Prince Frederick Hall

Tech Two

Construction, Sowers, 16 Oct 2013, PSU AE, University Park, Maryland

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Executive Summary

Prince Frederick Hall is a University of Maryland project designed and constructed with the university students in mind. It is a new dorm with technology classrooms and a massive lawn for students to enjoy. During construction much effort is taken to avoid disturbing the students.

Figure 1: Prince Frederick Hall as of 15 Oct 13

The University is content entrusting it to the project schedule has stepped into the fast tracked phase as construction moves gradually into the building space. While the fast track schedule means more traffic on and off the site it is a welcome change from the linear progression of phase one.

The site plan has also developed to meet the needs of both the construction team and the owners. Holding clearly presentable maps for each phase ensures clarity of understanding for the construction teams planning meetings and the universities efforts to present the project to the student body. These sites clearly define the extent of the construction as well as the major advancements on the site work.

The structural assemblies estimate came in at $11m per floor. This estimate strikes higher than expected. One explanation is it could be so due to differences in where elements are categorized. The general conditions estimate fell below the expected, oddly enough serving to balance the two out.

Despite the current progress this site still has its fair share of challenges. Currently some of the largest issues being addresses are construction noise, pedestrian safety and protecting the sole access point to the site. Interestingly the Universities' sustainability master plan is still benefiting from the alert managers within Clark Construction. Their relatively simple adjustments and documentations ensured not just the silver rating, but a Gold rating.

Overall Prince Frederick Hall is a project progressing as expected. While not without challenge it is still on track.

Project Schedule

The schedule for Prince Frederick Hall embraces the demanding pace set by the University of Maryland. The following references the schedules available in appendix A. For simplicities sake the second floor was selected to be the 'typical floor'.

Scheduling Methods

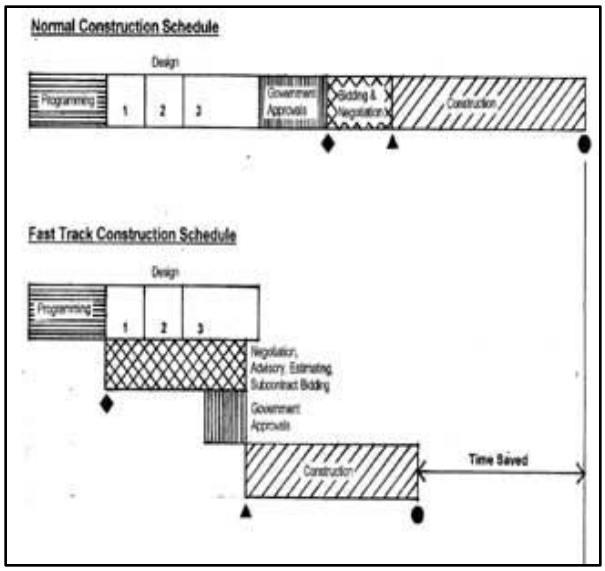


Figure 2: Liner vs. Fast Track Scheduling

Extensive site work and excavation begin during mobilization and continue through to the completion of phase one. These activities include demolition and excavation, demanding a linear schedule due to the site-wide nature of these tasks. Once Phase two begins this linear approach changes to a much faster staggered method, neatly fast tracking the project. Instead of having a task impact the whole site, tasks are broken up floor by floor. On site this sort of schedule demands heightened focus and attention from management to ensure each task is completed in a timely manner. This schedule, though difficult to manage, does greatly increase productivity day to day and can cut months or more off a project. This faster pace ensures Prince Frederick Hall is completed in time for occupation.

Critical Path

Due to the overlapping tasks and limitation of 200 tasks, a critical path was quite difficult to select and instead milestones are the driving force of the project. However, to demonstrate the flow of work the second floor was selected to represent the expected progress of each floor and thus presented as the critical path to completion. This floor was selected because it is the first floor devoted to dorm rooms without extensive offices as well. In the schedule the second floor has trade specific tasks listed for the entirety of the project to demonstrate what is occurring as each trade finishes a task.

Had there not been a limit of 200 tasks, then the trades would be broken down into half floors to better map the critical path to completion.

Unexpected Variations

When compared to Clark Construction's schedule, this schedules occupancy milestone fell one day later. This variation could be due to generalizing and grouping tasks to meet task number criteria for this report.

Site Plans

The attached site plans in Appendix B provide a big picture view of the critical equipment for each stage of construction. The do not address task by task or weekly site expectations. Please note that storm water management sandbags are along the perimeter fence and thus not drawn onto the site.

Site Orientation

The site of Prince Frederick Hall began as a parking lot. The University concluded that the growing student body would be better served by a large dormitory and thus the space purpose changed. The open lawn area to the west of the parking lot is a valued space on the campus and Prince Frederick Hall was designed with the intent of expanding that lawn area for more student use. Take note of the proximity to several dorms to Prince Frederick Hall.

Demolition

To prepare the site for construction the parking lot, road and Building 66 all needed to be demolished and removed. While the parking lot and road are easily removed and reused as aggregate, Building 66 presented more of a challenge. The Utility line to Building 66 would be extended to service Prince Frederick Hall, as well as the trailers during construction. This utility re-use demands that care be taken while demolition building 66 and laying down the future road path.

Structural

Prince Frederick Hall is a cast-in-place concrete structure. Due to the height of the structure a crane would be required for elevating the concrete hose and then lifting the exterior elements up to the correct floor. The boom of the crane will need to be able to swing over the four story building just to the north of the site. Since Prince Frederick Hall is seven stories tall this should not be an issue. The excavation was limited to be as close to the building as possible. The access ramp runs along the north side of the building footprint, forming a straight down –up ramp.

Enclosure

The watertight milestone is not reached until partway through MEP rough in for the lower floors. Because of this the site plans account for having both the crane and material elevators on site at the same time. Should the crane leave sooner than expected then the elevators would simply have more room to work. The elevators are positioned to be able to each handle a wing of the structure. The shape of the site provides plenty of turnaround space for forklifts near each elevator. The forklift paths depend on the excavation being refilled up to the building so the weight of the forklifts can begin to compact the soil.

Structural Estimate

The majority of the building structure is concrete; however there was no small and predictable bay that served to represent the entire building. Due to this an entire floor was selected to serve as the example assembly estimate.

Estimate Adjustments

Floor three was selected since its floor plan was mirrored on all above floors. Unfortunately this did not account well for the lower floors due to the extensive telecom systems. This is part of why hangers and inserts were not included in this estimate; to ensure the focus remained on the structural system and to reduce the variations between floors. The non-load bearing walls were also left out of this estimate to reduce variance and because they are not impactful on the structural system beyond being a load.

Curiously the floor structural system was entirely concrete and rebar. The few steel beams were relegated to the roof and an outdoor overhang. This monotony in material greatly simplified the estimate. The total cost came to around 23 million for the floor, higher than the expected estimate for floor. This could be due to the cheaper concrete options in the DC area. It could also be due to less conservative rebar estimates and more creative cost categorization.

General Conditions Estimate

The General Conditions Estimate erred on the side of caution for most every item listed. Due to the catch all nature of the category it seemed prudent to try to cover all the expected and unexpected costs. To that end the general conditions presented a weekly operating cost of $26k.

Costs

Costs for general conditions are typically pulled from past experience. The site staffing pay chart was derived from wage averages presented on the internet to protect their privacy. The Insurance costs were also derived from outside sources. Several other costs, such as traffic control measures were provided more funding to ensure the site entrance would always be ready for materials and other traffic. Interestingly, utilities ended up rolled up into one category due to the University providing much of such services.

Constructability Challenges

Every site is unique, and thus presents unique challenges to the construction efforts. When building on a university campus the construction challenges begin to center on the desires of the University and the safety of its students.

Noise Concerns

Due to the location of the site, construction noise and vibration will impact a large number of students in the surrounding dormitory buildings. Because of this the University requested that construction not occur during finals weeks and on commencement days. However, since students would hopefully desire to be studious all the time, additional measures can be taken to minimize noise disruption. Scheduling noisier site activities for later in the day is a simple means to ensure the student population stays content and happy. Additionally, use of absorptive materials along the site fencing or around a particularly noisy activity such as pile driving could significantly decrease the noise present on the site. Unfortunantly absorptive fencing would add a great deal of cost and should be used as a last resort.

