Kaiser Permanente Largo Medical Office Building – Largo, MD

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Construction

Technical Assignment 2

October 12, 2012

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Executive Summary

Technical Assignment 2 investigates several key features of the Kaiser Permanente Largo Medical Office Building and was valuable teaching about different construction processes. The first analysis is a much deeper look into the construction schedule. A lot was learned in the fact that this schedule is a live document and constantly changes. Interesting facts were discovered such as the roof going on before structural framing was anywhere near the roof level. An image of that can actually be seen on the cover page of this document.

For the last analysis a study was done on the cost break down for the project with a square foot and assemblies estimate of the MEP systems. This analysis consisted of a more detailed breakdown for the building's superstructure. Quantity takeoff was provided by the BIM model which is what allowed for the whole system to be analyzed as opposed to finding a typical bay. This medical office building has a steel structure and sits on concrete foundations. The total estimate was about 10.5% off of the actual cost.

A general conditions estimate was looked at in more detail as well. Project staffing made up for the majority of the general conditions cost estimate. Extra time required from prolonged construction can quickly turn a good earning into a large loss. Other utility and equipment costs were included, but neither were close to the total personnel cost.

Building Information Modeling use was evaluated. It's difficult at first to think how the model is actually handled other than at coordination meetings. Analyzing the BIM goals and uses helped me understand the owner and the project team better and learning what professionals expect from this technology. BIM was definitely a benefit on this project, especially with some intense MEP systems, medical gas equipment, and headwall units. There were also some unexpected challenges that were uncovered in the study.

The final thing that was looked into more was constructability issues. Sometimes the smallest things end up causing the largest or most effective problems. There are a lot of day to day occurrences that take place in construction that are unavoidable, but there definitely ways to avoid some events. When things do go wrong, it's important to have a strong team that know what they're doing because nothing ever goes perfectly according to plan, especially in the construction industry.

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Detailed Project Schedule Summary

Attached in **Appendix A** is the detailed schedule created for the Kaiser Permanente Largo Medical Office Building. The schedule has definitely provided challenges and surprises that will be discussed in more detail in the following summary. Table 1 shows the key factors driving that drove the schedule and are currently on it.

Description	Start	Finish	Duration (days)
Design and Procurement	**1-Nov-10**	**4-Sep-12**	**482**
Building Permit (Owner Provided)	1-Nov-10	25-Aug-11	214
Construction Phase	**10-Jun-11**	**13-Feb-13**	**439**
Foundations	31-Aug-11	12-Dec-11	74
Superstructure	19-Dec-11	24-May-12	114
Exterior Enclosure	5-Mar-12	25-Sep-12	144
Roof Construction	6-Mar-12	16-Oct-12	161
MEP Rough In	5-Mar-12	24-Oct-12	233
Finishes	1-Aug-12	20-Feb-12	142
3rd Floor OR Surgical Suites	20-Sep-12	20-Feb-13	107
Elevators	4-Sep-12	1-Feb-13	106
Closeout and Occupancy	**18-Sep-12**	**17-Jun-13**	**212**
OFCI	30-Oct-12	11-Feb-13	72
Substantial Completion	11-Feb-13	11-Feb-13	0
First Patient	17-Jul-13	17-Jul-13	0

Table 1 - Summary of the Kaiser Permanente Medical Office Building detailed schedule. These events have the most impact on the critical path. Table created by Chris Pozza.

The schedule is broken into three main categories; Design and Procurement, the Construction Phase, and Closeout and Occupancy. Each of the phases will be briefly discussed in more detail relating to its impact on the schedule.

Design and Procurement

Design and Procurement began in November 2010 and recently wrapped up after 482 days. This included bid/buyout, shop drawings, design and preconstruction services. The reason that the Owner Provided Building Permit was listed should catch one's attention. It took from the time Design and Procurement started until August 25, 2011 or 214 days. This had its impact on the rest of the schedule very early on in the construction process.

Construction Phase

This phase began with the Notice to Proceed from Kaiser Permanente on June 10, 2011. Immediately site mobilization started, however no major work could be done until the Owner Provided Building Permit was received. Once it was, site mobilization and underground utility work could begin to prepare for foundations. The building rests on spread footings and perimeter walls. The building uses a slab on grade but that is something to notice on the schedule. Structural steel actually began started before the slab on grade did, therefore; the slab had to be poured a few days after the crane was able to move from Area B to Area C.

Although there is curtain wall used, the majority of the façade is brick to match the exiting building, so the exterior enclosure fell on the critical path. Early weather delays and drawing details hindered progress which will be discussed in more detail later in this report. Between that and other delays, the Watertight milestone was hit on September 20, compared to the April 25 when it was originally expected to. Brick was put in place starting on the east elevation and moving clockwise around the building. The exterior façade was completed September 25, 2012 after 144 days.

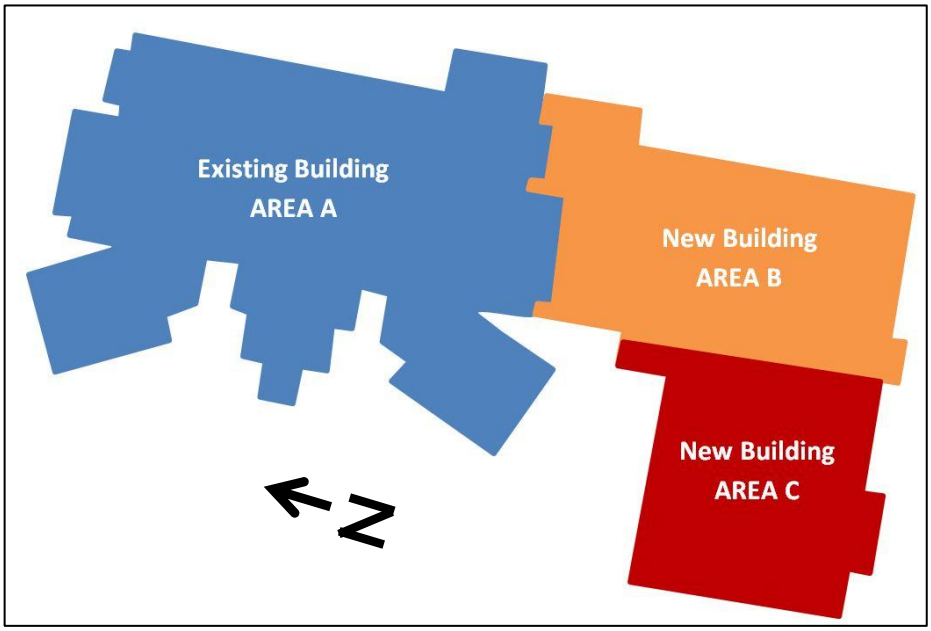


Figure 1 - The flow of construction is typical for almost all trades throughout construction of the addition. Area B and C make up the adddition. Work starts in Area B and flows to Area C. The existing building, Area A, will be getting renovated once the addition is complete.

Surprisingly, the roof had a large impact on the schedule. This will be discussed more in the Constructability Challenges Section, but the roof was actually put in place before there was much framing anywhere in the building. This construction lasted 158 days.

MEP, Electrcity & Tele/Data Rough Ins all began within a few days of each other. This process began in March as well, so there was a lot of major activity happening on site inside and out of the building. Typically the sequence would begin once walls were framed, overhead roughed in, finishes framing walls. MEP Rough Ins averaged about 115 days per floor area (B or C). Rough ins usually included about

25 items that would repeat in sequence. These were condensed in the schedule created after detailing one whole floor. A good flow was able to start and trades were given some flexibility to be working in all areas of the building at once. Some challenges for MEP rough ins was the coordination in certain areas like the MRI room. These MEP-heavy spaces required intense 3D coordination. Extra time is required in this medical office building for medical gas systems and headwall installation.

Finishes were really expected to be a key driver approaching Substantial Completion on February 11, 2013. Finishes consists of hanging, taping and finishing drywall. Also included is ceiling grid installation, paint, floors, cabinets, door and hardware installation. Finishes are completed once a rolling completion walk through is approved and signed off.

There have been some recent changes to the schedule. 3rd floor operating room suites are now on the critical path. After speaking with a project superintendent, he claimed that equipment and work in this area are crucial and it is going to be a challenge to complete. Elevators have recently been readjusted to have zero float falling on the critical path. This shows how much a project can change in a very short amount of time. The critical path is completely different than it was just a few weeks ago and is basically being updated daily. Site work has actually been removed from the critical path which.

This schedule has proved to be extremely challenging, and has varied greatly from what was originally expected. On several occasions, work has been started out of sequence. This requires an experienced team that's flexible and communicates well. Keeping work flowing smooth says a lot about the dynamic of the team.

Closeout & Occupancy

Commissioning is set to begin October 18, 2012 and last until Substantial Completion currently expected for February 11, 2013. There will be shared services activation expected to end on the Final Completion Milestone, April 12, 2013. Finally, KP regional services activation will next be taking place until July 17, 2013, which is the first patient milestone.

Detailed Structural Systems Estimate

A detailed estimate of the superstructure has been conducted on the Kaiser Permanente Largo Medical Office Building Addition. Although this building is only 3 stories, the footprint is a large L-shape with 106,700 square feet (SF) and varying bay sizes. Because of this and having access to the BIM model used on the project, a detailed estimate of the entire superstructure was calculated and compared to the original. This building has a steel skeleton with concrete foundations and elevated concrete slabs on metal deck, so these systems will be the only two building materials quantified.

RSMeans CostWorks was used to calculate the estimate. The data release used was year 2012 and the localization chosen was Silver Spring, MD, because that is the closest city to Largo, MD. Both time and location adjustments were made automatically throughout the calculations. The values produced are documented below in Table 2, along with the project budget values that have been used as a comparison.

	Original Cost		RSMeans Estimate	
Material	Total Cost	Cost / SF	Total Cost	Cost / SF
Concrete	**$870,118**	**$8.15**	**$779,152**	**$7.30**
Metals	**$2,252,965**	**$21.11**	**$2,018,451**	**$18.92**

Table 2 Estimate comparison using RSMeans CostWorks. Both estimates are in range of actual costs, but both are underestimated slightly. Table created by Chris Pozza.

A more detailed breakdown of estimates can be found in **Appendix B.** Estimates and quantities taken from the project's BIM model show how beneficial it could be to implement BIM for things like cost tracking and actually assigning costs to material before it's entered into the model.

	Original Cost		RSMeans Estimate	
Combined	Total Cost	Cost / SF	Total Cost	Cost / SF
Both	**$3,123,083**	**$29.26**	**$2,797,603**	**$26.22**

Table 3 - Comparison of combined systems. The total estimate is off by slightly under 10.5%. Table created by Chris Pozza.

The overall detailed estimate is off by $325,480. With just over a $3 per square foot difference, the calculated estimate is under budget by roughly 10.5%. There are many contributing reasons to the gap. Many could be to assumptions that were made. Average reinforcing was assumed for all foundations, beams and columns. This would most likely lead to an underestimate because many footings would have a better chance of being over designed for an extra factor of safety for large loads, in turn using larger and more expensive reinforcement. Another contributing factor is due to neglect of many miscellaneous metals and rooftop pate curbs. All of these require equipment but more importantly, labor.

Although both estimates are relatively equal in the amount that they're proportionally off by, quantity take off from a model is not perfect a perfect practice. Things like unit rounding can always play a small role, but another source of misconception can be variability in estimating equipment as well. Designs almost always include items that can't be found in RSMeans and require an alternate substitution. Therefore, in some cases assumptions needed to be made which can be found under Table 4. Table 4 is a more detailed breakdown of the estimate performed.

Description	Total Cost	Cost / SF
Structural Steel Framing	$1,628,571	$15.26
Steel Floor/Roof Decking	$389,880	$3.65
Welded Wire Fabric	$7,321	$0.07
Cast in Place Concrete	$188,521	$1.77
Structural Concrete Elements	$583,304	$5.47

Table 4 Square foot breakdown based off of the RSMeans CostWorks estimate.
Table created by Chris Pozza.

Major Assumptions:

- 115,000 SF of Metal deck is used. 10% waste is taken into account for deck and welded wire fabric.
- All footings and exterior walls are 3000 PSI normal weight concrete. Slabs on grade are 3000 PSI normal weight concrete. Slab-on-grade reinforcement is 6x6 W2.9xW2.9.
- All concrete foundations and concrete beams have average reinforcement included in estimate of total cubic yards of concrete.
- Slabs on composite deck are 3000 PSI lightweight concrete. All slab-on-deck is 2.5" lightweight concrete on 3" steel deck, gage 18 with 6x6 W1.4xW1.4. All roof deck is 3" deep, type N, 20 gage.
- 25 Housekeeping pads throughout the building.
- 4-use forms in place are used for perimeter with 6,480 square feet of contact area.
- Assume all anchor bolts are ¾" in diameter and 12" long.
- There are 200 Sideplate Moment connections throughout the structure and each plate requires a 2.5 hours of welding.

General Conditions Estimate

The general conditions estimate discussion focuses primarily on the addition as the renovation has not yet begun and it is still in the planning stages. Being that the addition is fully underway, it can provide a much more valuable comparison to investigate current conditions and how things have changed throughout construction. Table 1 below shows a breakdown of the estimate with values from the original estimate on the left side and updated values on the right side. A more detailed general conditions estimate breakdown can be found in **Appendix C.** RSMeans Costworks was used for the estimate calculated. In some cases when chosen items could not be matched with reasonable items provided by Costworks, user defined values were inserted to provide as accurate of a comparison as possible. It can be noted in Table 5 that every estimated value has been increased, usually substantially, compared to its original counterpart.

