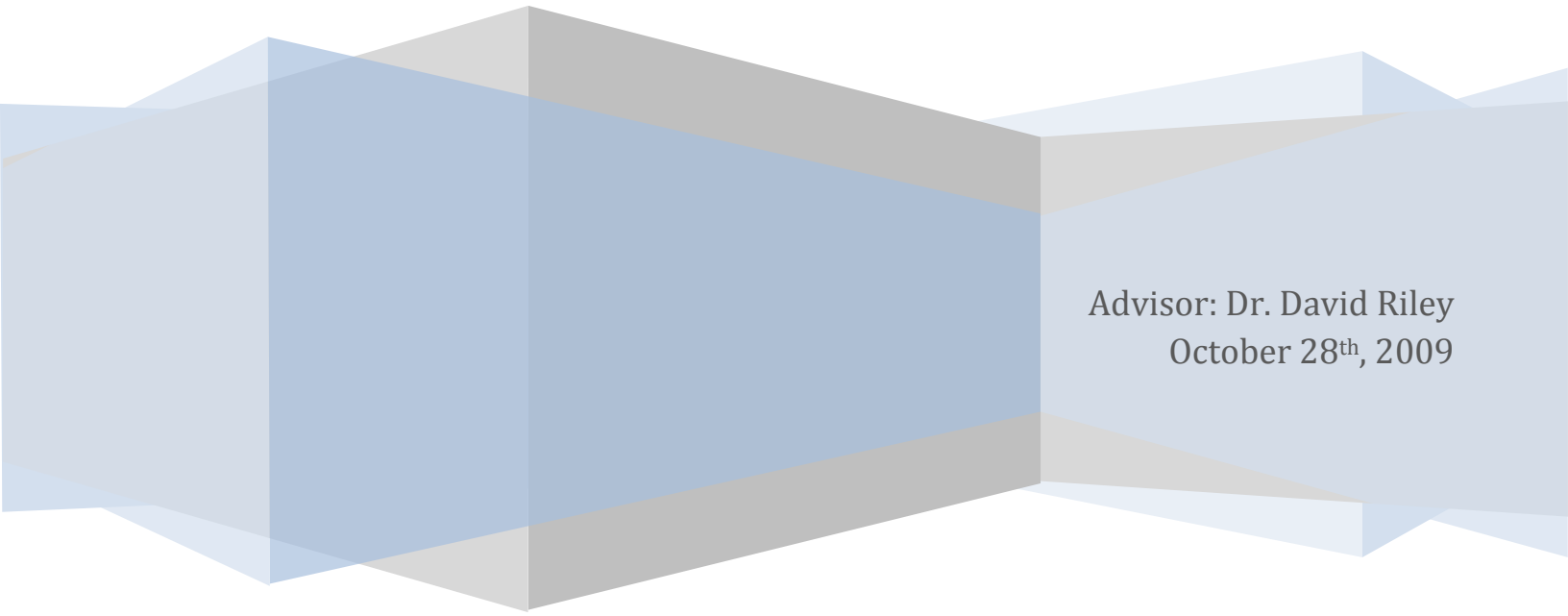
Westinghouse Electric Company
Nuclear Power Engineering Campus

Technical Assignment 2

Cost and Schedule Analysis

Mark Speicher



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October 28th, 2009

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EXECUTIVE SUMMARY

Technical assignment 2 looks at the cost and schedule of the Westinghouse Electric Company's Nuclear Power Engineering Headquarters Campus project. A detailed project schedule and a site layout plan were developed for the project. In addition, a detailed structural estimate and a general conditions estimate were performed. All of these sections just looked at Building One. Only information for Building One was provided. Finally, a summary of the PACE Roundtable with some opinions and thoughts are included.

First, a detailed schedule consisting of 146 activities was developed. This schedule included the core and shell of Building One. From this schedule, the sequence of activities is shown. The sequence starts in a linear sequence, then shifts starting with the superstructure phase.

A site layout was developed of this superstructure phase. During steel erection, there were two cranes located on-site. These shake out and lay-down areas were provided for both easy accesses for delivery and ease of use for the cranes. Location of trailers, dumpsters, construction entrances and other site features can be found in the layout.

Next, detailed estimates were performed for the structural systems and general conditions. Again this estimate was for just Building One, although some of the numbers used for the general conditions were overall project costs. The total cost obtained for the structural systems was $5,960,546 or $13.71/SF. This number seems low, which could result from some of the assumptions which were made. $11,074,800 was the total for the general conditions estimate. This included general expenses, staffing, temporary utilities, and fees and permits.

Summaries from the industry panel, student panel, and breakout sessions from the PACE Roundtable are provided. The breakout session attended dealt with energy and the building industry, including the importance of energy use. Also, some final thoughts and opinions are shared.

DETAILED PROJECT SCHEDULE

The full detailed schedule can be found in Appendix A.

Key Dates

Activity	Date
Start Construction	2/11/2008
Mobilization	2/11/2008
Structural Steel Start	6/4/2008
Start Roof	8/21/2008
Start Tenant Improvement Work	10/1/2008
Structural Steel Erection Complete	11/4/2008
Roof Complete	12/2/2008
Substantially Complete Core and Shell	3/20/2009
Finish Tenant Improvement Work	5/6/2009

Table 1: Key construction dates

Construction Sequences

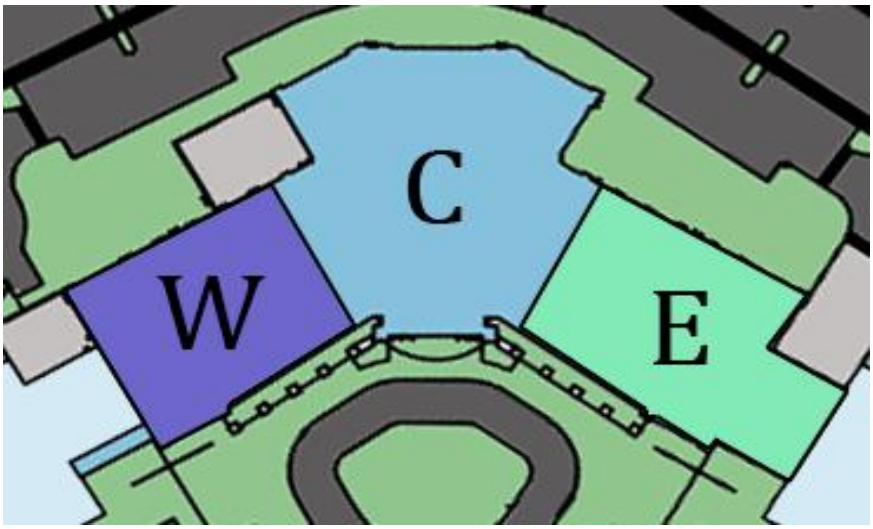


Figure 1: Labeled areas of Building One

In the beginning of the construction process, the general workflow is linear with the work progressing from the east side of Building One to the west side. This flow is maintained throughout the excavation and construction of the substructure. This includes the construction of:

- Footings
- Caissons
- Foundation Walls
- Grade Beams
- Waterproofing

However, when work begins on the superstructure, specifically the structural steel, a new pattern is used. Structural steel is first erected in the center of the building using crane 1. Midway through the erection of the center's steel, a second crane is used to begin erecting steel on the east side of the building. Once the first crane finishes work on the center portion, it is then used to erect steel on the west side. It is with the erection of steel the workflow for the duration of the project is established. From this point forward work will begin first in the center and move to the east and finally the west. This is true for the following:

- Slab-on-deck
- MEP Hangers
- Spray on Fireproofing
- MEP Rough-in
- Roof
- Masonry
- Exterior Framing
- Metal Panels
- Glass and Glazing
- Interior Shaft Walls
- Interiors
- MEP Finishes

SITE LAYOUT PLANNING

A full version of the site plan can be found in Appendix B.