Equipment	Sound Level at Operator	
	Average	Range
*Background**	86	
Earth Moving:		
Front End Loader	88	85-91
Back Hoe	86.5	79-89
Bull Dozer	96	89-103
Roller	90	79-93
Scraper	96	84-102
Grader	<85	
Truck	96	89-103
Paver	101	100-102
Material Handling:		
Concrete Mixer	<85	
Concrete Pump	< 85	
Crane	100	97-102
Derrick	<85	
Power Units:		
Generators	<85	
Compressors	<85	
Impact:		
Pile Driver (diesel and pneum.)	98	82-105
Pile Driver (gravity, bored)	82.5	62-91
Pneumatic Breaker	106	94-111
Hydraulic Breaker	95.5	90-100
Pneumatic chipper	109	
Other Equipment:		
Poker Vibrator	94.5	87-98
Compressed Air Blower	104	
Power Saw	88.5	78-95
Electric Drill	102	
Air Track Drill	113	
Noise Standards		**Noise Level**
OSHA (at workers ear)		90 dB (A)
Day Time Community (at property line)		65 dB (A)

Figure 3: Construction Noise in Decibels and Acoustic Fencing

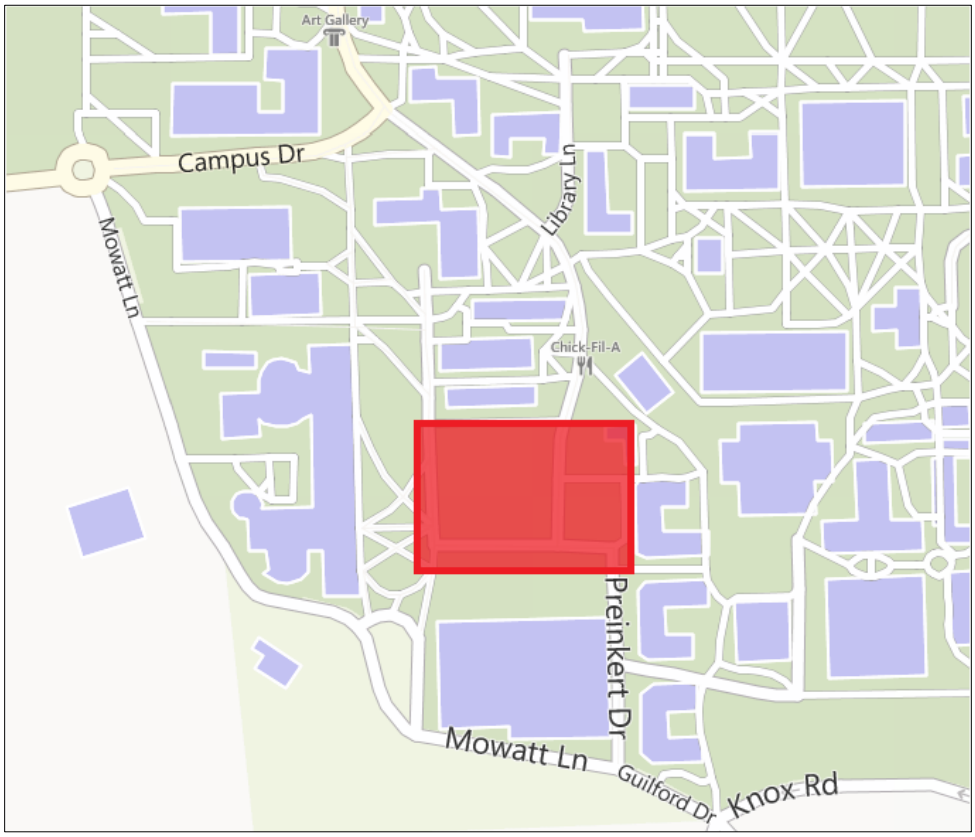
Site Security

Due to the location of the site, there will be pedestrian traffic passing by at all hours of the day and night. This creates concerns for the site security, especially if tipsy or sleep deprived students decide through the site is a faster route than around the site. While the site itself will be periodically shut down for the University mandated non-construction days, there will need to be some sort of presence on site to prevent trespassers.

Fortunately, there are many options for security. The University of Maryland could lend its police force to the task but they may not be willing to station someone at the site for the full night. Another option is to hire a security service such as Maryland Security Professionals to secure the site in the absence of construction work.

Single Entrance/Site Deliveries

The final construction concern for this report is the fact that the site has only one entrance for materials. This resulting in needing to ensure that nothing blocks the access route to the site due to lack of proper back up. As you can see on the map below, where the site is highlighted in red, there are only two roads to bring materials in through. However, Preinkert Drive is being used to provide parking for the students and thus not for material uses unless there is an emergency. To ensure the access road stays open staff should familiarize themselves with the campus that they will be driving though. Weekly updates on heavy traffic days should aid drivers in moving quickly and efficiently to and from the site.



LEED

Prince Frederic Hall was contracted to hold a Silver LEED rating by the University of Maryland. This would have required 50-59 points to achieve. The current LEED credit count places Prince Frederick Hall as a Gold rated building. The LEED Point Sheet can be found Appendix C

Sustainable Sites

This category focuses on the methods used to minimize the building impact on the environment and ecosystems around it. To this end it includes points such as alternative transportation and development density, both quite simple to pick up on a bike filled, pedestrian packed dormitory block. This category also includes open space development and storm water design. The University desired to create a lawn space near Prince Frederick Hall, easily filling the open space credit. The soil on site is very fine and sandy, demanding a plan to avoid extensive erosion and run-off. Due to this plan an extra credit was picked up for Quality Storm water management.

Water Efficiency

This category provides incentive to focus on water in all ways. While reducing water use helped to pick up credits in this category it was largely ignored due to the desire for an attractive landscape for the life of the building.

Energy and Atmosphere

This category places emphasis on energy performance. Since this building is new construction there were several credits available to be picked up for optimized energy performance. However a large number of credits were lost due to lack of on-site renewable energy in favor of maintain the Universities' architectural appearance.

Materials and Resources

This category presents an opportunity to gain huge benefits from smart construction efforts. Since the University decided to spare no expense there was very little recycled or re-used material. However construction waste management and regional material use made up for the lack of recycling and helped to earn credit back.

Indoor Environment Quality

This category is where the architectural and building lifespan are able to earn LEED credit. With its focus on indoor air quality and demand for daylight and view Prince Frederick Hall is a clear case study for this category. The dorm was designed with a long sustainable life in mind. To this end high quality HVAC systems were selected and efficient systems were put in place. It was also designed to provide each dorm room with equal access to light, creating a building with very few spaces without a window. As mentioned earlier, the University spared no expense, using high-quality, low-emission

materials to better serve the students who will occupy the building. The rest of the credits were earned with well documented construction practices.

Innovation and Design

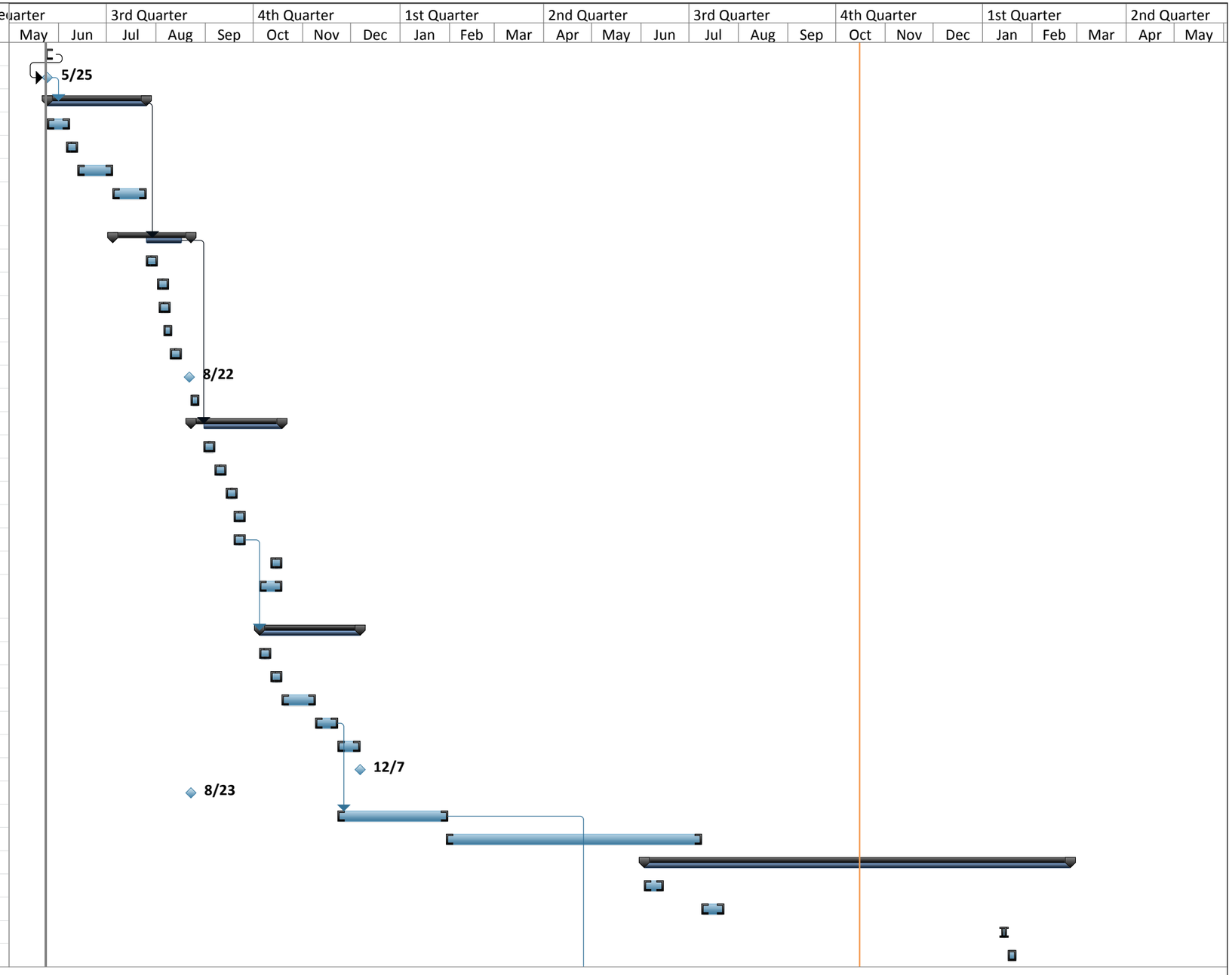
This category addresses all the sustainable aspects of the building and its construction that are not covered in any of the other categories.

Conclusion

Prince Frederick Hall, as said before, is a building with a few issues but overall doing just fine. The site only has one access road, but is overall easy to maneuver around. The cost estimates, while a bit imprecise did create a ground work for future improvement. And the constructability challenges provide unique opportunities to interact with students who otherwise would never have known about Clark Construction.