Addition General Conditions Estimate		
Original	**Description**	**Estimated**
$1,849,186	Staffing Cost	$2,326,450
$199,820	Temporary Facilities	$244,312
$384,174	Temporary Utilities	$519,706
$33,086	Temporary Equipment	$44,662
$222,070	Safety/Protection	$311,570
$287,390	Cleaning	$374,971
$99,400	General Expense	$115,187
$3,075,126	Total	$3,936,858

Table 5 - General Conditions comparison. The original estimate is given on the left side. The overall estimate is broken down into different categories to show major differences more easily. The estimated calculations were done using RSMeans Costworks provided a larger estimate.

The estimate calculated was roughly $860,000 over DPR's estimate. A major difference between calculations is the time frame that the project was initially expected to last. Many of the items included in the original General Conditions estimate that were expected to last the duration of the project were based off Substantial Completion occurring on October 2, 2012. That date has been pushed back a few months and is currently February 11, 2013. This creates a time frame of over 4 months or 20 weeks of added general conditions costs justifying the $860,000 difference.

Project staff was a large portion of the general conditions estimate and definitely the most impacted by the extra amount of time added. In addition to the extra time 20 weeks allotted for the project, additional staff members were required throughout construction. Project team members added included an assistant project manager, superintendent, project engineer, and also a large extension on the BIM Engineer's estimated time. The additional staff was required for the heavy workload that came with so many RFI's, change orders, construction change directives and submittals.

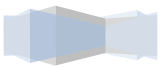
A third superintendent is required for the last few months of construction to help handle changes. The BIM engineer was required for coordination much longer than expected; that will be described in more detail in the BIM Use Evaluation section.

Temporary facilities increased primarily due to extended need for the office trailers. Also, jobsite vehicles and fuel costs have contributed to the $45,000 difference. Utilities have increased dramatically as well, mostly due to total power consumption. Most of the utility costs were provided by DPR for this section, although new durations needed to be calculated.

Two things contribute to the increased Safety/Protection estimate. Temporary protection at the loading dock was required for the majority of construction since the time cranes started picking steel on site. Protection was required until the loading dock was taken out of commission for construction, about eight months. The bigger contributor is due to the laborers on site responsible for keeping the site organized and protected. The amount of laborers dedicated to this changed throughout construction, ranging from 2-4. Some of these manhours have also contributed to the large increase in the Cleaning section of the estimate.

The crane was surprisingly not included in the general conditions estimate at all; it was under the steel subcontractor's scope, SteelFab. Temporary equipment was very low for this project, mostly due to subcontractors being responsible for it. The equipment estimates, both being small, are actually for two entirely different pieces of equipment. Originally it was intended to have a hoist that had a permanent operator. The labor cost for the operator makes up the full $33,000, but was never utilized. The piece of equipment that was actually paid for was a lull. An all-terrain forklift was used, and was key for getting materials to the second and third floors.

All estimates have been adjusted for time and location, using a Data Release for 2012. A slight inflation factor between the years the estimate was done contributes to only a very small amount. The location factor of Silver Spring, Maryland, was chosen because it is the closest city to Largo, MD.



Building Information Modeling Use Evaluation

Kaiser Permanente has required that Building Information Modeling (BIM) is implemented for the construction of the three-story addition. **See Appendix D for the Level 1 Process Map of how BIM was used.** BIM services were purchased from DPR. Below in Table 6 are the project goals and uses for BIM. The table includes the original intentions BIM was intended to be utilized for.

Priority (HIGH/ MED/ LOW)	Goal Description	BIM Uses
High	To minimize the amount and severity of field clashes between building systems	3D Coordination
High	To reduce schedule conflicts due to field clashes between building systems	3D Coordination
High	Create, collaboratively 3D virtual mock-ups of challenging building skin interface details and connection details	Virtual Mock-up

Table 6 - BIM Goals and Uses for DPR originally to perform as desired by Kaiser Permanente. Table created by Chris Pozza and modeled after Penn State's BIM Project Execution Planning Guide - 2.0.

3D Coordination is the major purpose BIM is being implemented on the medical office building addition. With so many complex building systems, virtual coordination will serve a great benefit to all parties involved as errors on 2D drawings are now detected much more easily before ever reaching the field where it's much more expensive to fix. Clash detection is a powerful tool that Kaiser Permanente would like to take advantage of to minimize the amount of field clashes between building systems and reduce schedule conflicts. Finding clashes while they're only in a model and on paper is believed to pay for itself as time, resources, and rework will not be wasted in the event of a design error.

The third and final goal for this project was to create virtual mock-ups digitally. A mock-up of the building façade with a window built into it has been physically fabricated on site. This mock-up has been used to ensure quality and grout colors meet the design intentions and how connections between different systems will be detailed, and has been very beneficial. As the building is being enclosed and finishes are being put in place, no virtual mock-ups have been created. At this point of construction, virtual mock-ups will most likely not be created. The original intention of creating virtual mock-ups was more for DPR's own benefit. Although they could have been useful, it's not felt that the project was impacted negatively without them. Even if that goal is not reached, the project overall has benefitted from the coordination that took place using BIM.

Table 7 below shows how BIM was used throughout the project. A more detailed evaluation of BIM uses can also be found in **Appendix D.** *Design Authoring* was the first step of executing BIM. All of the different design models were brought together into Navisworks Manage to create a central model. This is important to create transparency between involved parties and creates a powerful visualization tool. As mentioned in the BIM Goals, *3D Coordination* was the primary use of BIM. It was used for design and throughout construction while coordination and modeling took place simultaneously which will be discussed ahead in more detail. *Generate Drawings* was another BIM use. This was specifically chosen to go under the "Construct" phase because the model became a living document in most cases that would be updated as changes were made and coordination was dealt with in the field, and then transferred back to the model from which subcontractors could produce their own updated, finalized shop drawings. Also included in this step of the BIM process is *Virtual Mock-Up.* Again, as noted in the BIM Goals section, this use was an original intention but never actually utilized. The final major BIM Use included in Table 2 is *Record Modeling.* Although not contractually bound, DPR plans to turn over the model to Kaiser Permanente once construction is complete. This record model will minimize building turnover information and can be used for future modeling and 3D coordination if ever any renovations.

	PLAN	X	DESIGN	X	CONSTRUCT	X	OPERATE
		X	DESIGN AUTHORING	X	3D COORDINATION	X	RECORD MODELING
		X	3D COORDINATION		VIRTUAL MOCK-UP		
				X	GENERATE DRAWINGS		

Table 7 - BIM Uses utilized throughout the project. Virtual Mock-up was listed under the construction phase, but not marked as used because although it was originally expected to, virtual mock-ups were never created. Table created by Chris Pozza and modeled after Penn State's BIM Project Execution Planning Guide - 2.0.

Weekly coordination meetings took place on Wednesdays. Depending on specific points of construction and the area being modeled, different subcontractors would be required to attend meetings. Throughout construction, several different subcontractors contributed to the overall project model. Models were included for structural steel, duct and sheet metal, mechanical and plumbing, electric, fire protection, and glazing model. Coordination meetings began on site August 17, 2011, starting with underground utility coordination.

Development of the BIM model was originally expected to take 183 days for the entire addition, however; it actually ended up taking 283 days. There were several reasons for this. It wasn't intentional but modeling and coordination was basically occurring at the same time. Both tasks occurring simultaneously caused the process to take longer than expected. Unfortunately, the design of the

contract didn't allow for DPR to start BIM coordination with subcontractors earlier in the design process so there wasn't much that could be done to prevent the extra time required.

With that, there were several coordination issues:

- Imaging area – tight ceiling areas in imaging suites created problems with coordination of complex systems
- Design of arched ceilings – working around arches made it challenging to place MEP systems around structure in limited spaces
- Ducts – ceiling height and limited space on the 2nd floor made very tight squeezes for large ducts
- Operating Rooms – more ceiling height restrictions present problems for MEP systems and boom supports which were
- Drains and risers – (seen to the right in Figure 2) presented a challenge due to the third floor slab being poured before model coordination was finished. That required penetrations to be core drilled. Several drains ran and pipes were out of place and protruding through walls which would've required bump outs if not otherwise moved.

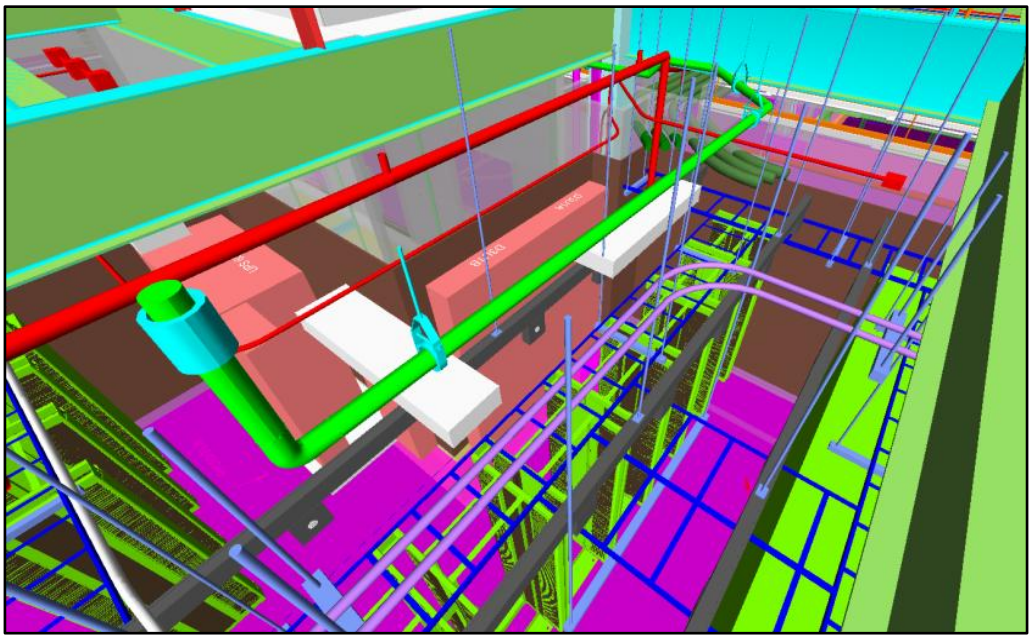


Figure 2 - At a quick glance, it would be hard to notice a clash in this image. That is partially due to its size but the bigger reason is there actually is no direct clash. The problem is the green pipe in the center of the screen is a sanitary line which is directly above a second floor Telecommunications Room. This pipe was required to be moved to eliminate any potential water hazards near equipment.

All of these reasons are how BIM was used successfully where drawings would make it difficult to find solutions, especially in the important spaces noted above. Arched ceilings are typically in lobbies and waiting areas making accurate coordination important to prevent architecture from being affected or create unappealing bump outs to cover up protruding objects. Operating rooms with so much necessary precision supports the appropriateness of BIM. Straps attaching to boom supports are unable to be in repetitive locations at different supports, so very intense coordination was needed to document exact locations to prevent clashes in such tight spaces.

Constructability Issues

The Kaiser Permanente Largo Medical Office Building presented several challenges throughout the duration of the project. One of the first major challenges faced was dealing with the exterior façade. On top of early major weather delays, flashing details at windows were extremely challenging. While the project team was working hard trying to determine the best way to move forward or create an alternative solution, time was still lost and the masonry subcontractor basically had to rebound the lost time.

Other than making up for lost time, there were now Fraco Lifts on site much longer than expected. The site isn't extremely small, but very busy and having Fraco lifts wrap entirely around the south and east side of the building limited flow of construction traffic and took away valuable lay down area. Figure 3 below shows an image of the east façade as work is wrapping up, although the large laydown area is still being used by the mason. Figure 4 was taken the very same day on the south façade. It can be seen the amount of space this equipment takes up. No work can be done underneath and building exits get blocked by them or aren't able to be passed through depending on where work is. Delay of the exterior façade also affected the critical path and forced the Water Tight Milestone to be pushed back. In an effort to try making up for the lost time early, the mason crew quickly doubled and tripled in size. More laborers on site allowed a larger area of façade to go up at a time as the Fraco Lifts were able to be utilized. People were also required to work weekends. Comparing a brick façade to precast panels might be a potential research topic.

Figure 3 - The east elevation is shown almost completed. A Fraco lift can be seen in the center, with a Mason King manual cranked scaffold equipment sits on the canopy roof. Notice the amount of space currently taken up by the mason subcontractor. Personal photograph taken by Chris Pozza.

Figure 4 - Image taken the same day as Figure 10. Masons preparing for the next phase at the south elevation. Work can never take place underneath Fraco Lifts. Personal photograph taken by Chris Pozza.

Another challenging aspect comes from the northwest of the addition. Tying into the existing building was expected in this precise area, but the drawings present a tricky connection as seen in Figure 5. Between all parties involved, no one has ever dealt with a connection quite like this. With curtain wall coming from the south (as seen to the left of Figure 6) to connect to new brick via an expansion joint, there won't be much room for error as the new brick is intended to land perfectly flush with the interior wall.