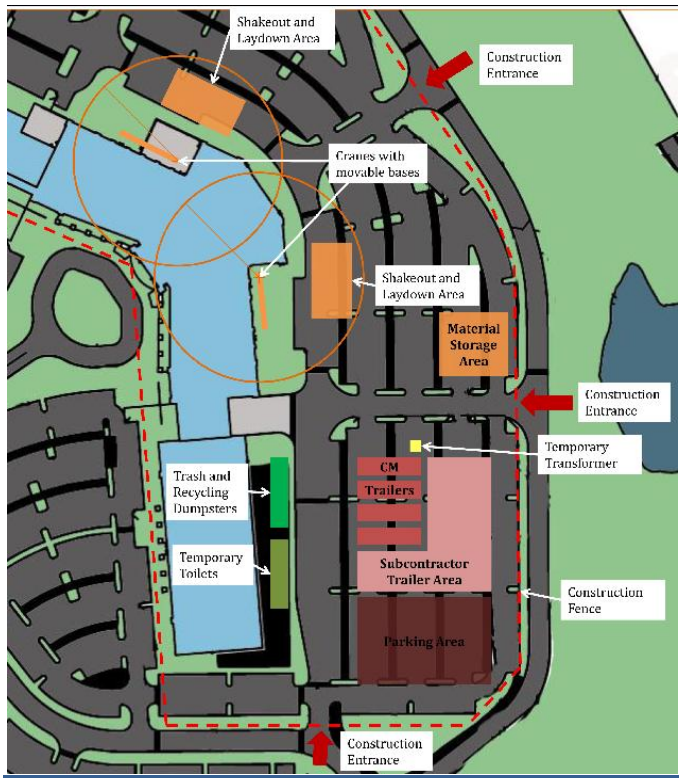


Figure 2: Snapshot of the site layout for the superstructure phase

Superstructure Phase

The superstructure phase of the project primarily consisted of two crawler cranes for the erection of steel. As discussed above, Crane One will erect steel on the center and west portions of the building, while Crane Two will erect steel on the East side. Shakeout and lay-down areas were placed to provide easy access for both the delivery trucks and the cranes.

With the access roads being completed, there are easy access points throughout the site. This allows for ease of delivery of materials. In addition, the trash and recycling can be easily removed. Also the site of the parking lot provided a good location for construction trailers and a parking area intended for the workers.

The entire site is surrounded by a fence with gates located at each construction entrance. The fence includes the parking in the rear so these areas could be used. However the fence omits the parking area in the front. This is done so as Building One is occupied in later phases, parking will be available to Westinghouse employees.

DETAILED STRUCTURAL SYSTEMS ESTIMATE

CSI Division	Description	Total Cost	Cost/SF
03 11 13	Concrete Forming	$ 2,395,221	$ 5.51
03 21 10	Reinforcing Steel	$ 59,307	$ 0.14
03 22 05	Welded Wire Fabric Reinforcing	$ 219,845	$ 0.51
03 31 05.35	Structural Concrete	$ 622,664	$ 1.43
03 31 07.70	Placing Concrete	$ 265,022	$ 0.61
05 12 23.17	Columns, Structural	$ 1,183,335	$ 2.72
05 12 23.75	Structural Steel Members (Beams)	$ 1,215,152	$ 2.79
Total		**$ 5,960,546**	**$ 13.71**

Table 2: Structural System Estimate Summary

The structural systems estimate for Building One was performed using cost data from R.S. Means 2009. The concrete from the caissons, footings and slabs (slab-on-grade and slab-on-decks) were taken into account for the concrete estimate. For steel all beams and columns were taken into account. All steel beams were assumed to be W24x55. This was the most common size and assumed to be typical. For columns, R.S. Means did not provide cost data for all sizes. Three sizes closest to the column sizes within the project were selected and an average cost per ton was determined. This value was used for all sizes.

All slabs were reinforced with 6 x 6- W2.1 x 2.1 welded wire fabric and was estimated using the square footage of the slabs. Typical reinforcing layouts were used for the footings and caissons. For the footings (20) #9 bars were assumed (10 in each direction). For the caissons, (12) # 8 bars were assumed.

The overall superstructure cost for Building One was determined to be **$5,960,546**. The cost per square foot for Building One would then be **$13.71**. No actual cost data was provided by Turner and therefore cannot be compared to the actual value. However, this value is significantly lower than the value obtained from Technical Assignment One. The *overall* project superstructure cost was determined to be $34,613,957. Building One would consist of approximately 40% of this value.

Tables of the takeoff and calculations can be found in Appendix C.

GENERAL CONDITIONS ESTIMATE

Description	Total Cost
General Expenses	$ 303,733
Project Staff	$ 1,153,595
Temporary Utilities	$ 1,841,472
Fees and Permits	$ 7,776,000
Total	**$ 11,074,800**

Table 3: General Conditions Estimate Summary

The General Conditions estimate for Building One was performed using R.S. Means 2009 cost data. The total for the estimate was **$11,074,800**. This took into account some general expenses, the project staff, temporary utilities, as well as some fees and permits. Overall, the general conditions of Building One made up **4.6%** of the overall project cost. This estimate is reflective of just the core and shell of Building One. However the fees and permits were calculated based on a percentage of the overall project cost. This was done because no cost data was given for just Building One.

For complete takeoffs and calculation see Appendix D.

CRITICAL INDUSTRY ISSUES

Industry Panel: State of Construction

The first session consisted of a group of volunteers from the industry sharing their thoughts on the state of the construction industry. They also shared some of the ideas their company was utilizing in order to maintain success. It was mentioned that during the recession there have been an increased number of bids. Instead of going up against three to four other companies, ten to twelve companies may be bidding. This places a larger emphasis on the prequalification process. Larger General Contractors must show why an owner would benefit from hiring them as opposed to a smaller GC whose price may come in lower. This is a reason why the relationship with owners and clients is more crucial than ever before. One must take care of these clients in hopes it will give them an advantage while attempting to get new projects.

The use of Building Information Modeling (BIM) during the recession was another topic of discussion. Some companies were employing a sit and wait strategy with BIM. They did not feel it is a real benefit to their company until their employees have been better educated on the subject matter. Another company agreed with this thought, but was unsure of the benefits even with proper education of their employees. An opposite stance was taken by another company who is using BIM as a marketing tool for obtaining new jobs. They feel it gives them an advantage in the bidding process against some of their competitors.

Energy and the Building Industry

Energy and the Building industry was a breakout session lead by Dr. Riley. The session began with brainstorming reasons why energy was so important in the building industry and why so much focus was placed upon energy use. Some of the reasons included:

- the environmental impact
- high energy costs
- finite resources/alternative energy
- world economy/energy independence
- stimulus package/incentives

Other reasons were identified including the use of new materials and new systems. At the end of part one of the session these new materials were broken down into categories:

1. new insulation
2. LED lighting
3. controls/smart buildings
4. interiors
5. hydronic
6. reuse/deconstruction

7. HVAC systems
8. CHP systems
9. solar thermal

After a short break the energy session resumed with Dr. Riley asking students about their thesis buildings and ideas they had regarding energy. Industry member would then give their insight regarding the building type and some possible ideas which may be applicable to their building. An example of an idea for the Westinghouse project consisted of looking at the finishes and the embodied energy within them. Because Westinghouse is an energy company, such issues could be important.

Student Panel: Communication Patterns of the Now Generation

During this panel, students shared insight regarding social networking sites, such as Facebook and Twitter, and their role in the workplace. Also, the role of instant information such as accessing e-mail from your phone and text messaging was discussed. A prevelant theme stemmed from the industry's uneasiness about texting and e-mail. Where our generation would send an e-mail to obtain information, the industry members prefer face-to-face communication or at the very least a phone conversation.

Accessing many things so readily raised a concern that personal business would be conducted on company time. For example, accessing Facebook from a phone or checking personal e-mails. Industry members wanted to know how a student would deal with this and how they would find a balance. An opinion was shared that even if this information was checked it would not affect the working ability. Also the point was raised that the same may be true in the home. One may find themselves checking and sending e-mails for work during personal time. It is all part of a balance that must be achieved.