Appendix A

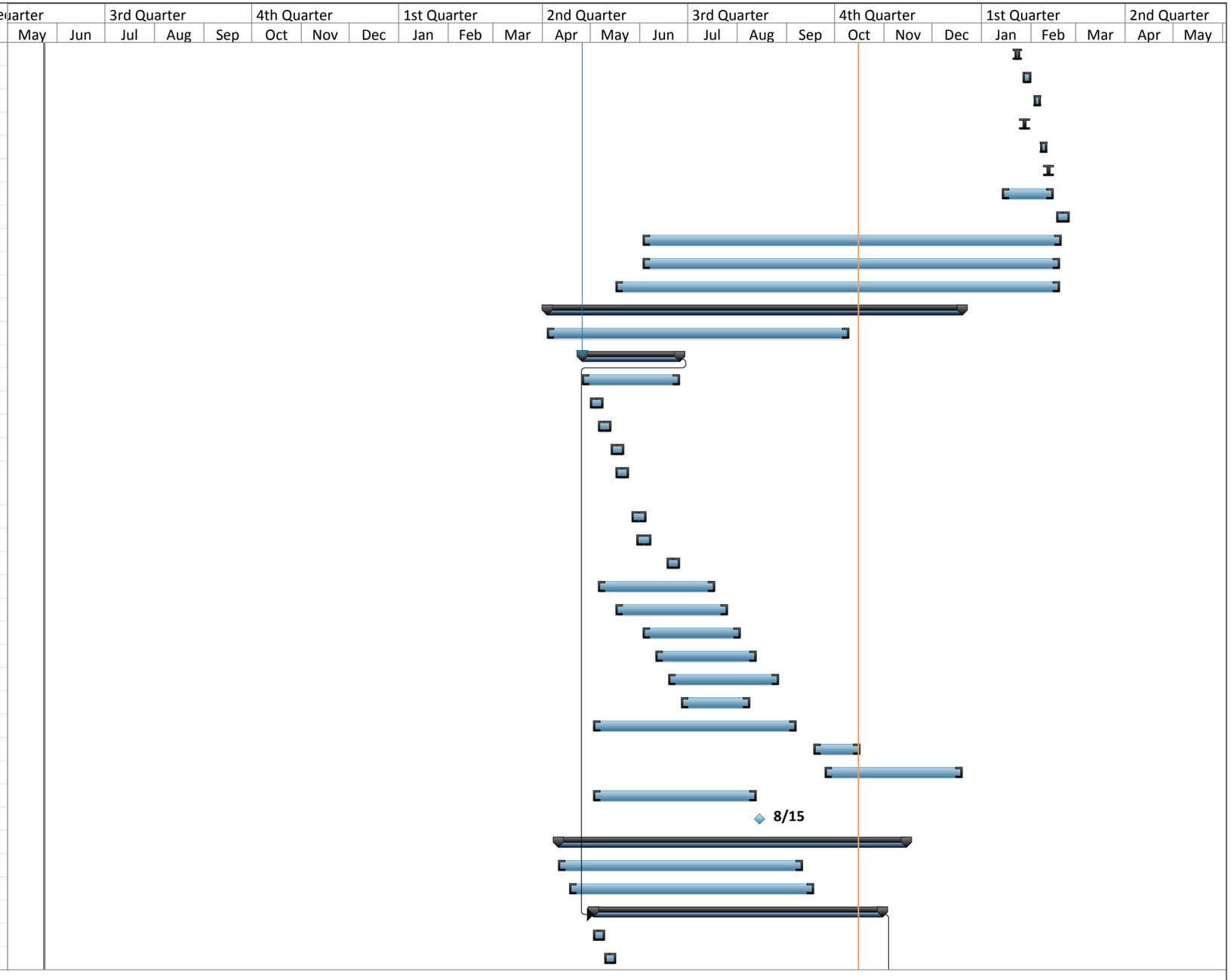
ID	Task Name	Duration	Start	Finish	Predecessors
1	Procurement		Thu 5/24/12		
2	Notice to Proceed	0 days	Fri 5/25/12	Fri 5/25/12	1
3	**Mobilization**	**44 days**	**Fri 5/25/12**	**Wed 7/25/12**	**2**
4	Clark Mobilization	10 days	Fri 5/25/12	Thu 6/7/12	
5	Install Site Fencing	5 days	Wed 6/6/12	Tue 6/12/12	
6	Clearing the Site	16 days	Wed 6/13/12	Wed 7/4/12	
7	Abatement/Demo Building 066	15 days	Thu 7/5/12	Wed 7/25/12	
8	**Sitework**	**35 days**	**Thu 7/5/12**	**Wed 8/22/12**	**3**
9	Grade for Road	5 days	Thu 7/26/12	Wed 8/1/12	
10	Install Road Sub base	5 days	Thu 8/2/12	Wed 8/8/12	
11	Install Curb and Gutter	5 days	Fri 8/3/12	Thu 8/9/12	
12	Install Sidewalks	5 days	Mon 8/6/12	Fri 8/10/12	
13	Fine Grade/ Stabilization	5 days	Fri 8/10/12	Thu 8/16/12	
14	Road Relocation Complete	0 days	Wed 8/22/12	Wed 8/22/12	
15	Install Fencing Part 2	3 days	Thu 8/23/12	Mon 8/27/12	
16	**Excavation**	**41 days**	**Thu 8/23/12**	**Thu 10/18/12**	**8**
17	Survey	5 days	Fri 8/31/12	Thu 9/6/12	
18	Remove/Relocate Sanitary	5 days	Fri 9/7/12	Thu 9/13/12	
19	Drive Piles	5 days	Fri 9/14/12	Thu 9/20/12	
20	Install Fall Protection	5 days	Wed 9/19/12	Tue 9/25/12	
21	Excavate 1st Tier	5 days	Wed 9/19/12	Tue 9/25/12	
22	Excavate 3rd Tier	5 days	Fri 10/12/12	Thu 10/18/12	
23	Prepare Subgrade for GeoPiers	10 days	Fri 10/5/12	Thu 10/18/12	
24	**Foundations**	**45 days**	**Fri 10/5/12**	**Thu 12/6/12**	**21**
25	Moblize GeoPiers	5 days	Fri 10/5/12	Thu 10/11/12	
26	GeoPier Modulus Test	5 days	Fri 10/12/12	Thu 10/18/12	
27	Install West Wing GEoPiers	15 days	Fri 10/19/12	Thu 11/8/12	
28	Install SCUB level GeoPiers	10 days	Fri 11/9/12	Thu 11/22/12	
29	Install East Wing GeoPiers	10 days	Fri 11/23/12	Thu 12/6/12	
30	Phase One Complete	0 days	Fri 12/7/12	Fri 12/7/12	
31	Phase Two Notice to Proceed	0 days	Thu 8/23/12	Thu 8/23/12	
32	SCUB	49 days	Fri 11/23/12	Wed 1/30/13	28
33	Above Grade Structure	114 days	Wed 1/30/13	Mon 7/8/13	
34	**Stair 1**	**191 days**	**Mon 6/3/13**	**Mon 2/24/14**	
35	Install Center Rails	10 days	Mon 6/3/13	Fri 6/14/13	
36	Install Wall Rails	10 days	Tue 7/9/13	Mon 7/22/13	
37	Caulk Stringer	3 days	Mon 1/13/14	Wed 1/15/14	
38	Prime Paint	3 days	Fri 1/17/14	Tue 1/21/14	



Project: TechTwoSchedule
Date: Wed 10/16/13

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	Predecessors
39	Finish Paint First Coat	3 days	Wed 1/22/14	Fri 1/24/14	
40	Install Lighting Fixtures	5 days	Mon 1/27/14	Fri 1/31/14	
41	Install Fire Alarm Devices	4 days	Mon 2/3/14	Thu 2/6/14	
42	Install Grills	2 days	Mon 1/27/14	Tue 1/28/14	
43	Final Paint	2 days	Fri 2/7/14	Mon 2/10/14	
44	Install Flooring/Treads	2 days	Tue 2/11/14	Wed 2/12/14	
45	Signage	24 days	Tue 1/14/14	Fri 2/14/14	
46	Stair Pressurization Testing	6 days	Mon 2/17/14	Mon 2/24/14	
47	Stair 2	188 days	Mon 6/3/13	Wed 2/19/14	
48	Stair 3&4	187 days	Mon 6/3/13	Tue 2/18/14	
49	Stair 5&6	198 days	Fri 5/17/13	Tue 2/18/14	
50	**Building Envelope**	**186 days**	**Thu 4/4/13**	**Thu 12/19/13**	
51	Ground to Second Floor	135 days	Thu 4/4/13	Wed 10/9/13	
52	**Second Floor**	**43 days**	**Fri 4/26/13**	**Tue 6/25/13**	**32**
53	Exterior Wall Lay Out	43 days	Fri 4/26/13	Tue 6/25/13	
54	Hang Relievign Angles	6 days	Wed 5/1/13	Wed 5/8/13	
55	Exterior Framing	6 days	Mon 5/6/13	Mon 5/13/13	
56	Exterior Sheathing	6 days	Tue 5/14/13	Tue 5/21/13	
57	Set Relievign Angle Flashing	6 days	Fri 5/17/13	Fri 5/24/13	
58	Vapor Barrier/Brick Ties	7 days	Mon 5/27/13	Tue 6/4/13	
59	Brick	7 days	Thu 5/30/13	Fri 6/7/13	
60	Punch Windows	6 days	Tue 6/18/13	Tue 6/25/13	
61	Third Floor	53 days	Mon 5/6/13	Wed 7/17/13	
62	Fourth Floor	50 days	Fri 5/17/13	Thu 7/25/13	
63	Fifth Floor	45 days	Mon 6/3/13	Fri 8/2/13	
64	Sixth Floor	45 days	Tue 6/11/13	Mon 8/12/13	
65	Seventh Floor	49 days	Wed 6/19/13	Mon 8/26/13	
66	Roof Level	31 days	Thu 6/27/13	Thu 8/8/13	
67	Roof Activities	91 days	Fri 5/3/13	Fri 9/6/13	
68	Brick Washdown	21 days	Wed 9/18/13	Wed 10/16/1	
69	Metal Panels	62 days	Wed 9/25/13	Thu 12/19/13	
70	Building MEP	72 days	Fri 5/3/13	Mon 8/12/13	
71	Building Watertight	0 days	Thu 8/15/13	Thu 8/15/13	
72	**Framing and MEP Rough In**	**156 days**	**Thu 4/11/13**	**Thu 11/14/13**	
73	Ground Floor	109 days	Thu 4/11/13	Tue 9/10/13	
74	First Floor	109 days	Thu 4/18/13	Tue 9/17/13	
75	**Second Floor**	**129 days**	**Fri 5/3/13**	**Wed 10/30/1**	**52**
76	Lay Out Interior Walls	5 days	Fri 5/3/13	Thu 5/9/13	
77	Interior CMU	5 days	Fri 5/10/13	Thu 5/16/13	



