TECHNICAL REPORT II

The Mary J. Drexel Home Assisted Living Addition

Bala Cynwyd, PA

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Executive Summary

The purpose of this technical report is to evaluate the project execution implemented on the Mary J. Drexel Home Assisted Living Additions project. Analysis of detailed scheduling, detailed and systems estimates, site layout planning, general conditions, and BIM uses are some of the key features that offer valuable information about the project.

The Mary J. Drexel Home project is a senior living addition facility to the existing Mary J. Drexel Home. The new additions include two two-story wings comprised of 40 residential units each totaling about 75,000 SF. The construction costs total approximately $ 14.6 million dollars with a schedule spanning 14 months. The project site is relatively small and the location does not allow for much flexibility regarding the project execution plan.

The major aspect of the project was focused on the design phase. The design started on June 2011 and was not complete until January 2013. The project was schedule to start in the end of November 2013 and finish construction with substantial complete on December 24, 2013.

A detailed cost analysis of the building's structural system was performed. This greatly expanded the Square Foot Estimate of Technical Report 1. The project mainly comprised of concrete slabs with prefabricated load bearing metal wall panels. Some structural steel framing was used in the center of the wings for the common areas to allow for longer spans and more open space. The values calculated for the concrete and structural costs were roughly $ 997,000 and $ 1,750,000, respectively. This is in comparison to the actual costs of roughly $ 880,000 and $ 1,370,000.

Three site layout plans were also developed to show critical phases during construction. The size and location of the site limited aspects such as parking, laydown areas, and deliveries. Another consideration when laying out the site was the neighboring residential homes. Effective communication between trades, neighbors, the owner, and architect still allowed for work to flow smoothly.

As just stated, the small site did not provide many layout possibilities, but it ended up saving costs regarding General Conditions. This is due to the fact that the existing Mansion on site was allowed to be used as an on-site trailer for the general contractor and the existing barn was used as a storage barn during constriction. The total amount for the General Conditions totaled $ 1,596,477 is roughly close to 10% of the total GMP amount of $ 14.6 million.

BIM use was not emphasized by either the owner or contractor in this project. The only aspect where BIM was used was in the MEP design of simple clash detection and 3D Coordination. This allowed the MEP process to be design quickly and constructed on site without many issues arising. This report details ways in which costs could have potentially been saved had this project employed a BIM plan throughout most of the phases of construction.

Constructability challenges and the solutions taken were also addressed and discussed with Wohlsen. These issues included site logistics, unforeseen site conditions, and foundation work near winter weather conditions.

Table of Contents

Detailed Project Schedule

A detailed project schedule has been developed for The Mary J. Drexel Project. The project summary schedule included in Technical Report 1 outlined the major milestones for critical activities on this project. The detailed project schedule is broken down into three main headings: preconstruction/design, construction, and final inspections & closeout. The construction phase is then broken down further into six different parts. The following Table 1 gives a summary of the major categories with a few significant milestones shown as well.

The Mary J. Drexel Project schedule begins on June 7, 2011 and owner turnover is on February 6, 2014.

Description	Duration (d)	Start	Finish
Preconstruction/Design	408	07-Jun-11	11-Jan-13
Construction	251	26-Nov-12	18-Nov-13
Mobilization	3	26-Nov-12	28-Nov-12
Excavation	33	30-Nov-12	17-Jan-13
Structure	110	04-Dec-12	08-May-13
West Wing SOD Finished	-	20-Mar-13	
East Wing SOD Finished	-	29-Apr-13	
Building Envelope	120	11-Mar-13	27-Aug-13
West Wing – Roof Trusses & Sheathing Complete	-	08-May-13	
West Wing – Dried In	-	31-May-13	
East Wing – Roof Trusses & Sheathing Complete	-	03-Jun-13	
East Wing – Dried In	-	24-Jun-13	
Interior Fit-Outs	158	08-Apr-13	18-Nov-13
Permanent Power	-	17-Jul-13	
Complete Elevators	-	06-Aug-13	
Finishes	148	08-Apr-13	04-Nov-13
West Wing – Drywall Complete	-	31-Aug-13	
East Wing – Drywall Complete	-	26-Sep-13	
Sitework	92	24-Jun-13	31-Oct-13
Final Inspections & Closeout	123	15-Aug-13	06-Feb-14
Substantial Completion	-	24-Dec-13	24-Dec-13

Table 1 – Project Milestone & Critical Item Overview

***See Appendix A for complete Detailed Project Schedule**

Preconstruction / Design

The Mary J. Drexel Project began the design process in the beginning of June 2011 with a mindset to start construction within a year or two and being complete a year after starting.

The longest and most important aspect of this project was the preconstruction and design phase. Throughout this phase many meetings and discussions took place between the Owner, Architect, and The Lower Merion Township Historical Commission specifically about the building façade. Another large part of this phase was the MEP Design-Build aspect that Wohlsen Construction coordinated which was completed 61 days after the design development was complete.

Upon completion of the design, the focus shifted to estimating the GMP contract that was reviewed and approved by the owner on September 17, 2012. This allowed Wohlsen to turn their focus on finishing the procurement process and coordinate the demolition work with the third party contractor hired by the owner.

Construction

Mobilization & Excavation

It is important to note that the demolition work to the existing buildings on the site started at the end of August 2012. As this work was completed by a third party contractor, it is not shown on the detailed project schedule. The demolition of the existing Cottage and Nursing Home was completed and removed from site by October 2012. Mobilization started on November 26, 2012. As the control points were being placed and excavation proceeded, rock was found. This unforeseen condition caused a delay on the project as blasting had to be performed in order to remove it.

Once the site is cleared and the excavation is complete, small quantities of rebar and lumber showed up on site for the concrete layout work to begin.

Structure

The structural phase began in the beginning of December 2012 and ended in the beginning of May 2013. The foundations of the new additions are very simple as it began with the placing of footings and CMU Masonry bearing walls. All underground MEP work was placed and inspected prior to any concrete slab being poured. The south half of the West Wing was the first part to be placed. The north footings and masonry walls followed four weeks after the south was complete. The typical sequence can be seen in Figure 1. The substructure of the West Wing took 60 days and was completed on February 27, 2013.

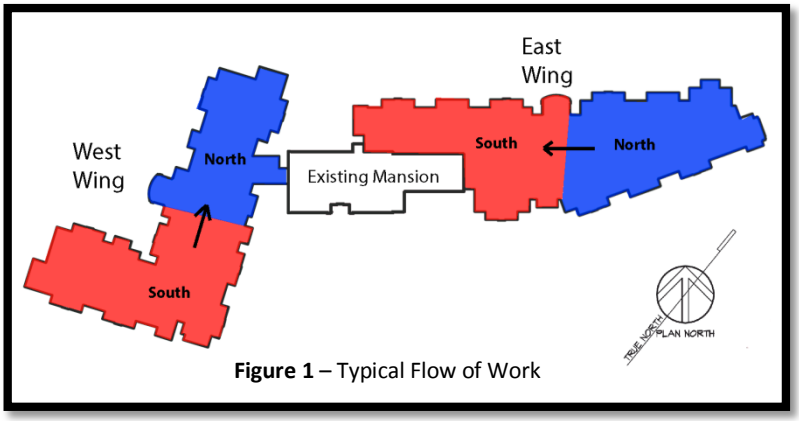


Figure 1 – Typical Flow of Work

The East Wing follows the similar sequence but rather than starting on the south end, the north end was the starting point. The sequencing was phased to have the two new additions be erected toward the existing Mansion. Each wing averages about 60 days to complete the substructure and only 25 days for the superstructure to be complete.

The superstructure is composed of prefabricated load bearing wall panels that are placed on site allowing for a swift erecting sequence. Two critical dates arise when the elevated floor slabs are complete so the building envelope work can commence.

Building Envelope & Enclosure

As mentioned earlier, the most time was spent in the design phase on the building envelope system due to Historical Commission requirements and recommendations. Comprised of stucco and stone veneer, careful inspections needed to be made after the lath for the stucco was placed. Work on the façade system began in mid-March 2013 with the West Wing and the East Wing following four weeks behind in mid-April 2013.

Each wing is first completely sheathed and wrapped before the windows are installed and flashed properly. Once the roof trusses were installed and sheathed, three weeks later the roof would be shingled and membrane roofing was installed. It is critical that the dried in dates for each wing are met so interior fit-outs and finishes can begin since these have the second longest durations.

Fit-Out

MEP rough-ins are the first to start once the building envelope is dry. The work sequence follows the same flow from south to north on the West Wing and north to south for the East Wing. The four week lag between wings allows for subcontractors to complete one floor of one wing then move to the same floor of the other wing. Using this tactic, each floor took a month to complete rough-ins.

A major milestone in this section is Permanent Power. With the many different amount of trades being on site, the earlier that permanent power can be on site the better. Having the finish trades using temporary power to finish two buildings is not very efficient and can slow down the production.

Finishes

Throughout the initial design development phase this project contained high quality finishes. This process follows the same flow of south-north West Wing and north-south East Wing to meet at the existing Mansion. After the rough-ins are complete, activities such as blocking, drywall, flooring, woodwork, fixtures, painting, and doors are included in this phase. Having the high quality finishes means that longer installation times are required when planning durations and lead times were greatly considered.