The challenge has become to find a way to overlap the new Air/Vapor Barrier (AVB) over existing AVB. DPR is currently underway working with subcontractors to prepare a cost effective alternative solution. Drawings and sketches have been passed between subs, superintendents, and architects. This process is still underway, but everyone being as actively involved as they are instead of letting it affect the schedule is great to see.

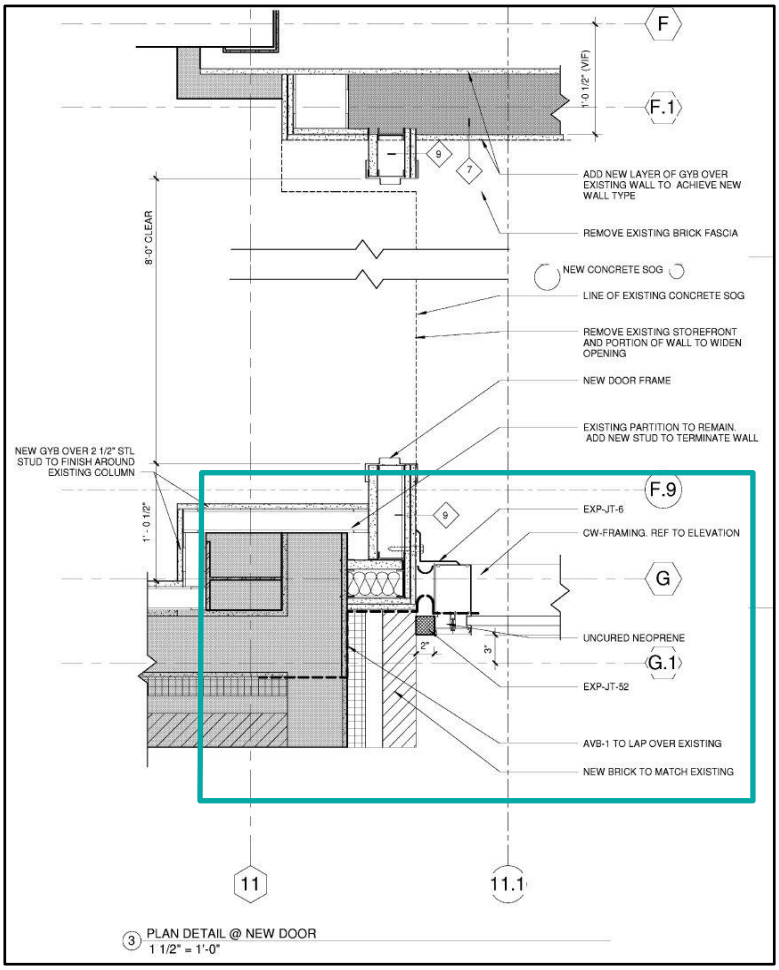


Figure 5 - Detail of a corridor entrance from the addition into the existing building. Notice in the lower central part of the image the bold dashed line that extends into the darker shaded area. This line is Air/Vapor Barrier (AVB) which is shown intruding into the existing brick extremely far as it is intended to overlap the existing AVB. Image courtesy of Ellerbe Becket.

Figure 6 - Photograph taken from the interior of the addition looking at the corner of the existing building. The challenge is ging to be demolishing small areas of existing facade and tying Air/Vapor Barrier to AVB behind that façade which will be getting opened. Personal photograph taken by Chris Pozza.

The last major constructability issue involves the schedule and sequencing. Throughout the project, there have been several activities that started well out of sequence. It's been tough to avoid with an extremely tight schedule and the superintendents realize they need to keep moving forward one way or another. A prime example of an activity beginning out of sequence involves the roof. When the roof was being built, there was actually no framing at the exterior walls up to that point. Construction of the roof began April 10, 2012 and completion was scheduled for October 16, 2012. The roof had to be temporarily fastened down which meant the parapet wall had to be fabricated at a later point. A progress photo, shown below in Figure 7, was taken on April 21, 2012 and clearly shows the temporary roof. The entire scenario created a problem that required the team to seriously consider logistics. How and when the rest of the material would be put in place and where it will be stored as other things will be picking up on site required a lot of time. The team was successful in created a plan as it was understood the schedule was already extremely tight and there was no time to wait.

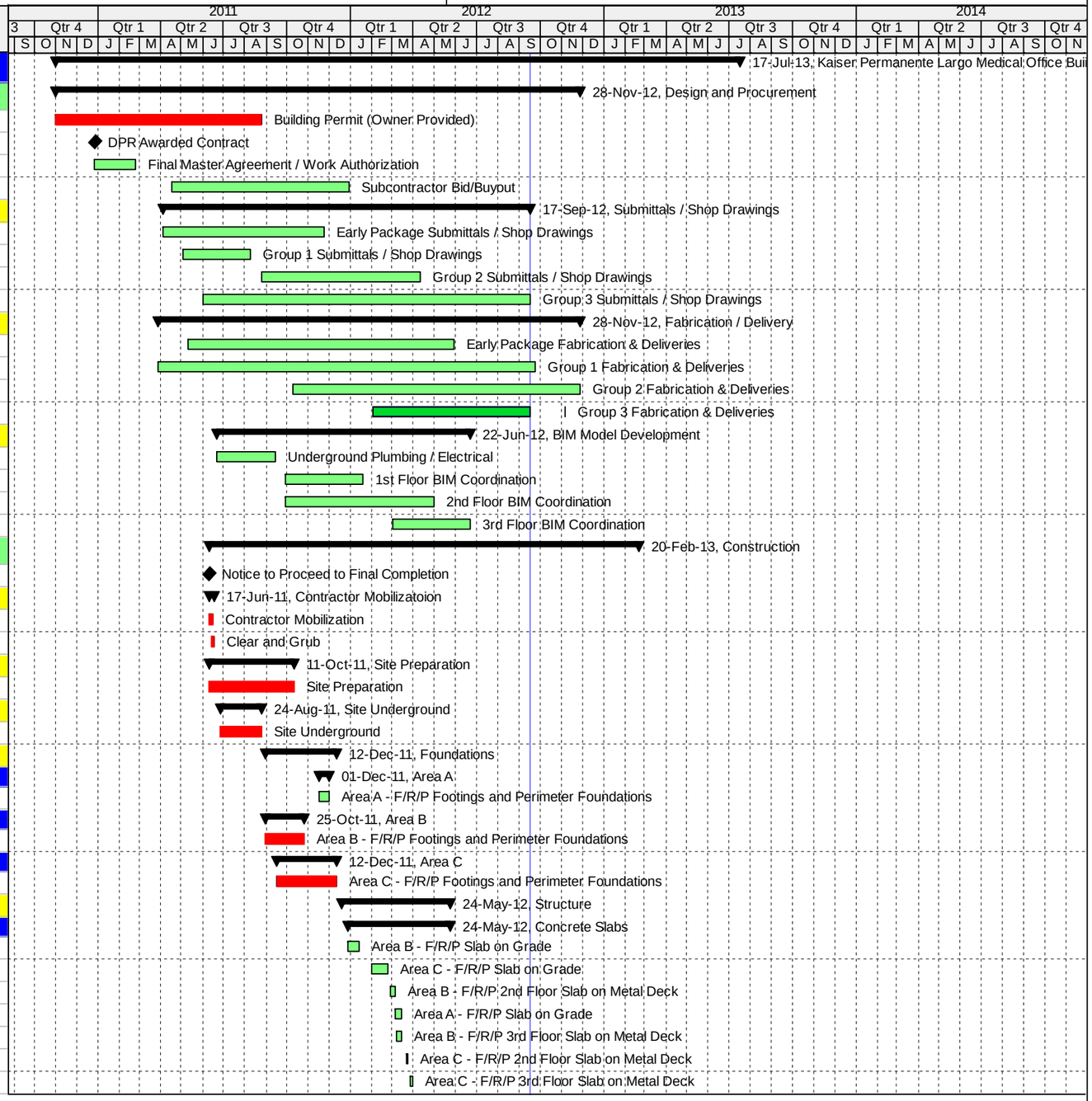
Figure 7 - An arial progress phonto taken on April 21, 2012 shows the temporary roof just 12 days after its construction began. Take notice that there is no framing on the east façade. Image courtesy of DPR Construction.

In response to there being a roof with virtually no walls, the superintendents worked to make sure the interior would remain as dry as possible at all times. With open floors in every direction, this was a challenge and laborers would repeatedly need to sweep the water out of low spots, but it was necessary to keep equipment and stored materials dry, especially if they were in the open building. Temporary plastic sheets were draped prior to storms and materials were stored away from the perimeter of the building when possible. Although that might not sound overly impressive, it became habit to make sure safe working conditions were maintained inside and outside the building.

Appendix A – Detailed Project Schedule

Detailed Project Schedule

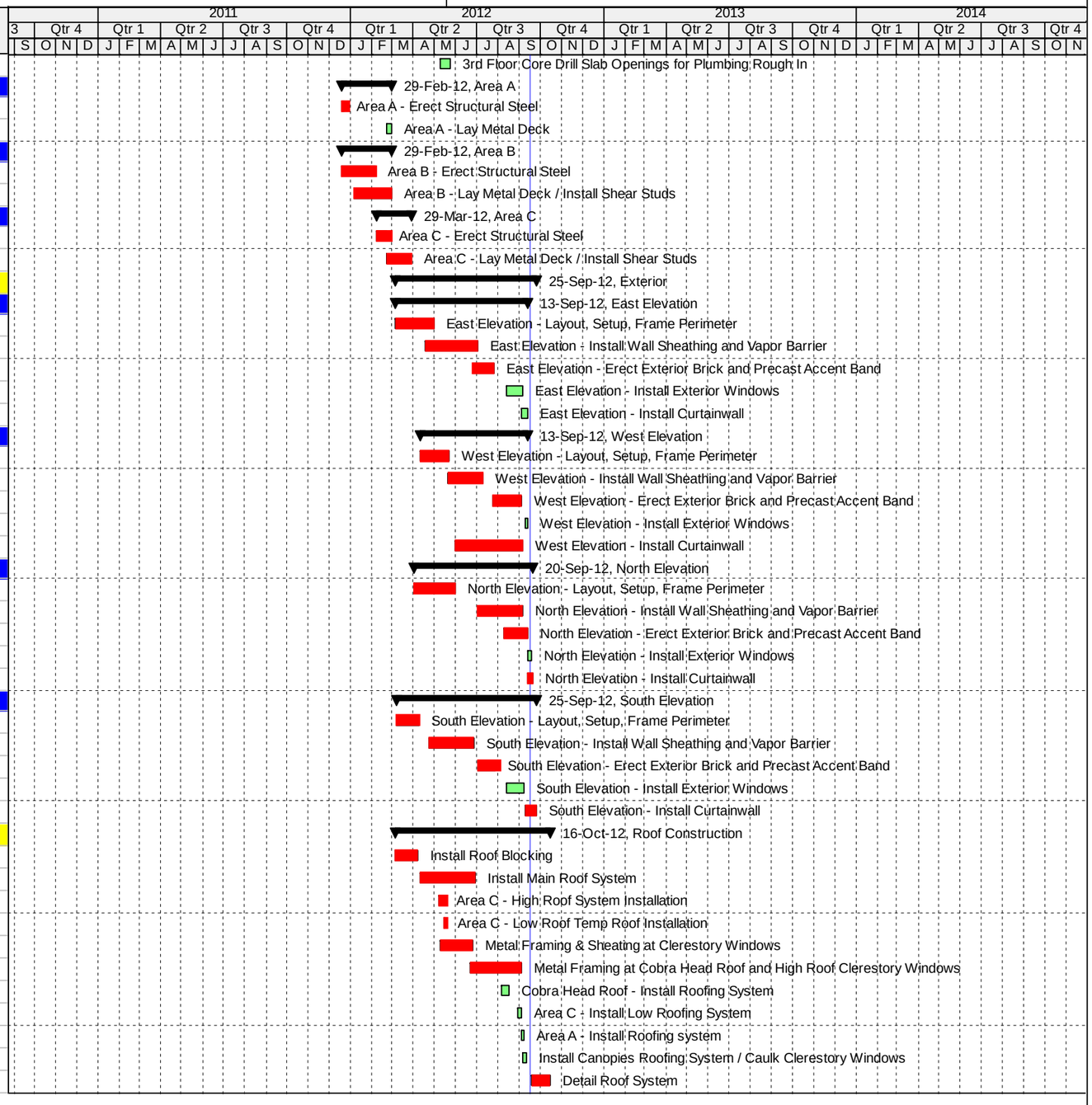
Activity Name	Original Duration	Start	Finish
Kaiser Permanente Largo Medical Office Bu	691	01-Nov-10 A	17-Jul-13
Design and Procurement	530	01-Nov-10 A	28-Nov-12
Building Permit (Owner Provided)	209	01-Nov-10	25-Aug-11
DPR Awarded Contract	1	27-Dec-10	27-Dec-10
Final Master Agreement / Work Authorization	42	27-Dec-10	23-Feb-11
Subcontractor Bid/Buyout	179	18-Apr-11	29-Dec-11
Submittals / Shop Drawings	372	04-Apr-11	17-Sep-12
Early Package Submittals / Shop Drawings	165	04-Apr-11	23-Nov-11
Group 1 Submittals / Shop Drawings	67	04-May-11	08-Aug-11
Group 2 Submittals / Shop Drawings	160	25-Aug-11	10-Apr-12
Group 3 Submittals / Shop Drawings	331	01-Jun-11	17-Sep-12
Fabrication / Delivery	428	28-Mar-11 A	28-Nov-12
Early Package Fabrication & Deliveries	268	11-May-11	29-May-12
Group 1 Fabrication & Deliveries	382	28-Mar-11	24-Sep-12
Group 2 Fabrication & Deliveries	291	10-Oct-11	28-Nov-12
Group 3 Fabrication & Deliveries	195	02-Feb-12 A	06-Nov-12
BIM Model Development	257	22-Jun-11	22-Jun-12
Underground Plumbing / Electrical	59	22-Jun-11	14-Sep-11
1st Floor BIM Coordination	77	29-Sep-11	18-Jan-12
2nd Floor BIM Coordination	150	29-Sep-11	30-Apr-12
3rd Floor BIM Coordination	81	01-Mar-12	22-Jun-12
Construction	433	10-Jun-11	20-Feb-13
Notice to Proceed to Final Completion	0	10-Jun-11	10-Jun-11
Contractor Mobilizatoion	6	10-Jun-11	17-Jun-11
Contractor Mobilization	5	10-Jun-11	16-Jun-11
Clear and Grub	4	14-Jun-11	17-Jun-11
Site Preparation	86	10-Jun-11	11-Oct-11
Site Preparation	86	10-Jun-11	11-Oct-11
Site Underground	42	27-Jun-11	24-Aug-11
Site Underground	42	27-Jun-11	24-Aug-11
Foundations	72	31-Aug-11	12-Dec-11
Area A	10	17-Nov-11	01-Dec-11
Area A - F/R/P Footings and Perimeter Foundations	10	17-Nov-11	01-Dec-11
Area B	39	31-Aug-11	25-Oct-11
Area B - F/R/P Footings and Perimeter Foundations	39	31-Aug-11	25-Oct-11
Area C	61	16-Sep-11	12-Dec-11
Area C - F/R/P Footings and Perimeter Foundations	61	16-Sep-11	12-Dec-11
Structure	112	19-Dec-11	24-May-12
Concrete Slabs	107	27-Dec-11	24-May-12
Area B - F/R/P Slab on Grade	13	27-Dec-11*	13-Jan-12
Area C - F/R/P Slab on Grade	19	31-Jan-12	24-Feb-12
Area B - F/R/P 2nd Floor Slab on Metal Deck	6	27-Feb-12	05-Mar-12
Area A - F/R/P Slab on Grade	8	05-Mar-12	14-Mar-12
Area B - F/R/P 3rd Floor Slab on Metal Deck	6	08-Mar-12	15-Mar-12
Area C - F/R/P 2nd Floor Slab on Metal Deck	3	21-Mar-12	23-Mar-12
Area C - F/R/P 3rd Floor Slab on Metal Deck	3	28-Mar-12	30-Mar-12



