Technical Assignment 2

Kaiser Permanente- Medical Office Building

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Executive Summary

The second technical report is meant to further analyze the Kaiser Permanente Medical Office Building and its construction process. Key components of the project will be explored to better understand the project details and its proficiency.

The project schedule will be in more depth than technical one report to comprehend the sequencing and work flow. The project does not follow a typical work sequence because time was a driving force throughout the project. Coordination and communication between trades was imperative to executing the schedule. The schedule structure will be looked into further in the report.

A general conditions estimate will be produced for the project in order to see what costs were associated with the General Contractor and their responsibilities. Another estimate will be a detailed structural system estimate for the new mechanical tower addition. A thorough analysis was done to fully understand the structural system and the costs associated with it.

Considering the wave of sustainable construction practices in the industry, a LEED scorecard evaluation for the project will be done. The project is following the Green Guide to Healthcare which is a subdivision of LEED. However, a LEED 2009 scorecard will be used to rate the building. This will be also be taken a step further by producing a scorecard based upon how the building could improve its LEED rating by adding sustainable features.

The project utilized BIM during its construction and a BIM execution plan is produced and reviewed in this report. The execution plan is imperative to understanding the purposes of BIM, the process used, the benefits provided and the future of BIM for this project.

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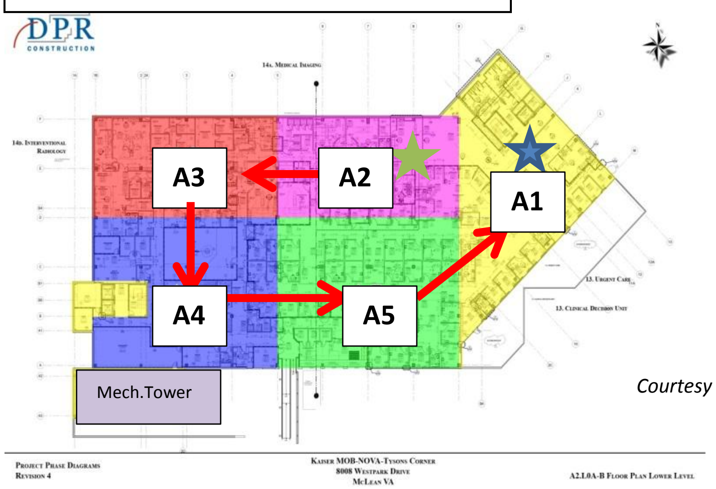
Detailed Project Schedule

***Please see Appendix A for Project Schedule

The Kaiser Permanente Tysons Corner project schedule was not a standard CPM schedule that defined distinct phases and used typical trade sequencing. Instead, a schedule was specifically developed to maximize productivity, minimize time and mold to the existing building's layout. This is due to the fact that this project required a strict deadline for substantial completion on March 15, 2012 to allow for Kaiser to move in and be ready for first patient on September 14, 2012. Even with the many change orders and bulletins that Kaiser Permanente initiated during construction, the deadline remained for substantial completion to be met on time, which required a schedule with flexibility.

This being stated, the detailed schedule that I developed is meant to reflect the typical schedule to be followed for each floor interior build-out as well as major phases including mechanical tower construction, miscellaneous exterior construction and important completion dates. For the interior build out phase, the schedule shows specifically the fifth floor typical activities associated with interior build out of the existing building. This is due to the layout and work flow remaining identical for the lower level up to the fifth floor so these activities will be repeated. The construction will be top down, which is reflected on the schedule with the fifth floor constructed first then succeeding floors. The workflow sequence on each level is seen in the figure below. The figure shows the typical floor layouts and how they were divided into quadrants in order to breakdown areas and assign a starting and ending point. The work flow begins at A2 indicated with a green star then flows counterclockwise around to A3, A4, A5, and finishes at A1 (blue star).

FIGURE 1: Typical Floor Divisions



Courtesy of DPR

Since timing was critical for the project, the work flow used was the best approach to minimize time spent between different trades work in a certain area. This layout made sequencing easy, organized, and time efficient because trades could follow one another and know where to work next. For example overhead rough-in was started in A2 and worked counterclockwise, directly followed by framing and blocking. It helped to keep each trade moving consistently and being pushed along by the following trade. It is important to note that once one task was begun the following task would begin as soon as the preceding task was far enough ahead, as seen in the schedule structure. Unfortunately with this following of trade setup, there were times when one trade could hold up another. An example was closing in coffers was delayed because of design setbacks. This delayed overhead rough-in to proceed and the framing track to be installed. In order to make up time, the schedule was adapted to move forward with rough-in on other quadrants/floors, frame priority walls in other quadrants/ floors, etc.

The other major phases that I incorporated on the schedule were happening throughout the interior build-out of the existing structure. The mechanical tower construction did not majorly effect the interior build-out construction since it was outside of the existing building footprint. The only significant activity was the removal of the precast panels on the existing structure where the mechanical tower attaches to the building. Also the mechanical tower relied on the MEP rough-in of the existing building to be fit out so that the mechanical in the tower could be connected to the existing structure equipment..

On each floor, the west side telecomm rooms were treated as part of the A1 quadrant as seen in yellow (Figure 1). This was decided because A1 was the last quadrant in the counter clockwise rotation to be constructed. The telecomm rooms needed to be done last because a large amounted of the wiring from the floor fed into this room, so all quadrants were done first as evidenced by the schedule.

The basement mechanical and electrical plant is another interesting phase because there is a lot of overlapping activities that would typically precede each other. As seen in the schedule, the basement mechanical/electrical room is toward the end of the schedule timeline and closer to completion dates. As a result, the overlapping of activities becomes more prevalent. For instance, F/R/P Concrete equipment pads is still taking place while mechanical rough in is beginning in the same area. Also, there are multiple pieces of equipment being installed while other equipment is being hoisted and set. This overlapping effect is what kept construction moving and deadlines kept.

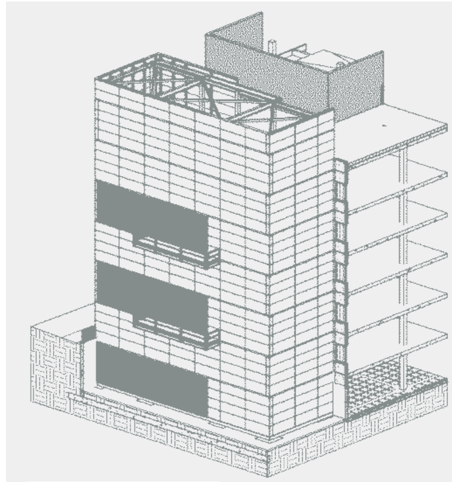
For this project there are many critical paths rather than one specific path. For each phase, a critical path exists and drives the substantial completion and first patient date. The main critical path activities are those that narrow in and effect the ending dates if they are behind. These activities can be seen in the schedule and include the construction of the main entrance canopy and metal panels in the exterior construction phase. Also, completing AHU connections and enclosure for the mechanical tower is a latter activity that is affected by the completion of the interior build out of the existing structure. This is to allow for the mechanical tower and existing structure to be connected. These activities along with finishing the basement mechanical/electrical plant effect when MEP startup and commission can begin. Once MEP equipment startup and commissioning is complete, this will propel Kaiser Permanent/ DPR inspections and turnover. With substantial completion met, Kaiser Permanente will be able to move in and start commissioning in order to prepare for their first patient on September 14, 2012. The main take away of the schedule is that the driving force of the schedule is on-time completion. No matter what changes occurred during construction, the substantial completion date and the first patient date must be met.

Detailed Structural Systems Estimate

***Reference Appendix B for Detailed Estimate and Assumptions.

Overview

In order to thoroughly understand the structural system details of the Kaiser Permanente project, a detail estimate was produced. Since the Kaiser Permanente MOB Project consists of the renovation of an existing structure and the addition of a new mechanical tower picking a typical structural bay to analyze would not be accurate. In order to thoroughly estimate a complete system in detail I decided to choose the steel framed mechanical tower addition for this analysis. This chose was beneficial to thoroughly understanding the system because the mechanical tower addition consists of the entire construction process from excavation to completion, unlike the renovation.



Courtesy of DPR

Figure 2: mechanical tower axonometric

This estimate includes a detailed takeoff of the materials used in the mechanical tower structural system and the cost associated with the materials, labor, and equipment according to R.S. Means 2011 Cost Data. In general, the mechanical tower is a three sided, 7-story structure to be attached to the existing building. The tower is 96 feet total with one level below grade on one side. It then has 5 typical stories, an additional story that meets with the existing structure's roof slab and a penthouse level, (See FIGURE 2). The estimate is broken down into 5 major categories: Steel, Formwork, Concrete, Miscellaneous Metals and Building Enclosure. Appendix B includes the detailed estimate, assumptions and R.S. Means Cost Data 2011.

Steel

The tower is steel frame construction with a total of 9 columns. There are 4 hollow structural steel exterior columns and 5 hollow structural steel interior columns. A cross bracing pattern is utilized to construct the sides and front panel of the tower in order to reduce torsion. This cross bracing design can be seen in FIGURE 3. The cross bracing is comprised of 2 hollow structural steel members that are connected with a 6x6 inch thick plate. The cross bracing connects at midlevel floors to the 50 grade W-beam members with a connection plate and (6) 3/4" high strength bolts. The W beams are connected to 1 of the 9 main columns with double angles and bolts. The details of these connections are shown in FIGURE 4.

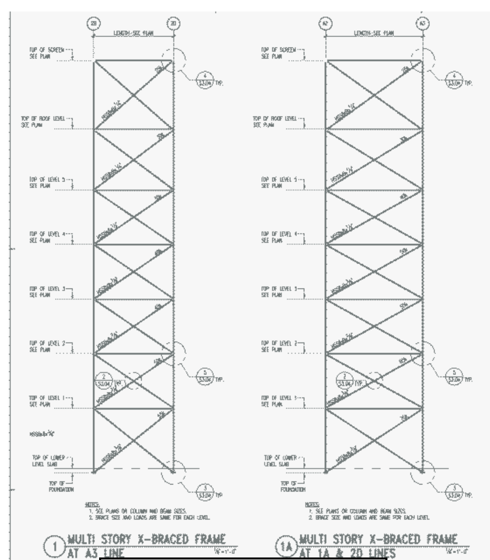
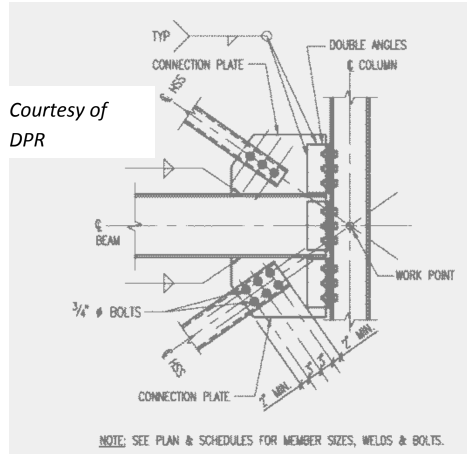


Figure 3: X-Bracing System

Courtesy of DPR

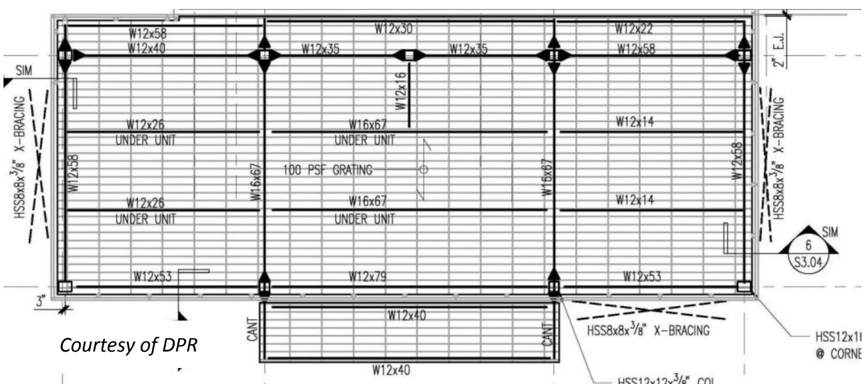
The tower uses two different steel layouts for the floors, one consisting of W-members that are spaced parallel and the other of HSS horizontal braced layout. For the purposes of this estimate, I chose the W-member layout as the typical structural steel design for the floors, (See FIGURE 5). This is because the W-member layout is seen on the majority of the floors, so it was the most practical option.

There are (22) 4x4 HSS purlins that connect to the framing columns. The purlins are spaced 5 feet apart along the perimeter of the exterior frame. The structural purpose of the purlins is to act as the members for the metal fasteners to attach the tower's metal panel skin.



Courtesy of DPR

Figure 4: HSS Diagonal Mid-level Connection



Courtesy of DPR

Figure 5: Typical Floor Layout for Structural Steel

Miscellaneous Metals

Also, as seen in FIGURE 5, the flooring on each level is 100 psf metal grate. Since the tower houses the mechanical equipment, it uses metal grating for the flooring to utilize ventilation in the tower. The metal grating is found on the 2nd and 4th floors since this is the locations of the large AHU's. Floors 3 and 5 are identified as being open to above.

Concrete

The lower level is the foundation level which is a 5" normal weight concrete slab on grade. The specified reinforcing for the slab is welded wire fabric and follows typical slab on grade construction. The column footings vary in dimension for the columns and callout certain columns to have individual footings and multiple columns to be supported by a continuous footing. A spread footing is needed for the curb that will be installed around the tower. In this estimate the spread footing was included however the concrete curb and concrete retaining wall around the tower were assumed to be part of site concrete, not the mechanical tower structure. Reinforcing for the footings include #4, #6, #8, and #9 bars that are used each way spaced at varying increments.