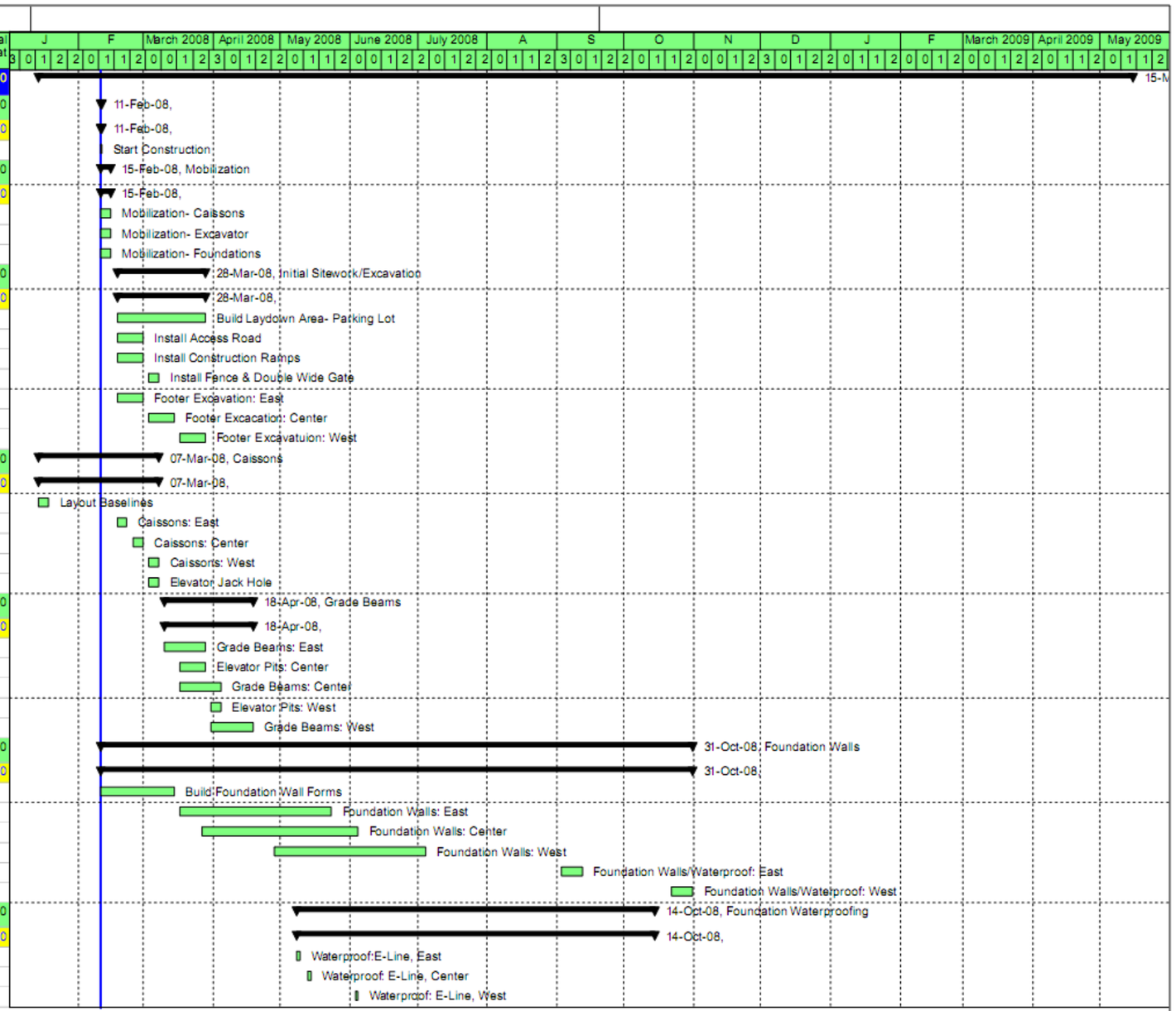
Thoughts and Opinions

Overall, I found the roundtable to be interesting and beneficial. It was good to be able to hear issues being raised by industry members outside of Penn State. Sometimes being at school makes you forget about the world around you and what is really going on. The breakout sessions were very beneficial. You got to hear more from different industry members on their areas of expertise. During the energy breakout I was able to obtain an idea to investigate for my project (embodied energy in finishes).

The most surprising theme seemed to come from the student panel. At Penn State, technology is embraced by not only the students but the faculty. That is why it was surprising to me to see so many of the industry members reluctant to use it. Whether that technology be the use of BIM or simply the use of text and e-mail.

APPENDIX A: DETAILED PROJECT SCHEDULE

Activity ID	Activity Name	Original Duration	Start	Finish	Total Float
Westinghouse		350	14-Jan-08	15-May-09	0
		1	11-Feb-08	11-Feb-08	0
		1	11-Feb-08	11-Feb-08	0
A10	Start Construction	1	11-Feb-08	11-Feb-08	
Mobilization		5	11-Feb-08	15-Feb-08	0
		5	11-Feb-08	15-Feb-08	0
A10	Mobilization- Caissons	5	11-Feb-08	15-Feb-08	
A10	Mobilization- Excavator	5	11-Feb-08	15-Feb-08	
A10	Mobilization- Foundations	5	11-Feb-08	15-Feb-08	
Initial Sitework/Excavation		30	18-Feb-08	28-Mar-08	0
		30	18-Feb-08	28-Mar-08	0
A10	Build Laydown Area- Parkin...	30	18-Feb-08*	28-Mar-08	
A10	Install Access Road	10	18-Feb-08*	29-Feb-08	
A10	Install Construction Ramps	10	18-Feb-08*	29-Feb-08	
A10	Install Fence & Double Wid...	5	03-Mar-08*	07-Mar-08	
A10	Footer Excavation: East	10	18-Feb-08*	29-Feb-08	
A10	Footer Excacation: Center	10	03-Mar-08*	14-Mar-08	
A11	Footer Excavatuion: West	10	17-Mar-08*	28-Mar-08	
Caissons		40	14-Jan-08	07-Mar-08	0
		40	14-Jan-08	07-Mar-08	0
A11	Layout Baselines	5	14-Jan-08*	18-Jan-08	
A11	Caissons: East	5	18-Feb-08*	22-Feb-08	
A11	Caissons: Center	5	25-Feb-08*	29-Feb-08	
A11	Caissons: West	5	03-Mar-08*	07-Mar-08	
A11	Elevator Jack Hole	5	03-Mar-08*	07-Mar-08	
Grade Beams		30	10-Mar-08	18-Apr-08	0
		30	10-Mar-08	18-Apr-08	0
A11	Grade Beams: East	15	10-Mar-08*	28-Mar-08	
A11	Elevator Pits: Center	10	17-Mar-08*	28-Mar-08	
A11	Grade Beams: Center	15	17-Mar-08*	04-Apr-08	
A11	Elevator Pits: West	5	31-Mar-08*	04-Apr-08	
A12	Grade Beams: West	15	31-Mar-08*	18-Apr-08	
Foundation Walls		190	11-Feb-08	31-Oct-08	0
		190	11-Feb-08	31-Oct-08	0
A12	Build Foundation Wall Forms	25	11-Feb-08	14-Mar-08	
A12	Foundation Walls: East	50	17-Mar-08*	23-May-08	
A12	Foundation Walls: Center	50	27-Mar-08*	04-Jun-08	
A12	Foundation Walls: West	50	28-Apr-08*	04-Jul-08	
A12	Foundation Walls/Waterpro...	8	03-Sep-08*	12-Sep-08	
A12	Foundation Walls/Waterpro...	8	22-Oct-08*	31-Oct-08	
Foundation Waterproofing		114	08-May-08	14-Oct-08	0
		114	08-May-08	14-Oct-08	0
A12	Waterproof:E-Line, East	2	08-May-08*	09-May-08	
A12	Waterproof: E-Line, Center	2	13-May-08*	14-May-08	
A12	Waterproof: E-Line, West	2	03-Jun-08*	04-Jun-08	