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

TASK filter: All Activities

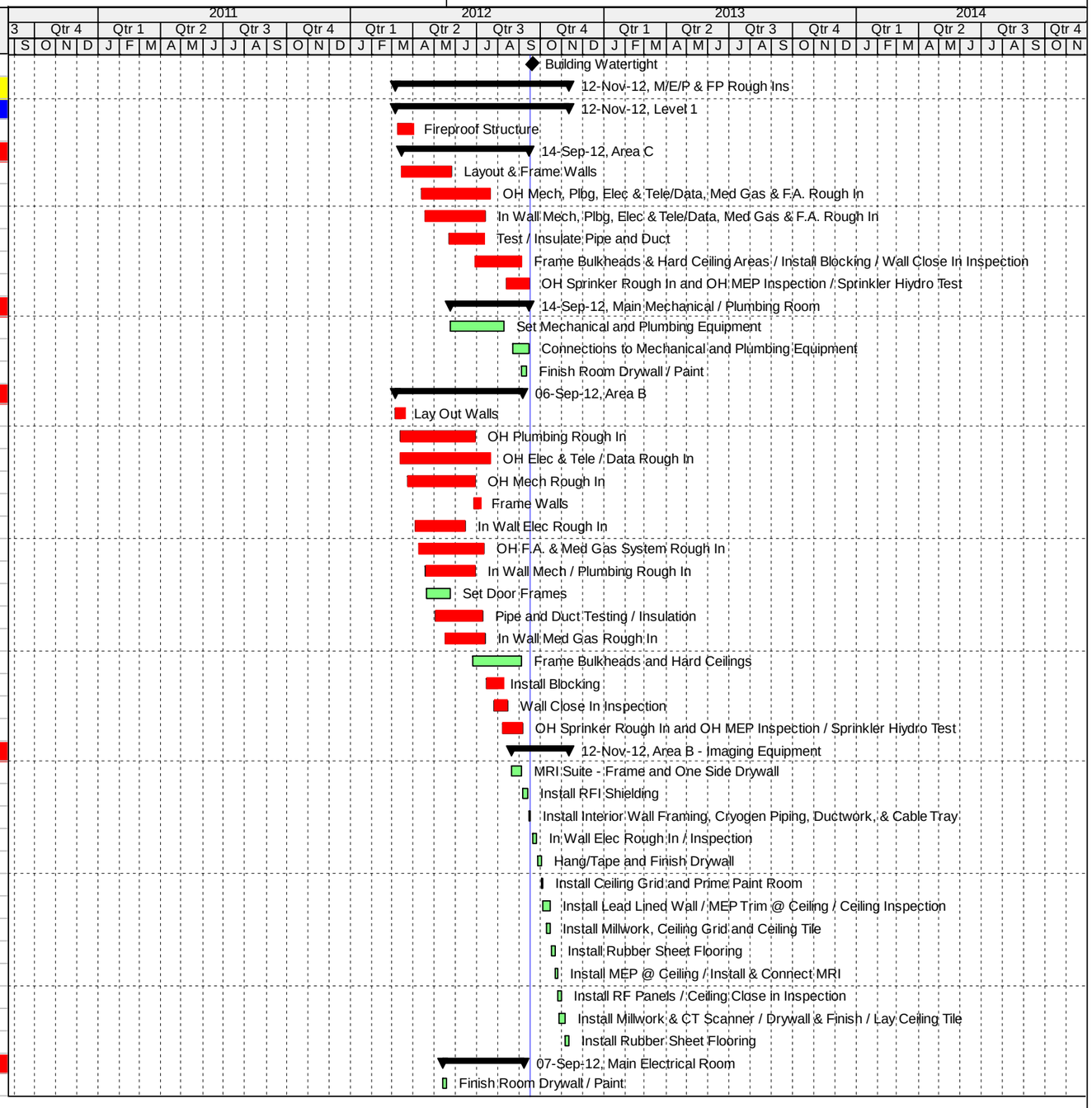
Activity Name	Original Duration	Start	Finish
3rd Floor Core Drill Slab Openings for Plumbing Rough In	12	09-May-12	24-May-12
Area A	51	19-Dec-11	29-Feb-12
Area A - Erect Structural Steel	4	19-Dec-11	22-Dec-11
Area A - Lay Metal Deck	6	22-Feb-12	29-Feb-12
Area B	51	19-Dec-11	29-Feb-12
Area B - Erect Structural Steel	34	19-Dec-11	06-Feb-12
Area B - Lay Metal Deck / Install Shear Studs	40	05-Jan-12	29-Feb-12
Area C	37	08-Feb-12	29-Mar-12
Area C - Erect Structural Steel	11	08-Feb-12	22-Feb-12
Area C - Lay Metal Deck / Install Shear Studs	27	22-Feb-12	29-Mar-12
Exterior	144	05-Mar-12	25-Sep-12
East Elevation	136	05-Mar-12	13-Sep-12
East Elevation - Layout, Setup, Frame Perimeter	41	05-Mar-12	30-Apr-12
East Elevation - Install Wall Sheathing and Vapor Barrier	54	17-Apr-12	02-Jul-12
East Elevation - Erect Exterior Brick and Precast Accent	23	25-Jun-12	26-Jul-12
East Elevation - Install Exterior Windows	17	13-Aug-12	05-Sep-12
East Elevation - Install Curtainwall	8	04-Sep-12	13-Sep-12
West Elevation	109	11-Apr-12	13-Sep-12
West Elevation - Layout, Setup, Frame Perimeter	29	11-Apr-12	21-May-12
West Elevation - Install Wall Sheathing and Vapor Barrier	35	21-May-12	10-Jul-12
West Elevation - Erect Exterior Brick and Precast Accen	29	25-Jul-12	04-Sep-12
West Elevation - Install Exterior Windows	4	10-Sep-12	13-Sep-12
West Elevation - Install Curtainwall	67	01-Jun-12	05-Sep-12
North Elevation	121	02-Apr-12	20-Sep-12
North Elevation - Layout, Setup, Frame Perimeter	43	02-Apr-12	31-May-12
North Elevation - Install Wall Sheathing and Vapor Barrier	47	02-Jul-12	06-Sep-12
North Elevation - Erect Exterior Brick and Precast Accer	23	10-Aug-12	12-Sep-12
North Elevation - Install Exterior Windows	4	13-Sep-12	18-Sep-12
North Elevation - Install Curtainwall	6	13-Sep-12	20-Sep-12
South Elevation	142	07-Mar-12	25-Sep-12
South Elevation - Layout, Setup, Frame Perimeter	24	07-Mar-12	09-Apr-12
South Elevation - Install Wall Sheathing and Vapor Barrie	46	24-Apr-12	27-Jun-12
South Elevation - Erect Exterior Brick and Precast Accer	19	02-Jul-12	27-Jul-12
South Elevation - Install Exterior Windows	19	13-Aug-12	07-Sep-12
South Elevation - Install Curtainwall	12	10-Sep-12	25-Sep-12
Roof Construction	158	06-Mar-12	16-Oct-12
Install Roof Blocking	24	06-Mar-12	06-Apr-12
Install Main Roof System	58	10-Apr-12	29-Jun-12
Area C - High Roof System Installation	7	07-May-12	15-May-12
Area C - Low Roof Temp Roof Installation	3	15-May-12	17-May-12
Metal Framing & Sheating at Clerestory Windows	33	10-May-12	26-Jun-12
Metal Framing at Cobra Head Roof and High Roof Clerestor	52	21-Jun-12	04-Sep-12
Cobra Head Roof - Install Roofing System	9	06-Aug-12	16-Aug-12
Area C - Install Low Roofing System	3	30-Aug-12	04-Sep-12
Area A - Install Roofing system	4	04-Sep-12	07-Sep-12
Install Canopies Roofing System / Caulk Clerestory Windov	5	05-Sep-12	11-Sep-12
Detail Roof System	20	19-Sep-12	16-Oct-12



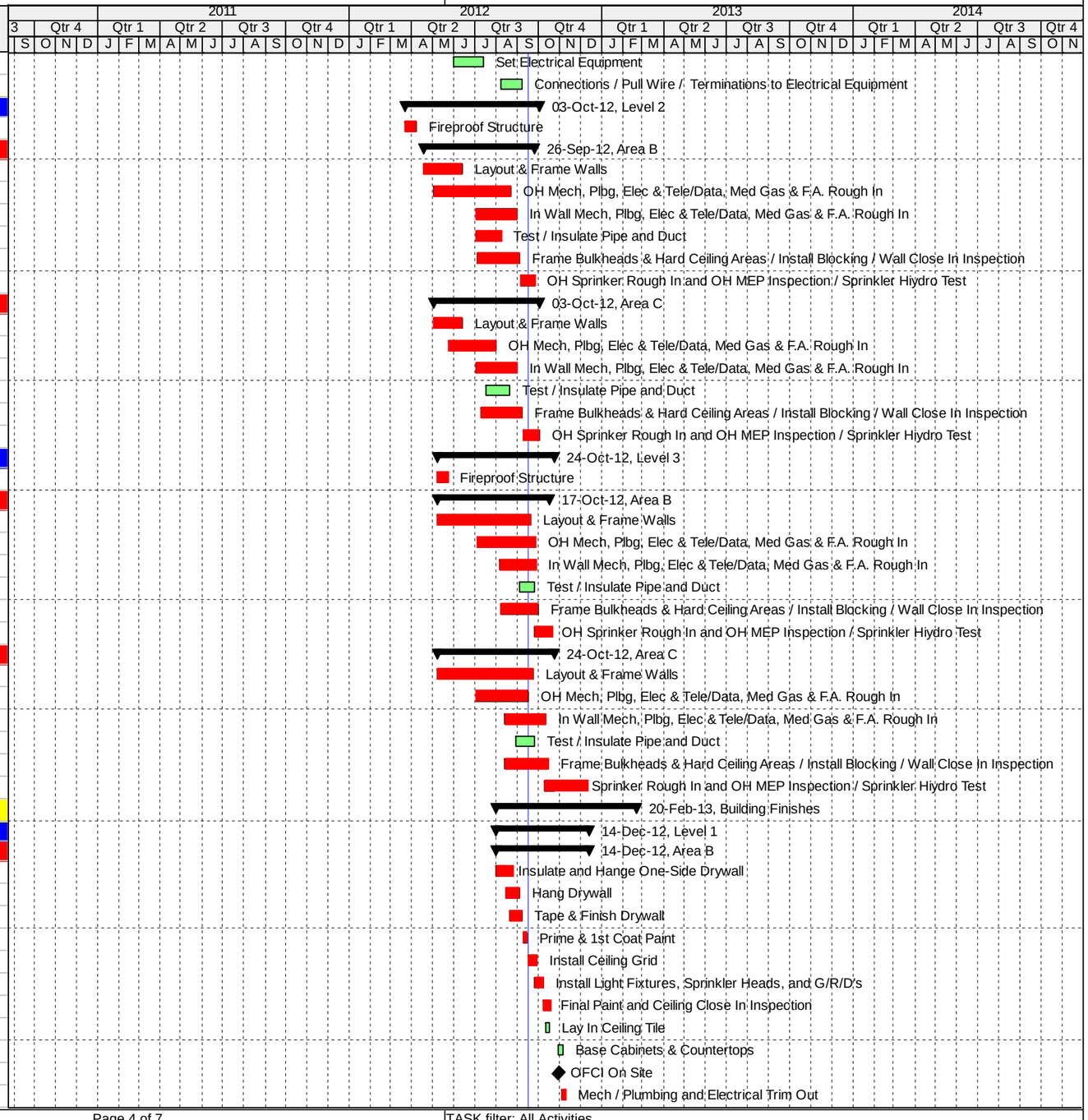
Actual Work | Critical Remaining Work | Summary
Remaining Work | Milestone