The other concrete flooring system that was used was on the 6th floor roof slab level. The roof slab is a 4.5" composite concrete slab with 20 gage steel decking. The reinforcing specified for the roof slab is welded wire fabric. This slab also utilizes rigid insulation and single ply membrane, which do not significantly impact the structure so are neglected from this estimate. The penthouse level does not specify a topping and is shown as an open to above level.

Enclosure

The building enclosure uses 3"thick metal insulated panels. The panels are tongue and groove, exterior metal face sheet with interior metal liner, bonded to factory foamed-in-place core. The panels are attached to the tower with metal fasteners which clip to the (22) HSS purlins on the exterior of the frame. The panels are installed in 10 foot modules and have a width of 40". Metal louvers are also on the structure's enclosure although do not cover a majority of the tower as the metal panels do. For purpose of this structural estimate, the metal panels are the main structural component estimated.

Conclusion

The overall cost for the mechanical tower structural system is estimated to be $1,090,021. This includes location adjustment for Fairfax County of .92 and a 10% connection allowance. In order to evaluate the accuracy of the estimate, it can be compared with the actual building costs.

The cost of metal panels for the project is approximately $1,175,000. This cost includes the mechanical tower and renovation of the existing building. The existing building uses most of the metal panels for the project for entrance canopies and the storefront system. Since the mechanical tower uses approximately a quarter of the metals panels for the project, this would give a cost of $293,750 for the mechanical tower metal panels. Comparing this with the estimate of $187,392 for metal panels on the mechanical tower, it shows that the estimate was under the actual amount.

The actual project cost for structural steel is $1,515,450. This cost includes not only the mechanical tower steel but the structural steel used for reinforcement in the existing building. In order to compare the estimated cost with the actual cost of steel for just the mechanical tower, it can be assumed that the mechanical tower uses about a quarter of the steel for the entire project. This would give an actual cost for mechanical tower steel of approximately $378,862.The estimated steel cost for the mechanical tower was $298, 427. The estimated cost is under the actual cost of about $80,000. Some of this may be due to steel connections not included in the structural steel estimate but instead given a 10% allowance to the total cost at the end.

For the purpose of finding out in detail what the structural system is comprised of, this detailed structural analysis was beneficial. Although, using this estimate for the structural systems cost resulted in an estimated cost below the actual project costs. A greater understanding of the materials, assembly of construction, overall structural design and general cost is known for the mechanical tower from this analysis.

General Conditions Summary

***Reference Appendix C

For the general conditions estimate on this project, the estimate is based on the general contractor, DPR's general conditions. It was assumed the owner, owner's representative and subcontractors are responsible for their own general conditions. It was also assumed that the project duration is 13 months and so the total costs given are divided by the duration to produce monthly cost per item. There were 6 main categories within the estimate: labor, material, equipment, other, subcontractor and surveying, which resulted in a total general conditions cost of $3,972,344.

The labor category included cost for the project team payment as well as the labor costs associated with the jobsite office setup/removal and periodic cleanup of the site. There was a material hoist on site although the labor for operating the hoist was not considered a part of general conditions because a laborer from DPR self-perform was in charge of this task. Opening protection needed to be added to the general conditions since there was labor for the wood doors to cover the openings on each floor, where the material hoist would stop to deliver materials. The total cost for labor was $2,563,306.

The material category includes the materials associated with such tasks as jobsite office setup/removal and the tools needed for cleanup. There was $12,343 for the jobsite safety which included the "Right to Know" safety boards which were on each floor that housed personal protection such as earplugs, lens cleaning stations and first aid kits. This total material cost was $21,179.

Equipment for the site included the jobsite office setup/ removal equipment needed such as tools, trucks, etc. Jobsite safety equipment such as personal protective equipment, first aid kits, etc. Also included are the DPR pickup trucks for certain DPR employees that are used for traveling from the jobsite to the DPR main office or for commuting to the project from home. Fire extinguishers were included in the equipment category since they were used in the trailers as well as on-site. The total cost was $75,407.

The 'Other' category is predominantly where the GC components are. The main costs included the trash chutes, which were hung off the exterior of the existing structural and were very useful through construction. Power washing the façade was another major component of this category since the existing precast panels were remaining on the building they needed to be cleaned. Other items such as the trailer rental, jobsite office setup and computers were necessary for the daily needs of DPR. Computers were a significant cost especially since DPR was utilizing a "paperless" environment, where all plans, specs and documents were electronic. This meant that every member of staff needed a computer monitor for the office, as well as an ipad for field. Also a big, flat screen television adorned the trailer wall for group viewing of construction documents on a larger scale. The use of BIM on the project also required technology cost to increase for general conditions with the computers and projection screens necessary. Since Kaiser Permanente requires a high standard of building, quality control on the project was critical and factored into the general conditions cost for about $10,000 per month. Jobsite Safety is included in this category for any other parts that were not included in materials and equipment jobsite safety, such as the cost for training workers on safety, safety posters, etc. Site security is usually included in general conditions cost although for the DPR general conditions it is not. The reason is because site security was provided through Jacobs, the construction manager, by having an on-site security guard during working hours to monitor the site. Dumpsters were another significant cost for general conditions since there was demolition of existing concrete walks and slabs, a lot of packaging from frequent deliveries, and large amounts of workers at once producing waste. From the high volume of waste produced, the dumpsters were being emptied very frequently and needed to be dispersed around the site to maintain cleanliness.

The remaining general conditions category is subcontractor general condition cost. The components of this cost is similar to the above components but is applied since DPR is responsible for the subcontractors. There needs to be cost associated with being responsible for cleanup of the subcontractors, incorporating subcontractors in jobsite safety, dumpsters for subcontractors, etc.

The final category of surveying was included in the general conditions cost to show it may be a component if necessary although up until this point no site surveying has been needed since it is an existing structure.

LEED Evaluation

Kaiser Permanente is striving to join the Green Building initiative when it comes to their Healthcare buildings. Although this project is not achieving LEED certification, it is following the USGBC and the Green Guide to Healthcare version 2.0. The GGHC is a combination of the groups Health Care Without Harm and Center for Maximum Potential Building Systems. It is trying to become streamline by having a self-certifying toolkit that is compatible with the LEED 2009 rating system. The GGHC is meant to target healthcare facilities and have them incorporate sustainable components to promote healthful, durable, affordable, and environmentally driven practices into building design and construction. The purpose of the GGHC is very similar to Kaiser Permanente's environmental mission statement of, "We aspire to provide health care service in a manner that protects and enhances the environment and health of the community now and for future generations" (Kaiser Permanente).

In order to assess Kaiser Permanente's ranking for LEED Healthcare 2009, a scorecard for the Kaiser Tysons Corner project is filled out according to the Kaiser Permanente company specifications and their GGHC Eco-toolkit scorecard evaluation. The scorecard used was the LEED 2009 scorecard for Healthcare Buildings. As seen below in FIGURE 6 is the general LEED 2009 Healthcare scorecard that is out of a possible 115 points. Please reference Appendix D for the detailed LEED scorecard evaluation for the project. This project earned 25 points, which does not certify it in any of the LEED categories. The lowest possible LEED score is 40 points, so this project would need 15 more LEED points to be certified. The 7 main topics of the scorecard are summarized below to explain what credits the project achieved.

FIGURE 6: LEED Scorecard for Kaiser Tysons Corner MOB

LEED 2009 for Healthcare: New Construction and Major Renovations

Project Checklist

Kaiser Permanente Tysons Corner

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Y	?	N			
5		11	**Sustainable Sites**	Possible Points:	18
Y			Prereq 1	Construction Activity Pollution Prevention	
Y			Prereq 2	Environmental Site Assessment	
Y			Credit 1	Site Selection	1
Y			Credit 2	Development Density and Community Connectivity	1
		X	Credit 3	Brownfield Redevelopment	1
		X	Credit 4.1	Alternative Transportation—Public Transportation Access	3
		X	Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1
		X	Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	1
		X	Credit 4.4	Alternative Transportation—Parking Capacity	1
		X	Credit 5.1	Site Development—Protect or Restore Habitat	1
		X	Credit 5.2	Site Development—Maximize Open Space	1
Y			Credit 6.1	Stormwater Design—Quantity Control	1
Y			Credit 6.2	Stormwater Design—Quality Control	1
		X	Credit 7.1	Heat Island Effect—Non-roof	1
		X	Credit 7.2	Heat Island Effect—Roof	1
		X	Credit 8	Light Pollution Reduction	1
Y			Credit 9.1	Connection to the Natural World—Places of Respite	1
		X	Credit 9.2	Connection to the Natural World—Direct Exterior Access for Patients	1
0		6	**Water Efficiency**	Possible Points:	9
Y			Prereq 1	Water Use Reduction—20% Reduction	
Y			Prereq 2	Minimize Potable Water Use for Medical Equipment Cooling	
		X	Credit 1	Water Efficient Landscaping—No Potable Water Use or No Irrigation	1
		X	Credit 2	Water Use Reduction: Measurement & Verification	1 to 2
		X	Credit 3	Water Use Reduction	1 to 3
		X	Credit 4.1	Water Use Reduction—Building Equipment	1
		X	Credit 4.2	Water Use Reduction—Cooling Towers	1
		X	Credit 4.3	Water Use Reduction— Food Waste Systems	1
1		6	**Energy and Atmosphere**	Possible Points:	39
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	Fundamental Refrigerant Management	
		X	Credit 1	Optimize Energy Performance	1 to 24
		X	Credit 2	On-Site Renewable Energy	1 to 8
		X	Credit 3	Enhanced Commissioning	1 to 2
Y			Credit 4	Enhanced Refrigerant Management	1
		X	Credit 5	`	2
		X	Credit 6	Green Power	1
		X	Credit 7	Community Contaminant Prevention—Airborne Releases	1

Y	?	N			
7		1	**Materials and Resources**	Possible Points:	16
Y			Prereq 1	Storage and Collection of Recyclables	
Y			Prereq 2	PBT Source Reduction—Mercury	
Y			Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3
Y			Credit 1.2	Building Reuse—Maintain Interior Non-Structural Elements	1
Y			Credit 2	Construction Waste Management	1 to 2
Y			Credit 3	Sustainably Sourced Materials and Products	1 to 4
Y			Credit 4.1	PBT Source Reduction—Mercury in Lamps	1
Y			Credit 4.2	PBT Source Reduction—Lead, Cadmium, and Copper	2
		X	Credit 5	Furniture and Medical Furnishings	1 to 2
Y			Credit 6	Resource Use—Design for Flexibility	1
6		5	**Indoor Environmental Quality**	Possible Points:	18
Y			Prereq 1	Minimum Indoor Air Quality Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
Y			Prereq 3	Hazardous Material Removal or Encapsulation	
		X	Credit 1	Outdoor Air Delivery Monitoring	1
Y			Credit 2	Acoustic Environment	1 to 2
Y			Credit 3.1	Construction IAQ Management Plan—During Construction	1
Y			Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
Y			Credit 4	Low-Emitting Materials	1 to 4
Y			Credit 5	Indoor Chemical and Pollutant Source Control	1
		X	Credit 6.1	Controllability of Systems—Lighting	1
		X	Credit 6.2	Controllability of Systems—Thermal Comfort	1
		X	Credit 7	Thermal Comfort—Design and Verification	1
Y			Credit 8.1	Daylight and Views—Daylight	2
		X	Credit 8.2	Daylight and Views—Views	1 to 3
1	5	0	**Innovation in Design**	Possible Points:	6
Y			Prereq 1	Integrated Project Planning and Design	
	?		Credit 1.1	Innovation in Design: Specific Title	1
	?		Credit 1.2	Innovation in Design: Specific Title	1
	?		Credit 1.3	Innovation in Design: Specific Title	1
	?		Credit 1.4	Innovation in Design: Specific Title	1
Y			Credit 2	LEED Accredited Professional	1
	?		Credit 3	Integrated Project Planning and Design	1
0	4	0	**Regional Priority Credits**	Possible Points:	4
	?		Credit 1.1	Regional Priority: Specific Credit	1
	?		Credit 1.2	Regional Priority: Specific Credit	1
	?		Credit 1.3	Regional Priority: Specific Credit	1
	?		Credit 1.4	Regional Priority: Specific Credit	1
20	9	29	**Total: 25**	Possible Points:	110

Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110

Sustainable Sites

In the sustainable site topic, the Kaiser Tysons Project earned a total of 5 points out of a possible 18. The credits earned in this were site selection, development density, storm water design, and connection to the natural world-places of respite. The site selection credit was earned due to the fact that they are utilizing an existing building site and are not jeopardizing farmland, habitat for species, etc. Development density was earned since it is a previously developed site, located within ½ mile of residential area and within ½ mile of 10 basic services. Storm water design was thoroughly met by this project since the sediment and erosion plan considered storm water runoff. Storm sewer inlet protection was installed and maintained throughout construction to ensure that the site as well as surrounding area was protected against water runoff. Credit was earned for the south side outdoor terraces cantilevered off of three floors that offer connection to the outdoors.