Westinghouse Electric Company Nuclear Power Engineering Headquarters Campus

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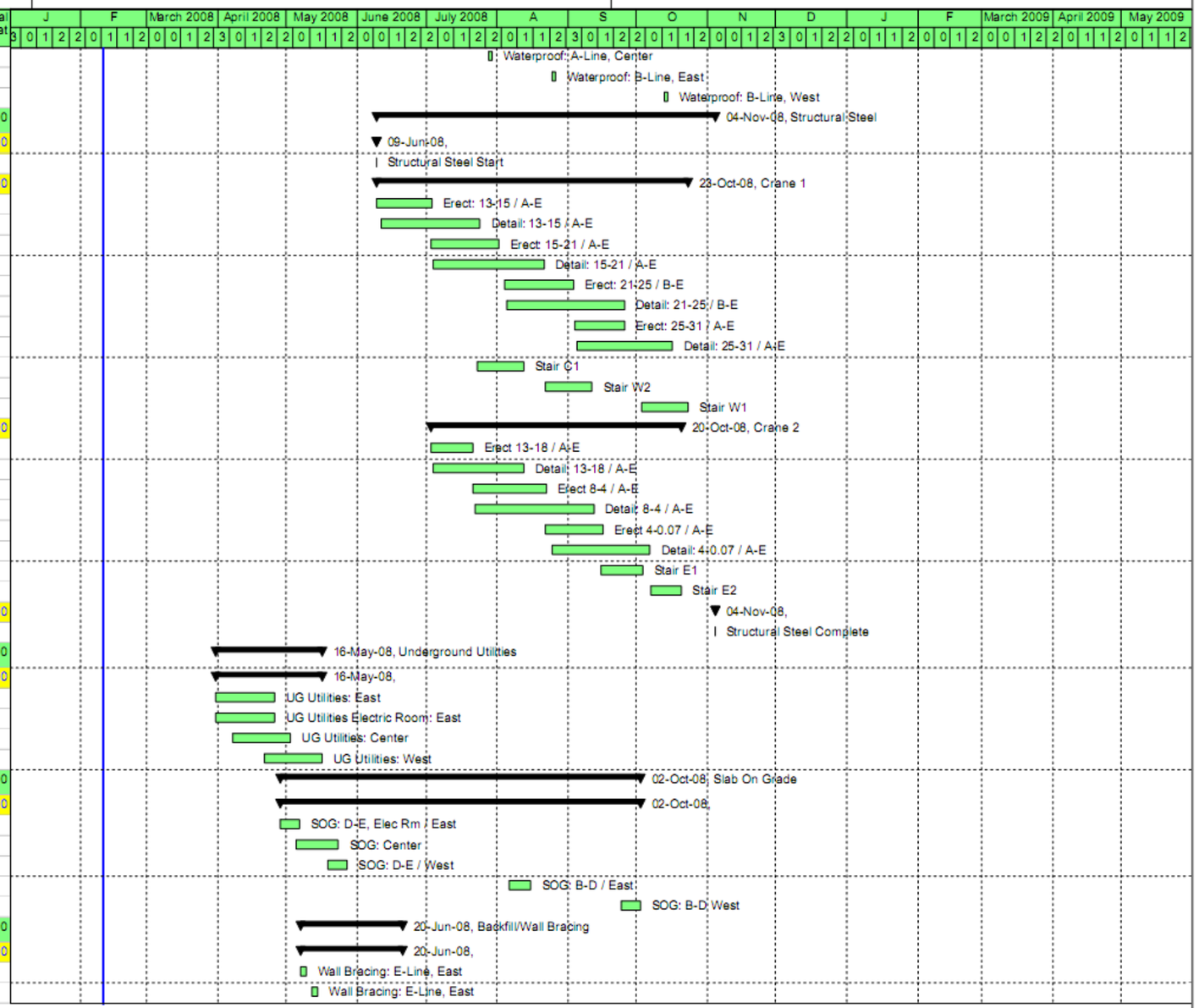
Actual Work · Critical Remaining Work · Summary · Remaining Work · Milestone

Activity ID	Activity Name	Original Duration	Start	Finish	Total Float
A13	Waterproof: A-Line, Center	2	28-Jul-08*	29-Jul-08	
A13	Waterproof: B-Line, East	2	25-Aug-08*	26-Aug-08	
A13	Waterproof: B-Line, West	2	13-Oct-08*	14-Oct-08	
Structural Steel		106	09-Jun-08	04-Nov-08	0
		0	09-Jun-08	09-Jun-08	0
A13	Structural Steel Start	0	09-Jun-08*	09-Jun-08	
Crane 1		99	09-Jun-08	23-Oct-08	0
A13	Erect: 13-15 / A-E	19	09-Jun-08*	03-Jul-08	
A13	Detail: 13-15 / A-E	32	11-Jun-08*	24-Jul-08	
A13	Erect: 15-21 / A-E	22	03-Jul-08*	01-Aug-08	
A13	Detail: 15-21 / A-E	35	04-Jul-08*	21-Aug-08	
A13	Erect: 21-25 / B-E	23	04-Aug-08*	03-Sep-08	
A13	Detail: 21-25 / B-E	38	05-Aug-08*	25-Sep-08	
A14	Erect: 25-31 / A-E	16	04-Sep-08*	25-Sep-08	
A14	Detail: 25-31 / A-E	30	05-Sep-08*	16-Oct-08	
A14	Stair C1	15	23-Jul-08*	12-Aug-08	
A14	Stair W2	15	22-Aug-08*	11-Sep-08	
A14	Stair W1	15	03-Oct-08*	23-Oct-08	
Crane 2		78	03-Jul-08	20-Oct-08	0
A14	Erect 13-18 / A-E	13	03-Jul-08*	21-Jul-08	
A14	Detail: 13-18 / A-E	28	04-Jul-08*	12-Aug-08	
A14	Erect 8-4 / A-E	25	21-Jul-08*	22-Aug-08	
A14	Detail: 8-4 / A-E	39	22-Jul-08*	12-Sep-08	
A14	Erect 4-0.07 / A-E	18	22-Aug-08*	16-Sep-08	
A15	Detail: 4-0.07 / A-E	31	25-Aug-08*	06-Oct-08	
A15	Stair E1	15	15-Sep-08*	03-Oct-08	
A15	Stair E2	10	07-Oct-08*	20-Oct-08	
		0	04-Nov-08	04-Nov-08	0
A15	Structural Steel Complete	0	04-Nov-08*	04-Nov-08	
Underground Utilities		35	31-Mar-08	16-May-08	0
		35	31-Mar-08	16-May-08	0
A15	UG Utilities: East	20	31-Mar-08*	25-Apr-08	
A15	UG Utilities Electric Room: ...	20	31-Mar-08*	25-Apr-08	
A15	UG Utilities: Center	20	07-Apr-08*	02-May-08	
A15	UG Utilities: West	20	21-Apr-08*	16-May-08	
Slab On Grade		114	28-Apr-08	02-Oct-08	0
		114	28-Apr-08	02-Oct-08	0
A15	SOG: D-E, Elec Rm / East	7	28-Apr-08*	06-May-08	
A15	SOG: Center	15	05-May-08*	23-May-08	
A16	SOG: D-E / West	7	19-May-08*	27-May-08	
A16	SOG: B-D / East	8	06-Aug-08*	15-Aug-08	
A16	SOG: B-D West	7	24-Sep-08*	02-Oct-08	
Backfill/Wall Bracing		33	07-May-08	20-Jun-08	0
		33	07-May-08	20-Jun-08	0
A16	Wall Bracing: E-Line, East	3	07-May-08*	09-May-08	
A16	Wall Bracing: E-Line, East	3	12-May-08*	14-May-08	



Westinghouse Electric Company Nuclear Power Engineering Headquarters Campus

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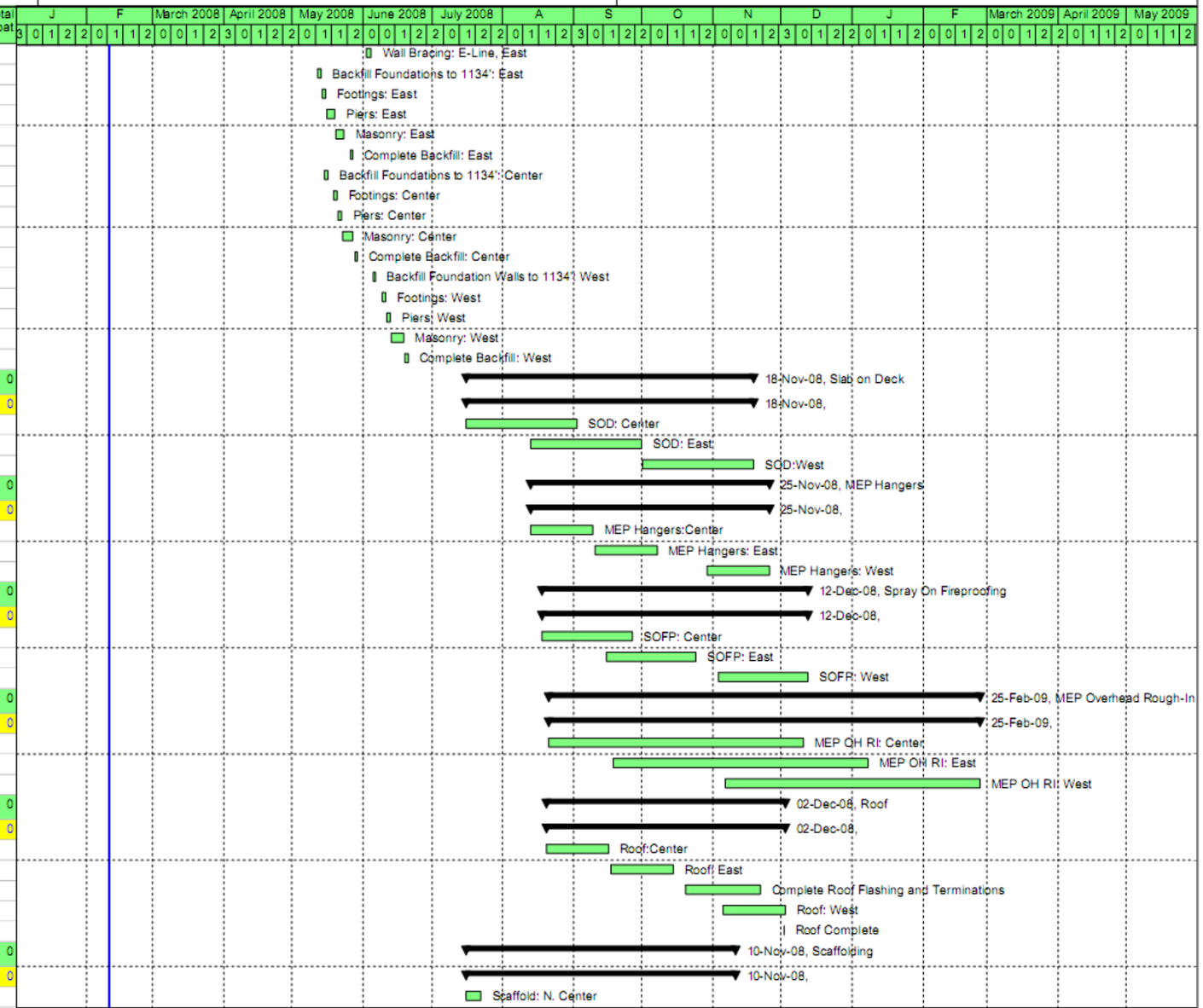
Actual Work | Critical Remaining Work | Summary | Remaining Work | Milestone