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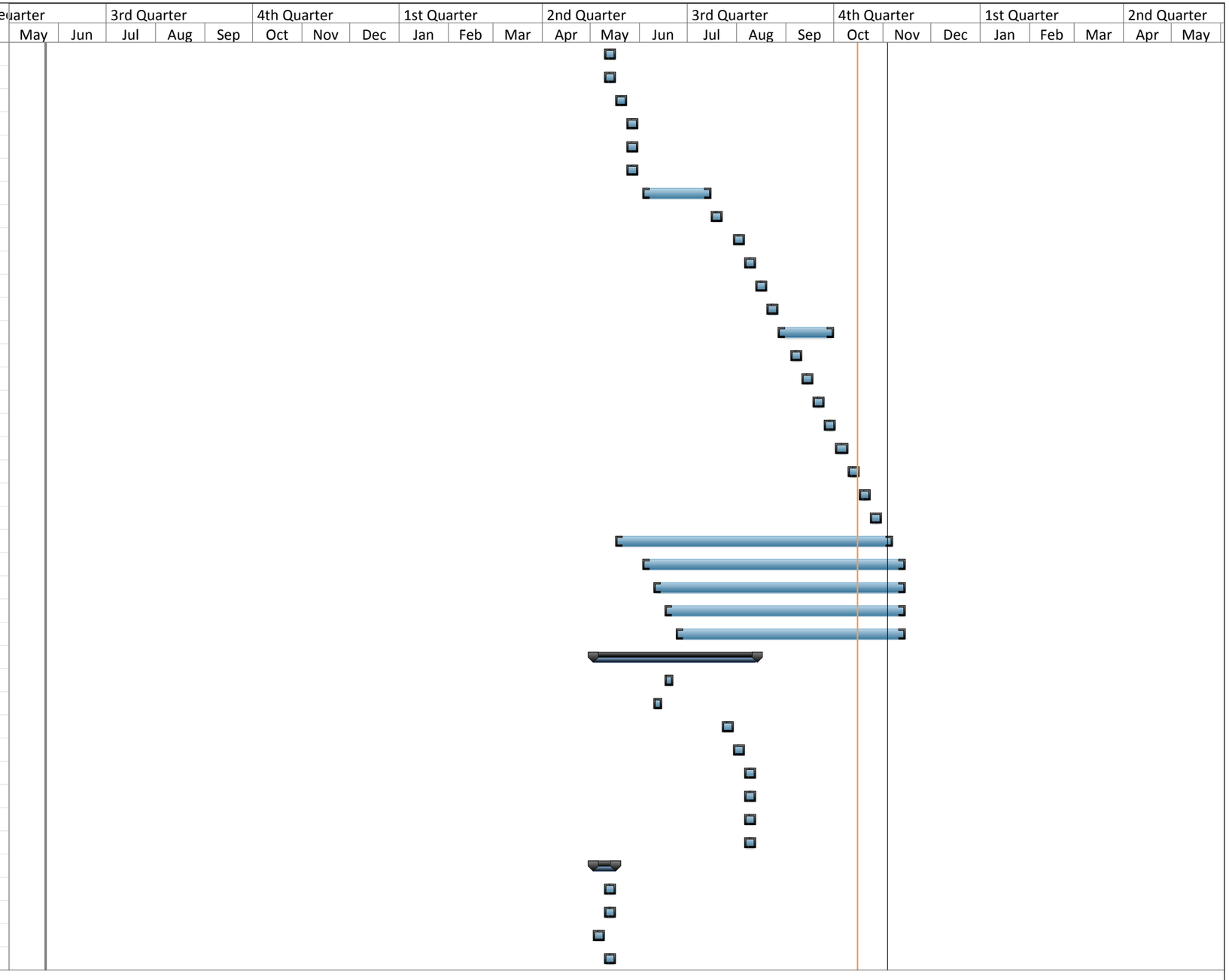
Milestone	External Milestone	Manual Task	Start-only		
Summary	Inactive Task	Duration-only	Finish-only		

ID	Task Name	Duration	Start	Finish	Predecessors
78	Sprinkler Risers	5 days	Fri 5/10/13	Thu 5/16/13	
79	Plumbing Risers	5 days	Fri 5/10/13	Thu 5/16/13	
80	Mechanical Risers	5 days	Fri 5/17/13	Thu 5/23/13	
81	Duct Risers	5 days	Fri 5/24/13	Thu 5/30/13	
82	Electric Risers	5 days	Fri 5/24/13	Thu 5/30/13	
83	Security/Telecom Risers	5 days	Fri 5/24/13	Thu 5/30/13	
84	Riser Testing	31 days	Mon 6/3/13	Mon 7/15/13	
85	Shaft Walls	5 days	Tue 7/16/13	Mon 7/22/13	
86	Ductwork Rough In	5 days	Tue 7/30/13	Mon 8/5/13	
87	Interior Framing	5 days	Tue 8/6/13	Mon 8/12/13	
88	Blocking	5 days	Tue 8/13/13	Mon 8/19/13	
89	Pre Rock/Set Showers	5 days	Tue 8/20/13	Mon 8/26/13	
90	Plumbing Rough In	25 days	Tue 8/27/13	Mon 9/30/13	
91	Mechanical Rough In	5 days	Wed 9/4/13	Tue 9/10/13	
92	Pipe Insulation	5 days	Wed 9/11/13	Tue 9/17/13	
93	Ceiling Rippers/Framing	5 days	Wed 9/18/13	Tue 9/24/13	
94	Sprinkler Rough In	5 days	Wed 9/25/13	Tue 10/1/13	
95	Electric Rough In	6 days	Wed 10/2/13	Wed 10/9/13	
96	Low Voltage Rough In	5 days	Thu 10/10/13	Wed 10/16/1	
97	Rough in Inspections	5 days	Thu 10/17/13	Wed 10/23/1	
98	Insulation	5 days	Thu 10/24/13	Wed 10/30/1	
99	Third Floor	124 days	Fri 5/17/13	Wed 11/6/13	
100	Fourth Floor	119 days	Mon 6/3/13	Thu 11/14/13	
101	Fifth Floor	114 days	Mon 6/10/13	Thu 11/14/13	
102	Sixth Floor	109 days	Mon 6/17/13	Thu 11/14/13	
103	Seventh Floor	104 days	Mon 6/24/13	Thu 11/14/13	
104	**MEP Equipment**	**73 days**	**Fri 5/3/13**	**Tue 8/13/13**	
105	Ground Floor	5 days	Mon 6/17/13	Fri 6/21/13	
106	First Floor	5 days	Mon 6/10/13	Fri 6/14/13	
107	Second Floor	5 days	Tue 7/23/13	Mon 7/29/13	
108	Third Floor	5 days	Tue 7/30/13	Mon 8/5/13	
109	Fourth Floor	5 days	Tue 8/6/13	Mon 8/12/13	
110	Fifth Floor	5 days	Tue 8/6/13	Mon 8/12/13	
111	Sixth Floor	5 days	Tue 8/6/13	Mon 8/12/13	
112	Seventh Floor	5 days	Tue 8/6/13	Mon 8/12/13	
113	**Roof Activities**	**10 days**	**Fri 5/3/13**	**Thu 5/16/13**	
114	Set Cooling Tower	5 days	Fri 5/10/13	Thu 5/16/13	
115	Set Emegency Generator	5 days	Fri 5/10/13	Thu 5/16/13	
116	Set Fan Curbs/Fans	5 days	Fri 5/3/13	Thu 5/9/13	
117	Set Rooftop Units	5 days	Fri 5/10/13	Thu 5/16/13	