Final Inspections & Closeout

As each wing comes to completion, a typical punch list walkthrough is performed by the Contractor, Architect, and Owner. All testing and inspections are completed at this time as well. Once substantial completion is met and the certificate of occupancy is issued the owner can move in. Substantial completion for the contractor is December 24, 2013.

Detailed Structural System Estimate

In order to further evaluate the project costs of the Mary J. Drexel Project, a detailed structural system estimate was performed. Technical Report 1 reported that the construction costs for the Mary J. Drexel project was roughly 22% higher than similar projects. The detailed structural system estimate and assemblies estimate of the MEP systems was compiled to better understand the reasons behind the difference in costs.

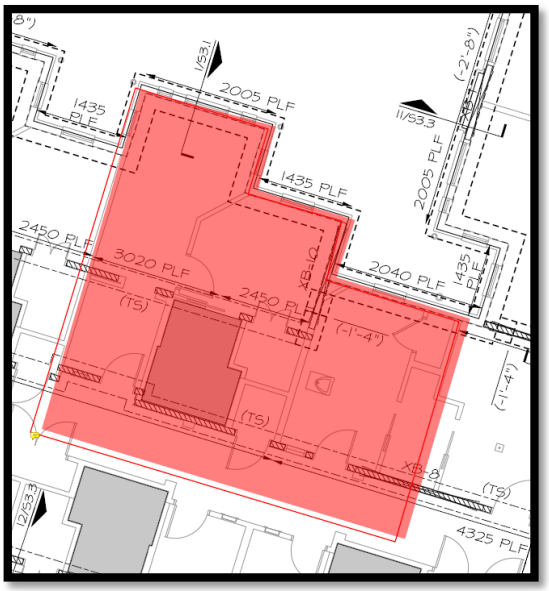


Figure 2 – Typical Resident Unit Module

The estimates were generated using an online, 2013 version of RS Means that allowed for automatic adjustment for construction near Philadelphia, PA. To simplify certain aspects of the detailed estimate a typical module, as seen in Figure 2, was established.

Using this module for allowed certain systems to be quantified simpler and efficiently. These systems included:

- Concrete | Slab on Grade & Elevated Slabs
- Concrete | Typical Continuous Wall Footings
- Concrete | Typical Reinforcing & WWF in slabs
- Concrete | Shoring
- Structural | Load Bearing Wall Panels
- Structural | Steel Decking

Since there are 80 resident units and common areas throughout the two wings, this module consists of a typical resident unit and an extra room to account for the common areas. When quantities are needed for certain systems, multiplying the quantity by a factor of 80 allowed for a close approximation of the entire two buildings.

Some parts of systems had to be accounted for individually. For example, structural steel members were counted for the West Wing then simply doubled since the East Wing is very similar to quantity wise. The systems that used this approach included:

- Concrete | Spread Footings
- Concrete | Beams & Piers
- Structural | Steel Members & Plates

The costs from RS Means combined with the quantities found using Autodesk Quantity Takeoff were combined to find the overall cost of the concrete and structural steel systems. The quantities were taken off from only the structural drawings from the project.

***See Appendix B for the Detailed Structural System Estimate**

Concrete

As stated above, part of the concrete was quantified using the typical module approach and others parts were individually taken off. All of the concrete on the project was normal weight, 4000 PSI unless otherwise noted. Each spread footing was accounted for concrete and reinforcement, which includes rebar running full length in both directions at the bottom. Both wings had concrete piers, but the East Wing is the only building that also used concrete beams since it has a small 3,000 SF basement underneath it.

The continuous wall footings were estimated using the typical module. These footings run along the whole perimeter of each wing and through the hallways as well. Slabs were another easy item to take off using the module. Each building is roughly around 36,000 SF and the only difference between the slab on grade and elevated slab was the reinforcing amount.

Structural Steel

Almost 75% of the structural system for this senior living project is made up of prefabricated load-bearing metal stud wall panels. The system used on this project is known as the "Infinity Structural System". The only area where structural steel framing is found is at the common areas in the center of each wing where longer spans were desired. The two most coming structural steel elements were HSS and W8x18 columns/beams. The roof deck is made up of 4-1/2" 16 GA and covers about 38,000 SF.

Cost Summary

The reported costs for the concrete system and structural system were $878,808 and $1,367,973, respectively. These values were then compared to the estimated costs derived from the detailed estimate produced in Appendix B in order to complete a variance analysis. Table 2 below compares the actual vs. estimated costs.

Description	Actual Costs ($)	Estimated Costs ($)	% Difference
Concrete	$ 878,808	$ 996,820	13.43 %
Concrete Cost ($) / SF	$ 11.72	$ 13.26	
Structural Steel	$ 1.367,973	$ 1,748,236	27.80 %
Structural Steel Cost ($) / SF	$ 18.24	$ 23.31	

Table 2 – Concrete & Steel Comparison

As shown above, the detailed estimate costs are higher than those actually incurred on the Mary J. Drexel Home project. After investigation there are a number of reasons that could allow this estimate for be higher than the actual contract value.

Using the "typical-bay" procedure allows for error in detail and can actually yield higher quantities. Another reason costs may be slightly higher than actual could have to do with using 2013 Costs for a project that was getting priced in 2011.

Assemblies MEP Estimate

To further investigate the total construction costs for the project, an assembly estimate of the MEP systems was calculated using RSMeans CostWorks software. An Assemblies estimate is used as a great budgeting tool in the planning stages of a project. It does not require much detail but the accuracy of the estimate is typically within plus or minus 10%.

Table 3 below compares the assembly cost estimate to the actual project costs.

Description	Actual Costs ($)	Assemblies Costs ($)	% Diff.
Plumbing	$ 970,669	$ 829,153	- 14.58 %
HVAC	$ 1,652,434	$ 1,377,362	- 16.65 %
Electrical	$ 1,207,469	$ 1,541,244.22	+ 27.64 %
TOTAL	**$ 3,830,572**	**$ 3,747,760**	**- 2.17 %**

Table 3 – Assembly Estimate Summary

The total MEP package of the Assemblies estimate is within the accurate 10% range of the actual project costs as shown above. However, when each system is broken down individually differences are greater than 10%. In most cases, the reason for the lower estimated costs can be attributed to the missing contribution due to subcontractor fees which may typically be 10%.

In regards to Plumbing and HVAC, if the subcontractor fees of 10% are included to the Assemblies estimates then the differing percentage will be less than 10%. A complete breakdown of the Assemblies estimate can be found in Appendix C.

The main parts taken off in the assemblies estimate for the plumbing system were plumbing fixtures and water heaters. The reasons for a difference between the actual and assembly estimate can be because of the higher quality finishes chosen for the plumbing fixtures. Another reason could be the difference in the cost of the resident unit showers compared to what was available in the RSMeans Assemblies Catalog. A 36" square shower was used in the estimate but the actual conditions have a shower that is 62" on the back wall and 36" on the sides.

The HVAC systems comprises of Rooftop Air Handling Units and individual thermostats and units for each resident room. When using the Assemblies costs, the individual thermostats and units are not accounted for this could be another reason for the difference in costs between estimated and actual.

***See Appendix C for the Assemblies MEP Estimate**

Site Layout Planning

The Mary J. Drexel Project is located off a heavily traveled Belmont Ave. just outside of Philadelphia, PA. Figure 3 below shows the Mary J. Drexel home before any demolition or construction has started. It is very evident that the site will bring about a few issues when considering laying out the site for construction work to be completed.

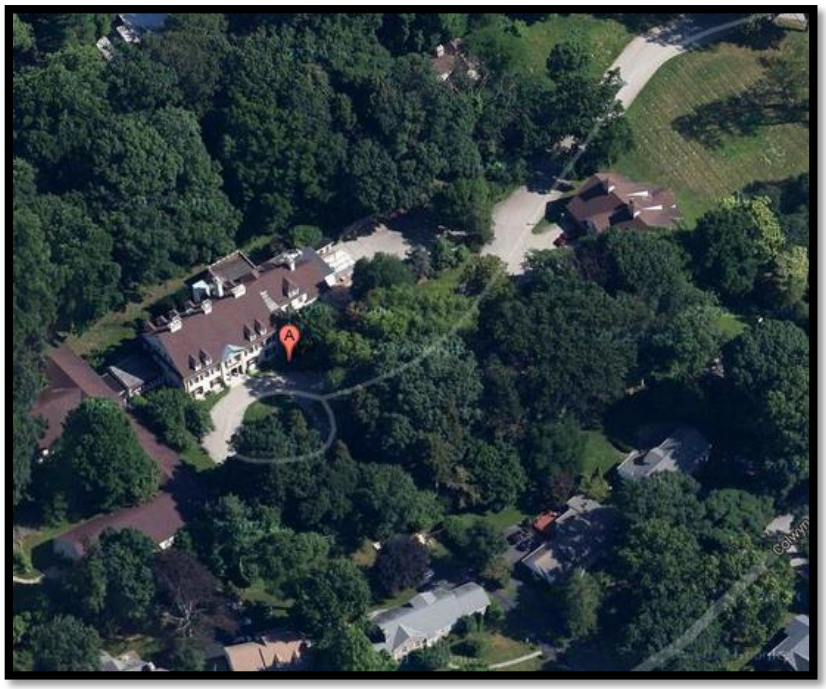


Figure 3 – 3D View of Site before construction – Image from Google maps

The other case to be considered for this project is the fact that it is located in the middle of a residential community. Having a restricted site such as this will require current vegetation to be removed and will also restrict certain equipment from being able to be placed on site. It is challenging to have many different phases planned out with this site, but three potential phases include:

- Existing & Demolition
- Superstructure
- Building Envelope

Throughout all three phases, the boundaries and fence lines remained as they were first installed. One benefit of completing a renovation & addition project is that the contractor requested to use the existing Mansion as an office trailer location. This allowed some savings in general conditions fees as well as the existing storage barn that was used for storage during construction. Not only was the general contractor allowed to use the mansion as an office trailer, but the plumbing subcontractor was as well.