Water Efficiency

In the water efficiency category, there were no credits earned. There was no evidence of intent to implement any practices to reduce water use. Water use reduction- measurement and verification was looked into for this project but ultimately decided that this would not be financially beneficial. It is assumed that since standard toilet and sink fixtures are being installed for this project, that using low flow toilets was not used in order to reduce water use. This topic will be looked into later in the report to analyze options for potential points.

Energy and Atmosphere

The energy and atmosphere topic earned 1 point out of a possible 39 points. The one credit that was achieved in this category is enhanced refrigerant management. The equipment chosen and refrigerants used for this project minimize the toxins that promote ozone deterioration and contribute to climate change. This is a typical Kaiser Permanente standard to use refrigerant management equipment.

Materials and Resources

In the materials and resources topic, there was 8 out a possible 16 points earned. Credits included building reuse, construction waste management, sustainability sourced materials and products, PBT source reduction and Resource Use- Design for flexibility. Building reuse credits were warned for reusing 55% of existing walls, floors and roof. Instead of demolishing the existing structure and beginning new construction, the building was salvaged and reused. Also, building reuse was used for this project by maintaining the interior non-structural elements, such as the staircases and elevators. There were 2 credits awarded since the project followed through with a construction waste management plan that recycled/ salvaged 75% of materials. Any concrete demolition on-site, materials salvaged from the existing building, or construction scraps were weighed and recycled. Credits in this category were earned for reducing the use/ release of Persistent Bioaccumulative and Toxic Chemicals such as mercury, lead, cadmium and copper. Design flexibility was another component touched upon when designing this project including sustainable features such as an above grade parking garage and a mechanical shaft to count as interstitial space.

Indoor Environmental Quality

There was 9 out a possible 18 points earned in this category. The topics achieved were acoustic environment, IAQ management plans, Low emitting materials, indoor chemical and pollutant source control and day-lighting. Sound isolation was utilized for certain areas of the building, especially rooms such as MRI rooms that are sensitive to sound vibration and patient recovery areas rooms to minimize disruptive sounds. IAQ management plans were constructed and executed for both construction and before occupancy phases. The comfort and well-being of workers is just as important as the occupants that will inhabit the building, so maintaining clean air and a healthy work environment earns 2 LEED credits. There were low emitting materials used on the project including interior adhesives and sealants, flooring, composite wood, Agrifiber and Batt insulation, which earned 3 credits. The use of day-lighting was achieved by the glass storefront system in the building lobby as well as the ribbon windows that wrap the building. Day-lighting not only reduces the need for artificial light but is also encouraged for healthcare facilities because of its effect on healing.

Innovation in Design

The only credit achievable in this category was the LEED Accredited Professional that was on the DPR team. No other initiatives were taken for this category.

Regional Priority Credits

No credits were attainable in this category for this project.

To follow is my general LEED scorecard (FIGURE 8) for the project indicating how this project could have earned LEED certification by implementing more green practices according to the 7 topics. The detailed scorecard can be found in APPENDIX D. The red “Y” marks that are seen in the new detailed scorecard are the additions made to the scorecard to achieve a new rating.

FIGURE 8: Proposed LEED Scorecard for Kaiser Tysons Corner MOB

LEED 2009 for Healthcare: New Construction and Major Renovations

Kaiser Permanente Tysons Corner

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Project Checklist

Y	?	N		Sustainable Sites	Possible Points: 18
11		5			
Y			Prereq 1	Construction Activity Pollution Prevention	
Y			Prereq 2	Environmental Site Assessment	
Y			Credit 1	Site Selection	1
Y			Credit 2	Development Density and Community Connectivity	1
		X	Credit 3	Brownfield Redevelopment	1
		X	Credit 4.1	Alternative Transportation—Public Transportation Access	3
Y			Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1
Y			Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicl	1
Y			Credit 4.4	Alternative Transportation—Parking Capacity	1
		X	Credit 5.1	Site Development—Protect or Restore Habitat	1
		X	Credit 5.2	Site Development—Maximize Open Space	1
Y			Credit 6.1	Stormwater Design—Quantity Control	1
Y			Credit 6.2	Stormwater Design—Quality Control	1
Y			Credit 7.1	Heat Island Effect—Non-roof	1
Y			Credit 7.2	Heat Island Effect—Roof	1
		X	Credit 8	Light Pollution Reduction	1
Y			Credit 9.1	Connection to the Natural World—Places of Respite	1
Y			Credit 9.2	Connection to the Natural World—Direct Exterior Access for Patients	1

Y	?	N		Water Efficiency	Possible Points: 9
6		0			
Y			Prereq 1	Water Use Reduction—20% Reduction	
Y			Prereq 2	Minimize Potable Water Use for Medical Equipment Cooling	
Y			Credit 1	Water Efficient Landscaping—No Potable Water Use or No Irrigatio	1
Y			Credit 2	Water Use Reduction: Measurement & Verification	1 to 2
Y			Credit 3	Water Use Reduction	1 to 3
Y			Credit 4.1	Water Use Reduction—Building Equipment	1
Y			Credit 4.2	Water Use Reduction—Cooling Towers	1
Y			Credit 4.3	Water Use Reduction— Food Waste Systems	1

Y	?	N		Energy and Atmosphere	Possible Points: 39
3		4			
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	Fundamental Refrigerant Management	
Y			Credit 1	Optimize Energy Performance	1 to 24
		X	Credit 2	On-Site Renewable Energy	1 to 8
		X	Credit 3	Enhanced Commissioning	1 to 2
Y			Credit 4	Enhanced Refrigerant Management	1
		X	Credit 5	`	2
Y			Credit 6	Green Power	1
		X	Credit 7	Community Contaminant Prevention—Airborne Releases	1

Y	?	N		Materials and Resources	Possible Points: 16
8		0			
Y			Prereq 1	Storage and Collection of Recyclables	
Y			Prereq 2	PBT Source Reduction—Mercury	
Y			Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3
Y			Credit 1.2	Building Reuse—Maintain Interior Non-Structural Elements	1
Y			Credit 2	Construction Waste Management	1 to 2
Y			Credit 3	Sustainably Sourced Materials and Products	1 to 4
Y			Credit 4.1	PBT Source Reduction—Mercury in Lamps	1
Y			Credit 4.2	PBT Source Reduction—Lead, Cadmium, and Copper	2
Y			Credit 5	Furniture and Medical Furnishings	1 to 2
Y			Credit 6	Resource Use—Design for Flexibility	1

Y	?	N		Indoor Environmental Quality	Possible Points: 18
6		4			
Y			Prereq 1	Minimum Indoor Air Quality Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
Y			Prereq 3	Hazardous Material Removal or Encapsulation	
		X	Credit 1	Outdoor Air Delivery Monitoring	1
Y			Credit 2	Acoustic Environment	1 to 2
Y			Credit 3.1	Construction IAQ Management Plan—During Construction	1
Y			Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
Y			Credit 4	Low-Emitting Materials	1 to 4
Y			Credit 5	Indoor Chemical and Pollutant Source Control	1
		X	Credit 6.1	Controllability of Systems—Lighting	1
		X	Credit 6.2	Controllability of Systems—Thermal Comfort	1
		X	Credit 7	Thermal Comfort—Design and Verification	1
Y			Credit 8.1	Daylight and Views—Daylight	2
		X	Credit 8.2	Daylight and Views—Views	1 to 3

Y	?	N		Innovation in Design	Possible Points: 6
1	5	0			
Y			Prereq 1	Integrated Project Planning and Design	
	?		Credit 1.1	Innovation in Design: Specific Title	1
	?		Credit 1.2	Innovation in Design: Specific Title	1
	?		Credit 1.3	Innovation in Design: Specific Title	1
	?		Credit 1.4	Innovation in Design: Specific Title	1
Y			Credit 2	LEED Accredited Professional	1
	?		Credit 3	Integrated Project Planning and Design	1

Y	?	N		Regional Priority Credits	Possible Points: 4
0	4	0			
	?		Credit 1.1	Regional Priority: Specific Credit	1
	?		Credit 1.2	Regional Priority: Specific Credit	1
	?		Credit 1.3	Regional Priority: Specific Credit	1
	?		Credit 1.4	Regional Priority: Specific Credit	1

Y	?	N	Total:46	Possible Points: 110
35	9	13		

Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110

Sustainable Sites

There are many areas of improvement that can be utilized in this category to achieve more credits. First, the alternative transportation bicycle storage and changing rooms can be an easy credit to achieve by simply promoting riding a bike to work. This is a reasonable request since the Tysons Corner area is bike friendly with sidewalks. By installing bike racks and changing rooms/ showers, this will not only promote a healthy lifestyle for a healthcare establishment, but also contribute to sustainable practices. Alternative transportation credits can also be achieved by installing low-emitting/ fuel efficient parking spaces in the soon to be built parking garage. The parking garage can also encourage carpooling by offering priority carpool spots in the garage. Another 2 credits can be earned by utilizing the heat island effect. Offering shade from the existing trees and placing solar resistant index materials on the parking garage roof can achieve this category. Also, using SRI roofing materials on the existing building roof or installing a vegetated roof could have easily been accomplished since the new roof for this project has no plans of housing any special finishes. The terrace pavilions can earn another connection to the natural world credit if the patients have direct access to those terraces. If not, included in the building design could have been balconies for the patients to have access to from their rooms to connect to the outdoors and promote healing.

Water Efficiency

This category on the original scorecard was strongly lacking in points for this project, although through simple actions credits can easily be earned as seen on my version of the LEED scorecard. Water efficient landscaping is an attainable action for this project due to the amount of rainfall this area receives. By using only captured rainwater or recycled wastewater, the landscaping can be maintained without having to touch the potable water. Setting up rain collectors during a season of rainfall would be able to sustain the building landscaping through times without natural rainfall and be an economically friendly solution. Another LEED suggestion is to attain a credit for measurement and verification of water reduction. By installing meters on equipment and fixtures that require water use can not only help to track water consumption but also be a strong message to the public about water use. In a Medical Office building environment, meters on toilet fixtures, sinks, etc. would be seen by many people on a daily basis. The facts of the amount of water consumption used by the building plus awareness about Kaiser's goal to go Green could help to curb the habits of patients and the public. It would not be a severe hindrance to the cost when compared to the savings it could produce. Other fairly easy fixes include low water flow fixtures that could replace the standard fixtures. By using low water flow toilets alone, the water use can reduce by 20%. If this fact was applied to all of the buildings fixtures and the high volume of people uses these facilities every day in a hospital setting, it could produce major water savings. The cooling towers used on this project can also be replaced with non- potable process cooling towers that can contribute to less water use and a credit for water use reduction.

Energy and Atmosphere

Optimizing energy performance is a subcategory that could offer many LEED points if it is improved by a fair percentage. Since this can be considered an existing building renovation, the performance percentage should be calculated based on that fact. I assume it is feasible to improve energy performance by at least 12% for this building by using energy efficient equipment, computers and lighting. For instance, for the temporary lighting on this project, typical fluorescent temporary lighting was used although in one area LED temp lights were installed to compare the energy savings. Though the LED lights proved to have a higher upfront cost, they used about 40% less of the energy that the fluorescent lights used. This indicates that it is feasible to earn credits in this category by simply changing the lighting used and reduce energy consumption. Another way to use energy although in a Green way is to utilize renewable Green Power. A credit can be added for this by providing 35% of the buildings electricity from renewable sources.

Materials and Resources

Since this project is a healthcare facility, the materials and resources used within the building need to be non-harming and made from sustainable textiles, finishes, and dyes. Easily achievable points can be added for the furniture and medical furnishings credit category. By ensuring that 30% of the total material used for freestanding and medical furnishing contains less than 100 parts per million of certain harmful chemicals, the requirements will be met. Purchasing these furnishings can potentially add initial cost although the savings will show in improved environmental and human health. Also, by using the minimum 30% of total material 1 point can be earned within this category.

Indoor Environmental Quality

By improving upon the already achieved points within this category, more credits can be earned in indoor environmental air quality. The acoustical environment sub category includes two topics of sound isolation, which was already achieved and acoustical finishes. Acoustical finishes is something that can be added and have a profound effect on the amount of sound pollution within the building. Simple sound absorbency calculations can be done for areas that will use the acoustical finishes, specifically patient recovery rooms, operating rooms, rooms next to mechanical equipment, etc. Another subcategory for further improvement is low emitting materials. The project can incorporate wall and ceiling finishes as well as exterior applied products to easily gain 2 more points within this category.

Innovation in Design

The attainable credit in this category is the LEED Accredited Professional, which was already achieved. No further initiatives have been taken to achieve points in this category since there is a majority of options in the earlier categories to utilize.

Regional Priority Credits

No credits were initiated for this category since they do not comply with this project.

Overall, the new LEED score card rating attains 46 points versus the original 25 points achieved. This project can be ranked as certified since it is within the 40-49 point range. Considering the suggestions made to achieve more credits and the cost associated with these improvements, it is assumed that the benefits will outweigh the cost for implementation.

Achieving a certified LEED rating should be the minimum this building can strive for. With more innovative ideas to promote sustainability, this building could easily achieve a higher rating. Unfortunately these sustainable practices needed to be established during the design phase of the project in order to be executed properly during construction. Considering the strict project deadline required by Kaiser Permanente, achieving a higher LEED rating at this point in time would be unattainable. For future Kaiser Projects, designing with LEED in mind can easily produce high LEED rated buildings, especially for healthcare facilities.