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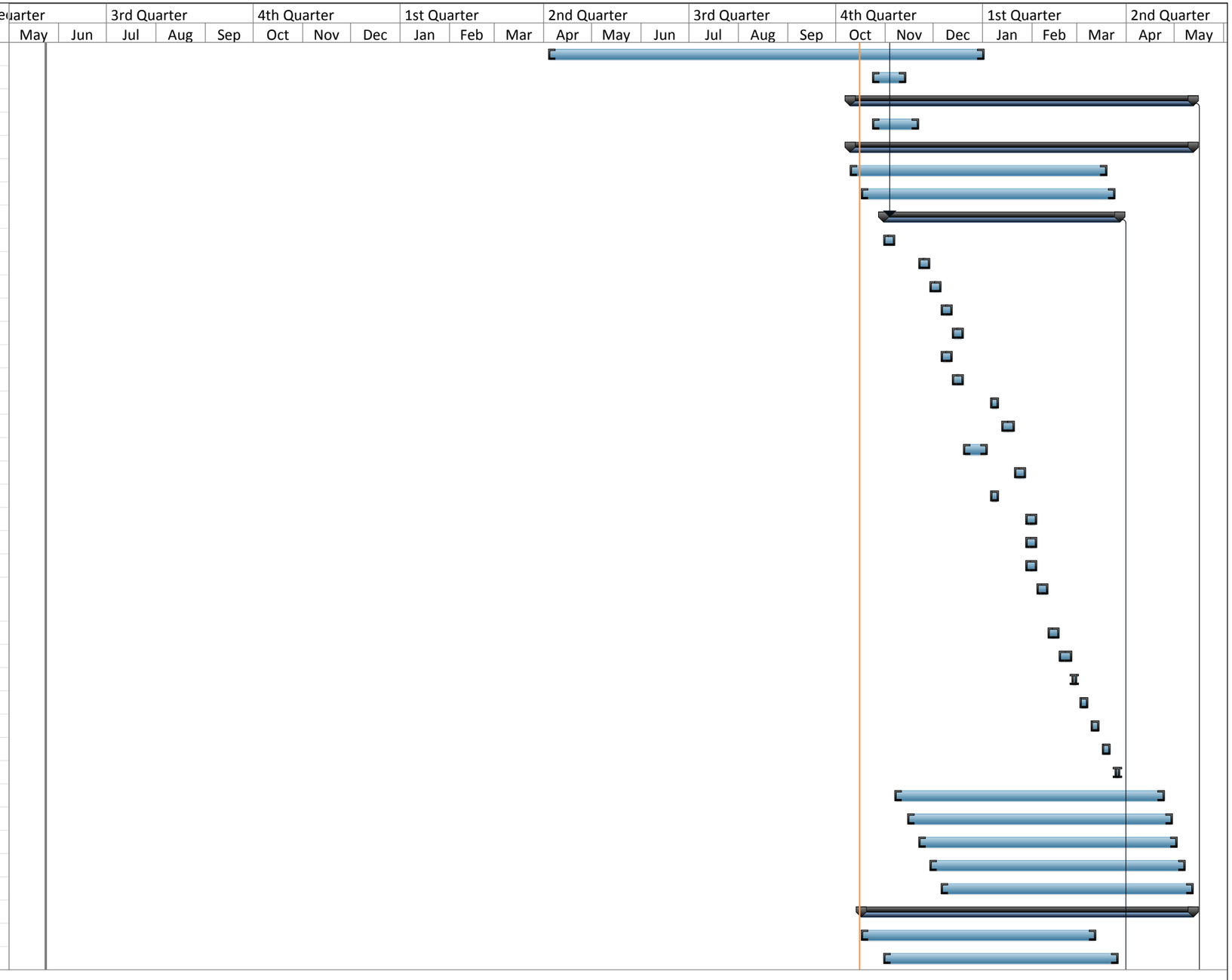
Split	External Tasks	Inactive Summary	Manual Summary	Progress
Milestone	External Milestone	Manual Task	Start-only	
Summary	Inactive Task	Duration-only	Finish-only	

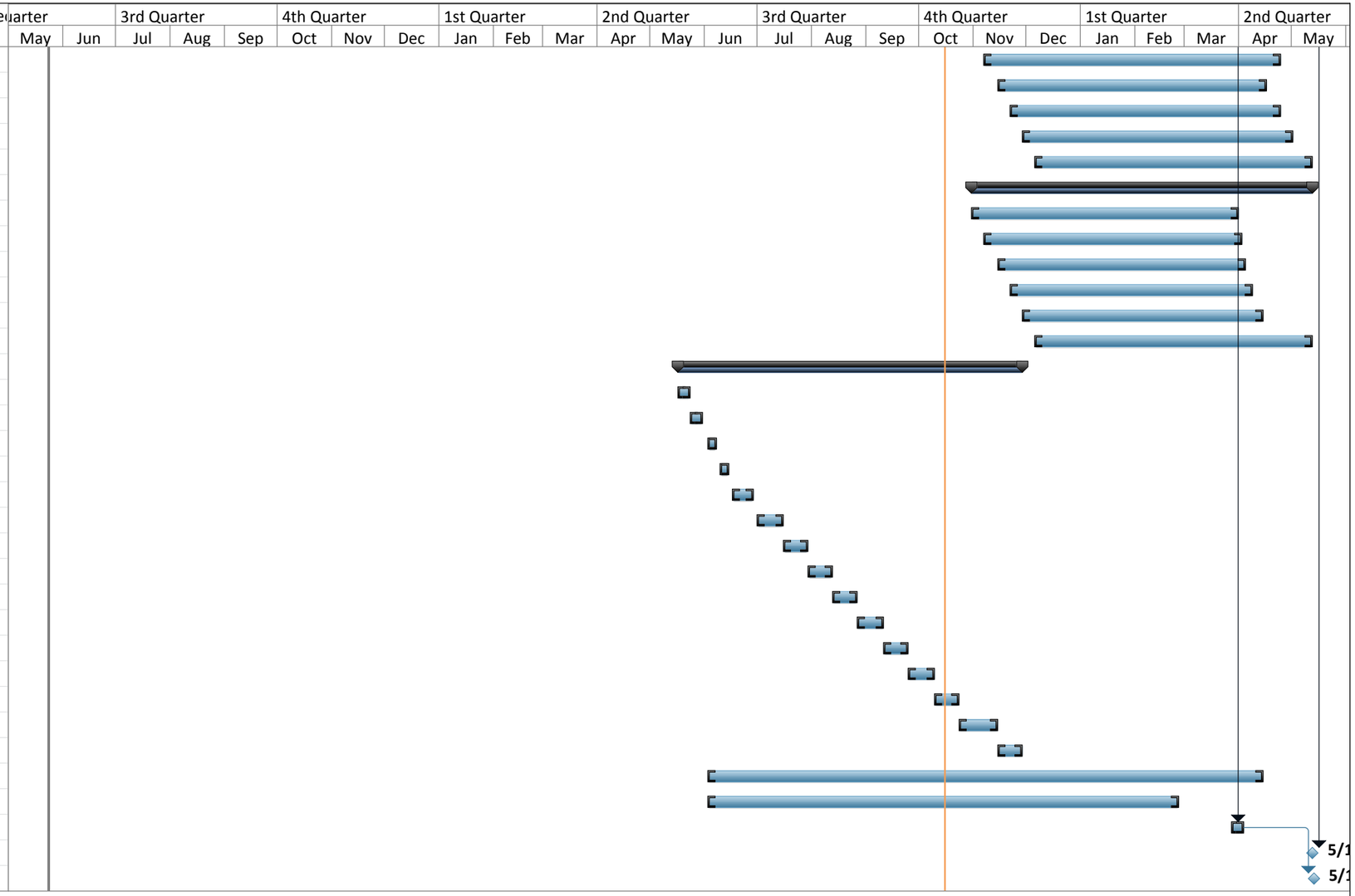
ID	Task Name	Duration	Start	Finish	Predecessors
118	Scub MEP Equipment	195 days	Thu 4/4/13	Wed 1/1/14	
119	SCUB Finishes	15 days	Thu 10/24/13	Wed 11/13/1	
120	**Finishes**	**153 days**	**Thu 10/10/13**	**Mon 5/12/14**	
121	SCUB Level	21 days	Thu 10/24/13	Thu 11/21/13	
122	**Common Areas**	**153 days**	**Thu 10/10/13**	**Mon 5/12/14**	
123	Ground Floor	115 days	Thu 10/10/13	Wed 3/19/14	
124	First Floor	113 days	Thu 10/17/13	Mon 3/24/14	
125	**Second Floor**	**106 days**	**Thu 10/31/13**	**Thu 3/27/14**	**75**
126	Hang Drywall	5 days	Thu 10/31/13	Wed 11/6/13	
127	Finish Drywall	5 days	Fri 11/22/13	Thu 11/28/13	
128	Prime Paint	5 days	Fri 11/29/13	Thu 12/5/13	
129	Point Up	5 days	Fri 12/6/13	Thu 12/12/13	
130	Finish Paint	5 days	Fri 12/13/13	Thu 12/19/13	
131	Waterproof Baths	5 days	Fri 12/6/13	Thu 12/12/13	
132	Install Bath Tile	5 days	Fri 12/13/13	Thu 12/19/13	
133	ACT Rough In	5 days	Mon 1/6/14	Fri 1/10/14	
134	Overhead Inspections	6 days	Mon 1/13/14	Mon 1/20/14	
135	Install Vanity Tops	11 days	Fri 12/20/13	Fri 1/3/14	
136	Install ACT Tile	5 days	Tue 1/21/14	Mon 1/27/14	
137	Plumbing Fixtures	5 days	Mon 1/6/14	Fri 1/10/14	
138	Electric Trim Out	5 days	Tue 1/28/14	Mon 2/3/14	
139	Mechanical Trim Out	5 days	Tue 1/28/14	Mon 2/3/14	
140	Sprinkler Trim Out	5 days	Tue 1/28/14	Mon 2/3/14	
141	Bath Accessories/ Shelving	5 days	Tue 2/4/14	Mon 2/10/14	
142	Doors/ Hardware	5 days	Tue 2/11/14	Mon 2/17/14	
143	Rough Punch	6 days	Tue 2/18/14	Tue 2/25/14	
144	Rough Clean	3 days	Wed 2/26/14	Fri 2/28/14	
145	Final Paint	5 days	Mon 3/3/14	Fri 3/7/14	
146	Carpet	5 days	Mon 3/10/14	Fri 3/14/14	
147	Final Punch	5 days	Mon 3/17/14	Fri 3/21/14	
148	Final Clean	3 days	Tue 3/25/14	Thu 3/27/14	
149	Third Floor	121 days	Thu 11/7/13	Thu 4/24/14	
150	Fourth Floor	118 days	Fri 11/15/13	Tue 4/29/14	
151	Fifth Floor	116 days	Fri 11/22/13	Fri 5/2/14	
152	Sixth Floor	114 days	Fri 11/29/13	Wed 5/7/14	
153	Seventh Floor	112 days	Fri 12/6/13	Mon 5/12/14	
154	**Living Areas**	**148 days**	**Thu 10/17/13**	**Mon 5/12/14**	
155	First Floor	105 days	Thu 10/17/13	Wed 3/12/14	
156	Second Floor	105 days	Thu 10/31/13	Wed 3/26/14	