One critique of the site plans detailed in Appendix D compared to that of the general contractor is to limit parking to certain areas. With large tractor trailers coming into the site, having vehicles stay at any location on site will further congest the site. Due to site constraints the only reasonable parking location would be near the entrance off Belmont Avenue.

The following sections detail the site planning difference between each phase listed above.

***See Appendix D for the Site Layout Plans**

Existing Conditions & Demolition

As seen in Figure 3 above and the site plan in Appendix D, the Nursing Wing and Cottage need to be demolished prior to the new wing additions being constructed. A few existing utilities such as the water line coming in from Belmont Avenue will have to be re-rerouted due to the new additions being built and there will be new gas, electric, and data lines that will be run.

Since the new additions do not have basements not much excavation is necessary. The only exception arises for the small 3,000 SF basement that will be attached to the existing Mansion basement under the new East Wing.

Superstructure

Once the existing parts of the home get demolished and trees get cleared, construction begins. This layout plan is the typical layout for most of the construction work that will be going on. This layout includes:

- Contractors' Trailers
- Laydown areas
- Portable Toilets
- Parking
- New Construction Access Roads
- Dumpsters
- Temporary Power

As discussed earlier, since this project is on a very tight site, some of the existing buildings will be utilized as trailer and storage locations. This will remain constant throughout the entire construction process.

The main restriction on this site is the installation of the Erosion Control Silt Fence. Most of the property slopes downward from the line of the fence especially on the north side of the lot. Limiting parking to the front entrance to all subcontractors will optimize more laydown areas near the new additions.

Two concrete pump truck locations are shown at a central location for each wing. Limiting the movement and locations of the pump will allow the site flow to remain constant and not have any blocking. The only other type of equipment that is able to crawl around and be used for the structure is either a small mobile crane or a lull/hoist.

Building Envelope & Finishes

Once the structure is up and crews will be able to work inside the site will be less congested. This will allow for lulls/hoists to be able to ride around the perimeter of each building for certain trades involved in the building envelope. The major difference shown on this phase the reduction of trailers needed on site as many trades will be able to store materials inside the new additions. Again, this will decrease the site congestion and could potentially allow for more parking.

The work flow as stated earlier will continue to go south-to-north for the West Wing and north-to-south for the East Wing.

The main concern throughout all three phases, besides site congestion, is the surrounding residential neighborhood. The Lower Merion Township has a noise ordinance that limits construction noise from 6 pm to 8 am daily. This greatly limits the workday and could decrease labor productivity.

General Conditions Estimate

A General Conditions estimate was performed and the summary of all the categories is $ 1,596,477. The detailed breakdown can be found in Appendix E which includes the costs incurred from the Project Management Team, Site Conditions, Insurance, Field Operations, and Safety.

The Project Management team includes all personnel with Wohlsen Construction. Not all roles were assumed to be spending 100% of their time on the project throughout the duration, in this case 14 months. For example, the Project Executive and Field Operations Manager spend about 10% of their time focusing on this one project. The only person on site would be the Superintendent. A concern arises here as maybe an Assistant Superintendent or another Project Engineer to assist the superintendent should be on site as well. The extra help could only be there for 50% of their time.

The others are working out of the regional office. The Project Manager and Project Engineer will travel out to site for Owner's meetings and subcontractor meetings on a weekly basis as necessary. Being able to manage this project

Insurance costs such as Builder's Risk and Liability are also included in the General Conditions. These values are based off the job as a total percentage that was agreed upon in the GMP Contract ($14.6M). An interesting item included here is also the MEP Design Liability Insurance. This was added to the GMP since Wohlsen coordinated and designed the MEP systems with subcontractors. If Wohlsen wasn't accepted to be the in charge of the project then the other party would be responsible for taking over the design and risk.

Field Operations play a vital role in determining General Conditions. Being able to use the existing Mansion as a field office and the existing barn as a storage barn greatly saves costs. Other necessities included in this category include office supplies, final cleaning, computer equipment, drawings, and safety equipment.

3% contingency was added to the general conditions cost. This was an agreed upon value within the GMP and will provide an allowance for a future event or circumstance that may or not occur that will incur extra costs on the project. Any schedule delays can contribute to this as well and will require additional costs to cover the extra management or work.

When compared to the total GMP amount of $14.6M, the General Conditions estimate of $1,596,477 is roughly close to 10% of the total amount. This may seem high at first but when carrying the risk of the MEP design and 3.0% contingency rate contributes to the higher General Conditions costs.

*** See Appendix E for the General Conditions Estimate**

The following Table 4 shows the cost summaries of each category and the percentage represented of the entire estimate.

Description	Project Cost
Project Team	$ 776,250
Site Conditions	$ 95,455
Insurance	$ 200,151
Field Operations	$ 86,334
Contingency	$ 438,287

Table 4 – GC Cost Summary

Figure 4 on the following page categorizes the general conditions by percentages as well.

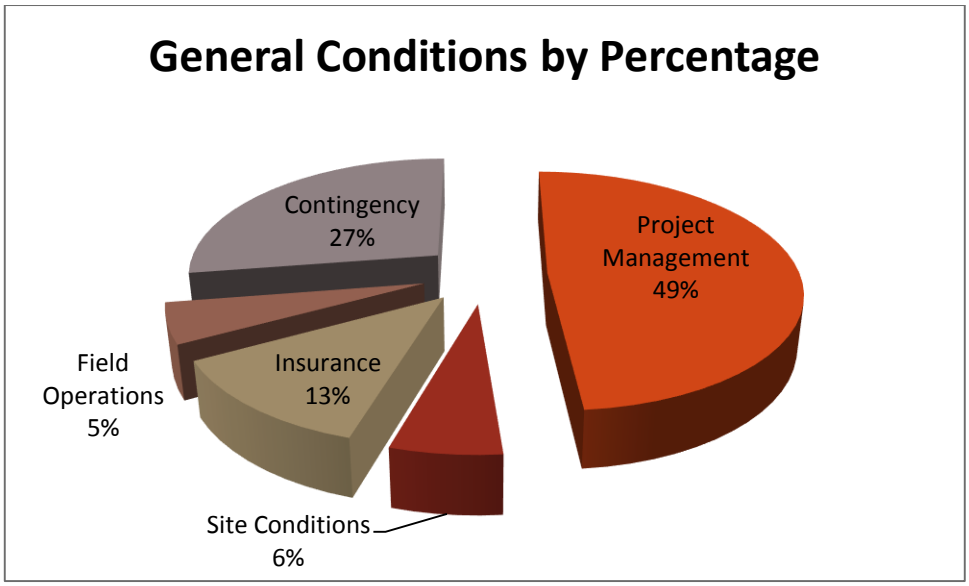


Figure 4 – General Conditions (%)

Constructability Challenges

The Mary J. Drexel Home project presented multiple unique constructability challenges to the construction team over the lifetime of the project. Three of the most distinctive challenges arose near the beginning of the project. After discussion with the project team those three challenges that the team had to overcome include site logistics, unforeseen soil conditions, and winter weather conditions. Through effective communication and collaboration between the parties involved on the project, all three challenges were overcome.

Site Logistics

As mentioned a few times throughout the report, the site constraints and actual site location presented a challenge to the construction efforts. The project is located just outside of North Philadelphia, PA and on Belmont Ave. which connects a highly congested two lane interstate-76 and US Route 1. Figure 5 below shows the map view of the site location.

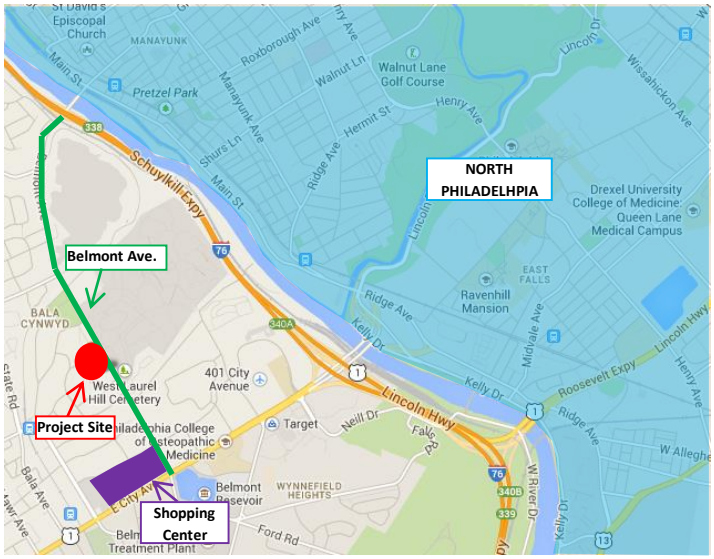


Figure 5 – Site Location – image from Google Maps

Belmont Avenue is a two-way one lane road and due to the heavy amount of traffic that flows on Belmont Avenue, it is very important that no tractor trailers or any vehicle sits on the road and blocks traffic. Effective communication between the Project Superintendent and subcontractors on delivery dates was vital to making sure there is room for deliveries to come into the site.