TASK filter: All Activities

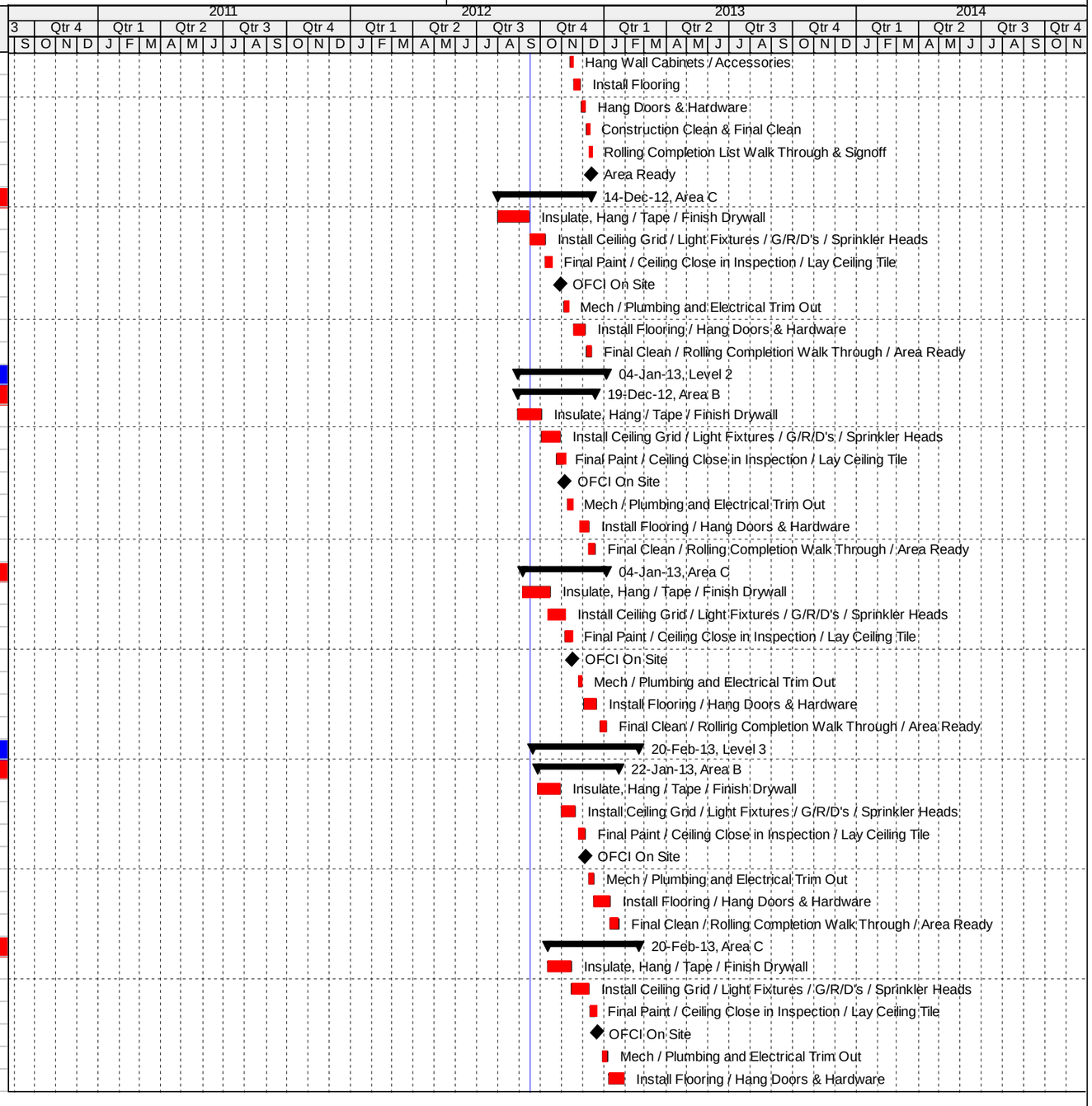
Activity Name	Original Duration	Start	Finish
Building Watertight	0	20-Sep-12	20-Sep-12
M/E/P & FP Rough Ins	178	05-Mar-12	12-Nov-12
Level 1	178	05-Mar-12	12-Nov-12
Fireproof Structure	15	09-Mar-12	29-Mar-12
Area C	129	15-Mar-12	14-Sep-12
Layout & Frame Walls	52	15-Mar-12	25-May-12
OH Mech, Plbg, Elec & Tele/Data, Med Gas & F.A. Ro	70	12-Apr-12	20-Jul-12
In Wall Mech, Plbg, Elec & Tele/Data, Med Gas & F.A.	62	17-Apr-12	13-Jul-12
Test / Insulate Pipe and Duct	36	22-May-12	12-Jul-12
Frame Bulkheads & Hard Ceiling Areas / Install Blocki	46	29-Jun-12	04-Sep-12
OH Sprinker Rough In and OH MEP Inspection / Sprir	23	14-Aug-12	14-Sep-12
Main Mechanical / Plumbing Room	79	24-May-12	14-Sep-12
Set Mechanical and Plumbing Equipment	55	24-May-12	10-Aug-12
Connections to Mechanical and Plumbing Equipment	16	23-Aug-12	14-Sep-12
Finish Room Drywall / Paint	5	04-Sep-12	10-Sep-12
Area B	131	05-Mar-12	06-Sep-12
Lay Out Walls	9	05-Mar-12	15-Mar-12
OH Plumbing Rough In	78	13-Mar-12	29-Jun-12
OH Elec & Tele / Data Rough In	92	13-Mar-12	20-Jul-12
OH Mech Rough In	69	23-Mar-12	28-Jun-12
Frame Walls	5	28-Jun-12	05-Jul-12
In Wall Elec Rough In	52	04-Apr-12	15-Jun-12
OH F.A. & Med Gas System Rough In	67	09-Apr-12	12-Jul-12
In Wall Mech / Plumbing Rough In	51	18-Apr-12	28-Jun-12
Set Door Frames	24	20-Apr-12	23-May-12
Pipe and Duct Testing / Insulation	48	02-May-12	10-Jul-12
In Wall Med Gas Rough In	41	16-May-12	13-Jul-12
Frame Bulkheads and Hard Ceilings	50	25-Jun-12	04-Sep-12
Install Blocking	12	16-Jul-12	31-Jul-12
Wall Close In Inspection	15	26-Jul-12	15-Aug-12
OH Sprinker Rough In and OH MEP Inspection / Sprir	22	07-Aug-12	06-Sep-12
Area B - Imaging Equipment	59	21-Aug-12	12-Nov-12
MRI Suite - Frame and One Side Drywall	10	21-Aug-12	04-Sep-12
Install RFI Shielding	7	05-Sep-12	13-Sep-12
Install Interior Wall Framing, Cryogen Piping, Ductwor	2	14-Sep-12	17-Sep-12
In Wall Elec Rough In / Inspection	4	21-Sep-12	26-Sep-12
Hang/Tape and Finish Drywall	5	27-Sep-12	03-Oct-12
Install Ceiling Grid and Prime Paint Room	4	02-Oct-12	05-Oct-12
Install Lead Lined Wall / MEP Trim @ Ceiling / Ceiling	8	05-Oct-12	16-Oct-12
Install Millwork, Ceiling Grid and Ceiling Tile	5	10-Oct-12	16-Oct-12
Install Rubber Sheet Flooring	5	17-Oct-12	23-Oct-12
Install MEP @ Ceiling / Install & Connect MRI	5	22-Oct-12	26-Oct-12
Install RF Panels / Ceiling Close in Inspection	5	26-Oct-12	01-Nov-12
Install Millwork & CT Scanner / Drywall & Finish / Lay	7	29-Oct-12	06-Nov-12
Install Rubber Sheet Flooring	5	06-Nov-12	12-Nov-12
Main Electrical Room	82	14-May-12	07-Sep-12
Finish Room Drywall / Paint	5	14-May-12	18-May-12



Activity Name	Original Duration	Start	Finish
Set Electrical Equipment	31	31-May-12	13-Jul-12
Connections / Pull Wire / Terminations to Electrical Eq	22	08-Aug-12	07-Sep-12
Level 2	137	22-Mar-12	03-Oct-12
Fireproof Structure	12	22-Mar-12	06-Apr-12
Area B	114	17-Apr-12	26-Sep-12
Layout & Frame Walls	41	17-Apr-12	13-Jun-12
OH Mech, Plbg, Elec & Tele/Data, Med Gas & F.A. Ro	78	03-May-12	22-Aug-12
In Wall Mech, Plbg, Elec & Tele/Data, Med Gas & F.A.	44	02-Jul-12	31-Aug-12
Test / Insulate Pipe and Duct	26	03-Jul-12	08-Aug-12
Frame Bulkheads & Hard Ceiling Areas / Install Blocki	43	05-Jul-12	04-Sep-12
OH Sprinker Rough In and OH MEP Inspection / Sprir	16	05-Sep-12	26-Sep-12
Area C	108	02-May-12	03-Oct-12
Layout & Frame Walls	29	02-May-12	12-Jun-12
OH Mech, Plbg, Elec & Tele/Data, Med Gas & F.A. Ro	47	24-May-12	31-Jul-12
In Wall Mech, Plbg, Elec & Tele/Data, Med Gas & F.A.	43	03-Jul-12	31-Aug-12
Test / Insulate Pipe and Duct	24	18-Jul-12	20-Aug-12
Frame Bulkheads & Hard Ceiling Areas / Install Blocki	43	10-Jul-12	07-Sep-12
OH Sprinker Rough In and OH MEP Inspection / Sprir	18	10-Sep-12	03-Oct-12
Level 3	119	08-May-12	24-Oct-12
Fireproof Structure	11	08-May-12	22-May-12
Area B	114	08-May-12	17-Oct-12
Layout & Frame Walls	95	08-May-12	20-Sep-12
OH Mech, Plbg, Elec & Tele/Data, Med Gas & F.A. Ro	60	05-Jul-12	27-Sep-12
In Wall Mech, Plbg, Elec & Tele/Data, Med Gas & F.A.	38	06-Aug-12	27-Sep-12
Test / Insulate Pipe and Duct	16	04-Sep-12	25-Sep-12
Frame Bulkheads & Hard Ceiling Areas / Install Blocki	39	07-Aug-12	01-Oct-12
OH Sprinker Rough In and OH MEP Inspection / Sprir	16	26-Sep-12	17-Oct-12
Area C	119	08-May-12	24-Oct-12
Layout & Frame Walls	97	08-May-12	24-Sep-12
OH Mech, Plbg, Elec & Tele/Data, Med Gas & F.A. Ro	54	02-Jul-12	17-Sep-12
In Wall Mech, Plbg, Elec & Tele/Data, Med Gas & F.A.	42	14-Aug-12	11-Oct-12
Test / Insulate Pipe and Duct	20	29-Aug-12	26-Sep-12
Frame Bulkheads & Hard Ceiling Areas / Install Blocki	45	13-Aug-12	15-Oct-12
OH Sprinker Rough In and OH MEP Inspection / Sprir	11	10-Oct-12	24-Oct-12
Building Finishes	142	01-Aug-12	20-Feb-13
Level 1	96	01-Aug-12	14-Dec-12
Area B	96	01-Aug-12	14-Dec-12
Insulate and Hange One-Side Drywall	10	01-Aug-12	14-Aug-12
Hang Drywall	14	15-Aug-12	04-Sep-12
Tape & Finish Drywall	14	20-Aug-12	07-Sep-12
Prime & 1st Coat Paint	5	10-Sep-12	14-Sep-12
Install Ceiling Grid	10	17-Sep-12	28-Sep-12
Install Light Fixtures, Sprinkler Heads, and G/R/D's	10	25-Sep-12	08-Oct-12
Final Paint and Ceiling Close In Inspection	5	09-Oct-12	15-Oct-12
Lay In Ceiling Tile	5	11-Oct-12	17-Oct-12
Base Cabinets & Countertops	5	30-Oct-12	05-Nov-12
OFCI On Site	1	30-Oct-12	30-Oct-12
Mech / Plumbing and Electrical Trim Out	5	05-Nov-12	09-Nov-12