BIM Execution Plan

Actual BIM implemented on the Kaiser Permanente Project:

The BIM Overview & Process

The Kaiser MOB-NOVA-Tysons Corner – BIM Execution Plan project team will be performing the coordination of architectural, structural, and MEP systems using 3D Building Information Modeling (BIM) tools. DPR is using BIM technologies such as 3D coordination, existing conditions modeling and virtual mockups, as seen in Table 1. By using BIM, the team can improve construction practices and minimize waste through the construction process.

Table 1: ACTUAL BIM USES for the KP Project

PRIORITY (HIGH/MED/LOW)	GOALDESCRIPTION	POTENTIAL BIM USES
HIGH	TO MINIMIZE THE NUMBER AND SEVERITY OF IN-FIELD SYSTEM CLASHES	3D COORDINATION
HIGH	REDUCE SCHEDULE CONFLICTS DUE TO IN-FIELD SYSTEM CLASHES	3D COORDINATION
HIGH	TO CREATE VIRTUAL MOCKUPS OF CHALLENGING DETAILS OR SPACES WITHIN THE BUILDING THAT MAY BE PROBLEMATIC OR HAVE HISTORICALLY BEEN	VIRTUAL MOCKUP
MEDIUM	TO VERIFY THE EXISTING CONDITIONS AND ESTABLISH TOLERANCES FOR THE EXISTING STRUCTURE TO INCREASE ACCURACY OF MODELS IN RESPECT TO 3D COORDINATION EFFORTS	EXISTING CONDITIONS MODELING

First, the architect and engineer develop the design for the project. They receive input from fellow co-workers to be sure the design is appropriate. The next step is for the creation of the BIM models which include architectural, structural, and separate MEP models. The models will be given to the various subcontractors for reference when they create their own models. The next step in the process will be to run a clash report that will generate a list of all conflicts between systems. This will be an iterative process ending only when no more clashes are present. Once this occurs, two-dimensional shop drawings will be created and used for fabrication. Then the systems will be installed in the field. Nothing is to be installed until the area is clash-free and all involved parties sign off. At the completion of steps, an as-built model will be created – containing the clash history over the life of the project – and will be turned over to the owner.

Table 2: Areas of Use

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

BIM for Clash Detection

BIM was a key tool in the communication and planning of the differing trades for this project and to organize sequencing. The procedure was that there was a designated BIM Engineer from DPR that would sit down daily with BIM representatives from mechanical, plumbing, electrical, and fire protection trades. These meetings would take place in the "Big Room" where a large projection screen would be the center of the meeting. The DPR BIM engineer would sit at the projection screen computer with the Navisworks Manager model and converse with the representatives. The representatives would reference their own Revitt models on their laptops and With respect to the architect and engineer, they shall be present on a weekly or monthly basis depending upon the current stage of the project to sign off on any design changes such as whether they could shift their ductwork an inch to make room for the fire main or critique the order that trades would perform work. The architect was to authorize the changes and sign off on any design changes that were needed to prevent in-field clashes that impact design intent or engineered design elements. These final decisions would be designed on the main model and produced into design plans. The "Big Room" meetings proved especially crucial during above ceiling rough in. Since all of the MEP trades were scheduled at the same time to work in one area, coordination was imperative. By conversing and performing clash detections, everyone was aware of what needed to occur in the field to make this design happen. In the end this procedure proved to eliminate many clashes in field that would have cost a lot of time and money

BIM for Virtual Mockups

Another major BIM use on this project was for virtual mockups. Since Kaiser Permanente is a client that appreciates and requires actual mockups for rooms in their buildings, DPR decided to model them with BIM. The purpose to model them with BIM was to plan the mockups out since they can be a challenging task and to show Kaiser Permanente the final product before it is executed. By having the virtual mockup, Kaiser was able to see the mockup and make changes before it was in place. This alone saved money and time and it also made the client happy.

BIM for Existing Conditions Model

The last major use of BIM on this project was creating an existing conditions model. Since this project includes renovating the existing building, having a model that depicts the components and tolerances of the existing structure is useful to build the new work off of.

Future Kaiser Tysons Corner BIM uses

Presently, DPR has started to implement a new BIM technology called augmented reality. It is a useful way for the owner to get a 3-D visualization of the future building while walking through the current skeleton of the building. It works by having "markers" that have a code to identify the room within the building that the computer recognizes. These markers are hung in the current room skeletons and used while walking through the building to aim a hand held computer at them. The computer recognizes the marker and immediately produces a 3-D model of the future room with finishes, equipment, etc.; so that the owner can see what this room will look like in the future.

Proposed BIM implementation for the KP Project:

Although BIM was utilized on the Kaiser Permanente project as previously outlined in the BIM execution plan, there are other areas that BIM could have been integrated for increased benefit. If a new BIM execution plan were to be created for the Kaiser Permanente project, potential BIM use could be incorporated into the "design" and "operate" categories. Since the original BIM execution plan mainly used BIM for construction purposes such as clash detection and virtual mockups, it leaves other areas open that could have been explored. As seen below, a new *BIM Area of Use Plan* has been created to show areas for improvement. Following the *BIM Area of Use Plan* is the category descriptions and the benefits they can offer.

Also for this proposed BIM plan, a Level 1 process map was created and can be found in Appendix E. The process map represents the steps followed to implement BIM on the project.

First, the architect and engineer develop the design for the project. They receive input from fellow co-workers to be sure the design is appropriate. The next step is for the creation of the BIM models which include architectural, structural, and separate MEP models. At a minimum, there should be an architectural, structural, and MEP model – all of which should be separate model files. Subsequently, these models will be given to the various subcontractors for reference when they create their own models.

The next step in the process will be to run a clash report that will generate a list of all conflicts between systems. Once the process produces no more clashes, two-dimensional shop drawings will be created and used for fabrication. Then and only then will the systems be installed in the field. Nothing is to be installed until the area is clash-free and all involved parties sign off. At the completion of the process map steps, an as-built model will be created – containing the clash history over the life of the project – and will be turned over to the owner.

***Please be advised that the Level 1 Process Map is a template design from the Penn State BIM Execution Planning Guide.*

Proposed Areas of Use Plan

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

Structural, Mechanical, and Energy Analysis

Implementing BIM for structural analysis on this project is meant to determine how a structural system will behave. The waffle slab and precast panel construction of the existing building is modeled and can be taken a step further to learn more about the loads associated with the structural system. Since reinforcing steel is needed in the building in order to accommodate the additional MAP systems and medical equipment, the BIM model could have been used to approximate locations for steel installation. Also the model could have been utilized to determine appropriate methods for erection and rigging associated with the renovations to the existing structure and mechanical tower addition. Other potential benefits of implementing structural analysis is to improve the quality of the design decisions, reduce the time it takes for structural design decisions to be made, and to increase efficiency of design solutions.

The BIM use for Energy Analysis and Mechanical systems could have been used on this project during the design phase to execute energy tests on the existing structure and to explore how to make the new MOB more energy efficient. Also, these energy tests could have been run after modeling the mechanical equipment design to see how well the system uses energy. By running these inspections via the model, there is the potential that Kaiser Permanente could have reduced the building's life-cycle energy costs and designed an optimum mechanical system.

Phase Planning (4D Modeling)

Phase planning could have been implemented during the design phase and throughout the project in order to offer Kaiser Permanente a visual process of construction. Since 4D modeling incorporates time into the 3D model, it could have been a great tool for weekly Owner-Architect -Contractor meetings to show project progress. Phase planning also could have been used to show the counterclockwise work progression on each floor and the top down interior build-out of the building. Since Kaiser Permanente changed design even throughout the construction phase, 4D modeling could have been used by the team to communicate the feasibility of the proposed changes. Other benefits include monitoring project materials, identifying sequencing issues, visually conveying the construction process up to the occupancy phase, and planning human, material and equipment resources into the building.

Cost Estimation (Quantity Take-off)

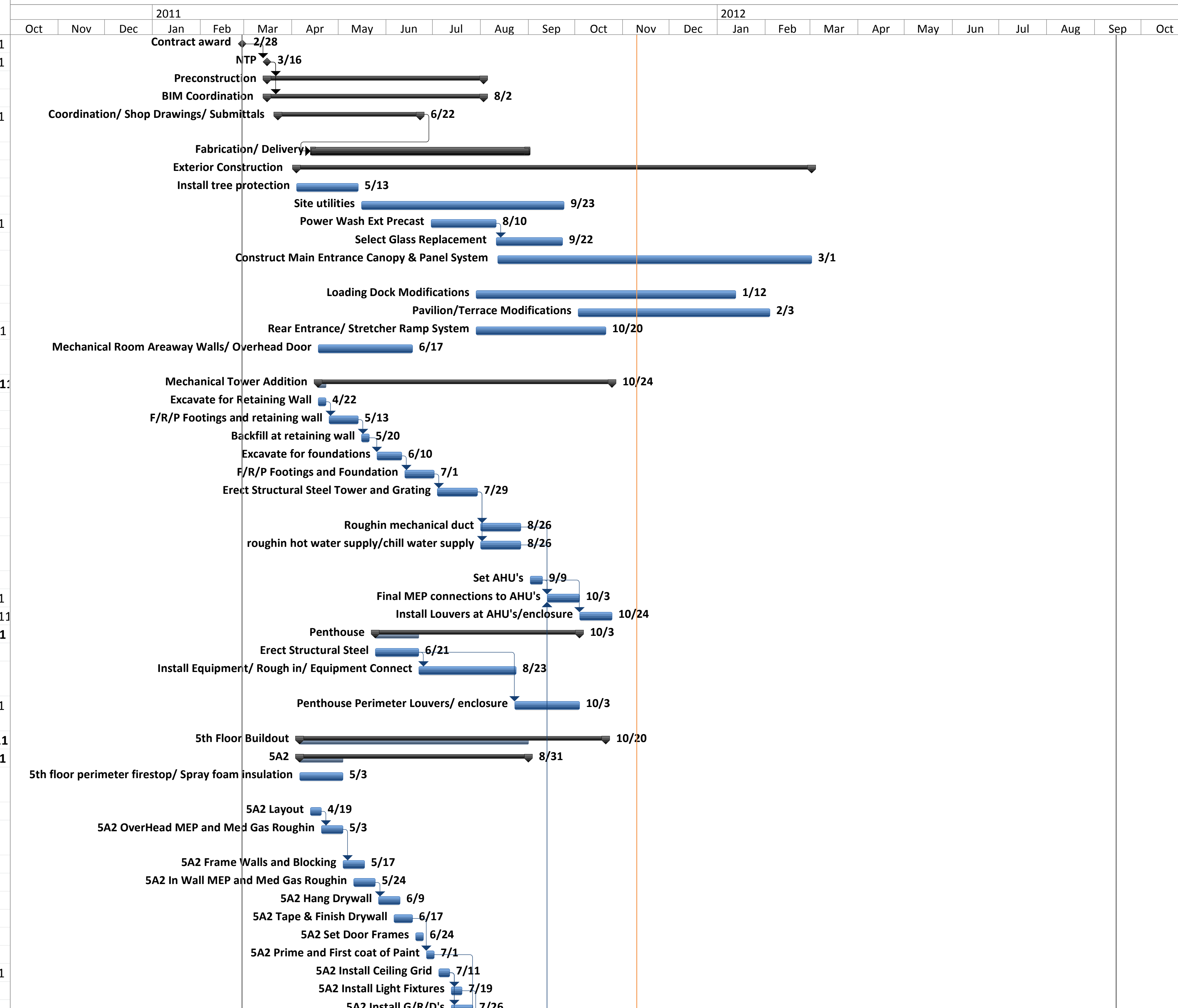
Cost estimation could have been added to the BIM plan to create accurate quantity take-offs and cost estimates for the building in the design, construction, operating phase. It would help the project team and Kaiser to estimate the cost of the changes during all phases of the project. Other possible benefits include producing cost estimates for additional work at a faster rate to aid in Kaiser's decision making, help track budgets through construction, and explore different design options based on the money allocated and time allotted.