Another issue involving the site included the limited amount of parking available. During times where large quantities of materials were being delivered on site, many vehicles needed to be moved around in order for deliveries to enter and exit. After communicating with the shopping center down the street, all trades were advised to car-pool laborers from the shopping center to the site if the available on site parking lot was full.

The largest impact on this project has to deal with the noise ordinance from Lower Merion Township. Since the Mary J. Drexel Home is located in a residential area there is a construction noise ordinance that does not allow any noise after 6 pm until 8 am the next day. In order to avoid any complaints from neighbors, Wohlsen set up an email system where neighbors were informed on certain days of what kind of work will be going on and also notified them whether work needed to be done on certain weekends.

Unforeseen Soil Conditions

The main challenge that arises early on in the construction phase is unforeseen conditions. Depending on how severe the condition is that arises, significant costs may be incurred and schedule changes may be required. This is especially true for the Mary J. Drexel project. Being an historic 150 year old site, the existing buildings had to be demolished in order for the new construction to start and there is no clue of what was underneath these buildings. After the buildings had been demolished, large amounts of rock were discovered.

Figure 6 – Hydraulic Breaker – Courtesy of Farley Plant Hire

The rock was discovered to be an ample amount and simple dozers and excavating equipment was not going to fix the problem. To account for this condition, a Hydraulic Breaker, as show in Figure 6 on the left, had to be used.

Usually, breakers are used in areas where blasting is not possible due to safety concerns and environmental issues. However, blasting was used simultaneously with the breaker to excavate the rock as quickly and efficiently as possible.

As stated before, this process required the neighbors to be notified and informed on exactly when and where the blasting was taking place. Although alterations needed to be made around the construction schedule for this condition, the project team's communication and coordination efforts allowed the process to go smoothly.

Foundation In Winter

The winter months in Pennsylvania can have a detrimental effect on concrete curing. Starting foundations in the winter was another challenge the project team faced early on in the project. Pouring concrete in these weather conditions has many risks such as longer curing, cracking due to freeze-thaw cycles, and freezing.

Shutting down the site until the weather warmed up was not an option to take as it could incur more costs to the project. The approach taken was to plan around the cold weather and take advantage of any warm days that came. Since Wohlsen self-performed the concrete work so it was simpler to schedule around pours and either push them back a few days or start them earlier. This approach was successful as by the beginning of January, 90% of the West Wing foundation was completed.

Building Information Modeling (BIM) Use

The Mary J. Drexel Project did not utilize much of what BIM has to offer. Two important expectations or goals from the Owner on this project that were listed in Technical Report 1 are staying within budget and maintain/increase quality. The use of BIM early on in the project definitely would have increased the possibility of meeting those expectations.

BIM Uses

Even though BIM was not required to be used for the project, Wohlsen used 3D coordination during the design phase with designing the MEP systems with subcontractors. That was the only BIM process that applied to this project.

Table 5 below outlines potential uses of BIM that could have been used on the project and could have impacted certain aspects of the project. Appendix F outlines the process map for the project also.

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

Table 5 – BIM Use Summary

*** See Appendix F for BIM Process Map**

Design Authoring & 3D Coordination

Design Authoring is the first step towards BIM and the key is connecting the 3D model (architectural, structural, MEP) to other properties, quantities, means and methods, costs and schedules. Implementing 3D Coordination allows for clash detection to be performed during coordination meetings. This process eliminates major system conflicts prior to being installed on the project. The use of a 3D model, preferably architectural, structural, and MEP would make the coordination more efficient and lead to lower RFIs and potentially less change orders. Implementing these on the Mary J. Drexel project would allow true collaboration between the team and lead to improved quality and better control of costs and schedule.

Design Reviews

The Mary J. Drexel project had a hierarchy of personnel who approved certain design aspects of the project. Being able to perform design reviews is an effective collaboration tool in that traditional construction mock-ups are not necessary as all the design features can be seen realistically in a virtual environment. This BIM Use can be done with simple computer design review software or in virtual-mock up facilities. For this project the simple computer software would allow for a shorter and more efficient design process and allow decisions to be made quickly.

Phase Planning (4D Modeling)

A 4D model may not be completely necessary for the Mary J. Drexel project as most issues and design concerns can be solved with the 3D model coordination and review. A 4D model is a great tool to show the construction sequence and allow for a better understanding of project milestones and construction plans.

Cost Estimation (Quantity Take-Off)

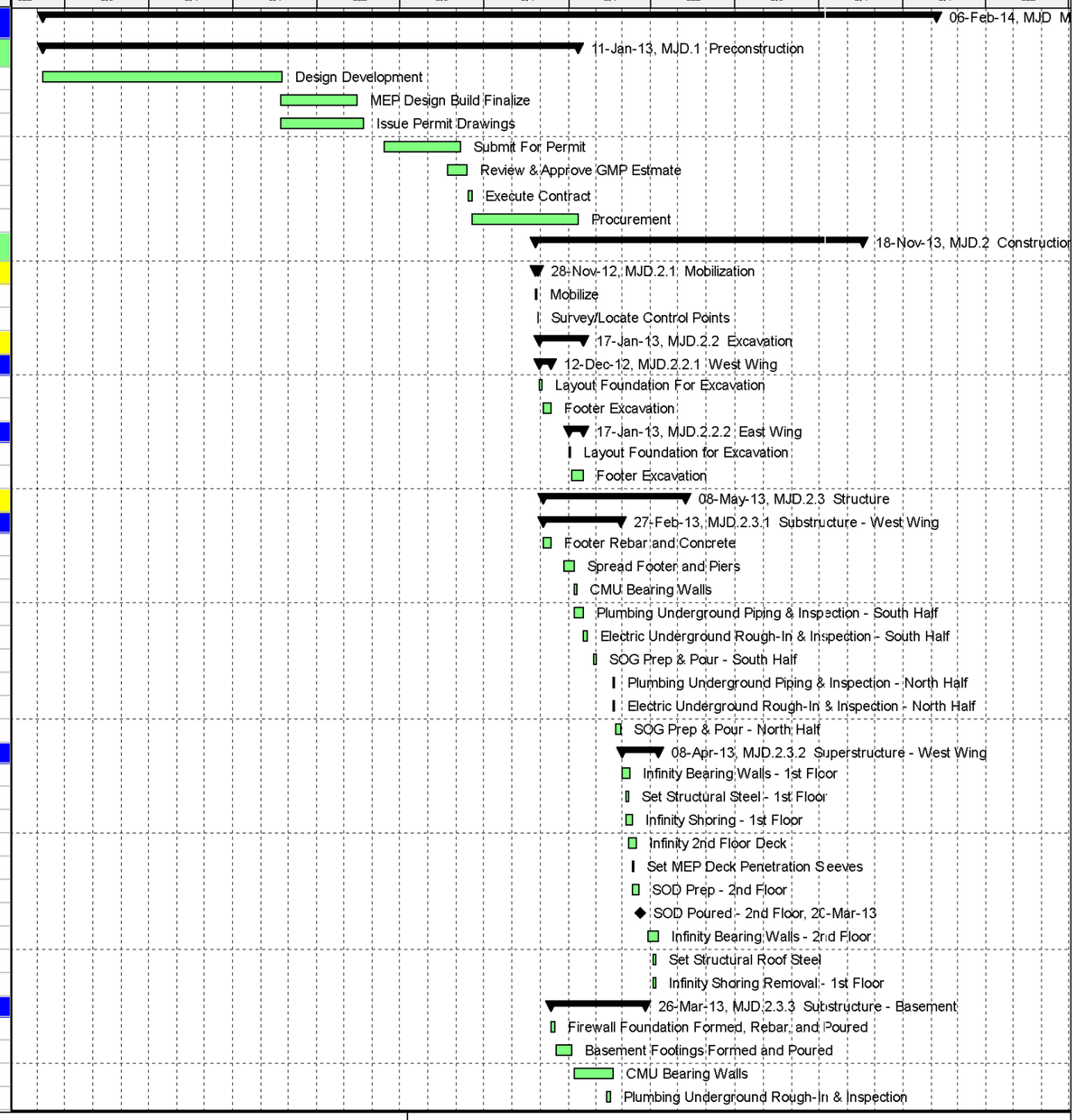
BIM allows the process of cost estimation to be more precise. Cost estimates are developed at a much faster rate and can be provided to the owner early in the decision making process. Adding the cost estimation to the project schedule can help keep track of budgets throughout the entire construction process.

The most beneficial BIM use item that could have been implemented on this project is the use of a 3D model allowing 3D coordination and design review. There is no drawback in trying to implement BIM on any project as it can provide many benefits. Detailed planning and effective communication amongst all aspects of the project team is the key to implement a BIM plan.