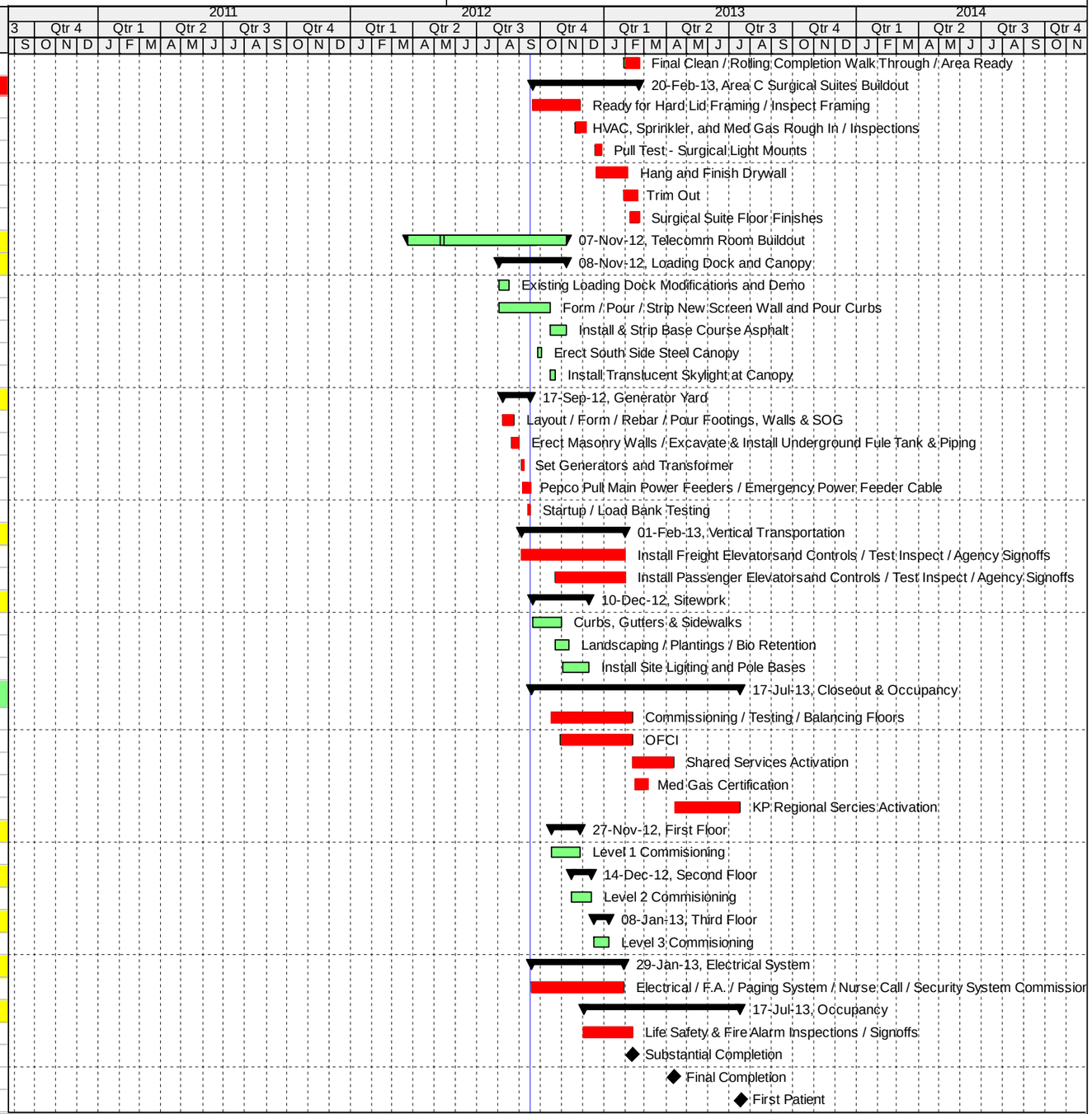
Activity Name	Original Duration	Start	Finish
Hang Wall Cabinets / Accessories	4	13-Nov-12	16-Nov-12
Install Flooring	6	19-Nov-12	27-Nov-12
Hang Doors & Hardware	5	29-Nov-12	05-Dec-12
Construction Clean & Final Clean	4	06-Dec-12	11-Dec-12
Rolling Completion List Walk Through & Signoff	3	12-Dec-12	14-Dec-12
Area Ready	1	14-Dec-12	14-Dec-12
Area C	96	01-Aug-12	14-Dec-12
Insulate, Hang / Tape / Finish Drywall	32	01-Aug-12	14-Sep-12
Install Ceiling Grid / Light Fixtures / G/R/D's / Sprinkle	16	17-Sep-12	08-Oct-12
Final Paint / Ceiling Close in Inspection / Lay Ceiling Ti	7	09-Oct-12	17-Oct-12
OFCI On Site	1	30-Oct-12	30-Oct-12
Mech / Plumbing and Electrical Trim Out	5	05-Nov-12	09-Nov-12
Install Flooring / Hang Doors & Hardware	12	19-Nov-12	05-Dec-12
Final Clean / Rolling Completion Walk Through / Area	7	06-Dec-12	14-Dec-12
Level 2	88	30-Aug-12	04-Jan-13
Area B	78	30-Aug-12	19-Dec-12
Insulate, Hang / Tape / Finish Drywall	23	30-Aug-12	02-Oct-12
Install Ceiling Grid / Light Fixtures / G/R/D's / Sprinkle	20	03-Oct-12	30-Oct-12
Final Paint / Ceiling Close in Inspection / Lay Ceiling Ti	7	25-Oct-12	02-Nov-12
OFCI On Site	1	05-Nov-12	05-Nov-12
Mech / Plumbing and Electrical Trim Out	5	09-Nov-12	15-Nov-12
Install Flooring / Hang Doors & Hardware	10	27-Nov-12	10-Dec-12
Final Clean / Rolling Completion Walk Through / Area	7	11-Dec-12	19-Dec-12
Area C	85	05-Sep-12	04-Jan-13
Insulate, Hang / Tape / Finish Drywall	29	05-Sep-12	15-Oct-12
Install Ceiling Grid / Light Fixtures / G/R/D's / Sprinkle	16	16-Oct-12	06-Nov-12
Final Paint / Ceiling Close in Inspection / Lay Ceiling Ti	7	07-Nov-12	15-Nov-12
OFCI On Site	1	16-Nov-12	16-Nov-12
Mech / Plumbing and Electrical Trim Out	5	26-Nov-12	30-Nov-12
Install Flooring / Hang Doors & Hardware	15	03-Dec-12	21-Dec-12
Final Clean / Rolling Completion Walk Through / Area	7	26-Dec-12	04-Jan-13
Level 3	107	20-Sep-12	20-Feb-13
Area B	80	28-Sep-12	22-Jan-13
Insulate, Hang / Tape / Finish Drywall	23	28-Sep-12	30-Oct-12
Install Ceiling Grid / Light Fixtures / G/R/D's / Sprinkle	16	31-Oct-12	21-Nov-12
Final Paint / Ceiling Close in Inspection / Lay Ceiling Ti	7	26-Nov-12	04-Dec-12
OFCI On Site	1	05-Dec-12	05-Dec-12
Mech / Plumbing and Electrical Trim Out	5	11-Dec-12	17-Dec-12
Install Flooring / Hang Doors & Hardware	16	18-Dec-12	10-Jan-13
Final Clean / Rolling Completion Walk Through / Area	8	11-Jan-13	22-Jan-13
Area C	91	12-Oct-12	20-Feb-13
Insulate, Hang / Tape / Finish Drywall	25	12-Oct-12	15-Nov-12
Install Ceiling Grid / Light Fixtures / G/R/D's / Sprinkle	17	16-Nov-12	11-Dec-12
Final Paint / Ceiling Close in Inspection / Lay Ceiling Ti	7	12-Dec-12	20-Dec-12
OFCI On Site	1	21-Dec-12	21-Dec-12
Mech / Plumbing and Electrical Trim Out	5	31-Dec-12	07-Jan-13
Install Flooring / Hang Doors & Hardware	16	08-Jan-13	29-Jan-13



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

TASK filter: All Activities

Activity Name	Original Duration	Start	Finish
Final Clean / Rolling Completion Walk Through / Area	16	30-Jan-13	20-Feb-13
Area C Surgical Suites Buildout	107	20-Sep-12	20-Feb-13
Ready for Hard Lid Framing / Inspect Framing	49	20-Sep-12	28-Nov-12
HVAC, Sprinkler, and Med Gas Rough In / Inspections	5	21-Nov-12	28-Nov-12
Pull Test - Surgical Light Mounts	7	19-Dec-12	28-Dec-12
Hang and Finish Drywall	30	21-Dec-12	04-Feb-13
Trim Out	12	30-Jan-13	14-Feb-13
Surgical Suite Floor Finishes	9	08-Feb-13	20-Feb-13
Telecomm Room Buildout	161	23-Mar-12	07-Nov-12
Loading Dock and Canopy	70	02-Aug-12	08-Nov-12
Existing Loading Dock Modifications and Demo	12	02-Aug-12	17-Aug-12
Form / Pour / Strip New Screen Wall and Pour Curbs	52	02-Aug-12	15-Oct-12
Install & Strip Base Course Asphalt	18	16-Oct-12	08-Nov-12
Erect South Side Steel Canopy	3	28-Sep-12	02-Oct-12
Install Translucent Skylight at Canopy	5	16-Oct-12	22-Oct-12
Generator Yard	29	07-Aug-12	17-Sep-12
Layout / Form / Rebar / Pour Footings, Walls & SOG	13	07-Aug-12	23-Aug-12
Erect Masonry Walls / Excavate & Install Underground Fule	10	20-Aug-12	31-Aug-12
Set Generators and Transformer	2	04-Sep-12	05-Sep-12
Pepco Pull Main Power Feeders / Emergency Power Feede	6	06-Sep-12	13-Sep-12
Startup / Load Bank Testing	2	14-Sep-12	17-Sep-12
Vertical Transportation	106	04-Sep-12	01-Feb-13
Install Freight Elevatorsand Controls / Test Inspect / Agency	106	04-Sep-12	01-Feb-13
Install Passenger Elevatorsand Controls / Test Inspect / Ag	71	23-Oct-12	01-Feb-13
Sitework	56	21-Sep-12	10-Dec-12
Curbs, Gutters & Sidewalks	30	21-Sep-12	01-Nov-12
Landscaping / Plantings / Bio Retention	15	23-Oct-12	12-Nov-12
Install Site Ligiting and Pole Bases	26	02-Nov-12	10-Dec-12
Closeout & Occupancy	212	18-Sep-12	17-Jul-13
Commissioning / Testing / Balancing Floors	80	18-Oct-12	11-Feb-13
OFCI	72	30-Oct-12	11-Feb-13
Shared Services Activation	44	12-Feb-13	12-Apr-13
Med Gas Certification	11	15-Feb-13	01-Mar-13
KP Regional Sercies Activation	65	15-Apr-13	16-Jul-13
First Floor	28	18-Oct-12	27-Nov-12
Level 1 Commisioning	28	18-Oct-12	27-Nov-12
Second Floor	20	16-Nov-12	14-Dec-12
Level 2 Commisioning	20	16-Nov-12	14-Dec-12
Third Floor	14	18-Dec-12	08-Jan-13
Level 3 Commisioning	14	18-Dec-12	08-Jan-13
Electrical System	93	18-Sep-12	29-Jan-13
Electrical / F.A. / Paging System / Nurse Call / Security Syst	93	18-Sep-12	29-Jan-13
Occupancy	158	04-Dec-12	17-Jul-13
Life Safety & Fire Alarm Inspections / Signoffs	48	04-Dec-12	11-Feb-13
Substantial Completion	1	11-Feb-13	11-Feb-13
Final Completion	1	12-Apr-13	12-Apr-13
First Patient	1	17-Jul-13	17-Jul-13



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

TASK filter: All Activities

Appendix B – Detailed Structural Systems Estimate

Detailed Structural Systems Estimate

Unit Detail Report

Cost Estimate Report CostWorks RSMeans

Largo,

Year 2012

Date: 11-Oct-12

Concrete Estimate

Prepared By:
Topher Pozza
State

LineNumber			Description	Quantity	Unit	Total Incl. O&P	Ext. Total Incl. O&P
Division 03 Concrete							
031113357070			C.I.P. concrete forms, elevated slab, edge forms, 7" to 12" high, 1 use, includes shoring, erecting, bracing, stripping and cleaning	2,640.00	SFCA	$9.90	$26,136.00
031113450150			C.I.P. concrete forms, footing, continuous wall, plywood, 4 use, includes erecting, bracing, stripping and cleaning	6,480.00	SFCA	$4.97	$32,205.60
031113653000			C.I.P. concrete forms, slab on grade, edge, wood, to 6" high, 4 use, includes erecting, bracing, stripping and cleaning	1,050.00	L.F.	$2.70	$2,835.00
032205500100			Welded wire fabric, sheets, 6 x 6 - W1.4 x W1.4 (10 x 10) 121 lb. per C.S.F., A185, incl labor for accessories, excl material for accessories	115.00	C.S.F.	$42.16	$4,848.40
032205500300			Welded wire fabric, sheets, 6 x 6 - W2.9 x W2.9 (6 x 6) 42 lb. per C.S.F., A185, incl labor for accessories, excl material for accessories	42.00	C.S.F.	$58.87	$2,472.54
033053400920			Structural concrete, in place, column (4000 psi), square, avg reinforcing, 24" x 24", includes forms(4 uses), reinforcing steel, concrete, placing and finishing	21.00	C.Y.	$1,276.42	$26,804.82
033053401000			Structural concrete, in place, column (4000 psi), square, min reinforcing, 36" x 36", includes forms(4 uses), reinforcing steel, concrete, placing and finishing	20.00	C.Y.	$646.84	$12,936.80
033053403540			Structural concrete, in place, equipment pad (3000 psi), 3' x 3' x 6", includes forms, reinforcing steel, concrete, placing and finishing	25.00	Ea.	$122.45	$3,061.25
033053403940			Structural concrete, in place, continuous strip footing (3000 psi), 24" wide x 12" deep, reinforced, includes forms, reinforcing steel, concrete, placing and finishing	25.00	C.Y.	$322.45	$8,061.25
033053403950			Structural concrete, in place, continuous strip footing (3000 psi), 36" wide x 12" deep, reinforced, includes forms, reinforcing steel, concrete, placing and finishing	85.00	C.Y.	$290.45	$24,688.25
033053404250			Structural concrete, in place, free-standing wall (3000 psi), 8" thick x 14' high, includes forms(4 uses), reinforcing steel, concrete, placing and finishing	30.00	C.Y.	$716.88	$21,506.40

