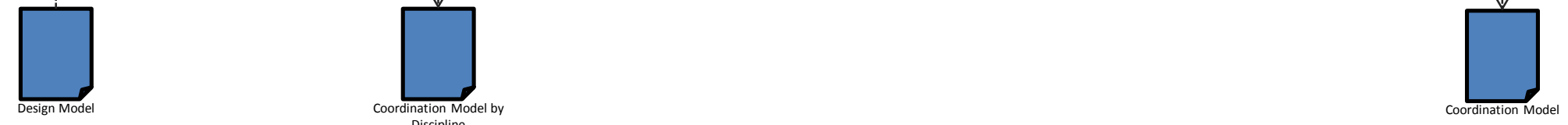
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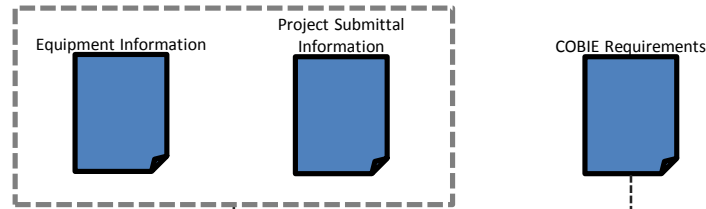
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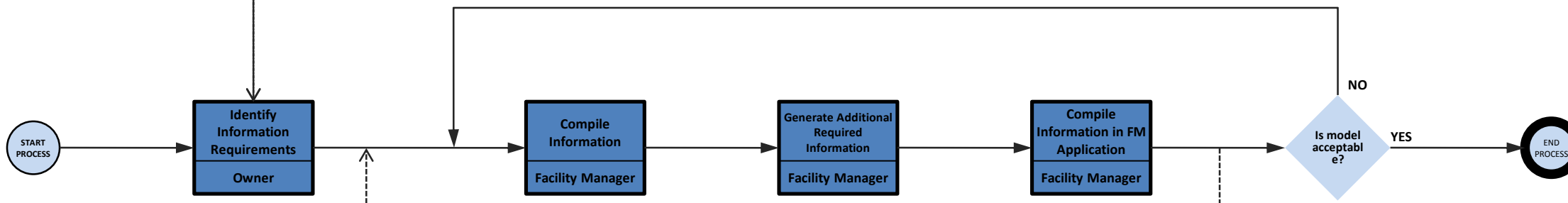
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