Building Maintenance and Systems Analysis Description

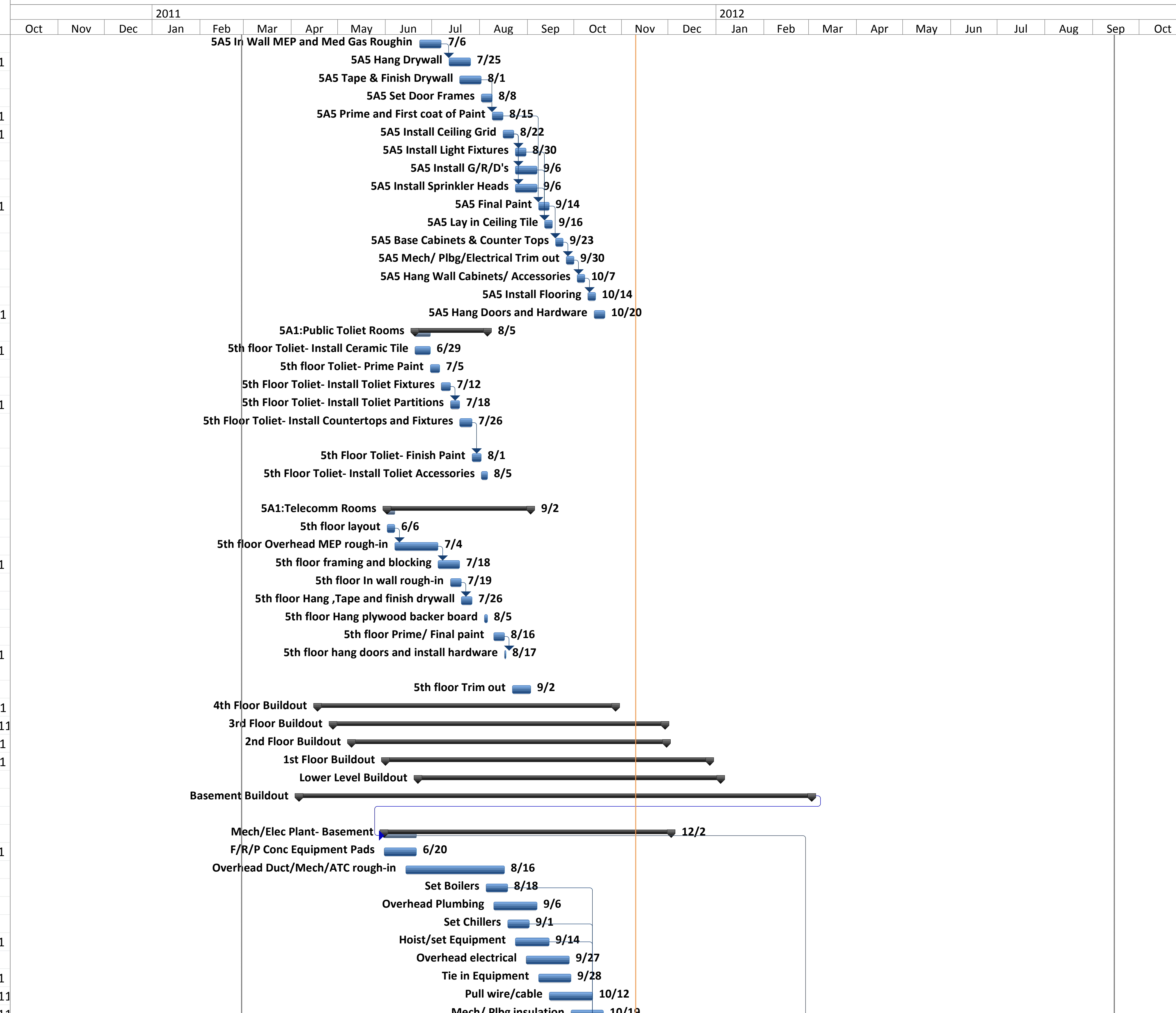
Since this building is a Medical Facility operating 24 hours a day and 7 days a week, it needs to have an optimum maintenance plan. Through BIM, a building maintenance plan including the structure and equipment of the building can be maintained for the 24/7 operational hours. Kaiser Permanente will be able to run the building with optimum efficiency with features such as planning maintenance activities, tracking maintenance history, and evaluate different maintenance approaches based on cost.

Another application of BIM for the operational phase of the building is the Systems Analysis. This will allow Kaiser to track the performance of the systems within the building and ensure they are meeting design standards. Since this is a Healthcare facility, it has high standards for air quality, lighting, temperature control, continuous power, and equipment function. In order to efficiently maintain these systems and ensure they are working properly, it is critical to have a way to track their performance.

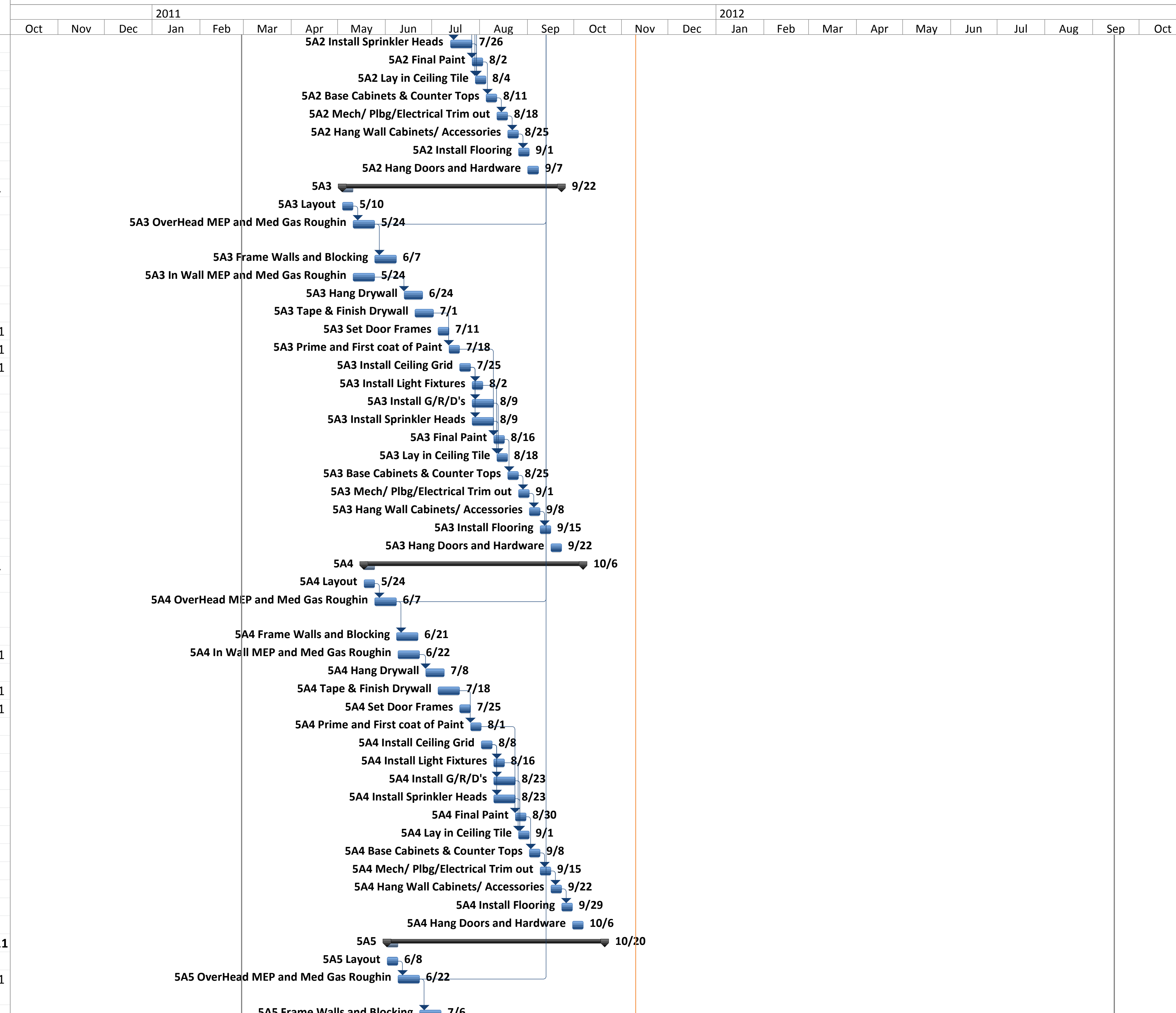
ID	Trade	Task Name	Duration	Start	Finish
1		Contract award	0 days	Mon 2/28/11	Mon 2/28/11
2		NTP	0 days	Wed 3/16/11	Wed 3/16/11
3		Preconstruction	100 days	Wed 3/16/11	Tue 8/2/11
4		BIM Coordination	100 days	Wed 3/16/11	Tue 8/2/11
5		Coordination/ Shop Drawings/ Submittals	66 days	Wed 3/23/11	Wed 6/22/11
6		Fabrication/ Delivery	102 days	Wed 4/13/11	Thu 9/1/11
7	Exterior Constr	Exterior Construction	239 days	Mon 4/4/11	Thu 3/1/12
8		Install tree protection	30 days	Mon 4/4/11	Fri 5/13/11
9		Site utilities	95 days	Mon 5/16/11	Fri 9/23/11
10		Power Wash Ext Precast	30 days	Thu 6/30/11	Wed 8/10/11
11		Select Glass Replacement	31 days	Thu 8/11/11	Thu 9/22/11
12		Construct Main Entrance Canopy & Panel System	145 days	Fri 8/12/11	Thu 3/1/12
13		Loading Dock Modifications	120 days	Fri 7/29/11	Thu 1/12/12
14		Pavilion/Terrace Modifications	90 days	Mon 10/3/11	Fri 2/3/12
15		Rear Entrance/ Stretcher Ramp System	60 days	Fri 7/29/11	Thu 10/20/11
16		Mechanical Room Areaway Walls/ Overhead Door	45 days	Mon 4/18/11	Fri 6/17/11
17	**Mechanical To**	**Mechanical Tower Addition**	**136 days**	**Mon 4/18/11**	**Mon 10/24/1**
18		Excavate for Retaining Wall	5 days	Mon 4/18/11	Fri 4/22/11
19		F/R/P Footings and retaining wall	15 days	Mon 4/25/11	Fri 5/13/11
20		Backfill at retaining wall	5 days	Mon 5/16/11	Fri 5/20/11
21		Excavate for foundations	12 days	Thu 5/26/11	Fri 6/10/11
22		F/R/P Footings and Foundation	15 days	Mon 6/13/11	Fri 7/1/11
23		Erect Structural Steel Tower and Grating	20 days	Mon 7/4/11	Fri 7/29/11
24		Roughin mechanical duct	20 days	Mon 8/1/11	Fri 8/26/11
25		roughin hot water supply/chill water supply	20 days	Mon 8/1/11	Fri 8/26/11
26		Set AHU's	6 days	Fri 9/2/11	Fri 9/9/11
27		Final MEP connections to AHU's	15 days	Tue 9/13/11	Mon 10/3/11
28		Install Louvers at AHU's/enclosure	15 days	Tue 10/4/11	Mon 10/24/11
29		**Penthouse**	**94 days**	**Wed 5/25/11**	**Mon 10/3/11**
30		Erect Structural Steel	20 days	Wed 5/25/11	Tue 6/21/11
31		Install Equipment/ Rough in/ Equipment Connect	45 days	Wed 6/22/11	Tue 8/23/11
32		Penthouse Perimeter Louvers/ enclosure	30 days	Tue 8/23/11	Mon 10/3/11
33		**5th Floor Buildout**	**142 days**	**Wed 4/6/11**	**Thu 10/20/11**
34		**5A2**	**106 days**	**Wed 4/6/11**	**Wed 8/31/11**
35		5th floor perimeter firestop/ Spray foam insulation	20 days	Wed 4/6/11	Tue 5/3/11
36		5A2 Layout	5 days	Wed 4/13/11	Tue 4/19/11
37		5A2 OverHead MEP and Med Gas Roughin	10 days	Wed 4/20/11	Tue 5/3/11
38		5A2 Frame Walls and Blocking	10 days	Wed 5/4/11	Tue 5/17/11
39		5A2 In Wall MEP and Med Gas Roughin	10 days	Wed 5/11/11	Tue 5/24/11
40		5A2 Hang Drywall	10 days	Fri 5/27/11	Thu 6/9/11
41		5A2 Tape & Finish Drywall	10 days	Mon 6/6/11	Fri 6/17/11
42		5A2 Set Door Frames	5 days	Mon 6/20/11	Fri 6/24/11
43		5A2 Prime and First coat of Paint	5 days	Mon 6/27/11	Fri 7/1/11
44		5A2 Install Ceiling Grid	5 days	Tue 7/5/11	Mon 7/11/11
45		5A2 Install Light Fixtures	5 days	Wed 7/13/11	Tue 7/19/11
46		5A2 Install G/R/D's	10 days	Wed 7/13/11	Tue 7/26/11