Project: TechTwoSchedule
Date: Wed 10/16/13

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	Predecessors
157	Third Floor	121 days	Thu 11/7/13	Thu 4/24/14	
158	Fourth Floor	109 days	Fri 11/15/13	Wed 4/16/14	
159	Fifth Floor	110 days	Fri 11/22/13	Thu 4/24/14	
160	Sixth Floor	110 days	Fri 11/29/13	Thu 5/1/14	
161	Seventh Floor	112 days	Fri 12/6/13	Mon 5/12/14	
162	**Corridors**	**138 days**	**Thu 10/31/13**	**Mon 5/12/14**	
163	Second Floor	108 days	Thu 10/31/13	Mon 3/31/14	
164	Third Floor	105 days	Thu 11/7/13	Wed 4/2/14	
165	Fourth Floor	101 days	Fri 11/15/13	Fri 4/4/14	
166	Fifth Floor	98 days	Fri 11/22/13	Tue 4/8/14	
167	Sixth Floor	97 days	Fri 11/29/13	Mon 4/14/14	
168	Seventh Floor	112 days	Fri 12/6/13	Mon 5/12/14	
169	**Elevators 4-5**	**140 days**	**Fri 5/17/13**	**Thu 11/28/13**	
170	Hoistway Dried In	5 days	Fri 5/17/13	Thu 5/23/13	
171	Control Room Ready	5 days	Fri 5/24/13	Thu 5/30/13	
172	Power Ready	5 days	Mon 6/3/13	Fri 6/7/13	
173	Mobilise Elevators	5 days	Mon 6/10/13	Fri 6/14/13	
174	Install Rails/Platforms	10 days	Mon 6/17/13	Fri 6/28/13	
175	Install Door Frames	11 days	Mon 7/1/13	Mon 7/15/13	
176	Grout Sills	10 days	Tue 7/16/13	Mon 7/29/13	
177	Close in Elevator Fronts	10 days	Tue 7/30/13	Mon 8/12/13	
178	Install Doors	10 days	Tue 8/13/13	Mon 8/26/13	
179	Hoistway Wiring	11 days	Tue 8/27/13	Tue 9/10/13	
180	Call Buttons/Lanterns	10 days	Wed 9/11/13	Tue 9/24/13	
181	Build Cabs	11 days	Wed 9/25/13	Wed 10/9/13	
182	Adjusting	10 days	Thu 10/10/13	Wed 10/23/1	
183	Third Party Inspection	16 days	Thu 10/24/13	Thu 11/14/13	
184	State Inspection	10 days	Fri 11/15/13	Thu 11/28/13	
185	Elevators 1-3	226 days	Mon 6/3/13	Mon 4/14/14	
186	Final Sitework	192 days	Mon 6/3/13	Tue 2/25/14	
187	Inspections	5 days	Fri 3/28/14	Thu 4/3/14	125
188	Building Finish	0 days	Tue 5/13/14	Tue 5/13/14	120
189	Occupancy	0 days	Wed 5/14/14	Wed 5/14/14	187

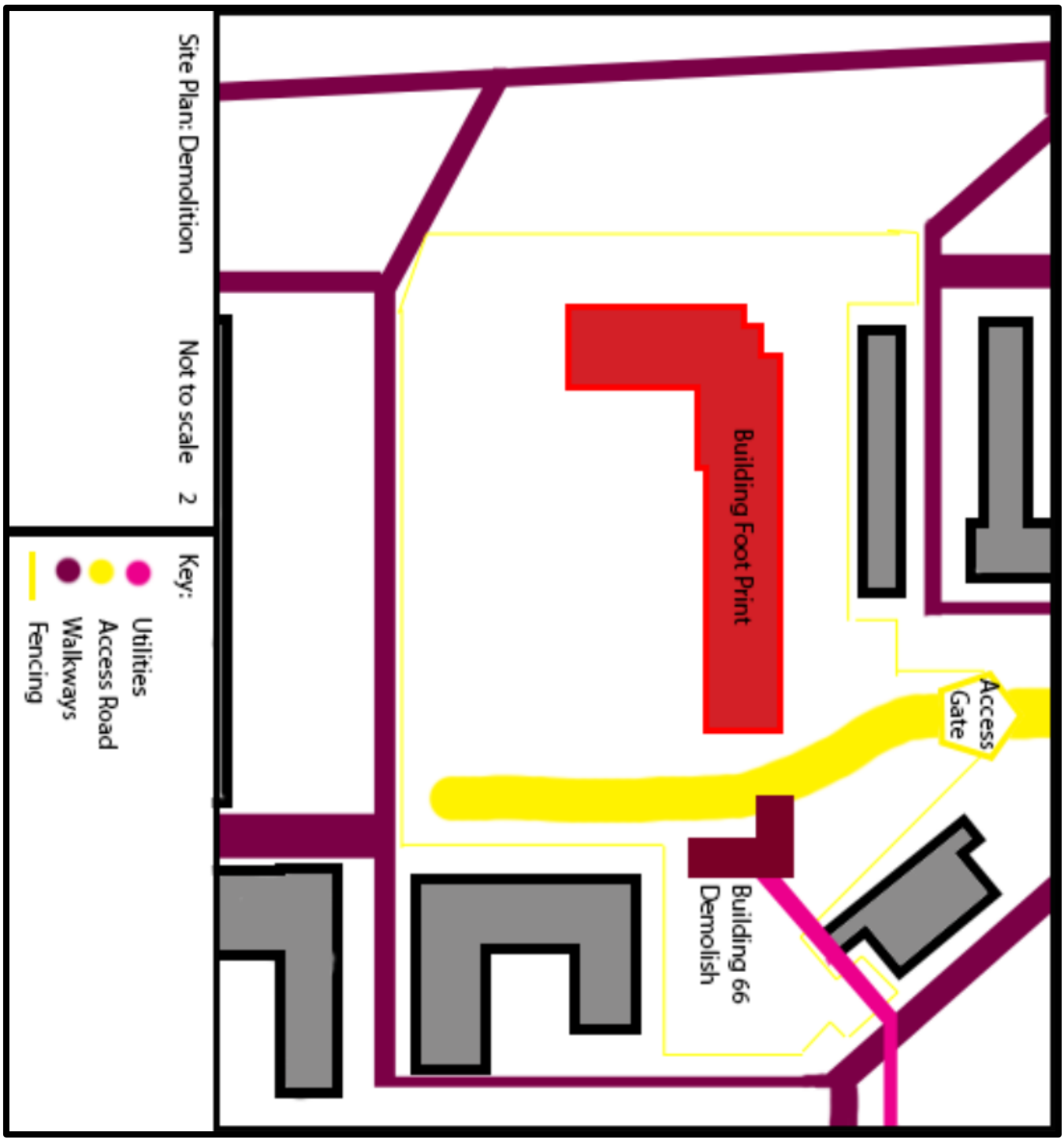


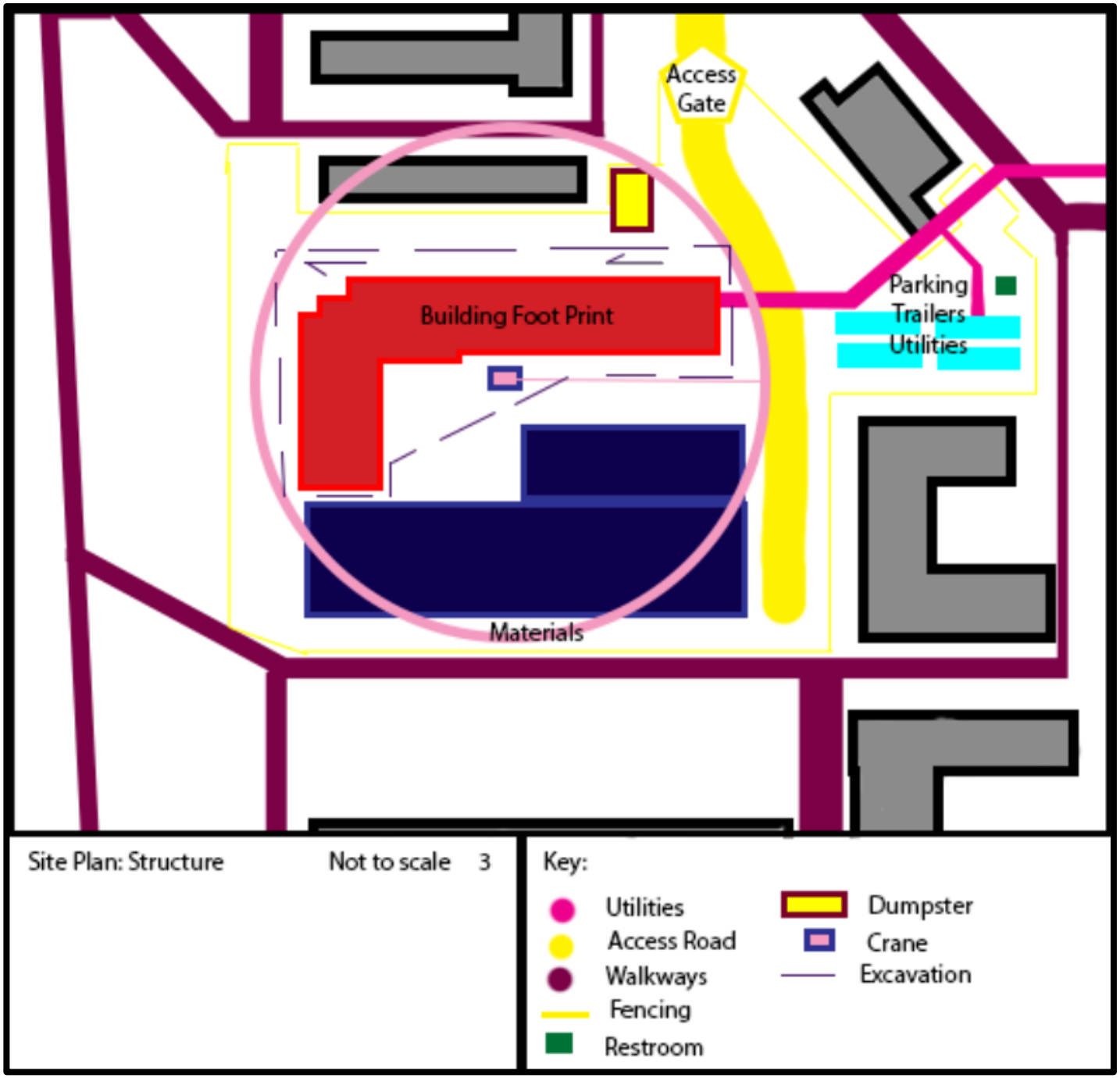
Project: TechTwoSchedule
Date: Wed 10/16/13