Activity ID	Activity Name	Original Duration	Start	Finish	Total Float
A1E	Wall Bracing: E-Line, East	3	02-Jun-08*	04-Jun-08	
A1E	Backfill Foundations to 113...	2	12-May-08*	13-May-08	
A17	Footings: East	2	14-May-08*	15-May-08	
A17	Piers: East	2	16-May-08*	19-May-08	
A17	Masonry: East	4	20-May-08*	23-May-08	
A17	Complete Backfill: East	2	26-May-08*	27-May-08	
A17	Backfill Foundations to 113...	2	15-May-08*	16-May-08	
A17	Footings: Center	2	19-May-08*	20-May-08	
A17	Piers: Center	2	21-May-08*	22-May-08	
A17	Masonry: Center	3	23-May-08*	27-May-08	
A17	Complete Backfill: Center	2	28-May-08*	29-May-08	
A17	Backfill Foundation Walls to...	2	05-Jun-08*	06-Jun-08	
A1E	Footings: West	2	09-Jun-08*	10-Jun-08	
A1E	Piers: West	2	11-Jun-08*	12-Jun-08	
A1E	Masonry: West	4	13-Jun-08*	18-Jun-08	
A1E	Complete Backfill: West	2	19-Jun-08*	20-Jun-08	
Slab on Deck		90	16-Jul-08	18-Nov-08	0
		90	16-Jul-08	18-Nov-08	0
A1E	SOD: Center	35	16-Jul-08*	02-Sep-08	
A1E	SOD: East	35	13-Aug-08*	30-Sep-08	
A1E	SOD:West	35	01-Oct-08*	18-Nov-08	
MEP Hangers		75	13-Aug-08	25-Nov-08	0
		75	13-Aug-08	25-Nov-08	0
A1E	MEP Hangers:Center	20	13-Aug-08*	09-Sep-08	
A1E	MEP Hangers: East	20	10-Sep-08*	07-Oct-08	
A1E	MEP Hangers: West	20	29-Oct-08*	25-Nov-08	
Spray On Fireproofing		85	18-Aug-08	12-Dec-08	0
		85	18-Aug-08	12-Dec-08	0
A1E	SOFP: Center	30	18-Aug-08*	26-Sep-08	
A1E	SOFP: East	30	15-Sep-08*	24-Oct-08	
A1E	SOFP: West	30	03-Nov-08*	12-Dec-08	
MEP Overhead Rough-In		135	21-Aug-08	25-Feb-09	0
		135	21-Aug-08	25-Feb-09	0
A1E	MEP OH RI: Center	80	21-Aug-08*	10-Dec-08	
A1E	MEP OH RI: East	80	18-Sep-08*	07-Jan-09	
A1E	MEP OH RI: West	80	06-Nov-08*	25-Feb-09	
Roof		75	20-Aug-08	02-Dec-08	0
		75	20-Aug-08	02-Dec-08	0
A1E	Roof:Center	20	20-Aug-08*	16-Sep-08	
A1E	Roof: East	20	17-Sep-08*	14-Oct-08	
A1E	Complete Roof Flashing an...	25	20-Oct-08*	21-Nov-08	
A1E	Roof: West	20	05-Nov-08*	02-Dec-08	
A2C	Roof Complete	0	02-Dec-08*	02-Dec-08	
Scaffolding		84	16-Jul-08	10-Nov-08	0
		84	16-Jul-08	10-Nov-08	0
A2C	Scaffold: N. Center	5	16-Jul-08*	22-Jul-08	



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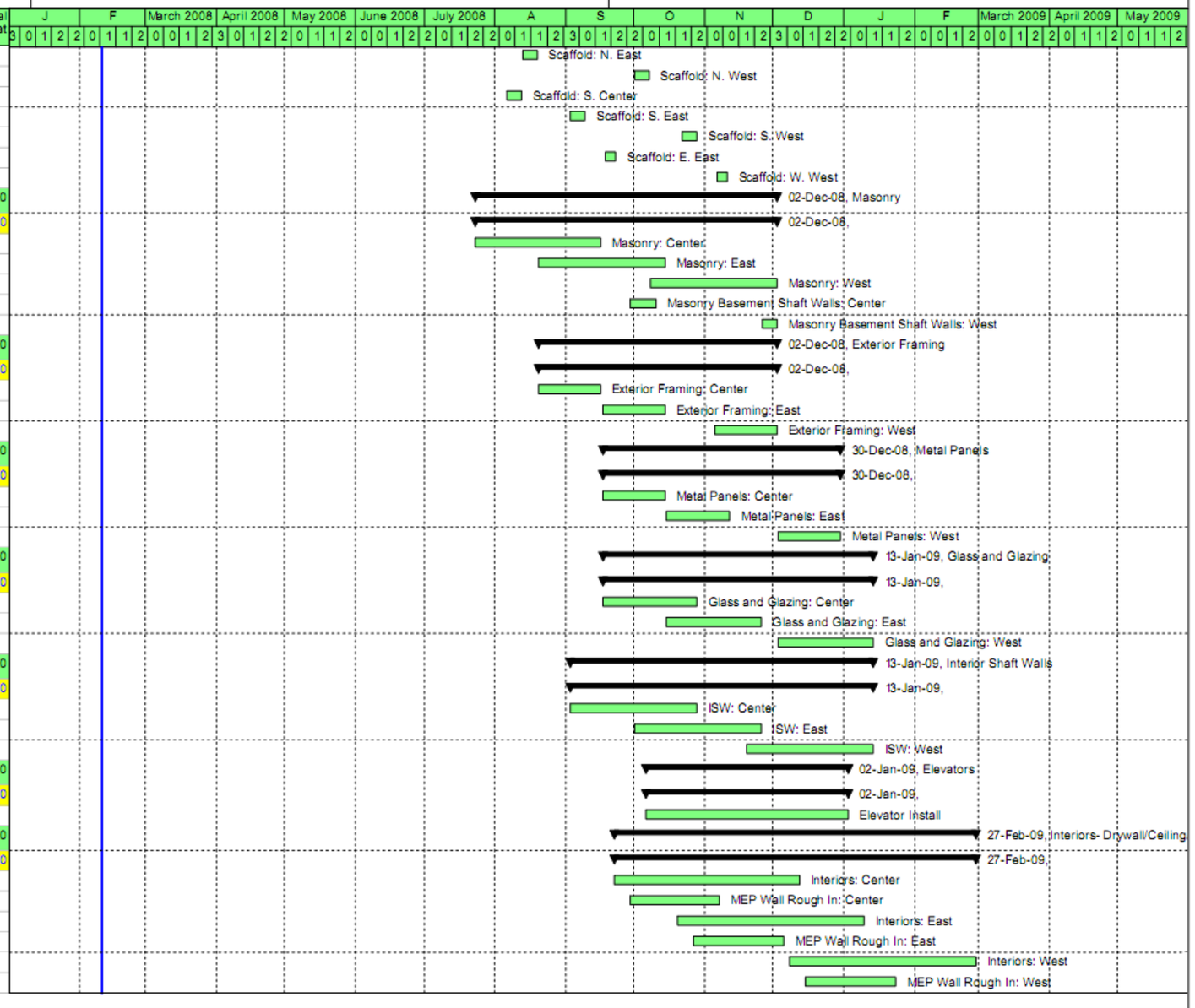
Actual Work
Critical Remaining Work
Summary
Remaining Work
Milestone