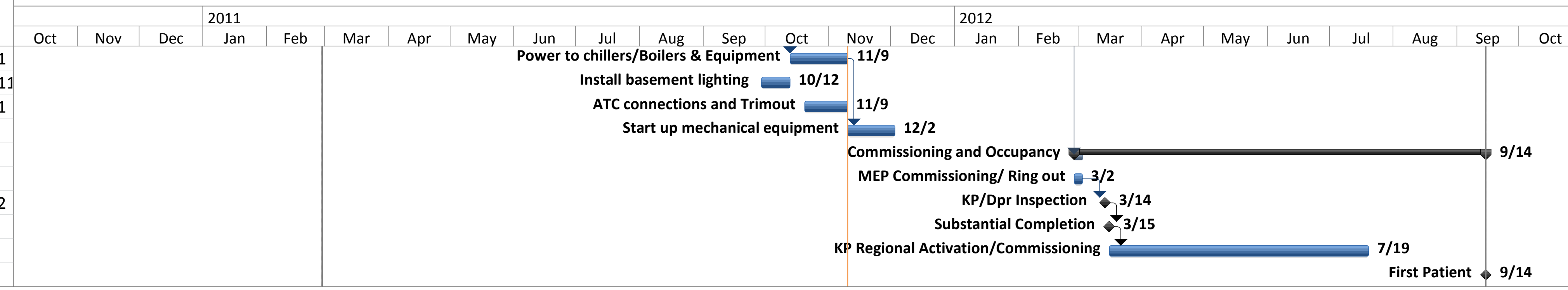
ID	Task Mode	Trade	Task Name	Duration	Start	Finish
99			5A5 In Wall MEP and Med Gas Roughin	10 days	Thu 6/23/11	Wed 7/6/11
100			5A5 Hang Drywall	10 days	Tue 7/12/11	Mon 7/25/11
101			5A5 Tape & Finish Drywall	10 days	Tue 7/19/11	Mon 8/1/11
102			5A5 Set Door Frames	5 days	Tue 8/2/11	Mon 8/8/11
103			5A5 Prime and First coat of Paint	5 days	Tue 8/9/11	Mon 8/15/11
104			5A5 Install Ceiling Grid	5 days	Tue 8/16/11	Mon 8/22/11
105			5A5 Install Light Fixtures	5 days	Wed 8/24/11	Tue 8/30/11
106			5A5 Install G/R/D's	10 days	Wed 8/24/11	Tue 9/6/11
107			5A5 Install Sprinkler Heads	10 days	Wed 8/24/11	Tue 9/6/11
108			5A5 Final Paint	5 days	Thu 9/8/11	Wed 9/14/11
109			5A5 Lay in Ceiling Tile	5 days	Mon 9/12/11	Fri 9/16/11
110			5A5 Base Cabinets & Counter Tops	5 days	Mon 9/19/11	Fri 9/23/11
111			5A5 Mech/ Plbg/Electrical Trim out	5 days	Mon 9/26/11	Fri 9/30/11
112			5A5 Hang Wall Cabinets/ Accessories	5 days	Mon 10/3/11	Fri 10/7/11
113			5A5 Install Flooring	5 days	Mon 10/10/11	Fri 10/14/11
114			5A5 Hang Doors and Hardware	5 days	Fri 10/14/11	Thu 10/20/11
115			**5A1:Public Toliet Rooms**	**35 days**	**Mon 6/20/11**	**Fri 8/5/11**
116			5th floor Toliet- Install Ceramic Tile	8 days	Mon 6/20/11	Wed 6/29/11
117			5th floor Toliet- Prime Paint	4 days	Thu 6/30/11	Tue 7/5/11
118			5th Floor Toliet- Install Toliet Fixtures	4 days	Thu 7/7/11	Tue 7/12/11
119			5th Floor Toliet- Install Toliet Partitions	4 days	Wed 7/13/11	Mon 7/18/11
120			5th Floor Toliet- Install Countertops and Fixtures	6 days	Tue 7/19/11	Tue 7/26/11
121			5th Floor Toliet- Finish Paint	4 days	Wed 7/27/11	Mon 8/1/11
122			5th Floor Toliet- Install Toliet Accessories	4 days	Tue 8/2/11	Fri 8/5/11
123			**5A1:Telecomm Rooms**	**67 days**	**Thu 6/2/11**	**Fri 9/2/11**
124			5th floor layout	3 days	Thu 6/2/11	Mon 6/6/11
125			5th floor Overhead MEP rough-in	20 days	Tue 6/7/11	Mon 7/4/11
126			5th floor framing and blocking	10 days	Tue 7/5/11	Mon 7/18/11
127			5th floor In wall rough-in	5 days	Wed 7/13/11	Tue 7/19/11
128			5th floor Hang ,Tape and finish drywall	5 days	Wed 7/20/11	Tue 7/26/11
129			5th floor Hang plywood backer board	2 days	Thu 8/4/11	Fri 8/5/11
130			5th floor Prime/ Final paint	5 days	Wed 8/10/11	Tue 8/16/11
131			5th floor hang doors and install hardware	1 day	Wed 8/17/11	Wed 8/17/11
132			5th floor Trim out	10 days	Mon 8/22/11	Fri 9/2/11
133			4th Floor Buildout	139 days	Mon 4/18/11	Thu 10/27/11
134			3rd Floor Buildout	153 days	Thu 4/28/11	Mon 11/28/11
135			2nd Floor Buildout	146 days	Tue 5/10/11	Tue 11/29/11
136			1st Floor Buildout	150 days	Wed 6/1/11	Tue 12/27/11
137			Lower Level Buildout	140 days	Wed 6/22/11	Tue 1/3/12
138			Basement Buildout	238 days	Wed 4/6/11	Fri 3/2/12
139						
140			**Mech/Elec Plant- Basement**	**134 days**	**Tue 5/31/11**	**Fri 12/2/11**
141			F/R/P Conc Equipment Pads	15 days	Tue 5/31/11	Mon 6/20/11
142			Overhead Duct/Mech/ATC rough-in	46 days	Tue 6/14/11	Tue 8/16/11
143			Set Boilers	10 days	Fri 8/5/11	Thu 8/18/11
144			Overhead Plumbing	20 days	Wed 8/10/11	Tue 9/6/11
145			Set Chillers	10 days	Fri 8/19/11	Thu 9/1/11
146			Hoist/set Equipment	16 days	Wed 8/24/11	Wed 9/14/11
147			Overhead electrical	20 days	Wed 8/31/11	Tue 9/27/11
148			Tie in Equipment	15 days	Thu 9/8/11	Wed 9/28/11
149			Pull wire/cable	20 days	Thu 9/15/11	Wed 10/12/11
150			Mech/ Plbg insulation	15 days	Thu 9/29/11	Wed 10/19/11



ID		Ta Mo	Trade	Task Name	Duration	Start	Finish
47				5A2 Install Sprinkler Heads	10 days	Wed 7/13/11	Tue 7/26/11
48				5A2 Final Paint	5 days	Wed 7/27/11	Tue 8/2/11
49				5A2 Lay in Ceiling Tile	5 days	Fri 7/29/11	Thu 8/4/11
50				5A2 Base Cabinets & Counter Tops	5 days	Fri 8/5/11	Thu 8/11/11
51				5A2 Mech/ Plbg/Electrical Trim out	5 days	Fri 8/12/11	Thu 8/18/11
52				5A2 Hang Wall Cabinets/ Accessories	5 days	Fri 8/19/11	Thu 8/25/11
53				5A2 Install Flooring	5 days	Fri 8/26/11	Thu 9/1/11
54				5A2 Hang Doors and Hardware	5 days	Thu 9/1/11	Wed 9/7/11
55				**5A3**	**102 days**	**Wed 5/4/11**	**Thu 9/22/11**
56				5A3 Layout	5 days	Wed 5/4/11	Tue 5/10/11
57				5A3 OverHead MEP and Med Gas Roughin	10 days	Wed 5/11/11	Tue 5/24/11
58				5A3 Frame Walls and Blocking	10 days	Wed 5/25/11	Tue 6/7/11
59				5A3 In Wall MEP and Med Gas Roughin	10 days	Wed 5/11/11	Tue 5/24/11
60				5A3 Hang Drywall	10 days	Mon 6/13/11	Fri 6/24/11
61				5A3 Tape & Finish Drywall	10 days	Mon 6/20/11	Fri 7/1/11
62				5A3 Set Door Frames	5 days	Tue 7/5/11	Mon 7/11/11
63				5A3 Prime and First coat of Paint	5 days	Tue 7/12/11	Mon 7/18/11
64				5A3 Install Ceiling Grid	5 days	Tue 7/19/11	Mon 7/25/11
65				5A3 Install Light Fixtures	5 days	Wed 7/27/11	Tue 8/2/11
66				5A3 Install G/R/D's	10 days	Wed 7/27/11	Tue 8/9/11
67				5A3 Install Sprinkler Heads	10 days	Wed 7/27/11	Tue 8/9/11
68				5A3 Final Paint	5 days	Wed 8/10/11	Tue 8/16/11
69				5A3 Lay in Ceiling Tile	5 days	Fri 8/12/11	Thu 8/18/11
70				5A3 Base Cabinets & Counter Tops	5 days	Fri 8/19/11	Thu 8/25/11
71				5A3 Mech/ Plbg/Electrical Trim out	5 days	Fri 8/26/11	Thu 9/1/11
72				5A3 Hang Wall Cabinets/ Accessories	5 days	Fri 9/2/11	Thu 9/8/11
73				5A3 Install Flooring	5 days	Fri 9/9/11	Thu 9/15/11
74				5A3 Hang Doors and Hardware	5 days	Fri 9/16/11	Thu 9/22/11
75				**5A4**	**102 days**	**Wed 5/18/11**	**Thu 10/6/11**
76				5A4 Layout	5 days	Wed 5/18/11	Tue 5/24/11
77				5A4 OverHead MEP and Med Gas Roughin	10 days	Wed 5/25/11	Tue 6/7/11
78				5A4 Frame Walls and Blocking	10 days	Wed 6/8/11	Tue 6/21/11
79				5A4 In Wall MEP and Med Gas Roughin	10 days	Thu 6/9/11	Wed 6/22/11
80				5A4 Hang Drywall	10 days	Mon 6/27/11	Fri 7/8/11
81				5A4 Tape & Finish Drywall	10 days	Tue 7/5/11	Mon 7/18/11
82				5A4 Set Door Frames	5 days	Tue 7/19/11	Mon 7/25/11
83				5A4 Prime and First coat of Paint	5 days	Tue 7/26/11	Mon 8/1/11
84				5A4 Install Ceiling Grid	5 days	Tue 8/2/11	Mon 8/8/11
85				5A4 Install Light Fixtures	5 days	Wed 8/10/11	Tue 8/16/11
86				5A4 Install G/R/D's	10 days	Wed 8/10/11	Tue 8/23/11
87				5A4 Install Sprinkler Heads	10 days	Wed 8/10/11	Tue 8/23/11
88				5A4 Final Paint	5 days	Wed 8/24/11	Tue 8/30/11
89				5A4 Lay in Ceiling Tile	5 days	Fri 8/26/11	Thu 9/1/11
90				5A4 Base Cabinets & Counter Tops	5 days	Fri 9/2/11	Thu 9/8/11
91				5A4 Mech/ Plbg/Electrical Trim out	5 days	Fri 9/9/11	Thu 9/15/11
92				5A4 Hang Wall Cabinets/ Accessories	5 days	Fri 9/16/11	Thu 9/22/11
93				5A4 Install Flooring	5 days	Fri 9/23/11	Thu 9/29/11
94				5A4 Hang Doors and Hardware	5 days	Fri 9/30/11	Thu 10/6/11
95				**5A5**	**101 days**	**Thu 6/2/11**	**Thu 10/20/11**
96				5A5 Layout	5 days	Thu 6/2/11	Wed 6/8/11
97				5A5 OverHead MEP and Med Gas Roughin	10 days	Thu 6/9/11	Wed 6/22/11
98				5A5 Frame Walls and Blocking	10 days	Thu 6/23/11	Wed 7/6/11



ID	Task Mode	Trade	Task Name	Duration	Start	Finish
151			Power to chillers/Boilers & Equipment	20 days	Thu 10/13/11	Wed 11/9/11
152			Install basement lighting	10 days	Thu 9/29/11	Wed 10/12/11
153			ATC connections and Trimout	15 days	Thu 10/20/11	Wed 11/9/11
154			Start up mechanical equipment	17 days	Thu 11/10/11	Fri 12/2/11
155			**Commissioning and Occupancy**	**144 days**	**Tue 2/28/12**	**Fri 9/14/12**
156			MEP Commissioning/ Ring out	4 days	Tue 2/28/12	Fri 3/2/12
157			KP/Dpr Inspection	0 days	Wed 3/14/12	Wed 3/14/12
158			Substantial Completion	0 days	Thu 3/15/12	Thu 3/15/12
159			KP Regional Activation/Commissioning	90 days	Fri 3/16/12	Thu 7/19/12
160			First Patient	0 days	Fri 9/14/12	Fri 9/14/12



Appendix B

Assumptions for Detailed Structural Estimate

1. The X bracing members HSS 8x8x3/8 vary in length- I assumed they were an average of 21'3-1/2" long. R.S. Means does not list HSS bracing members.
2. The Exterior and Interior columns are dimensioned by 57' members then additional 39' members according to the steel piece sheet. I priced the columns based on a continuous 96' length for each column. Exterior: (4) 96'=384' Interior: (5)96'=480'. Also, exact dimension of members not found in R.S. Means, assumed closest members listed.
3. Steel floor grating – 100psf. Floors 2 and 4 each have a square footage of 1835 SF. 1835*100psf= *2 floors= 367,200 pounds. Price for steel floor grating based on L.K. Goodwin Company unit pricing. Approx. $150/SF for galvanized steel floor grating weighing 100psf.Labor cost associated with installation not available.
4. The structural members that were not specifically listed in R.S. Means were priced by interpolating the costs between the member sizes given.
5. Assumed 22 gage, galvanized, insulated metal wall panel. Assume that metal panels cover whole tower (neglecting metal louvers). 68'*96'=6528 SF and 27'*96'*2=5184 SF.
6. Assumed that all formwork was one use formwork.
7. The column footing dimensions are based on the footings shown in the structural drawings. Select columns have their own column footing where as some columns use a continuous footing to support multiple columns.
8. Connection plates, high strength bolts, anchor bolts and other fasteners are not included in this estimate. A 10% connection allowance was used to represent these components of the structural system in the estimate.
9. The two service balconies located on the 2nd and 4th floor are assumed to be negligible for this estimate.
10. No time adjustment needed because R.S. Means pricing information is for 2010, which is compatible with the year that these materials were purchased during buyout.