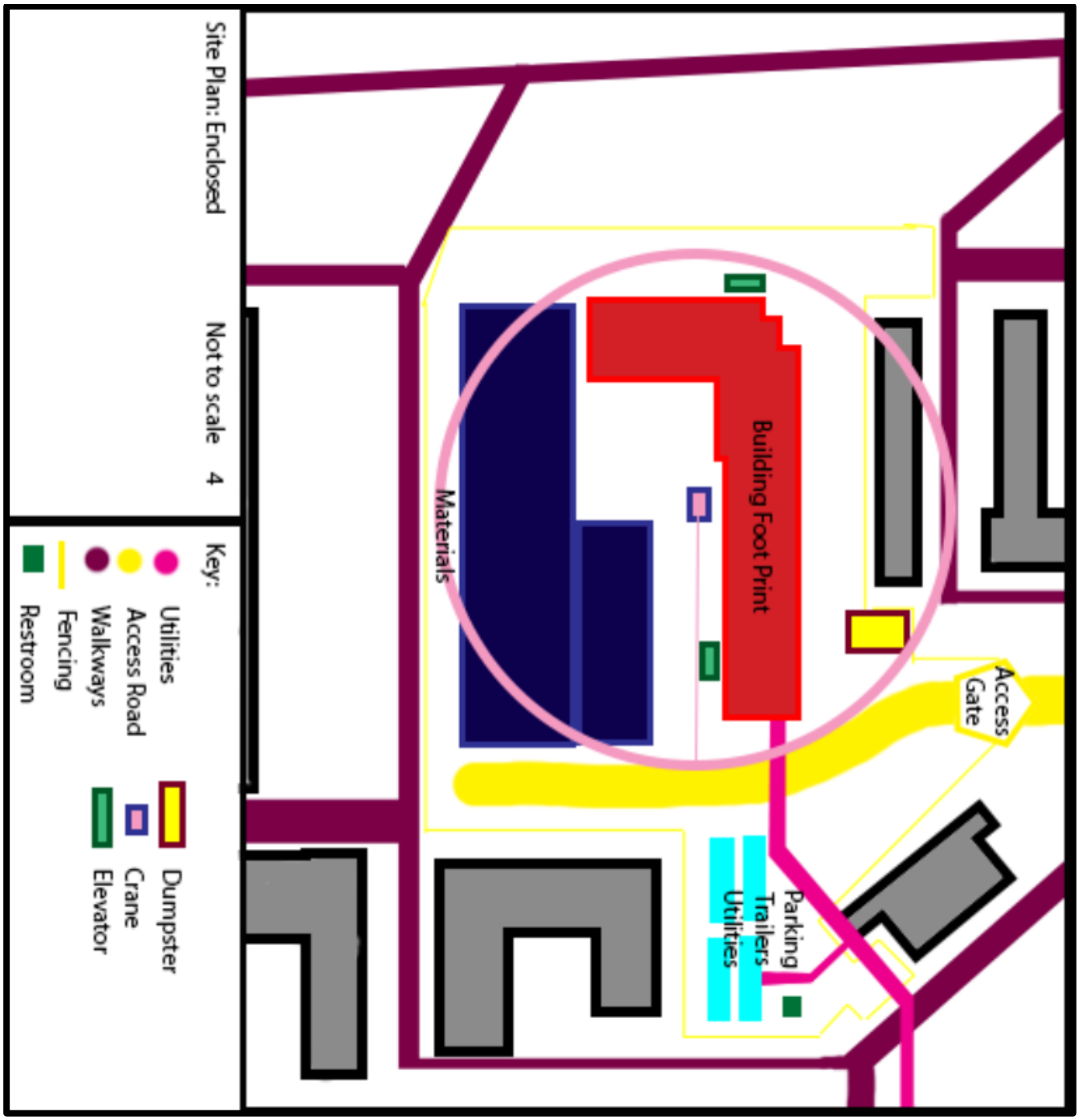
Task	Project Summary	Inactive Milestone	Manual Summary Rollup	Deadline			
Split	External Tasks	Inactive Summary	Manual Summary	Progress			
Milestone	External Milestone	Manual Task	Start-only				
Summary	Inactive Task	Duration-only	Finish-only				

Appendix B

Site Plan: Orientation	Not to scale	1	Key:	N/A


Site Plan: Demolition
Not to scale
2
Key:
Utilities
Access Road
Walkways
Fencing
Building Foot Print
Access Gate
Building 66 Demolish


Access Gate
Building Foot Print
Parking
Trailers
Utilities
Materials
Site Plan: Structure
Not to scale
3
Key:
Utilities
Access Road
Walkways
Fencing
Restroom
Dumpster
Crane
Excavation


Site Plan: Enclosed
Not to scale
4
Key:
Utilities
Access Road
Walkways
Fencing
Restroom
Dumpster
Crane
Elevator
Materials
Building Foot Print
Access Gate
Parking
Trailers
Utilities

Appendix C

General Conditions	
Line Items	Cost/year
Project Management	$ 60,000.00
Superintendents	$ 55,000.00
Safety Manager	$ 45,000.00
Quality Control	$ 30,000.00
Project Managers	$ 40,000.00
Field Officer Engineer	$ 30,000.00
Field Office Support Staff	$ 30,000.00
Assistant Superintendents	$ 40,000.00
Bonds and Insurance	$ 20,000.00
Builders Risk Insurance	$ 20,000.00
General Liability Insurance	$ 20,000.00
Site Utilites	$ 179,300.00
Traffic Control Measures	$ 10,000.00
Temporary Barricades and Signage	$ 2,000.00
Security System/Watchmen	$ 226,000.00
Pre-construcion Photo Documentation	$ 20,000.00
Trash Chutes	$ 4,000.00
Dumpsters	$ 8,000.00
Field Office	$ 15,000.00
Field Office and Furnishings	$ 2,500.00
Small Tools and Consumables	$ 1,000.00
Mobilization and Demobilization	$ 10,000.00
Job Site Communication	$ 3,000.00
Postal Services	$ 1,300.00
Job Office Supplies	$ 5,000.00
Computers, Copiers, ect.	$ 5,000.00
Project Sign	$ 1,000.00
Parking Permits	$ 3,000.00
Printing Costs	$ 6,000.00
Partnering Cost	$ 4,000.00
Project Milestone Event Costs	$ 2,000.00
Employee ID/Background Checks	$ 4,000.00
Safety Expenses	$ 1,000.00
PPE for visiters	$ 1,000.00
First Aid	$ 1,000.00
Fall Protection	$ 364,600.00