Appendix A: Detailed Project Schedule

MJD Assisted Living Additions — Classic Schedule Layout — 15-Oct-13 21:45

Activity ID	Activity Name	Original Duration	Start	Finish
MJD	MJD Assisted Living Additions	682	07-Jun-11	06-Feb-14
MJD.1	Preconstruction	408	07-Jun-11	11-Jan-13
A1000	Design Development	182	07-Jun-11	22-Feb-12
A1010	MEP Design Build Finalize	59	22-Feb-12	14-May-12
A1020	Issue Permit Drawings	65	22-Feb-12	22-May-12
A1030	Submit For Permit	57	14-Jun-12	04-Sep-12
A1040	Review & Approve GMP Estmate	16	21-Aug-12	12-Sep-12
A1050	Execute Contract	3	13-Sep-12	17-Sep-12
A1060	Procurement	81	18-Sep-12	11-Jan-13
MJD.2	Construction	251	26-Nov-12	18-Nov-13
MJD.2.1	Mobilization	3	26-Nov-12	28-Nov-12
A1070	Mobilize	2	26-Nov-12	27-Nov-12
A1080	Survey/Locate Control Points	1	28-Nov-12	28-Nov-12
MJD.2.2	Excavation	33	30-Nov-12	17-Jan-13
MJD.2.2.1	West Wing	9	30-Nov-12	12-Dec-12
A1090	Layout Foundation For Excavation	2	30-Nov-12	03-Dec-12
A1100	Footer Excavation	7	04-Dec-12	12-Dec-12
MJD.2.2.2	East Wing	12	02-Jan-13	17-Jan-13
A1110	Layout Foundation for Excavation	2	02-Jan-13	03-Jan-13
A1120	Footer Excavation	10	04-Jan-13	17-Jan-13
MJD.2.3	Structure	110	04-Dec-12	08-May-13
MJD.2.3.1	Substructure - West Wing	60	04-Dec-12	27-Feb-13
A1130	Footer Rebar and Concrete	7	04-Dec-12	12-Dec-12
A1140	Spread Footer and Piers	7	27-Dec-12	07-Jan-13
A1150	CMU Bearing Walls	4	07-Jan-13	10-Jan-13
A1160	Plumbing Underground Piping & Inspection - South Half	8	07-Jan-13	16-Jan-13
A1170	Electric Underground Rough-In & Inspection - South Half	3	17-Jan-13	21-Jan-13
A1180	SOG Prep & Pour - South Half	4	28-Jan-13	31-Jan-13
A1190	Plumbing Underground Piping & Inspection - North Half	3	18-Feb-13	20-Feb-13
A1200	Electric Underground Rough-In & Inspection - North Half	3	18-Feb-13	20-Feb-13
A1210	SOG Prep & Pour - North Half	5	21-Feb-13	27-Feb-13
MJD.2.3.2	Superstructure - West Wing	28	28-Feb-13	08-Apr-13
A1220	Infinity Bearing Walls - 1st Floor	7	28-Feb-13	08-Mar-13
A1230	Set Structural Steel - 1st Floor	3	05-Mar-13	07-Mar-13
A1240	Infinity Shoring - 1st Floor	5	05-Mar-13	11-Mar-13
A1250	Infinity 2nd Floor Deck	7	07-Mar-13	15-Mar-13
A1260	Set MEP Deck Penetration Sleeves	3	11-Mar-13	13-Mar-13
A1270	SOD Prep - 2nd Floor	7	11-Mar-13	19-Mar-13
A1280	SOD Poured - 2nd Floor	0	20-Mar-13	
A1290	Infinity Bearing Walls - 2nd Floor	7	29-Mar-13	08-Apr-13
A1300	Set Structural Roof Steel	3	03-Apr-13	05-Apr-13
A1310	Infinity Shoring Removal - 1st Floor	3	03-Apr-13	05-Apr-13
MJD.2.3.3	Substructure - Basement	72	13-Dec-12	26-Mar-13
A1320	Firewall Foundation Formed, Rebar, and Poured	3	13-Dec-12	17-Dec-12
A1330	Basement Footings Formed and Poured	12	18-Dec-12	04-Jan-13
A1340	CMU Bearing Walls	31	07-Jan-13	18-Feb-13
A1350	Plumbing Underground Rough-In & Inspection	5	11-Feb-13	15-Feb-13



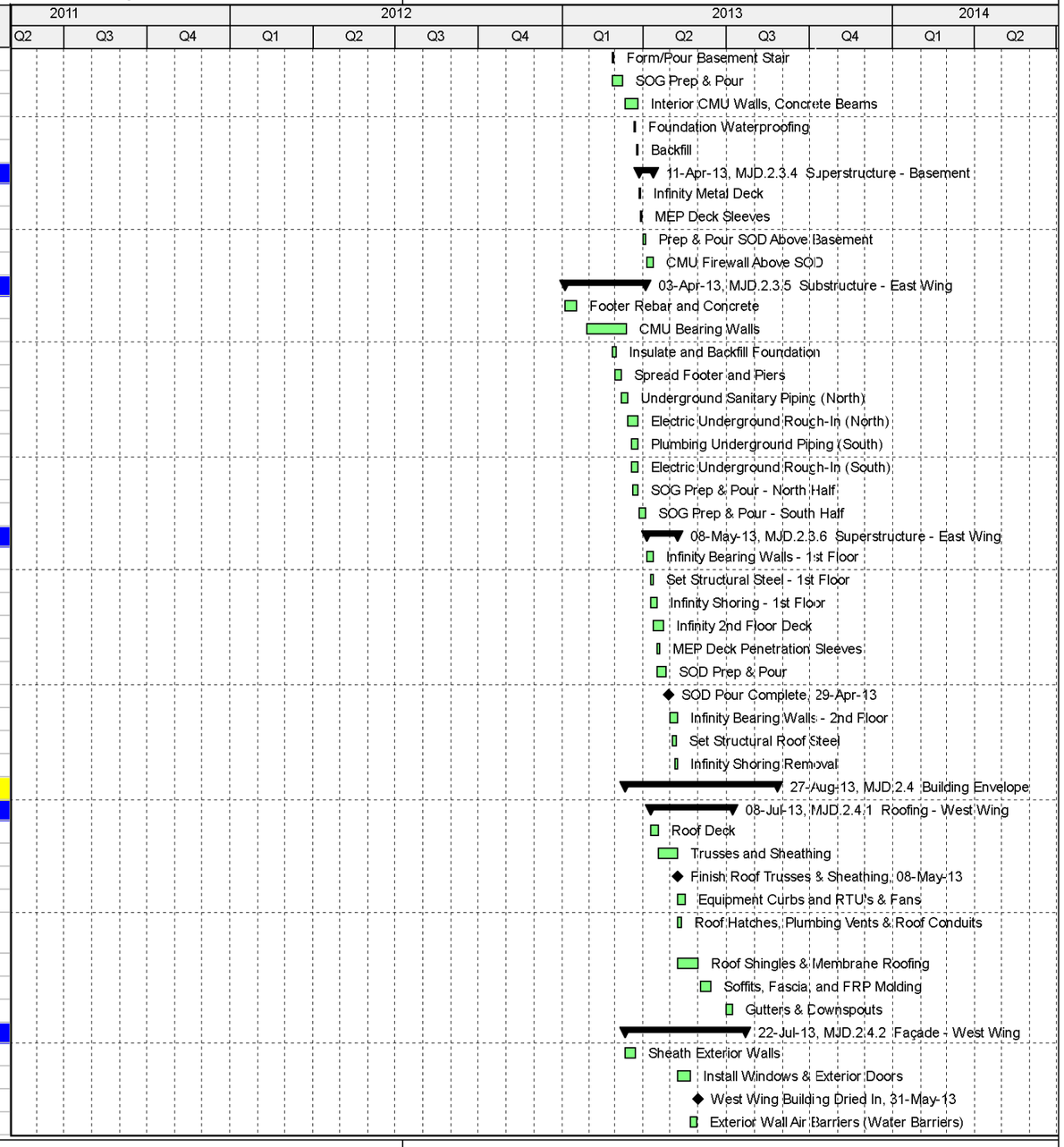
Actual Level of Effort — Remaining Work — Milestone
Actual Work — Critical Remaining Work — summary