Activity ID	Activity Name	Original Duration	Start	Finish	Total Float
A20	Scaffold: N. East	5	13-Aug-08*	19-Aug-08	
A20	Scaffold: N. West	5	01-Oct-08*	07-Oct-08	
A20	Scaffold: S. Center	5	06-Aug-08*	12-Aug-08	
A20	Scaffold: S. East	5	03-Sep-08*	09-Sep-08	
A20	Scaffold: S. West	5	22-Oct-08*	28-Oct-08	
A20	Scaffold: E. East	3	18-Sep-08*	22-Sep-08	
A20	Scaffold: W. West	3	06-Nov-08*	10-Nov-08	
Masonry		95	23-Jul-08	02-Dec-08	0
		95	23-Jul-08	02-Dec-08	0
A20	Masonry: Center	40	23-Jul-08*	16-Sep-08	
A21	Masonry: East	40	20-Aug-08*	14-Oct-08	
A21	Masonry: West	40	08-Oct-08*	02-Dec-08	
A21	Masonry Basement Shaft W...	10	29-Sep-08*	10-Oct-08	
A21	Masonry Basement Shaft W...	5	26-Nov-08*	02-Dec-08	
Exterior Framing		75	20-Aug-08	02-Dec-08	0
		75	20-Aug-08	02-Dec-08	0
A21	Exterior Framing: Center	20	20-Aug-08*	16-Sep-08	
A21	Exterior Framing: East	20	17-Sep-08*	14-Oct-08	
A21	Exterior Framing: West	20	05-Nov-08*	02-Dec-08	
Metal Panels		75	17-Sep-08	30-Dec-08	0
		75	17-Sep-08	30-Dec-08	0
A21	Metal Panels: Center	20	17-Sep-08*	14-Oct-08	
A21	Metal Panels: East	20	15-Oct-08*	11-Nov-08	
A21	Metal Panels: West	20	03-Dec-08*	30-Dec-08	
Glass and Glazing		85	17-Sep-08	13-Jan-09	0
		85	17-Sep-08	13-Jan-09	0
A22	Glass and Glazing: Center	30	17-Sep-08*	28-Oct-08	
A22	Glass and Glazing: East	30	15-Oct-08*	25-Nov-08	
A22	Glass and Glazing: West	30	03-Dec-08*	13-Jan-09	
Interior Shaft Walls		95	03-Sep-08	13-Jan-09	0
		95	03-Sep-08	13-Jan-09	0
A16	ISW: Center	40	03-Sep-08*	28-Oct-08	
A16	ISW: East	40	01-Oct-08*	25-Nov-08	
A16	ISW: West	40	19-Nov-08*	13-Jan-09	
Elevators		65	06-Oct-08	02-Jan-09	0
		65	06-Oct-08	02-Jan-09	0
A22	Elevator Install	65	06-Oct-08*	02-Jan-09	
Interiors- Drywall/Ceiling/P...		115	22-Sep-08	27-Feb-09	0
		115	22-Sep-08	27-Feb-09	0
A22	Interiors: Center	60	22-Sep-08*	12-Dec-08	
A22	MEP Wall Rough In: Center	30	29-Sep-08*	07-Nov-08	
A22	Interiors: East	60	20-Oct-08*	09-Jan-09	
A22	MEP Wall Rough In: East	30	27-Oct-08*	05-Dec-08	
A22	Interiors: West	60	08-Dec-08*	27-Feb-09	
A22	MEP Wall Rough In: West	30	15-Dec-08*	23-Jan-09	

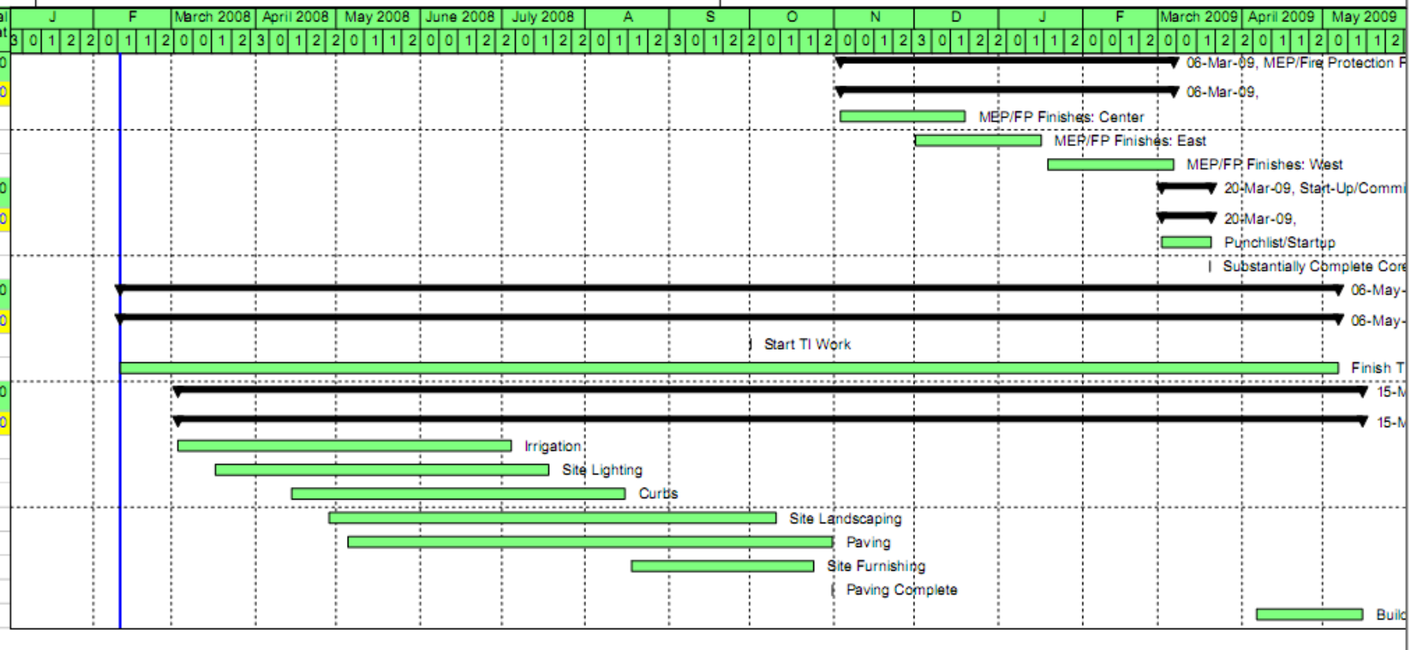


Westinghouse Electric Company Nuclear Power Engineering Headquarters Campus

Mark Speicher

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

Activity ID	Activity Name	Original Duration	Start	Finish	Total Float
	MEP/Fire Protection Finish...	90	03-Nov-08	06-Mar-09	0
		90	03-Nov-08	06-Mar-09	0
A23	MEP/FP Finishes: Center	35	03-Nov-08*	19-Dec-08	
A23	MEP/FP Finishes: East	35	01-Dec-08*	16-Jan-09	
A23	MEP/FP Finishes: West	35	19-Jan-09*	06-Mar-09	
	Start-Up/Commissioning/P...	15	02-Mar-09	20-Mar-09	0
		15	02-Mar-09	20-Mar-09	0
A23	Punchlist/Startup	15	02-Mar-09*	20-Mar-09	
A23	Substantially Complete Cor...	0	20-Mar-09*	20-Mar-09	
	Tenant Improvements	323	11-Feb-08	06-May-09	0
		323	11-Feb-08	06-May-09	0
A23	Start TI Work	0	01-Oct-08*	01-Oct-08	
A23	Finish TI Work	323	11-Feb-08	06-May-09	
	Sitework/Landscaping	315	03-Mar-08	15-May-09	0
		315	03-Mar-08	15-May-09	0
A23	Irrigation	90	03-Mar-08*	04-Jul-08	
A23	Site Lighting	90	17-Mar-08*	18-Jul-08	
A23	Curbs	90	14-Apr-08*	15-Aug-08	
A24	Site Landscaping	120	28-Apr-08*	10-Oct-08	
A24	Paving	130	05-May-08*	31-Oct-08	
A24	Site Furnishing	50	18-Aug-08*	24-Oct-08	
A24	Paving Complete	1	31-Oct-08*	31-Oct-08	
A24	Building Landscaping	30	06-Apr-09*	15-May-09	



Westinghouse Electric Company Nuclear Power Engineering Headquarters Campus

Mark Speicher

Actual Work
Remaining Work
Critical Remaining Work
Milestone
Summary

APPENDIX B: SITE LAYOUT PLANNING: SUPERSTRUCTURE PHASE

Westinghouse Electric Company Nuclear Power Engineering Campus	Superstructure (Steel Erection) Phase	Mark Speicher	October 28, 2009