Total	$ 1,269,700.00
Total/Month	$ 105,808.33
Total/Week	$ 26,452.08

Structural Assembly Estimate														
	Units	Quantity	Cost/Unit	Material Cost	Labor/Unit	Labor Cost	Hours/Unit	Labor Hours	Equipment/unit	Equipment Cost	Total	Total O&P	Total Sum	O&P Sum
Forms														
Edge Form, 6", 4 uses	LF	852.3	$ 0.17	$ 144.89	$ 2.68	$ 2,284.16	0.064	54.5472			$ 2.85	$ 4.31	$ 2,429.06	$ 3,673.41
Columns														
24"x24" column, 4 use	SFCA	6480	$ 0.83	$ 5,378.40	$ 5.65	$ 36,612.00	0.134	868.32			$ 6.48	$ 9.53	$ 41,990.40	$ 61,754.40
Splicing Rebar, Standard														
#4	E.A.	1602	$ 5.95	$ 9,531.90	$ 6.50	$ 10,413.00	0.168	269.136			$ 12.45	$ 17.10	$ 19,944.90	$ 27,394.20
#5	E.A.	445	$ 7.27	$ 3,235.15	$ 7.25	$ 3,226.25	0.188	83.66			$ 14.50	$ 19.75	$ 6,452.50	$ 8,788.75
#6	E.A.	866	$ 8.40	$ 7,274.40	$ 8.20	$ 7,101.20	0.213	184.458			$ 16.60	$ 22.50	$ 14,375.60	$ 19,485.00
#9	E.A.	720	$ 18.15	$ 13,068.00	$ 25.50	$ 18,360.00	0.533	383.76	$ 6.65	$ 4,788.00	$ 50.30	$ 68.00	$ 36,216.00	$ 48,960.00
Uncoated Reinforcing Steel														
Column #8-#18	Ton	3916	$ 980.00	$ 3,837,680.00	$ 685.00	$ 2,682,460.00	13.91	54471.56			$ 1,665.00	$ 2,175.00	$ 6,520,140.00	$ 8,517,300.00
Elevated Slab #4-#9	Ton	2913	$ 1,050.00	$ 3,058,650.00	$ 540.00	$ 1,573,020.00	11.034	32142.042			$ 1,590.00	$ 2,025.00	$ 4,631,670.00	$ 5,898,825.00
Normal Weight Concrete, 3500psi	CY	4490	$ 99.50	$ 446,755.00							$ 99.50	$ 110.00	$ 446,755.00	$ 493,900.00
Elevated Slab, 6-10" Pumped	CY	4490			$ 15.10	$ 67,799.00	0.4	1796	$ 4.82	$ 21,641.80	$ 19.92	$ 28.50	$ 89,440.80	$ 127,965.00
Composit Finish	SF	16840.9			$ 0.56	$ 9,430.90	0.14	2357.726	$ 0.03	$ 505.23	$ 0.59	$ 0.86	$ 9,936.13	$ 14,483.17

Floor Total	$ 11,819,350.39
Floor Total O&P	$ 15,222,528.94

Prince Frederick Hall

University of Maryland, College Park, MD 20742

LEED for New Construction v2009 Scorecard

June 24, 2013

Prepared by EMO Energy Solutions

	Yes	?	No
Total Score:	63	8	39

Certified: 40 to 49 points, Silver: 50 to 59 points, Gold: 60 to 79 points, Platinum: 80+ points

= LEED Online documention is complete.

Sustainable Sites — 26 Points

Yes 21 | ? 1 | No 4

Y			C	Prereq 1	**Construction Activity Pollution Prevention** — Required
1			D	Credit 1	**Site Selection** — 1
5			D	Credit 2	**Development Density & Community Connectivity** — 5
		1	D	Credit 3	**Brownfield Redevelopment** — 1
6			D	Credit 4.1	**Alternative Transportation:** Public Transportation Access — 6
1			D	Credit 4.2	**Alternative Transportation:** Bicycle Storage & Changing Rooms — 1
3			D	Credit 4.3	**Alternative Transportation:** Low-Emitting & Fuel-Eff. Vehicles — 3
2			D	Credit 4.4	**Alternative Transportation:** Parking Capacity — 2
		1	C	Credit 5.1	**Site Development:** Protect or Restore Habitat — 1
1			D	Credit 5.2	**Site Development:** Maximize Open Space — 1
1			D	Credit 6.1	**Stormwater Design:** Quantity Control — 1
		1	D	Credit 6.2	**Stormwater Design:** Quality Control — 1
	1		C	Credit 7.1	**Heat Island Effect,** Non-Roof — 1
1			D	Credit 7.2	**Heat Island Effect,** Roof — 1
		1	D	Credit 8	**Light Pollution Reduction** — 1

Water Efficiency — 10 Points

Yes 4 | ? 2 | No 4

Y			D	Prereq 1	**Water Use Reduction,** 20% Reduction — Required
	2		D	Credit 1.1	**Water Efficient Landscaping:** Reduce by 50% — 2
		2	D	Credit 1.2	**Water Efficient Landscaping:** No Potable Use or No Irrigation — 2
		2	D	Credit 2	**Innovative Wastewater Technologies** — 2
4			D	Credit 3	**Water Use Reduction** — 2 to 4
					30% Reduction — 2
					35% Reduction — 3
					4 40% Reduction (43%) — 4

Energy & Atmosphere — 35 Points

Yes 13 | ? 2 | No 20

Y			C	Prereq 1	**Fundamental Commissioning of Energy Systems** — Required
Y				Prereq 2	**Minimum Energy Performance** — Required
Y				Prereq 3	**Fundamental Refrigerant Management** — Required
6		13		Credit 1	**Optimize Energy Performance** — 1 to 19
					12% New Buildings or 8% Existing Building Renovations — 1
					14% New Buildings or 10% Existing Building Renovations — 2
					16% New Buildings or 12% Existing Building Renovations — 3
					18% New Buildings or 14% Existing Building Renovations — 4
					20% New Buildings or 16% Existing Building Renovations — 5
					6 22% New Buildings or 18% Existing Building Renovations — 6
					24% New Buildings or 20% Existing Building Renovations — 7
					26% New Buildings or 22% Existing Building Renovations — 8
					28% New Buildings or 24% Existing Building Renovations — 9
					30% New Buildings or 26% Existing Building Renovations — 10
					32% New Buildings or 28% Existing Building Renovations — 11
					34% New Buildings or 30% Existing Building Renovations — 12
					36% New Buildings or 32% Existing Building Renovations — 13
					38% New Buildings or 34% Existing Building Renovations — 14
					40% New Buildings or 36% Existing Building Renovations — 15
		7		Credit 2	**On-Site Renewable Energy** — 1 to 7
2			C	Credit 3	**Enhanced Commissioning** — 2
2				Credit 4	**Enhanced Refrigerant Management** — 2
1	2		C	Credit 5	**Measurement & Verification** — 3
2			C	Credit 6	**Green Power** — 2

Materials & Resources — 14 Points

Yes 4 | ? 2 | No 8

Y			D	Prereq 1	**Storage & Collection of Recyclables** — Required
		3	C	Credit 1	**Building Reuse, Maintain Existing Walls Floors & Roof** — 1 to 3
				Credit 1.1	55% Existing Walls Floors & Roof — 1
				Credit 1.2	75% Existing Walls Floors & Roof — 2
				Credit 1.3	95% Existing Walls Floors & Roof — 3
		1	C	Credit 1.4	**Building Reuse, Maintain 50% interior Non-Structural Elements** — 1
1			C	Credit 2.1	**Construction Waste Management:** Divert 50% from Disposal — 1
1			C	Credit 2.2	**Construction Waste Management:** Divert 75% from Disposal — 1
		1	C	Credit 3.1	**Materials Reuse:** 5% — 1
		1	C	Credit 3.2	**Materials Reuse:** 10% — 1
1			C	Credit 4.1	**Recycled Content:** 10% (post-consumer + ½ pre-consumer) — 1
	1		C	Credit 4.2	**Recycled Content:** 20% (post-consumer + ½ pre-consumer) — 1
1			C	Credit 5.1	**Regional Materials:** 10% Extracted, Processed & Manufactured Regionally — 1
	1		C	Credit 5.2	**Regional Materials:** 20% Extracted, Processed & Manufactured Regionally — 1
		1	C	Credit 6	**Rapidly Renewable Materials** — 1
		1	C	Credit 7	**Certified Wood** — 1

Indoor Environmental Quality — 15 Points

Yes 12 | ? 1 | No 2

Y			D	Prereq 1	**Minimum IAQ Performance** — Required
Y			D	Prereq 2	**Environmental Tobacco Smoke (ETS) Control** — Required
1			D	Credit 1	**Outdoor Air Delivery Monitoring** — 1
1			D	Credit 2	**Increased Ventilation** — 1
1				Credit 3.1	**Construction IAQ Management Plan:** During Construction — 1
	1			Credit 3.2	**Construction IAQ Management Plan:** Before Occupancy — 1
1				Credit 4.1	**Low-Emitting Materials:** Adhesives & Sealants — 1
1				Credit 4.2	**Low-Emitting Materials:** Paints & Coatings — 1
1				Credit 4.3	**Low-Emitting Materials:** Flooring Systems — 1
1				Credit 4.4	**Low-Emitting Materials:** Composite Wood & Agrifiber Products — 1
1			D	Credit 5	**Indoor Chemical Pollutant & Source Control** — 1
1			D	Credit 6.1	**Controllability of Systems:** Lighting — 1
		1	D	Credit 6.2	**Controllability of Systems:** Thermal Comfort — 1
1			D	Credit 7.1	**Thermal Comfort:** Design — 1
1			D	Credit 7.2	**Thermal Comfort:** Verification — 1
		1	D	Credit 8.1	**Daylight & Views:** Daylight 75% of Spaces — 1
1			D	Credit 8.2	**Daylight & Views:** Views for 90% of Spaces — 1

Innovation & Design Process — 6 Points

Yes 6 | ? 0 | No 0

1			D	Credit 1.1	**Innovation in Design:** SSc5.2 Open Space exemplary performance — 1
1			C	Credit 1.2	**Innovation in Design:** Green Cleaning Program — 1
1			C	Credit 1.3	**Innovation in Design:** Integrated Pest Management — 1
1			C	Credit 1.4	**Innovation in Design:** Transportation Demand Management Plan — 1
1			C	Credit 1.5	**Innovation in Design:** 70% green power or 35% on a 4-year contract — 1
1			C	Credit 2	**LEED® Accredited Professional** — 1

Regional Priority Credits — 4 Points

Yes 3 | ? 0 | No 1

Available: SSc6.1, WEc2, WEc3 (40%), EAc2 (1%), MRc1.1 (55%), MRc2 (50%)

1				Credit 1.1	**Regional Priority Credit:** MRc2(50%) — 1
1				Credit 1.2	**Regional Priority Credit:** SSc6.1 — 1
1				Credit 1.3	**Regional Priority Credit:** WEc3(40%) — 1
		1		Credit 1.4	**Regional Priority Credit:** EAc2 (1%) — 1