LineNumber			Description	Quantity	Unit	Total Incl. O&P	Ext. Total Incl. O&P
033105350150			Structural concrete, ready mix, normal weight, 3000 psi, includes local aggregate, sand, Portland cement and water, delivered, excludes all additives and treatments	660.00	C.Y.	$150.19	$99,125.40
033105700800			Structural concrete, placing, column, square or round, pumped, 24" thick, includes strike off & consolidation, excludes material	180.00	C.Y.	$40.60	$7,308.00
033105701000			Structural concrete, placing, column, square or round, pumped, 36" thick, includes strike off & consolidation, excludes material	72.00	C.Y.	$26.85	$1,933.20
033105701400			Structural concrete, placing, elevated slab, pumped, less than 6" thick, includes strike off & consolidation, excludes material	1,615.00	C.Y.	$26.85	$43,362.75
033105702150			Structural concrete, placing, continuous footing, deep, pumped, includes strike off & consolidation, excludes material	440.00	C.Y.	$23.35	$10,274.00
033105703250			Structural concrete, placing, grade beam, pumped, includes strike off & consolidation, excludes material	270.00	C.Y.	$20.81	$5,618.70
033105705100			Structural concrete, placing, walls, pumped, 12" thick, includes strike off & consolidation, excludes material	25.00	C.Y.	$34.00	$850.00
033116100760			Structural concrete, ready mix, lightweight, 110 #/C.F., 3000 psi, includes lightweight aggregate, sand, portland cement and water, excludes all additives and treatments	1,612.00	C.Y.	$197.13	$317,773.56
033529300200			Concrete finishing, floors, basic finishing for unspecified flatwork, bull float, manual float & manual steel trowel, excludes placing, striking off & consolidating	141,500.00	S.F.	$0.90	$127,350.00
Division 03 Subtotal							**$779,151.92**

Unit Detail Report

Cost Estimate Report CostWorks RSMeans

Largo,

Year 2012

Date: 11-Oct-12

Steel Framing

Prepared By:
Topher Pozza
State

LineNumber			Description	Quantity	Unit	Total Incl. O&P	Ext. Total Incl. O&P
Division 05 Metals							
050521900300			Welding structural steel in field, cost per welder, 1/8" dia, type 6011, incl 1 operating engineer	500.00	Hr.	$168.48	$84,240.00
050523050080			Anchor bolts, hooked type, single, 3/4" diameter x 12" long, installed in fresh concrete, includes nut and washer, excludes template	208.00	Ea.	$8.53	$1,774.24
051223170930			Column, structural, concrete filled, 6" dia, extra strong pipe, incl shop primer, cap & base plate, excludes bolts	70.00	L.F.	$73.52	$5,146.40
051223171950			Column, structural, 12" dia x 18'-0" H, extra strong pipe, incl shop primer, cap & base plate, excludes bolts	17.00	Ea.	$1,524.19	$25,911.23
051223174550			Column, structural tubing, 6" x 6" x 1/4" x 12'-0", incl shop primer, cap & base plate, bolts	40.00	Ea.	$425.98	$17,039.20
051223174600			Column, structural tubing, 8" x 8" x 3/8" x 14'-0", incl shop primer, cap & base plate, bolts	14.00	Ea.	$807.59	$11,306.26
051223175600			Column, structural tubing, 8" x 4" x 3/8" x 12'-0", incl shop primer, cap & base plate, bolts	2.00	Ea.	$537.52	$1,075.04
051223175700			Column, structural tubing, 12" x 8" x 1/2" x 16'-0", incl shop primer, cap & base plate, bolts	33.00	Ea.	$1,387.58	$45,790.14
051223177000			Column, structural, 2-tier, W10x45, A992 steel, incl shop primer, splice plates, bolts	580.00	L.F.	$64.02	$37,131.60
051223177050			Column, structural, 2-tier, W10x68, A992 steel, incl shop primer, splice plates, bolts	30.00	L.F.	$94.31	$2,829.30
051223177250			Column, structural, 2-tier, W12x120, A992 steel, incl shop primer, splice plates, bolts	54.00	L.F.	$162.26	$8,762.04
051223177300			Column, structural, 2-tier, W12x190, A992 steel, incl shop primer, splice plates, bolts	347.00	L.F.	$252.69	$87,683.43
051223750320			Structural steel member, 100-ton project, 1 to 2 story building, W8x15, A992 steel, shop fabricated, incl shop primer, bolted connections	460.00	L.F.	$29.03	$13,353.80
051223750360			Structural steel member, 100-ton project, 1 to 2 story building, W8x24, A992 steel, shop fabricated, incl shop primer, bolted connections	60.00	L.F.	$41.93	$2,515.80

LineNumber			Description	Quantity	Unit	Total Incl. O&P	Ext. Total Incl. O&P
051223750600			Structural steel member, 100-ton project, 1 to 2 story building, W10x12, A992 steel, shop fabricated, incl shop primer, bolted connections	139.00	L.F.	$25.29	$3,515.31
051223750700			Structural steel member, 100-ton project, 1 to 2 story building, W10x22, A992 steel, shop fabricated, incl shop primer, bolted connections	8.00	L.F.	$38.46	$307.68
051223750740			Structural steel member, 100-ton project, 1 to 2 story building, W10x33, A992 steel, shop fabricated, incl shop primer, bolted connections	157.00	L.F.	$53.51	$8,401.07
051223750740			Structural steel member, 100-ton project, 1 to 2 story building, W10x33, A992 steel, shop fabricated, incl shop primer, bolted connections	485.00	L.F.	$53.51	$25,952.35
051223751100			Structural steel member, 100-ton project, 1 to 2 story building, W12x16, A992 steel, shop fabricated, incl shop primer, bolted connections	930.00	L.F.	$27.23	$25,323.90
051223751300			Structural steel member, 100-ton project, 1 to 2 story building, W12x22, A992 steel, shop fabricated, incl shop primer, bolted connections	228.00	L.F.	$35.38	$8,066.64
051223751500			Structural steel member, 100-ton project, 1 to 2 story building, W12x26, A992 steel, shop fabricated, incl shop primer, bolted connections	659.00	L.F.	$40.53	$26,709.27
051223751520			Structural steel member, 100-ton project, 1 to 2 story building, W12x35, A992 steel, shop fabricated, incl shop primer, bolted connections	566.00	L.F.	$52.67	$29,811.22
051223751560			Structural steel member, 100-ton project, 1 to 2 story building, W12x50, A992 steel, shop fabricated, incl shop primer, bolted connections	172.00	L.F.	$72.60	$12,487.20
051223751580			Structural steel member, 100-ton project, 1 to 2 story building, W12x58, A992 steel, shop fabricated, incl shop primer, bolted connections	39.00	L.F.	$82.90	$3,233.10
051223751740			Structural steel member, 100-ton project, 1 to 2 story building, W12x87, A992 steel, shop fabricated, incl shop primer, bolted connections	141.00	L.F.	$122.41	$17,259.81
051223751900			Structural steel member, 100-ton project, 1 to 2 story building, W14x26, A992 steel, shop fabricated, incl shop primer, bolted connections	1,103.00	L.F.	$39.80	$43,899.40
051223752100			Structural steel member, 100-ton project, 1 to 2 story building, W14x30, A992 steel, shop fabricated, incl shop primer, bolted connections	14.00	L.F.	$45.54	$637.56
051223752320			Structural steel member, 100-ton project, 1 to 2 story building, W14x43, A992 steel, shop fabricated, incl shop primer, bolted connections	119.00	L.F.	$62.97	$7,493.43

LineNumber			Description	Quantity	Unit	Total Incl. O&P	Ext. Total Incl. O&P
051223752380			Structural steel member, 100-ton project, 1 to 2 story building, W14x90, A992 steel, shop fabricated, incl shop primer, bolted connections	47.00	L.F.	$124.59	$5,855.73
051223752700			Structural steel member, 100-ton project, 1 to 2 story building, W16x26, A992 steel, shop fabricated, incl shop primer, bolted connections	4,135.00	L.F.	$39.74	$164,324.90
051223752900			Structural steel member, 100-ton project, 1 to 2 story building, W16x31, A992 steel, shop fabricated, incl shop primer, bolted connections	2,962.00	L.F.	$46.83	$138,710.46
051223753100			Structural steel member, 100-ton project, 1 to 2 story building, W16x40, A992 steel, shop fabricated, incl shop primer, bolted connections	424.00	L.F.	$59.23	$25,113.52
051223753300			Structural steel member, 100-ton project, 1 to 2 story building, W18x35, A992 steel, shop fabricated, incl shop primer, bolted connections	464.00	L.F.	$53.74	$24,935.36
051223753500			Structural steel member, 100-ton project, 1 to 2 story building, W18x40, A992 steel, shop fabricated, incl shop primer, bolted connections	825.00	L.F.	$60.18	$49,648.50
051223753520			Structural steel member, 100-ton project, 1 to 2 story building, W18x46, A992 steel, shop fabricated, incl shop primer, bolted connections	70.00	L.F.	$67.90	$4,753.00
051223753700			Structural steel member, 100-ton project, 1 to 2 story building, W18x50, A992 steel, shop fabricated, incl shop primer, bolted connections	624.00	L.F.	$73.51	$45,870.24
051223753920			Structural steel member, 100-ton project, 1 to 2 story building, W18x65, A992 steel, shop fabricated, incl shop primer, bolted connections	35.00	L.F.	$93.36	$3,267.60
051223754100			Structural steel member, 100-ton project, 1 to 2 story building, W21x44, A992 steel, shop fabricated, incl shop primer, bolted connections	1,532.00	L.F.	$64.51	$98,829.32
051223754300			Structural steel member, 100-ton project, 1 to 2 story building, W21x50, A992 steel, shop fabricated, incl shop primer, bolted connections	112.00	L.F.	$72.23	$8,089.76
051223754500			Structural steel member, 100-ton project, 1 to 2 story building, W21x62, A992 steel, shop fabricated, incl shop primer, bolted connections	1,870.00	L.F.	$88.33	$165,177.10
051223754700			Structural steel member, 100-ton project, 1 to 2 story building, W21x68, A992 steel, shop fabricated, incl shop primer, bolted connections	973.00	L.F.	$96.05	$93,456.65
051223754720			Structural steel member, 100-ton project, 1 to 2 story building, W21x83, A992 steel, shop fabricated, incl shop primer, bolted connections	72.00	L.F.	$116.08	$8,357.76

LineNumber			Description	Quantity	Unit	Total Incl. O&P	Ext. Total Incl. O&P
051223754780			Structural steel member, 100-ton project, 1 to 2 story building, W21x122, A992 steel, shop fabricated, incl shop primer, bolted connections	25.00	L.F.	$166.70	$4,167.50
051223754780			Structural steel member, 100-ton project, 1 to 2 story building, W21x122, A992 steel, shop fabricated, incl shop primer, bolted connections	937.00	L.F.	$166.70	$156,197.90
051223755300			Structural steel member, 100-ton project, 1 to 2 story building, W24x68, A992 steel, shop fabricated, incl shop primer, bolted connections	432.00	L.F.	$95.53	$41,268.96
051223774300			Column base plates, structural, light, 100-ton project, up to 150 lb each, A992 steel, shop fabricated, incl shop primer	14,263.00	Lb.	$1.95	$27,812.85
053113505900			Metal floor decking, steel, non-cellular, composite, galvanized, 3" D, 18 gauge	76,000.00	S.F.	$3.38	$256,880.00
053123503300			Metal roof decking, steel, open type N wide rib, galvanized, under 50 Sq, 3" D, 20 gauge	38,000.00	S.F.	$3.50	$133,000.00
055113500300			Stair, shop fabricated, steel, 4'-0" W, incl picket railing, stringers, metal pan treads, excl concrete for pan treads, per riser	4.00	Riser	$657.33	$2,629.32
Division 05 Subtotal							**$2,016,002.85**
Division 07 Thermal and Moisture Protection							
077233100600			Roof Hatches, with curb, 1" fiberglass insulation, aluminum curb & cover, 2'-6" x 4'-6"	2.00	Ea.	$1,223.92	$2,447.84
Division 07 Subtotal							**$2,447.84**