Detailed Structural System Takeoff and Cost

Steel

Description/Type	Quantity of members	Length of Each	Total Length	R.S. Means Unit	R.S. Means Material	R.S. Means Labor	R.S. Means Equipment	Total	multiplier	Total Cost	Assumptions
Columns and Bracing steel											
HSS8x8x3/8 (Xbracing on sides)	42	21'-3-1/2"	894'	each (14 ft section)	660	53	32.5	745.5	64	11,273	1
HSS12x12x3/8 (Interior columns)	5	96'	480'	each (16 ft section)	1225	55.5	34	1314.5	24	31,536	2
HSS12x16x1/2 (Exterior columns)	4	96'	384'	each (16 ft section)	1225	55.5	34	1314.5	24	31,536	2
HSS 4x4x1/4" Purlins	22	96'	2,112'	each (12 foot section)	186	45.5	28	259.5	176	45,584	
Typical Middle Floors (structural steel framing)											
W12x58	1	19'-5-5/8"	19'-5-5/8"x 7 floors	LF	72	3.54	2.16	77.7	137'	10,645	4
W12x58	1	17'-5"	17'-5" x 7 floors	LF	72	3.54	2.16	77.7	122'	9,479	4
W12x58	2	21-6-3/4"	43'-2" x 7 floors	LF	72	3.54	2.16	77.7	302'	23,465	4
W12x40	1	18'-4"	18'-4" x 7 floors	LF	52	3.4	2.08	58.75	130'	7,637	4
W12x30	1	28'-1-5/8"	28'-1-5/8" x 7 floors	LF	37	3.15	1.94	41.85	196'	8,203	4
W12x26	2	19'-5-5/8"	39' x 7 floors	LF	32	3.01	1.84	36.85	273'	10,060	4
W12x79	1	27'-1"	27'-1" x 7 floors	LF	99	4.14	2.53	105.67	189'	19,971	4
W12x35	2	13-1-1/2"	26'-3" x 7 floors	LF	43.5	3.27	2	48.77	182'	8,876	4
W16x67	2	28'-3-1/8"	56'-6" x 7 floors	LF	83	3.49	2.13	88.62	399'	35,351	4
W12x16	1	6'-11-1/2"	6'-11-1/2" x 7 floors	LF	19.8	3.01	1.84	24.65	49'	1,207	4
W12x14	2	18'-5-1/8"	36'-10" x 7 floors	LF	19.8	3.01	1.84	24.65	259'	6,384	4
W12x22	1	18'-5-1/8"	18'-5-1/8" x 7 floors	LF	27	3.01	1.84	31.85	130'	4,160	4
W12x53	1	18'-5-1/8"	18'-5-1/8" x 7 floors	LF	67	3.54	2.16	72.7	130'	9,490	4
W12x53	1	17-3-1/2	17-3-1/2 x 7 floors	LF	67	3.54	2.16	72.7	121'	8,712	4
Slab on Grade											
WWF (6x6 W2.0xW2.0)	1836 S.F.			C.S.F.	18.9	25		43.9	18.36	806	
Column Footings											
F6.0-#6 bar Each way	12			each	6.4	8.05		14.45	12	173	
F4x6.5-#6 Each way	12			each	6.4	8.05		14.45	12	173	
F9x28-#9 bar	12			each	14.1	25	7.15	46.25	12	555	
F9x28-#8 bar	36			each	12.9	10.5		23.4	36	842	
FB-#9 bar	23			each	14.1	25	7.15	46.25	23	1,064	
FB #8 bar	64			each	12.9	10.5		23.4	64	1,472	
Foundation Spread Footings											
(4) #4 bars 12" O.C.	488			each	4.55	6.35		10.9	488	5,368	
Roof Slab											
WWF (6x6 W2.1xW2.1)	1836 S.F.			C.S.F.	18.9	25		43.9	18.36	806	
Steel decking (20 gage 2" thick)	1836 S.F.			S.F.	1.49	0.44	0.03	1.96	1836	3,598.56	
										298,427	

Formwork

Description	Quantity	S.F.	R.S. Means Unit	R.S. Means Material	R.S. Means Labor	R.S. Means Equipment	Total	multiplier	Total Cost	Assumptions
Roof Elevated slab	1	1836 S.F.	S.F.	1.99	4.15		6.14	1836	11,273	6
Slab on Grade	1	50.83 S.F.	SFCA	1.8	6.1		7.9	50.83	402	6
Spread Footing	1	366 S.F.	SFCA	1.79	4.29		6.08	366	2,196	6
Column Footings										
F6.0 footing	1	36 S.F.	SFCA	1.79	4.29		6.08	36	220	6
F4 footing	3	117 S.F.	SFCA	1.79	4.29		6.08	117	714	6
F9 footing	1	84 S.F.	SFCA	1.79	4.29		6.08	84	512	6
FB footing	1	576 S.F.	SFCA	1.79	4.29		6.08	576	3,514	6
									18,831	

Concrete

Description	Quantity	Width/length/depth	C.F./C.Y.	R.S. Means Unit	R.S. Means Material	R.S. Means Labor	R.S. Means Equipment	Total	multiplier	Total Cost	Assumptions
Foundation slab on grade	1	27'x68'x5"	765/28	C.Y.	113	41	0.25	154.25	28	4,319	
Column footings											
F6.0- 6'x6'x18"	1	6'x6'x18"	54/2	C.Y.	185	108	0.55	293.55	2	587	7
F4x6.5	3	4'x6'-6"x18"	39/1.5	C.Y.	185	108	0.55	293.55	1.5	440	7
F9x28	1	9'x28'x36"	756/28	C.Y.	185	108	0.55	293.55	28	8,219	7
FB	1	9'-6"X64'x36"	1824/68	C.Y.	185	108	0.55	293.55	68	1,996	7
Spread footing (for curb)	1	1'x122'x3'	366/14	C.Y.	127	77	0.39	204.39	14	2,861	
Roof Slab Concrete, normal weight	1	27'x68'x2.5"	382/14	S.F.	0.85	0.79	0.28	1.92	1836	3,525	
										21,947	

MISC Metals

Description	Quantity	w/l/d	S.F.	R.S. Means Unit	R.S. Means Material	R.S. Means Labor	R.S. Means Equipment	Total	multiplier	Total Cost	Assumptions
Steel Floor Grating-100 psf	3670(SF)		3,670	SF**				150	3,670	550, 500	3

Building Enclosure

Description	Quantity	w/l/d	S.F.	R.S. Means Unit	R.S. Means Material	R.S. Means Labor	R.S. Means Equipment	Total	multiplier	Total Cost	Assumptions
3" Insulated metal wall panels	11,712 (SF)	40"x10'x3"	11,712 S.F.	S.F.	12.2	3.82		16.02	11,712	187,392	5

Total	**1,077,097**	
Total with 10% Connection Allowance	**1,184,806**	8
Location Adjustment- Fairfax VA	**0.92**	
Adjusted Total	**1,090,021**	10

**This cost information not R.S. Means Cost Data. See Assumptions in Appendix B for details.

Appendix C- General Conditions Cost

General Conditions Estimate- Kaiser Tysons Corner

	Monthly Cost	Projected Total Cost
Labor		
Misc MEP Layout	47	610
Project Executive	10,706	139,181
Project Manager	17,503	227,543
Project Superintendent	23,870	310,315
Project Engineer	49,042	637,555
Project Accountant	2,000	26,009
Field Office Coordinator	8,055	104,725
Scheduling Engineer	2,817	36,631
MEP Coordinator	17,079	222,028
Jobsite Office- Setup/ Removal	2,615	34,000
Bim Engineer	7,352	95,583
Superindent- OR's	10,165	132,155
Superindent- QC	5,806	75,484
Precast Superintendent	8,500	110,500
Safety Engineer	2,461	32,000
Jobsite Safety	7,922	102,987
Material Handling/ Hoisting	0	0
Personnel Hoisting	5,835	75,861
Floor Protection	422	5,491
Interim Clean-Up	14,387	187,038
Safety: Opening Protection	277	3,610
Total Labor:	**197,177**	**2,563,306**
Material		
Jobsite Office- Setup/ Removal	636	8,269
Jobsite Safety	949	12,343
Interim Clean-Up	44	567
Total Material:	**1,629**	**21,179**
Equipment		
Jobsite Office- Setup/ Removal	2,110	27,433
Pick Up Trucks	2,798	36,377
Jobsite Safety	549	7,137
Fire Extinguishers	346	4,500
Total Equipment:	**5800**	**75,407**
Other		
Concrete Walks	151	1,975
Trash Chutes	246	32,000
Existing Sill Protection	1,181	15,360
Power Wash Façade	3,076	40,000
Field Office Coordinator	231	3,000

Trailer Rental	5,244	68,173
Jobsite Office- Setup/ Removal	9,486	123,324
Furniture Rental	68	880
Computers/Printers	6,089	79,160
Supplies/ Petty Cash	2,319	30,157
Postage/ Federal Express	229	2,978
Telephone install/ service	153	2,000
Telephone Monthly	1,390	18,072
Travel Related Expenses	438	5,705
Promotions and Entertainment	0	0
Audio Visual Innovations	0	0
Pick Up Trucks	37	476
Fuel- Trucks/Cars	2,573	33,459
Blueprinting/reproduction	340	4,422
Progress Photographs	384	5,000
Superintendent QC	10,059	130,779
Network Setup	2,032	26,423
Jobsite Safety	6,338	82,396
Expendable Tools	22	284
Material Handling/ Hoisting	3,506	45,582
Temp Elec Set-up/Removal	1,384	18,000
Temp Toliets	1,672	21,743
Wood Barricades/Signs	307	4,000
Interim Clean-Up	396	5,143
Final Clean	6,153	80,000
Site Security	0	0
Misc. Site Requirements	0	0
Debris Box	4,344	56,483
GC Change Orders	3,546	46,105
Other Total:	**75,649**	**983,440**
Subcontractor		
Trash Chutes	801	10,411
Jobsite Office Setup/Removal	5,654	73,507
Jobsite safety	5,480	71,247
Material Handling/Hoisting	8,023	104,308
Interim Clean-up	667	8,670
Site Security	1,412	18,353
Debris Boxes	3,270	42,517
Subcontractor Total:	**25,308**	**329,012**
Surveying	**0**	**0**
Report total	**305,564**	**3,972,344**

Appendix D- LEED Evaluation

FIGURE 6b: Detailed LEED Scorecard for Kaiser Tysons Corner MOB

LEED 2009 for Healthcare: New Construction and Major Renovation

Project Checklist

Project Name- Kaiser Permanente Tysons Corner

Date-10/10/11

Y	?	N				Points
5	0	11		**Sustainable Sites**	Possible Points:	**18**
Y			Prereq 1	Construction Activity Pollution Prevention		
Y			Prereq 2	Environmental Site Assessment		
Y			Credit 1	Site Selection		1
Y			Credit 2	Development Density and Community Connectivity		1
		X	Credit 3	Brownfield Redevelopment		1
		X	Credit 4.1	Alternative Transportation—Public Transportation Access		3
		X	Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms		1
		X	Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles		1
		X	Credit 4.4	Alternative Transportation—Parking Capacity		1
		X	Credit 5.1	Site Development—Protect or Restore Habitat		1
		X	Credit 5.2	Site Development—Maximize Open Space		1
Y			Credit 6.1	Stormwater Design—Quantity Control		1
Y			Credit 6.2	Stormwater Design—Quality Control		1
		X	Credit 7.1	Heat Island Effect—Non-roof		1
		X	Credit 7.2	Heat Island Effect—Roof		1
		X	Credit 8	Light Pollution Reduction		1
Y			Credit 9.1	Connection to the Natural World—Places of Respite		1
		X	Credit 9.2	Connection to the Natural World—Direct Exterior Access for Patients		1
						5
0	0	6		**Water Efficiency**	Possible Points:	**9**
Y			Prereq 1	Water Use Reduction		
Y			Prereq 2	Minimize Potable Water Use for Medical Equipment Cooling		
		X	Credit 1	Water Efficient Landscaping—No Potable Water Use or No Irrigation		1
		X	Credit 2	Water Use Reduction—Measurement & Verification		1 to 2
				Track 2 Measures		1
				Track 3 or more Measures		2
		X	Credit 3	Water Use Reduction		1 to 3
				Reduce by 30%		1
				Reduce by 35%		2
				Reduce by 40%		3
		X	Credit 4.1	Water Use Reduction—Building Equipment		1
		X	Credit 4.2	Water Use Reduction—Cooling Towers		1
		X	Credit 4.3	Water Use Reduction—Food Waste Systems		1
						0
1	0	6		**Energy and Atmosphere**	Possible Points:	**39**
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems		
Y			Prereq 2	Minimum Energy Performance		
Y			Prereq 3	Fundamental Refrigerant Management		
		X	Credit 1	Optimize Energy Performance		1 to 24
				Improve by 12% for New Buildings or 8% for Existing Building Renovations		1
				Improve by 14% for New Buildings or 10% for Existing Building Renovations		2
				Improve by 16% for New Buildings or 12% for Existing Building Renovations		3
				Improve by 18% for New Buildings or 14% for Existing Building Renovations		5
				Improve by 20% for New Buildings or 16% for Existing Building Renovations		7
				Improve by 22% for New Buildings or 18% for Existing Building Renovations		9
				Improve by 24% for New Buildings or 20% for Existing Building Renovations		11
				Improve by 26% for New Buildings or 22% for Existing Building Renovations		13
				Improve by 28% for New Buildings or 24% for Existing Building Renovations		14
				Improve by 30% for New Buildings or 26% for Existing Building Renovations		15
				Improve by 32% for New Buildings or 28% for Existing Building Renovations		16
				Improve by 34% for New Buildings or 30% for Existing Building Renovations		17
				Improve by 36% for New Buildings or 32% for Existing Building Renovations		18
				Improve by 38% for New Buildings or 34% for Existing Building Renovations		19
				Improve by 40% for New Buildings or 36% for Existing Building Renovations		20
				Improve by 42% for New Buildings or 38% for Existing Building Renovations		21
				Improve by 44% for New Buildings or 40% for Existing Building Renovations		22
				Improve by 46% for New Buildings or 42% for Existing Building Renovations		23