Page 1 of 6

TASK filter: All Activities

MJD Assisted Living Additions | Classic Schedule Layout | 15-Oct-13 21:45

Activity ID	Activity Name	Original Duration	Start	Finish
A1360	Form/Pour Basement Stair	3	25-Feb-13	27-Feb-13
A1370	SOG Prep & Pour	10	25-Feb-13	08-Mar-13
A1380	Interior CMU Walls, Concrete Beams	11	12-Mar-13	26-Mar-13
A1390	Foundation Waterproofing	1	22-Mar-13	22-Mar-13
A1400	Backfill	2	25-Mar-13	26-Mar-13
MJD.2.3.4	Superstructure - Basement	12	27-Mar-13	11-Apr-13
A1410	Infinity Metal Deck	2	27-Mar-13	28-Mar-13
A1420	MEP Deck Sleeves	1	29-Mar-13	29-Mar-13
A1430	Prep & Pour SOD Above Basement	3	01-Apr-13	03-Apr-13
A1440	CMU Firewall Above SOD	6	04-Apr-13	11-Apr-13
MJD.2.3.5	Substructure - East Wing	64	04-Jan-13	03-Apr-13
A1450	Footer Rebar and Concrete	10	04-Jan-13	17-Jan-13
A1460	CMU Bearing Walls	32	28-Jan-13	12-Mar-13
A1470	Insulate and Backfill Foundation	5	25-Feb-13	01-Mar-13
A1480	Spread Footer and Piers	6	28-Feb-13	07-Mar-13
A1490	Underground Sanitary Piping (North)	5	08-Mar-13	14-Mar-13
A1500	Electric Underground Rough-In (North)	8	14-Mar-13	25-Mar-13
A1510	Plumbing Underground Piping (South)	7	18-Mar-13	26-Mar-13
A1520	Electric Underground Rough-In (South)	6	19-Mar-13	26-Mar-13
A1530	SOG Prep & Pour - North Half	4	20-Mar-13	25-Mar-13
A1540	SOG Prep & Pour - South Half	6	27-Mar-13	03-Apr-13
MJD.2.3.6	Superstructure - East Wing	25	04-Apr-13	08-May-13
A1550	Infinity Bearing Walls - 1st Floor	7	04-Apr-13	12-Apr-13
A1560	Set Structural Steel - 1st Floor	3	09-Apr-13	11-Apr-13
A1570	Infinity Shoring - 1st Floor	6	09-Apr-13	16-Apr-13
A1580	Infinity 2nd Floor Deck	7	12-Apr-13	22-Apr-13
A1590	MEP Deck Penetration Sleeves	3	16-Apr-13	18-Apr-13
A1600	SOD Prep & Pour	9	16-Apr-13	26-Apr-13
A1605	SOD Pour Complete	0	29-Apr-13	
A1610	Infinity Bearing Walls - 2nd Floor	7	30-Apr-13	08-May-13
A1620	Set Structural Roof Steel	3	03-May-13	07-May-13
A1630	Infinity Shoring Removal	3	06-May-13	08-May-13
MJD.2.4	Building Envelope	120	11-Mar-13	27-Aug-13
MJD.2.4.1	Roofing - West Wing	63	09-Apr-13	08-Jul-13
A1640	Roof Deck	7	09-Apr-13	17-Apr-13
A1650	Trusses and Sheathing	15	18-Apr-13	08-May-13
A1655	Finish Roof Trusses & Sheathing	0	08-May-13	
A1660	Equipment Curbs and RTU's & Fans	7	09-May-13	17-May-13
A1670	Roof Hatches, Plumbing Vents & Roof Conduits	3	09-May-13	13-May-13
A1680	Roof Shingles & Membrane Roofing	16	09-May-13	31-May-13
A1690	Soffits, Fascia, and FRP Molding	10	03-Jun-13	14-Jun-13
A1700	Gutters & Downspouts	5	01-Jul-13	08-Jul-13
MJD.2.4.2	Façade - West Wing	94	11-Mar-13	22-Jul-13
A1710	Sheath Exterior Walls	10	11-Mar-13	22-Mar-13
A1720	Install Windows & Exterior Doors	10	09-May-13	22-May-13
A1730	West Wing Building Dried In	0	31-May-13	
A1740	Exterior Wall Air Barriers (Water Barriers)	5	23-May-13	30-May-13



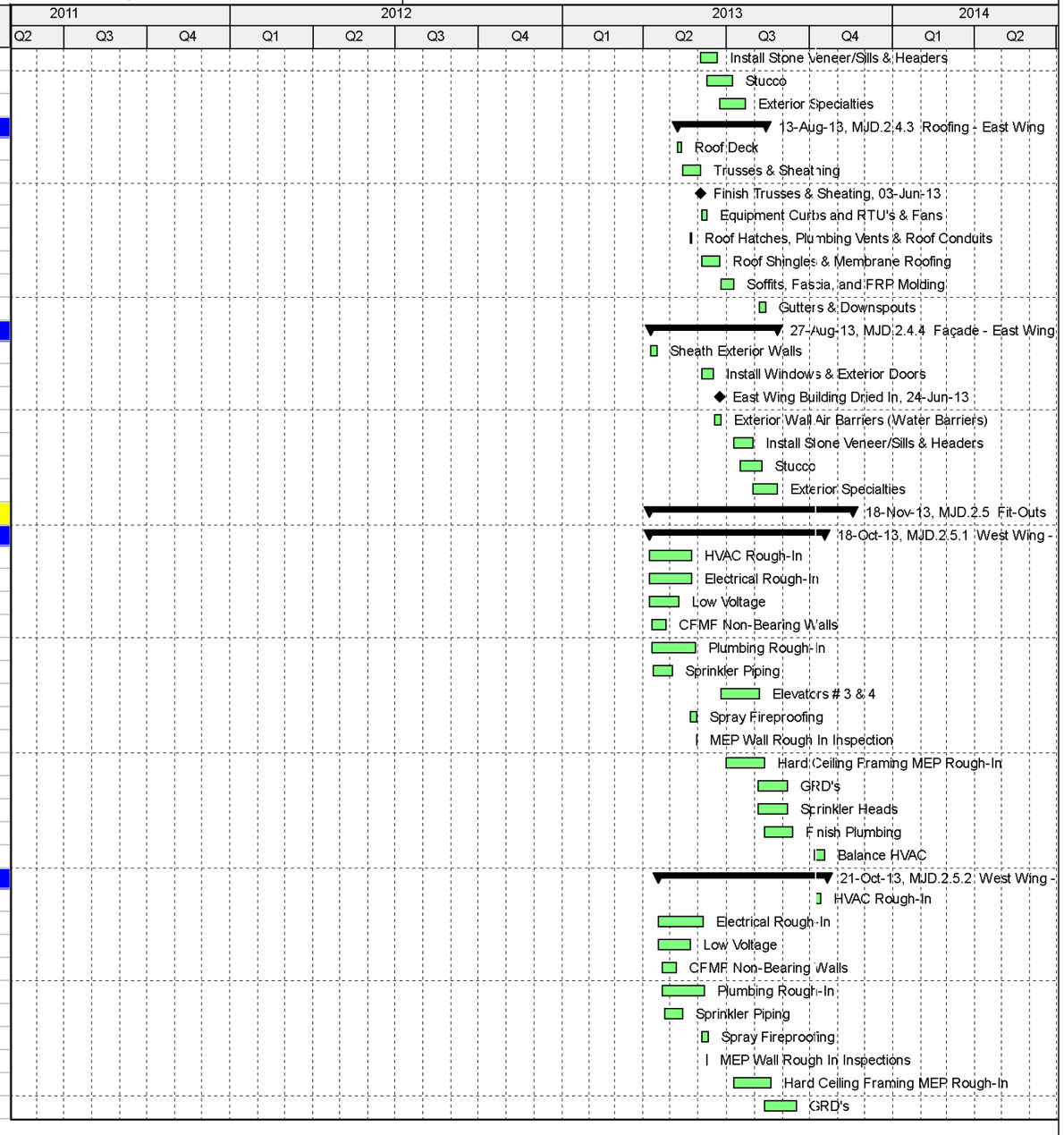
Actual Level of Effort | Remaining Work | Milestone
Actual Work | Critical Remaining Work | summary