APPENDIX C: STRUCTURAL SYSTEM TAKEOFFS AND CALCULATIONS

Concrete Takeoffs

Caissons					
Diameter	Depth	Volume	Diameter	Depth	Volume
78	12.17	44.86	36	22.167	17.41
78	18.67	68.84	36	22.167	17.41
66	20.17	53.24	42	25.67	27.44
36	20.67	16.23	36	29.67	23.30
36	21.67	17.02	42	31.167	33.32
84	22.67	96.94	66	12	31.68
84	16.67	71.28	66	15	39.60
84	18.17	77.68	66	18	47.52
48	23.67	33.05	66	21	55.44
42	27.67	29.58	66	22	58.08
42	28.17	30.11	36	19.67	15.45
36	29.67	23.30	36	13.67	10.74
72	14.67	46.09	36	13.67	10.74
84	18.67	79.83	42	14.67	15.68
84	19.17	81.96	36	12.167	9.56
48	22.67	31.65	36	12.167	9.56
36	28.67	22.52	66	12.167	32.12
54	30.67	54.20	48	13.67	19.09
66	14.67	38.73	36	7.67	6.02
66	16.67	44.01	48	13.5	18.85
36	12.5	9.82	48	25.5	35.60
36	18.5	14.53	30	31.167	17.00
36	16.5	12.96	78	30.167	111.23
36	19.5	15.32	78	29.167	107.54
36	24.67	19.38	30	28.167	15.36
36	30.67	24.09	54	18.67	32.99
36	30.17	23.69	54	24.67	43.60
36	11.67	9.17	66	8	21.12
36	16.67	13.09	66	8	21.12
36	17.67	13.88	66	8	21.12
72	18.17	57.07	66	8	21.12
72	21.67	68.08	66	8	21.12
66	22.17	58.52			
Total Volume			**2268.59**		

Footings			
Volume (CF)	Volume (CY)	Quantity	Total Volume
432	48	14	672
37.5	4.17	2	8.33333
507	56.33	11	619.667
562.77	62.53	2	125.06
294.37	32.71	2	65.4156
432	48	2	96
50.52	5.61	2	11.2267
170.88	18.99	22	417.707
210.2825	23.36	1	23.3647
267	29.67	10	296.667
342.83	38.09	2	76.1844
Total			**2411.6**

Slabs						
Location	Area	Thickness	Cubic Yards	SFCA	Reinforcing	Deck
SOG	74022	5	3427	588	6x6 W2.1xW2.1 WWF	
1	74022	2.5	1713	294	6x6 W2.1xW2.1 WWF	2" 22 Ga. Comp.
2	74022	2.5	1713	294	6x6 W2.1xW2.1 WWF	2" 22 Ga. Comp.
3	74022	2.5	1713	294	6x6 W2.1xW2.1 WWF	2" 22 Ga. Comp.
4	74022	2.5	1713	294	6x6 W2.1xW2.1 WWF	2" 22 Ga. Comp.
5	74022	2.5	1713	294	6x6 W2.1xW2.1 WWF	2" 22 Ga. Comp.

Concrete Calculations

Concrete Forming					
Elevated Slabs, 1 use					
Location	Square Footage	Material Cost/SF	Labor Cost/SF	Total Cost/SF	Cost
1	74022	$ 2.92	$ 3.39	$ 6.31	$ 467,079
2	74022	$ 2.92	$ 3.39	$ 6.31	$ 467,079
3	74022	$ 2.92	$ 3.39	$ 6.31	$ 467,079
4	74022	$ 2.92	$ 3.39	$ 6.31	$ 467,079
5	74022	$ 2.92	$ 3.39	$ 6.31	$ 467,079
Total	**370110**				**$ 2,335,394**
Slab on Grade, 1 use					
Location	SFCA	Material Cost/SF	Labor Cost/SF	Total Cost/SF	Cost
Base	**7055**	**$ 2.83**	**$ 5.65**	**$ 8.48**	**$ 59,826**
Footings, 4 use					
Location	SFCA	Material Cost/SF	Labor Cost/SF	Total Cost/SF	Cost
Base		$ 2.42	$ 2.50	$ 4.92	$ -
Total				**$2,395,221**	

Reinforcing Steel					
Welded Wire Fabric, 6 x 6-W2.1 x W2.1					
Location	C.S.F.	Material Cost/SF	Labor Cost/SF	Total Cost/SF	Cost
SOG	740.22	$ 26.50	$ 23.00	$ 49.50	$ 36,641
1	740.22	$ 26.50	$ 23.00	$ 49.50	$ 36,641
2	740.22	$ 26.50	$ 23.00	$ 49.50	$ 36,641
3	740.22	$ 26.50	$ 23.00	$ 49.50	$ 36,641
4	740.22	$ 26.50	$ 23.00	$ 49.50	$ 36,641
5	740.22	$ 26.50	$ 23.00	$ 49.50	$ 36,641
Total					**$ 219,845**
Reinforcing Steel					
	Tons	Material Cost/SF	Labor Cost/SF	Total Cost/SF	Cost
Footings	23.819	$ 1,400.00	$ 395.00	$ 1,795.00	$ 42,755.11
Caissons	7.34	$ 1,575.00	$ 680.00	$ 2,255.00	$ 16,551.70
Total					**$ 59,307**

Structural Concrete			
Type	Cubic Yards	Cost/CY	Total Cost
Caissons	2268.59	$ 106.00	$ 240,471
Footings	2411.6	$ 106.00	$ 255,630
Slabs	1194	$ 106.00	$ 126,564
Total			$ 622,664

Placing Concrete					
	Cubic Yards	Labor Cost/CY	Equipment Cost/CY	Total Cost/CY	Total Cost
Elevated Slabs, less than 6", pumped	8567	$ 15.50	$ 5.65	$ 21.15	$ 181,192
Footings, spread, direct chute	2411.6	$ 13.20	$ 0.43	$ 13.63	$ 32,870
Slab on Grade, up to 6" direct chute	3427	$ 14.40	$ 0.47	$ 14.87	$ 50,959
Total				**$265,022**	

Steel Takeoffs/Calculations

Beams

Length of Member	Quantity	Total Linear Feet	Unit Cost ($/LF)			Total	Total Cost
			Material	Labor	Equipment		
12	6	72	91	3.18	1.69	95.87	$ 6,903
12.33	18	221.94	91	3.18	1.69	95.87	$ 21,277
12.5	4	50	91	3.18	1.69	95.87	$ 4,794
14	12	168	91	3.18	1.69	95.87	$ 16,106
15	3	45	91	3.18	1.69	95.87	$ 4,314
18	14	252	91	3.18	1.69	95.87	$ 24,159
20	14	280	91	3.18	1.69	95.87	$ 26,844
20.5	4	82	91	3.18	1.69	95.87	$ 7,861
22.5	24	540	91	3.18	1.69	95.87	$ 51,770
24	111	2664	91	3.18	1.69	95.87	$ 255,398
25	5	125	91	3.18	1.69	95.87	$ 11,984
25.67	18	462.06	91	3.18	1.69	95.87	$ 44,298
26	4	104	91	3.18	1.69	95.87	$ 9,970
29	2	58	91	3.18	1.69	95.87	$ 5,560
32	21	672	91	3.18	1.69	95.87	$ 64,425
35	6	210	91	3.18	1.69	95.87	$ 20,133
36	82	2952	91	3.18	1.69	95.87	$ 283,008
39	2	78	91	3.18	1.69	95.87	$ 7,478
42	2	84	91	3.18	1.69	95.87	$ 8,053
45	79	3555	91	3.18	1.69	95.87	$ 340,818
TOTAL							**$ 1,215,152**