Notes:

Notes:

Notes:

Y	?	N	Credit	Option	Description	Points
					Improve by 48%+ for New Buildings or 44%+ for Existing Building Renovations	24
		X	Credit 2		On-Site Renewable Energy	1 to 8
					1% Renewable Energy	1
					3% Renewable Energy	2
					10% Renewable Energy	5
					20% Renewable Energy	6
					30% Renewable Energy	7
					40% Renewable Energy	8
		X	Credit 3		Enhanced Commissioning	1 to 2
Y			Credit 4		Enhanced Refrigerant Management	1
		X	Credit 5		Measurement and Verification	2
		X	Credit 6		Green Power	1
		X	Credit 7		Community Contaminant Prevention—Airborne Releases	1
						1

Y	?	N			**Materials and Resources** Possible Points:	**16**
7	0	1				
Y			Prereq 1		Storage and Collection of Recyclables	
Y			Prereq 2		PBT Source Reduction—Mercury	
Y			Credit 1.1		Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3
				Y	Reuse 55%	1
					Reuse 75%	2
					Reuse 95%	3
Y			Credit 1.2		Building Reuse—Maintain Interior Non-Structural Elements	1
Y			Credit 2		Construction Waste Management	1 to 2
					50% Recycled or Salvaged	1
				Y	75% Recycled or Salvaged	2
Y			Credit 3		Sustainably Sourced Materials and Products	1 to 4
				Y	10% of Total Material	1
				?	20% of Total Material	2
				?	30% of Total Material	3
				?	40% of Total Material	4
Y			Credit 4.1		PBT Source Reduction—Mercury in Lamps	1
Y			Credit 4.2		PBT Source Reduction—Lead, Cadmium and Copper	2
		X	Credit 5		Furniture & Medical Furnishings	1 to 2
					30% of Total Material	1
					40% of Total Material	2
Y			Credit 6		Resource Use—Design for Flexibility	1
						9

Notes:

Y	?	N			**Indoor Environmental Quality** Possible Points:	**18**
8	0	5				
Y			Prereq 1		Minimum Indoor Air Quality Performance	
Y			Prereq 2		Environmental Tobacco Smoke (ETS) Control	
Y			Prereq 3		Hazardous Material Removal or Encapsulation	
		X	Credit 1		Outdoor Air Delivery Monitoring	1
Y			Credit 2		Acoustic Environment	1 to 2
				Y	Sound Isolation	1
				?	Acoustical Finishes	1
Y			Credit 3.1		Construction IAQ Management Plan—During Construction	1
Y			Credit 3.2		Construction IAQ Management Plan—Before Occupancy	1
Y			Credit 4		Low-Emitting Materials	1 to 4
				Y	Interior Adhesives & Sealants	1
				?	Wall & Ceiling Finishes	1
				Y	Flooring	1
				Y	Composite Wood, Agrifiber Products and Batt Insulation Products	1
				?	Exterior Applied Products	1
Y			Credit 5		Indoor Chemical and Pollutant Source Control	1
		X	Credit 6.1		Controllability of Systems—Lighting	1
		X	Credit 6.2		Controllability of Systems—Thermal Comfort	1
		X	Credit 7		Thermal Comfort—Design and Verification	1
Y			Credit 8.1		Daylight and Views—Daylight	2
		X	Credit 8.2		Daylight and Views—Views	1 to 3
					90% of Inpatient Units	1
					Threshold A for Non-Inpatient Areas	1
					Threshold B for Non-Inpatient Areas	2
						9

Notes:

Y	?	N			Points
1	5	0	**Innovation in Design**	Possible Points:	6
Y			Prereq 1	Integrative Project Planning & Design	
	?		Credit 1.1	Innovation in Design: Specific Title	1
	?		Credit 1.2	Innovation in Design: Specific Title	1
	?		Credit 1.3	Innovation in Design: Specific Title	1
	?		Credit 1.4	Innovation in Design: Specific Title	1
Y			Credit 2	LEED Accredited Professional	1
	?		Credit 3	Integrative Project Planning & Design	1
					1

Notes:

Y	?	N			Points
0	4		**Regional Priority Credits**	Possible Points:	4
	?		Credit 1.1	Regional Priority: Specific Credit	1
	?		Credit 1.2	Regional Priority: Specific Credit	1
	?		Credit 1.3	Regional Priority: Specific Credit	1
	?		Credit 1.4	Regional Priority: Specific Credit	1
					0

Notes:

Y	?	N				
22	9	29	**Total** 25	Possible Points:	115	NOT RATED

Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110

FIGURE 7b: Proposed Detailed LEED Scorecard for Kaiser Tysons Corner MOB

LEED 2009 for Healthcare: New Construction and Major Renovation

Project Checklist

Project Name- Kaiser Permanente Tysons Corner

Date- 10/10/11

Sustainable Sites — Possible Points: 18

Y	?	N				
11	0	5			**Sustainable Sites**	Possible Points: 18
Y			Prereq 1		Construction Activity Pollution Prevention	
Y			Prereq 2		Environmental Site Assessment	
Y			Credit 1		Site Selection	1
Y			Credit 2		Development Density and Community Connectivity	1
		X	Credit 3		Brownfield Redevelopment	1
		X	Credit 4.1		Alternative Transportation—Public Transportation Access	3
Y			Credit 4.2		Alternative Transportation—Bicycle Storage and Changing Rooms	1
Y			Credit 4.3		Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	1
Y			Credit 4.4		Alternative Transportation—Parking Capacity	1
		X	Credit 5.1		Site Development—Protect or Restore Habitat	1
		X	Credit 5.2		Site Development—Maximize Open Space	1
Y			Credit 6.1		Stormwater Design—Quantity Control	1
Y			Credit 6.2		Stormwater Design—Quality Control	1
Y			Credit 7.1		Heat Island Effect—Non-roof	1
Y			Credit 7.2		Heat Island Effect—Roof	1
		X	Credit 8		Light Pollution Reduction	1
Y			Credit 9.1		Connection to the Natural World—Places of Respite	1
Y			Credit 9.2		Connection to the Natural World—Direct Exterior Access for Patients	1
						11

Notes:

Water Efficiency — Possible Points: 9

Y	?	N				
6	0	0			**Water Efficiency**	Possible Points: 9
Y			Prereq 1		Water Use Reduction	
Y			Prereq 2		Minimize Potable Water Use for Medical Equipment Cooling	
Y			Credit 1		Water Efficient Landscaping—No Potable Water Use or No Irrigation	1
			Credit 2		Water Use Reduction—Measurement & Verification	1 to 2
					Track 2 Measures	1
				Y	Track 3 or more Measures	2
Y			Credit 3		Water Use Reduction	1 to 3
					Reduce by 30%	1
				Y	Reduce by 35%	2
					Reduce by 40%	3
Y			Credit 4.1		Water Use Reduction—Building Equipment	1
Y			Credit 4.2		Water Use Reduction—Cooling Towers	1
Y			Credit 4.3		Water Use Reduction—Food Waste Systems	1
						8

Notes:

Energy and Atmosphere — Possible Points: 39

Y	?	N				
3	0	5			**Energy and Atmosphere**	Possible Points: 39
Y			Prereq 1		Fundamental Commissioning of Building Energy Systems	
Y			Prereq 2		Minimum Energy Performance	
Y			Prereq 3		Fundamental Refrigerant Management	
			Credit 1		Optimize Energy Performance	1 to 24
					Improve by 12% for New Buildings or 8% for Existing Building Renovations	1
					Improve by 14% for New Buildings or 10% for Existing Building Renovations	2
				Y	Improve by 16% for New Buildings or 12% for Existing Building Renovations	3
					Improve by 18% for New Buildings or 14% for Existing Building Renovations	5
					Improve by 20% for New Buildings or 16% for Existing Building Renovations	7
					Improve by 22% for New Buildings or 18% for Existing Building Renovations	9
					Improve by 24% for New Buildings or 20% for Existing Building Renovations	11
					Improve by 26% for New Buildings or 22% for Existing Building Renovations	13
					Improve by 28% for New Buildings or 24% for Existing Building Renovations	14
					Improve by 30% for New Buildings or 26% for Existing Building Renovations	15
					Improve by 32% for New Buildings or 28% for Existing Building Renovations	16
					Improve by 34% for New Buildings or 30% for Existing Building Renovations	17
					Improve by 36% for New Buildings or 32% for Existing Building Renovations	18
					Improve by 38% for New Buildings or 34% for Existing Building Renovations	19
					Improve by 40% for New Buildings or 36% for Existing Building Renovations	20
					Improve by 42% for New Buildings or 38% for Existing Building Renovations	21
					Improve by 44% for New Buildings or 40% for Existing Building Renovations	22
					Improve by 46% for New Buildings or 42% for Existing Building Renovations	23

Notes:

Y	?	N	Credit	Option	Description	Points
					Improve by 48%+ for New Buildings or 44%+ for Existing Building Renovations	24
		X	Credit 2		On-Site Renewable Energy	1 to 8
					1% Renewable Energy	1
					3% Renewable Energy	2
					10% Renewable Energy	5
					20% Renewable Energy	6
					30% Renewable Energy	7
					40% Renewable Energy	8
		X	Credit 3		Enhanced Commissioning	1 to 2
Y			Credit 4		Enhanced Refrigerant Management	1
		X	Credit 5		Measurement and Verification	2
Y		X	Credit 6		Green Power	1
		X	Credit 7		Community Contaminant Prevention—Airborne Releases	1
						5

8	0	0			**Materials and Resources** Possible Points:	**16**
Y	?	N				
Y			Prereq 1		Storage and Collection of Recyclables	
Y			Prereq 2		PBT Source Reduction—Mercury	
Y			Credit 1.1		Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3
				Y	Reuse 55%	1
					Reuse 75%	2
					Reuse 95%	3
Y			Credit 1.2		Building Reuse—Maintain Interior Non-Structural Elements	1
Y			Credit 2		Construction Waste Management	1 to 2
					50% Recycled or Salvaged	1
				Y	75% Recycled or Salvaged	2
Y			Credit 3		Sustainably Sourced Materials and Products	1 to 4
				Y	10% of Total Material	1
				?	20% of Total Material	2
				?	30% of Total Material	3
				?	40% of Total Material	4
Y			Credit 4.1		PBT Source Reduction—Mercury in Lamps	1
Y			Credit 4.2		PBT Source Reduction—Lead, Cadmium and Copper	2
Y			Credit 5		Furniture & Medical Furnishings	1 to 2
				Y	30% of Total Material	1
					40% of Total Material	2
Y			Credit 6		Resource Use—Design for Flexibility	1
						10

Notes:

11	0	5			**Indoor Environmental Quality** Possible Points:	**18**
Y	?	N				
Y			Prereq 1		Minimum Indoor Air Quality Performance	
Y			Prereq 2		Environmental Tobacco Smoke (ETS) Control	
Y			Prereq 3		Hazardous Material Removal or Encapsulation	
		X	Credit 1		Outdoor Air Delivery Monitoring	1
Y			Credit 2		Acoustic Environment	1 to 2
				Y	Sound Isolation	1
				Y	Acoustical Finishes	1
Y			Credit 3.1		Construction IAQ Management Plan—During Construction	1
Y			Credit 3.2		Construction IAQ Management Plan—Before Occupancy	1
Y			Credit 4		Low-Emitting Materials	1 to 4
				Y	Interior Adhesives & Sealants	1
				Y	Wall & Ceiling Finishes	1
				Y	Flooring	1
				Y	Composite Wood, Agrifiber Products and Batt Insulation Products	1
				Y	Exterior Applied Products	1
Y			Credit 5		Indoor Chemical and Pollutant Source Control	1
		X	Credit 6.1		Controllability of Systems—Lighting	1
		X	Credit 6.2		Controllability of Systems—Thermal Comfort	1
		X	Credit 7		Thermal Comfort—Design and Verification	1
Y			Credit 8.1		Daylight and Views—Daylight	2
		X	Credit 8.2		Daylight and Views—Views	1 to 3
					90% of Inpatient Units	1
					Threshold A for Non-Inpatient Areas	1
					Threshold B for Non-Inpatient Areas	2
						11

Notes:

Y	?	N			Possible Points:	
1	5	0	**Innovation in Design**		Possible Points:	6
Y	?	N				
Y			Prereq 1	Integrative Project Planning & Design		
	?		Credit 1.1	Innovation in Design: Specific Title	1	
	?		Credit 1.2	Innovation in Design: Specific Title	1	
	?		Credit 1.3	Innovation in Design: Specific Title	1	
	?		Credit 1.4	Innovation in Design: Specific Title	1	
Y			Credit 2	LEED Accredited Professional	1	
	?		Credit 3	Integrative Project Planning & Design	1	
					1	
0	4	0	**Regional Priority Credits**		Possible Points:	4
Y	?	N				
	?		Credit 1.1	Regional Priority: Specific Credit	1	
	?		Credit 1.2	Regional Priority: Specific Credit	1	
	?		Credit 1.3	Regional Priority: Specific Credit	1	
	?		Credit 1.4	Regional Priority: Specific Credit	1	
40	9	15	**Total**	46	Possible Points:	121

Notes:

Notes:

CERTIFIED

Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110

LEVEL 1: BIM EXECUTION PLANNING PROCESS
Project Title Kaiser Permanente MOB @Tysons Corner

Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team
http://www.engr/psu.edu/ae/cic/bimex

Proposed Level 1 Process Map