Appendix C – General Conditions Estimate

General Conditions Estimate

General Condition Estimate

Date: 10-Oct-12

Line Number			Description	Quantity	Unit	Total Incl. O&P	Ext. Total Incl. O&P
Division 01 General Requirements							
013113200020			Field Personnel, clerk, average	80	Week	$650.00	$52,000.00
013113200140			Field personnel, field engineer, maximum	95	Week	$2,275.00	$216,125.00
013113200140			Field personnel, field engineer, maximum	95	Week	$2,275.00	$216,125.00
013113200140			Field personnel, field engineer, maximum	60	Week	$2,275.00	$136,500.00
013113200200			Field personnel, project manager, average	70	Week	$3,275.00	$229,250.00
013113200220			Field personnel, project manager, maximum	100	Week	$3,750.00	$375,000.00
013113200240			Field personnel, superintendent, minimum	25	Week	$2,775.00	$69,375.00
013113200280			Field personnel, superintendent, maximum	95	Week	$3,475.00	$330,125.00
013113200280			Field personnel, superintendent, maximum	91	Week	$3,475.00	$316,225.00
013113200280			Field personnel, superintendent, maximum	91	Week	$3,475.00	$316,225.00
013113200280			Field personnel, superintendent, maximum	20	Week	$3,475.00	$69,500.00
Division 01 General Requirements Subtotal							$2,326,450.00

Temporary Facilities

Date: 10-Oct-12

Line Number			Description	Quantity	Unit	Total Incl. O&P	Ext. Total Incl. O&P
Division 01 General Requirements							
015212400122	U		Large Trailer Setup	1	Each	$25,000.00	$25,000.00
015212400132	U		Jobsite Setup/Tear Down	1	Each	$15,000.00	$15,000.00
015213200300			Office Trailer, furnished, buy, 32' x 8', excl. hookups	2	Ea.	$15,971.80	$31,943.60
015213200500			Office Trailer, furnished, buy, 50' x 12', excl. hookups	1	Ea.	$30,868.65	$30,868.65
015523000010	U		Offsite Parking	20	Month	$2,000.00	$40,000.00
015523000020	U		Jobsite Vehicles	70	Month	$800.00	$56,000.00
015523000030	U		Fuel	91	Month	$500.00	$45,500.00
Division 01 General Requirements Subtotal							$244,312.25

Temporary Utilities Estimate

Date: 10-Oct-12

Line Number			Description	Quantity	Unit	Total Incl. O&P	Ext. Total Incl. O&P
Division 01 General Requirements							
012123111000	U		Temporary Toilets (Building)	20	Month	$800.00	$16,000.00
012311111110	U		Water Consumption	20	Month	$400.00	$8,000.00
012312111110	U		Water Meter	1	Each	$15,000.00	$15,000.00
012354100000	U		Power Consumption	13	Month	$32,282.00	$419,666.00
015113100000	U		Temporary Generators	4	Month	$13,260.00	$53,040.00
015433110000	U		Temporary Toilets (Trailers)	20	Month	$400.00	$8,000.00
Division 01 General Requirements Subtotal							**$519,706.00**

Safety and Protection Estimate

Date: 10-Oct-12

Line Number			Description	Quantity	Unit	Total Incl. O&P	Ext. Total Incl. O&P
Division 01 General Requirements							
013113200160			Field personnel, general purpose laborer, average	84	Week	$2,125.00	$178,500.00
014523505900			Vibration monitoring, seismograph and technician	40	Day	$449.96	$17,998.40
015409500005	U		Safety Supplies and First Aid	20	Month	$500.00	$10,000.00
015423700005	U		Scaffold Stair Tower	16	Month	$750.00	$12,000.00
015616000005	U		Temporary Walkway Protection	300	LF	$125.00	$37,500.00
015626500015	U		Temporary Fence Installation	1	Each	$7,500.00	$7,500.00
015626500025	U		Site Signage	1	Each	$7,500.00	$7,500.00
Division 01 General Requirements Subtotal							**$270,998.40**
Division 10 Specialties							
104416131100			Fire extinguishers, dry chemical, pressurized, standard type, portable, painted, 20 lb	35	Ea.	$138.00	$4,830.00
Division 10 Specialties Subtotal							**$4,830.00**
Division 32 Exterior Improvements							
320130200420			Snow removal, sidewalks and drives, double driveway (20' x 50'), 10" - 15" deep, 24" power blower	188	Ea.	$190.11	$35,740.68
Division 32 Exterior Improvements Subtotal							**$35,740.68**

Cleaning Estimate

Date: 10-Oct-12

Line Number			Description	Quantity	Unit	Total Incl. O&P	Ext. Total Incl. O&P
Division 01 General Requirements							
013113200160			Field personnel, general purpose laborer, average	110	Week	$2,125.00	$233,750.00
015409600205	U		Debris Boxes	130	Each	$550.00	$71,500.00
017413200105	U		Final Clean	106700	SF	$0.51	$54,417.00
Division 01 General Requirements Subtotal							**$359,667.00**
Division 14 Conveying Equipment							
149182103000			Chutes, package, spiral type, max	2	Floor	$7,652.45	$15,304.90
Division 14 Conveying Equipment Subtotal							**$15,304.90**

General Expense Estimate

Date: 11-Oct-12

Line Number			Description	Quantity	Unit	Total Incl. O&P	Ext. Total Incl. O&P
Division 01 General Requirements							
011131110105	U		Blueprints throughout construction	10	Month	$1,500.00	$15,000.00
013233500600			Construction photographs, aerial photos, initial fly-over, 6 shots, 1 print ea., 16" x 20" prints	2	Set	$1,294.53	$2,589.06
015213200010	U		Office Furniture (all Trailers)	1	Each	$3,000.00	$3,000.00
015213200020	U		Network and Server	20	Month	$800.00	$16,000.00
015213200030	U		DSL Line Setup and Charges	1	Each	$5,000.00	$5,000.00
015213200040	U		Printer/Fax/Copy Machine	20	Month	$350.00	$7,000.00
015213200050	U		Jobsite Telephones	20	20	$250.00	$5,000.00
015213200060	U		Jobsite Telephones Service Setup	1	Each	$2,000.00	$2,000.00
015213200070	U		Postage/Federal Express	20	Month	$250.00	$5,000.00
015213200080	U		Meeting Supplies/Snacks/Coffee	20	Month	$300.00	$6,000.00
015213200090	U		Survey	1	Each	$40,000.00	$40,000.00
015213400100			Field Office Expense, office equipment rental, average	40	Month	$214.94	$8,597.60
Division 01 General Requirements Subtotal							**$115,186.66**

Appendix D – Level 1 Process Map

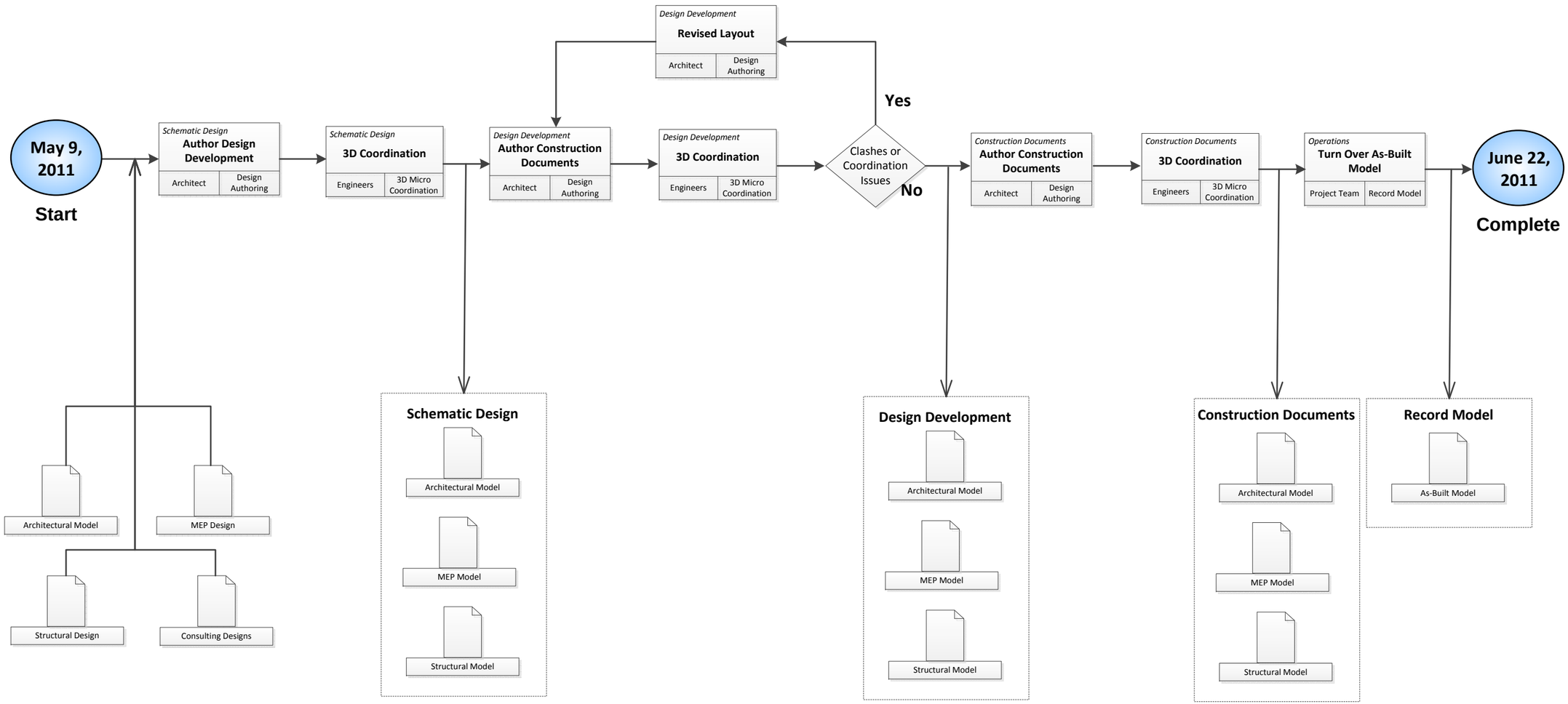
BIM Process Map

Level 1 Process Map: Kaiser Permanente Largo Medical Center

Largo, MD

Chris Pozza

Tech Report 2



October 12, 2012

Appendix E – BIM Uses Evaluation

BIM Uses Evaluation

BIM USE ANALYSIS
Version 2.0

BIM USE WORKSHEET

BIM Use*	Value to Project	Responsible Party	Value to Resp Party	Capability Rating			Additional Resources / Competencies Required to Implement	Notes	Proceed with Use
	High / Med / Low		High / Med / Low	Scale 1-3 (1 = Low)					YES / NO / MAYBE
				Resources	Competency	Experience			
3D Coordination (Design)	High	Architect	High	3	3	3	BIM Model and Analysis Programs to Help Determine Potetential Clashes Between Disciplines	Coordinating and modelling took place at the same time. Creating the BIM model took longer than originally anticipated due to the tasks happening simultaneously.	**YES**
		Structural	High	3	2	2			
		Mechanical	High	3	2	1			
		Electrical	High	3	2	2			
		BIM Engineer	High	3	3	3			
		Plumbing	High	3	3	3			
Design Authoring	High	Architect	High	3	3	3	Design plans and 3D modeling software to create overall BIM Model, Requires close collaboration between BIM users	Teamwork and experience allowed decisions to be made that were best for the project team and	**YES**
		BIM Engineer	High	3	3	3			
		Structural	High	3	2	2			
		Mechanical	High	3	2	1			
		Electrical	High	3	2	2			
		Plumbing	High	3	3	3			
3D Coordination (Construction)	High	Architect	High	3	3	3	BIM Engineer to lead meetings throughout design and construction. Members are to meet on site weekly in order to complete different building areas in their entirety.	Coordinating and modelling took place at the same time. There were a lot of coordination issues which slowed this process much more than expected.	**YES**
		BIM Engineer	High	3	3	3			
		Structural	High	3	2	2			
		Mechanical	High	3	2	1			
		Electrical	High	3	2	2			
		Plumbing	High	3	3	3			
Generate Shop Drawings	High	Architect	High	3	2	2	3D Model Manipulation Tools Ability to effectively communicate between design, construction, and facilities management teams	Changes are made to models during weekly meetings and noted in order to make changes to subcontractor models and produce up-to-date drawings.	**YES**
		Structural	High	3	2	1			
		Mechanical	High	3	3	1			
		Electrical	High	3	3	3			
		Plumbing	High	3	2	2			
Record Modeling	Low	Mechanical	Low	1	1	1	Ability to understand typical equipment operation and maintenance practices	General Contractor is not legally required to give model to owner, but will hand over once complete.	**YES**
		Lighting	Low	1	1	1			
		Structural	Low	1	1	1			
Virtual Mockup	Medium	BIM Engineer	Low	3	3	3	Drawings and Specs for specific systems to be constructed virtually	Originally a BIM Goal to construct virtual mockups, however this goal was never achieved	**NO**
		Architect	Low	3	3	3			
		Structural	Low	3	2	2			

* Additional BIM Uses as well as information on each Use can be found at http://www.engr.psu.edu/ae/cic/bimex/