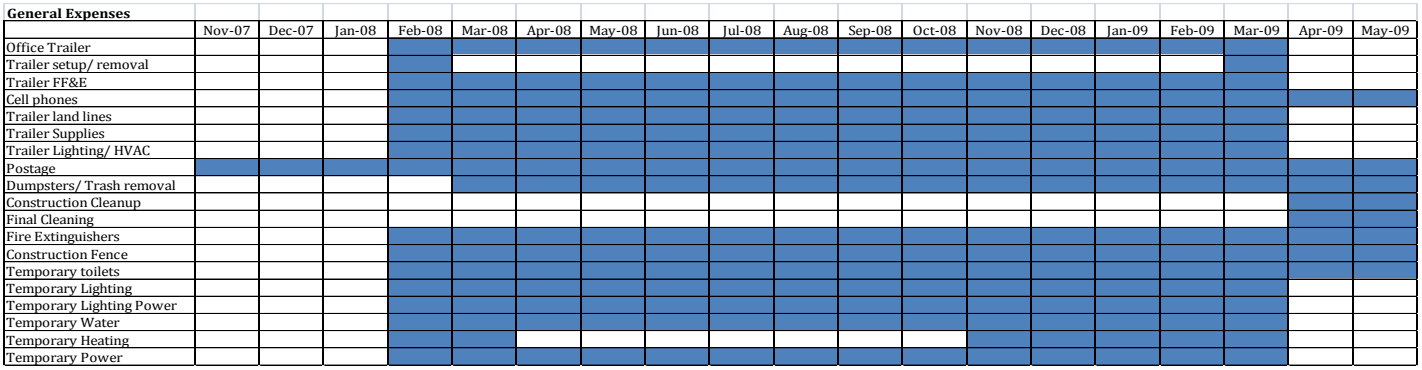
Steel Columns

Size	Linear Feet	Tons	Unit Cost ($/ton)			Unit Cost ($/ton)	Cost
			Material	Labor	Equipment		
W14x49	252	12348	1.65	0.023	0.017	1.69	$ 20,868
W14x68	144	9792	1.65	0.023	0.017	1.69	$ 16,548
W14x90	2726	245340	1.65	0.023	0.017	1.69	$ 414,625
W14x100	728	72800	1.65	0.023	0.017	1.69	$ 123,032
W14x120	784	94080	1.65	0.023	0.017	1.69	$ 158,995
W14x193	306	59058	1.65	0.023	0.017	1.69	$ 99,808
W14x211	980	206780	1.65	0.023	0.017	1.69	$ 349,458
TOTAL							**$ 1,183,335**

Unit Cost per Ton from RS Means

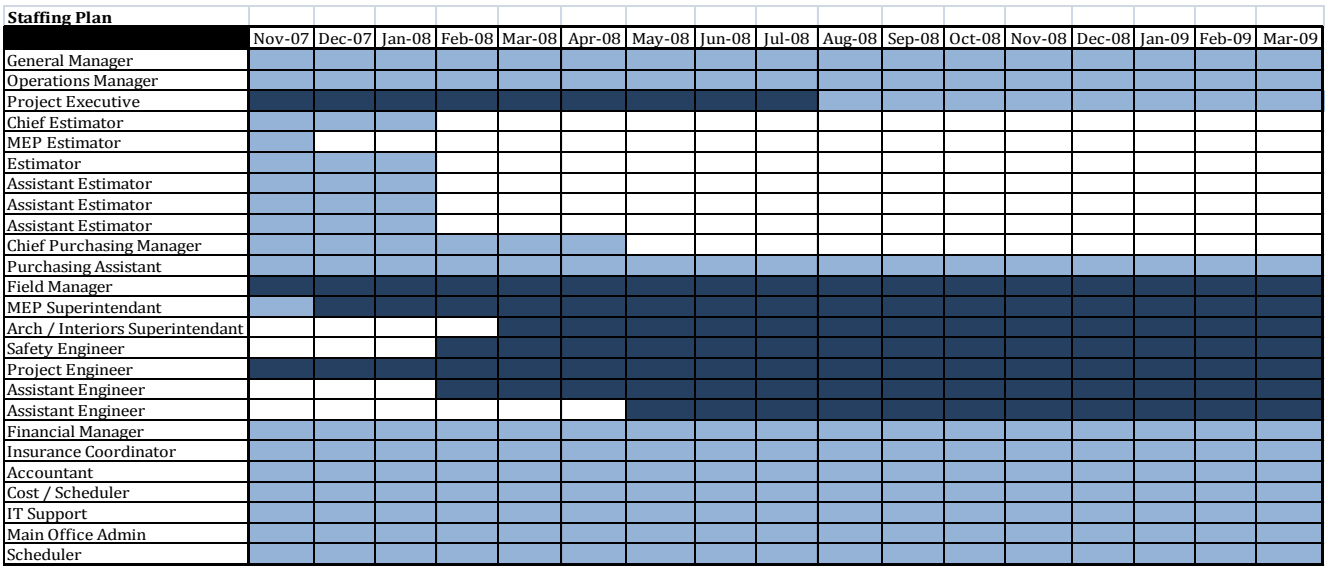
	Material	Labor	Equipment	Total
W14x74	1.65	0.034	0.024	1.71
W14x120	1.65	0.021	0.015	1.69
W14x176	1.65	0.015	0.011	1.67
Average	**1.649**	**0.023**	**0.017**	**1.689**

APPENDIX D: GENERAL CONDITIONS TAKEOFFS AND CALCULATIONS



General Expenses					
	Quantity	Months	Units	Unit Price	Total
Office Trailer	4	14	$/Month	$ 281	$ 15,736
Trailer setup/ removal	4	14	Each	$ 3,200	$ 12,800
Trailer FF&E	4	14	$/Month	$ 155	$ 8,680
Cell phones	8	16	$/Month	$ 200	$ 25,600
Trailer land lines	4	14	$/Month	$ 80	$ 4,480
Trailer Supplies	4	14	$/Month	$ 85	$ 4,760
Trailer Lighting/ HVAC	4	14	$/Month	$ 150	$ 8,400
	Quantity	Weeks	Units	Unit Price	Total
Dumpsters/ Trash removal	4	48	Weeks	$ 775	$ 148,800
Construction Cleanup	435	8	MSF	$ 27	$ 11,845
Fire Extinguishers	20	64	EA	$ 159	$ 3,180
Construction Fence	4264	64	LF	$ 9	$ 40,252
Temporary Toilets	8	64	EA	$ 150	$ 19,200
Temporary Utilities					
	Quantity	Months	Units	Unit Price	Total
Temporary Lighting	2000	16	CSF Flr	$ 14	$ 27,360
Temporary Lighting Power	2000	16	CSF Flr/Mo	$ 1	$ 24,000
Temporary Water	-	16	Month	$ 62	$ 992
Temporary Heating	2000	7	CSF Flr/Wk	$ 30	$ 1,695,120
Temporary Power	2000	11	CSF Fl	$ 47	$ 94,000
Fees and Permits					
	Quantity	Months	Units	Unit Price	Total
Insurance, Builders risk	$ 240,000,000	16	Job	0.24%	576000
Performance bond	$ 240,000,000	16	Job	2.50%	6000000
Permits, Rule of thumb	$ 240,000,000	16	Job	0.50%	1200000
Total					**$ 9,921,205**

Staffing Plan



Staffing

	Qty	Weeks (full-time)	Hours/ Week	Cost/ Week	Weeks (part-time)	Hours/ Week	Cost/ Week	Total
General Manager	1	0	40	$ 2,500	68	15	$ 938	$ 63,750
Operations Manager	1	0	40	$ 2,500	68	15	$ 938	$ 63,750
Project Executive	1	36	40	$ 2,175	32	15	$ 816	$ 104,400
Chief Estimator	1	0	40	$ 1,350	12	20	$ 675	$ 8,100
MEP Estimator	1	0	40	$ 1,165	4	20	$ 583	$ 2,330
Estimator	1	0	40	$ 1,165	12	20	$ 583	$ 6,990
Assistant Estimator	3	0	40	$ 1,000	12	20	$ 500	$ 6,000
Chief Purchasing Manager	1	0	40	$ 1,350	24	15	$ 506	$ 12,150
Purchasing Assistant	1	0	40	$ 1,165	68	15	$ 437	$ 29,708
Field Manager	1	68	40	$ 1,925	0	0	$ -	$ 130,900
MEP Superintendant	1	64	40	$ 1,775	4	20	$ 888	$ 117,150
Arch / Interiors Superintendant	1	52	40	$ 1,775	0	0	$ -	$ 92,300
Safety Engineer	1	56	40	$ 1,165	0	0	$ -	$ 65,240
Project Engineer	1	68	40	$ 1,350	0	0	$ -	$ 91,800
Assistant Engineer	1	56	40	$ 1,165	0	0	$ -	$ 65,240
Assistant Engineer	1	44	40	$ 1,165	0	0	$ -	$ 51,260
Financial Manager	1	0	40	$ 1,650	68	15	$ 619	$ 42,075
Insurance Coordinator	1	0	40	$ 1,165	68	15	$ 437	$ 29,708
Accountant	1	0	40	$ 1,165	68	15	$ 437	$ 29,708
Cost / Scheduler	1	0	40	$ 1,165	68	15	$ 437	$ 29,708
IT Support	1	0	40	$ 1,040	68	15	$ 390	$ 26,520
Main Office Admin	1	0	40	$ 2,175	68	15	$ 816	$ 55,463
Scheduler	1	0	40	$ 1,165	68	15	$ 437	$ 29,708
Total								**$ 1,153,955**