Page 2 of 6

TASK filter: All Activities

MJD Assisted Living Additions — Classic Schedule Layout — 15-Oct-13 21:45

Activity ID	Activity Name	Original Duration	Start	Finish
A1750	Install Stone Veneer/Sills & Headers	15	03-Jun-13	21-Jun-13
A1760	Stucco	20	10-Jun-13	08-Jul-13
A1770	Exterior Specialties	20	24-Jun-13	22-Jul-13
MJD.2.4.3	Roofing - East Wing	67	09-May-13	13-Aug-13
A1780	Roof Deck	3	09-May-13	13-May-13
A1790	Trusses & Sheathing	14	14-May-13	03-Jun-13
A1795	Finish Trusses & Sheating	0	03-Jun-13	
A1800	Equipment Curbs and RTU's & Fans	5	04-Jun-13	10-Jun-13
A1810	Roof Hatches, Plumbing Vents & Roof Conduits	3	22-May-13	24-May-13
A1820	Roof Shingles & Membrane Roofing	15	04-Jun-13	24-Jun-13
A1830	Soffits, Fascia, and FRP Molding	10	25-Jun-13	09-Jul-13
A1840	Gutters & Downspouts	5	07-Aug-13	13-Aug-13
MJD.2.4.4	Façade - East Wing	99	09-Apr-13	27-Aug-13
A1850	Sheath Exterior Walls	5	09-Apr-13	15-Apr-13
A1860	Install Windows & Exterior Doors	10	04-Jun-13	17-Jun-13
A1870	East Wing Building Dried In	0	24-Jun-13	
A1880	Exterior Wall Air Barriers (Water Barriers)	6	18-Jun-13	25-Jun-13
A1890	Install Stone Veneer/Sills & Headers	15	10-Jul-13	30-Jul-13
A1900	Stucco	18	17-Jul-13	09-Aug-13
A1910	Exterior Specialties	20	31-Jul-13	27-Aug-13
MJD.2.5	Fit-Outs	158	08-Apr-13	18-Nov-13
MJD.2.5.1	West Wing - 1st Floor	137	08-Apr-13	18-Oct-13
A1920	HVAC Rough-In	35	08-Apr-13	24-May-13
A1930	Electrical Rough-In	35	08-Apr-13	24-May-13
A1940	Low Voltage	25	08-Apr-13	10-May-13
A1950	CFMF Non-Bearing Walls	12	10-Apr-13	25-Apr-13
A1960	Plumbing Rough-In	34	10-Apr-13	28-May-13
A1970	Sprinkler Piping	15	12-Apr-13	02-May-13
A1980	Elevators # 3 & 4	30	25-Jun-13	06-Aug-13
A1990	Spray Fireproofing	5	23-May-13	30-May-13
A2000	MEP Wall Rough In Inspection	1	29-May-13	29-May-13
A2010	Hard Ceiling Framing MEP Rough-In	30	01-Jul-13	12-Aug-13
A2020	GRD's	24	05-Aug-13	06-Sep-13
A2030	Sprinkler Heads	24	05-Aug-13	06-Sep-13
A2040	Finish Plumbing	24	12-Aug-13	13-Sep-13
A2050	Balance HVAC	10	07-Oct-13	18-Oct-13
MJD.2.5.2	West Wing - 2nd Floor	130	18-Apr-13	21-Oct-13
A2060	HVAC Rough-In	5	08-Oct-13	14-Oct-13
A2070	Electrical Rough-In	34	18-Apr-13	05-Jun-13
A2080	Low Voltage	25	18-Apr-13	22-May-13
A2090	CFMF Non-Bearing Walls	12	22-Apr-13	07-May-13
A2100	Plumbing Rough-In	34	22-Apr-13	07-Jun-13
A2110	Sprinkler Piping	15	24-Apr-13	14-May-13
A2120	Spray Fireproofing	6	04-Jun-13	11-Jun-13
A2130	MEP Wall Rough In Inspections	1	10-Jun-13	10-Jun-13
A2140	Hard Ceiling Framing MEP Rough-In	30	10-Jul-13	20-Aug-13
A2150	GRD's	24	13-Aug-13	16-Sep-13



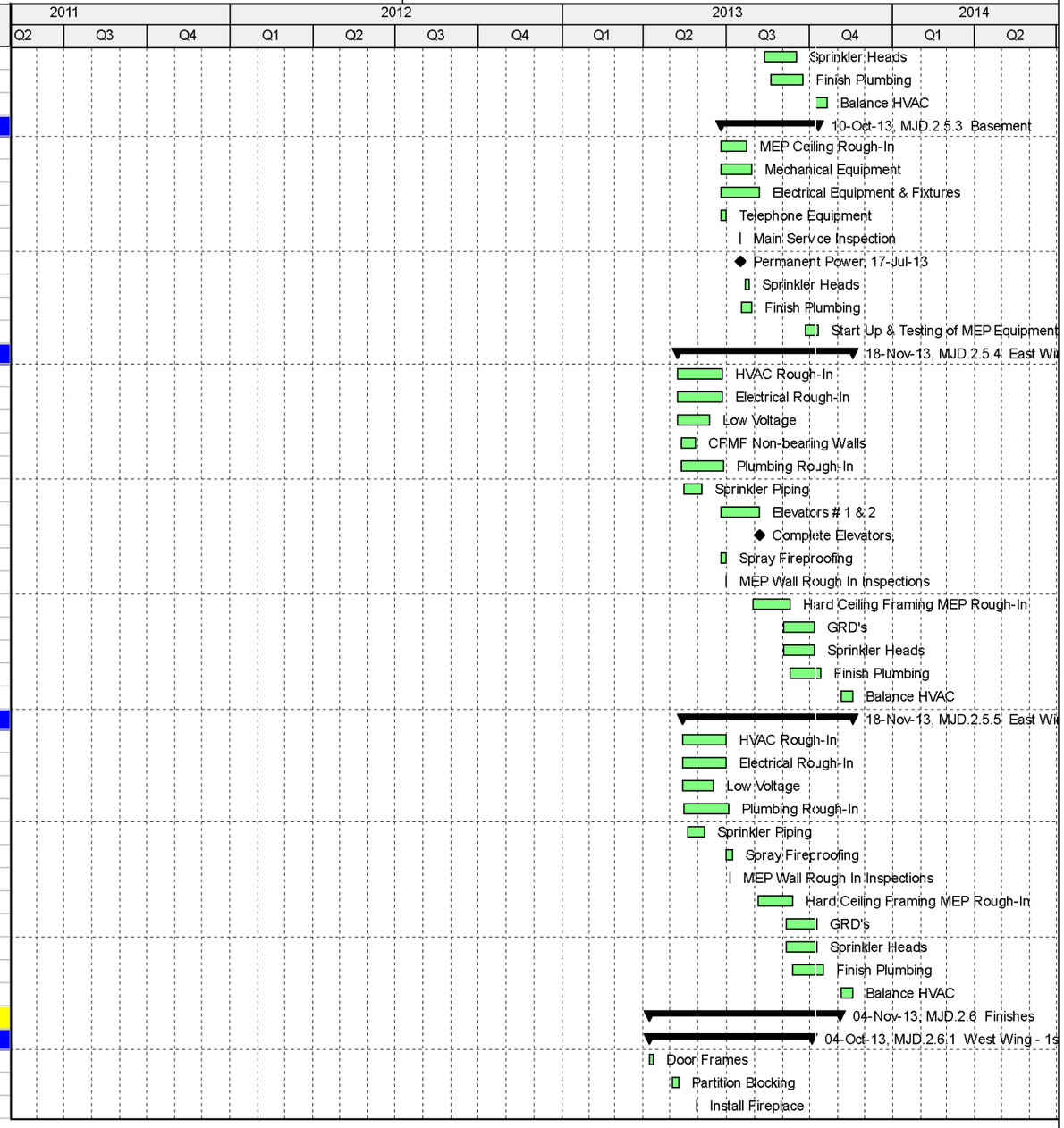
Actual Level of Effort · Actual Work · Remaining Work · Critical Remaining Work · Milestone · summary

Page 3 of 6

TASK filter: All Activities

MJD Assisted Living Additions | Classic Schedule Layout | 15-Oct-13 21:45

Activity ID	Activity Name	Original Duration	Start	Finish
A2160	Sprinkler Heads	24	13-Aug-13	16-Sep-13
A2170	Finish Plumbing	24	20-Aug-13	23-Sep-13
A2180	Balance HVAC	10	08-Oct-13	21-Oct-13
MJD.2.5.3	**Basement**	**76**	**25-Jun-13**	**10-Oct-13**
A2190	MEP Ceiling Rough-In	20	25-Jun-13	23-Jul-13
A2200	Mechanical Equipment	24	25-Jun-13	29-Jul-13
A2210	Electrical Equipment & Fixtures	30	25-Jun-13	06-Aug-13
A2220	Telephone Equipment	5	25-Jun-13	01-Jul-13
A2230	Main Service Inspection	1	17-Jul-13	17-Jul-13
A2240	Permanent Power	0	17-Jul-13	
A2250	Sprinkler Heads	5	22-Jul-13	26-Jul-13
A2260	Finish Plumbing	8	18-Jul-13	29-Jul-13
A2270	Start Up & Testing of MEP Equipment	10	27-Sep-13	10-Oct-13
MJD.2.5.4	**East Wing - 1st Floor**	**135**	**09-May-13**	**18-Nov-13**
A2280	HVAC Rough-In	34	09-May-13	26-Jun-13
A2290	Electrical Rough-In	34	09-May-13	26-Jun-13
A2300	Low Voltage	24	09-May-13	12-Jun-13
A2310	CFMF Non-bearing Walls	11	13-May-13	28-May-13
A2320	Plumbing Rough-In	34	13-May-13	28-Jun-13
A2330	Sprinkler Piping	14	15-May-13	04-Jun-13
A2340	Elevators # 1 & 2	30	25-Jun-13	06-Aug-13
A2345	Complete Elevators	0		06-Aug-13
A2350	Spray Fireproofing	5	25-Jun-13	01-Jul-13
A2360	MEP Wall Rough In Inspections	1	01-Jul-13	01-Jul-13
A2370	Hard Ceiling Framing MEP Rough-In	29	31-Jul-13	10-Sep-13
A2380	GRD's	25	03-Sep-13	07-Oct-13
A2390	Sprinkler Heads	25	03-Sep-13	07-Oct-13
A2400	Finish Plumbing	25	10-Sep-13	14-Oct-13
A2410	Balance HVAC	10	05-Nov-13*	18-Nov-13
MJD.2.5.5	**East Wing - 2nd Floor**	**132**	**14-May-13**	**18-Nov-13**
A2420	HVAC Rough-In	34	14-May-13	01-Jul-13
A2430	Electrical Rough-In	34	14-May-13	01-Jul-13
A2440	Low Voltage	24	14-May-13	17-Jun-13
A2450	Plumbing Rough-In	34	16-May-13	03-Jul-13
A2460	Sprinkler Piping	14	20-May-13	07-Jun-13
A2470	Spray Fireproofing	5	01-Jul-13	08-Jul-13
A2480	MEP Wall Rough In Inspections	1	05-Jul-13	05-Jul-13
A2490	Hard Ceiling Framing MEP Rough-In	29	05-Aug-13	13-Sep-13
A2500	GRD's	25	05-Sep-13	09-Oct-13
A2510	Sprinkler Heads	25	05-Sep-13	09-Oct-13
A2520	Finish Plumbing	25	12-Sep-13	16-Oct-13
A2530	Balance HVAC	10	05-Nov-13*	18-Nov-13
MJD.2.6	**Finishes**	**148**	**08-Apr-13**	**04-Nov-13**
MJD.2.6.1	**West Wing - 1st Floor**	**127**	**08-Apr-13**	**04-Oct-13**
A2540	Door Frames	5	08-Apr-13	12-Apr-13
A2550	Partition Blocking	5	03-May-13	09-May-13
A2560	Install Fireplace	2	29-May-13	30-May-13



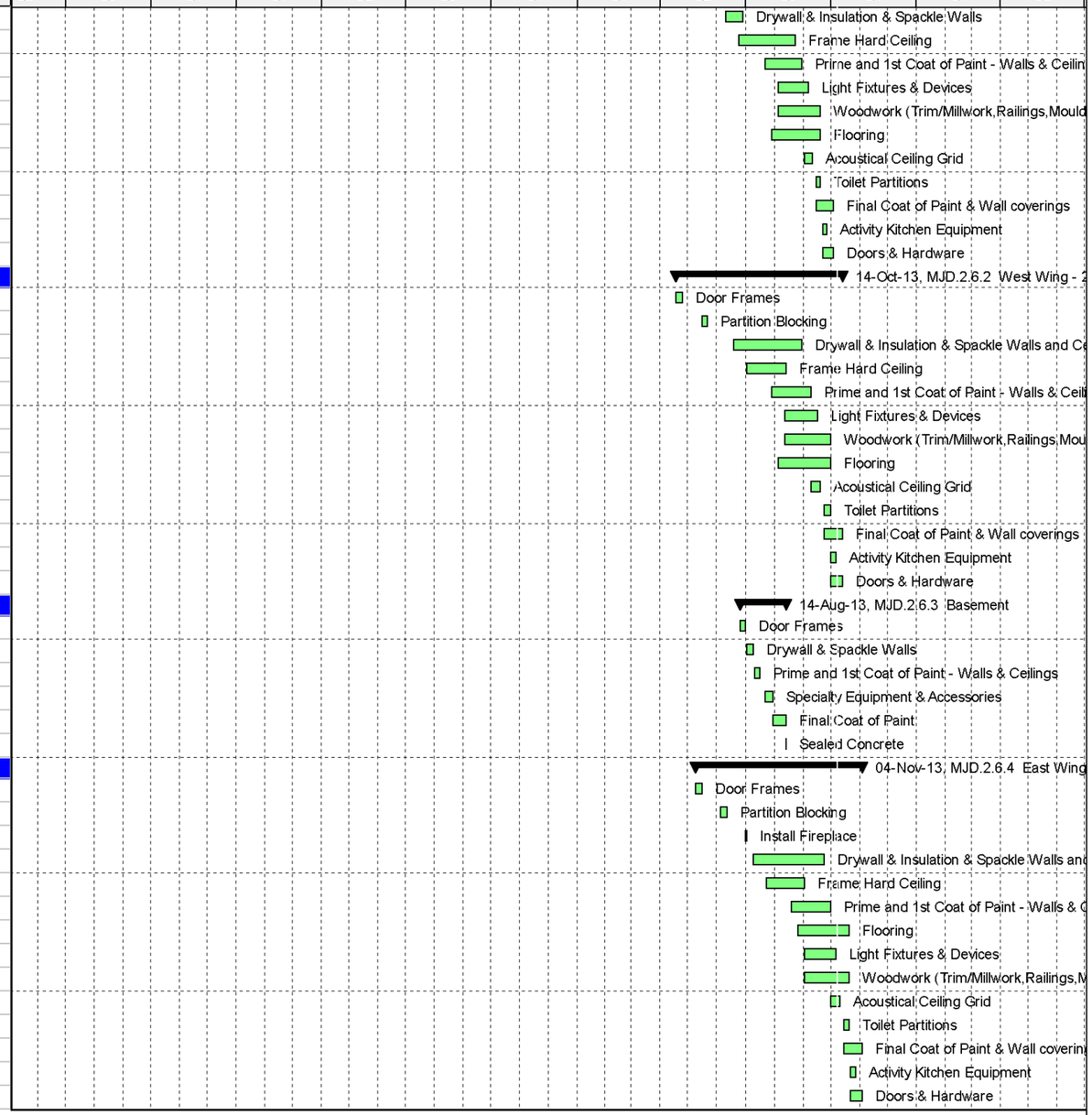
Actual Level of Effort | Remaining Work | Milestone
Actual Work | Critical Remaining Work | summary

Page 4 of 6

TASK filter: All Activities

MJD Assisted Living Additions | Classic Schedule Layout | 15-Oct-13 21:45

Activity ID	Activity Name	Original Duration	Start	Finish
A2570	Drywall & Insulation & Spackle Walls	15	10-Jun-13	28-Jun-13
A2580	Frame Hard Ceiling	44	24-Jun-13	23-Aug-13
A2590	Prime and 1st Coat of Paint - Walls & Ceilings	30	22-Jul-13	30-Aug-13
A2600	Light Fixtures & Devices	24	05-Aug-13	06-Sep-13
A2610	Woodwork (Trim/Millwork,Railings,Mouldings)	34	05-Aug-13	20-Sep-13
A2620	Flooring	39	29-Jul-13	20-Sep-13
A2630	Acoustical Ceiling Grid	7	03-Sep-13	11-Sep-13
A2640	Toilet Partitions	5	16-Sep-13	20-Sep-13
A2650	Final Coat of Paint & Wall coverings	15	16-Sep-13	04-Oct-13
A2660	Activity Kitchen Equipment	5	23-Sep-13	27-Sep-13
A2670	Doors & Hardware	10	23-Sep-13	04-Oct-13
MJD.2.6.2	**West Wing - 2nd Floor**	125	18-Apr-13	14-Oct-13
A2680	Door Frames	5	18-Apr-13	24-Apr-13
A2690	Partition Blocking	5	15-May-13	21-May-13
A2700	Drywall & Insulation & Spackle Walls and Ceilings	53	18-Jun-13	30-Aug-13
A2710	Frame Hard Ceiling	30	02-Jul-13	13-Aug-13
A2720	Prime and 1st Coat of Paint - Walls & Ceilings	29	30-Jul-13	09-Sep-13
A2730	Light Fixtures & Devices	24	13-Aug-13	16-Sep-13
A2740	Woodwork (Trim/Millwork,Railings,Mouldings)	34	13-Aug-13	30-Sep-13
A2750	Flooring	39	06-Aug-13	30-Sep-13
A2760	Acoustical Ceiling Grid	8	10-Sep-13	19-Sep-13
A2770	Toilet Partitions	5	24-Sep-13	30-Sep-13
A2780	Final Coat of Paint & Wall coverings	15	24-Sep-13	14-Oct-13
A2790	Activity Kitchen Equipment	5	01-Oct-13	07-Oct-13
A2800	Doors & Hardware	10	01-Oct-13	14-Oct-13
MJD.2.6.3	**Basement**	36	25-Jun-13	14-Aug-13
A2810	Door Frames	5	25-Jun-13	01-Jul-13
A2820	Drywall & Spackle Walls	6	02-Jul-13	10-Jul-13
A2830	Prime and 1st Coat of Paint - Walls & Ceilings	5	11-Jul-13	17-Jul-13
A2840	Specialty Equipment & Accessories	8	22-Jul-13	31-Jul-13
A2850	Final Coat of Paint	10	31-Jul-13	13-Aug-13
A2860	Sealed Concrete	1	14-Aug-13	14-Aug-13
MJD.2.6.4	**East Wing - 1st Floor**	125	09-May-13	04-Nov-13
A2870	Door Frames	5	09-May-13	15-May-13
A2880	Partition Blocking	5	05-Jun-13	11-Jun-13
A2890	Install Fireplace	2	01-Jul-13	02-Jul-13
A2900	Drywall & Insulation & Spackle Walls and Ceilings	53	10-Jul-13	23-Sep-13
A2910	Frame Hard Ceiling	29	24-Jul-13	03-Sep-13
A2920	Prime and 1st Coat of Paint - Walls & Ceilings	29	20-Aug-13	30-Sep-13
A2930	Flooring	39	27-Aug-13	21-Oct-13
A2940	Light Fixtures & Devices	25	03-Sep-13	07-Oct-13
A2950	Woodwork (Trim/Millwork,Railings,Mouldings)	35	03-Sep-13	21-Oct-13
A2960	Acoustical Ceiling Grid	8	01-Oct-13	10-Oct-13
A2970	Toilet Partitions	5	15-Oct-13*	21-Oct-13
A2980	Final Coat of Paint & Wall coverings	15	15-Oct-13*	04-Nov-13
A2990	Activity Kitchen Equipment	5	22-Oct-13*	28-Oct-13
A3000	Doors & Hardware	10	22-Oct-13*	04-Nov-13



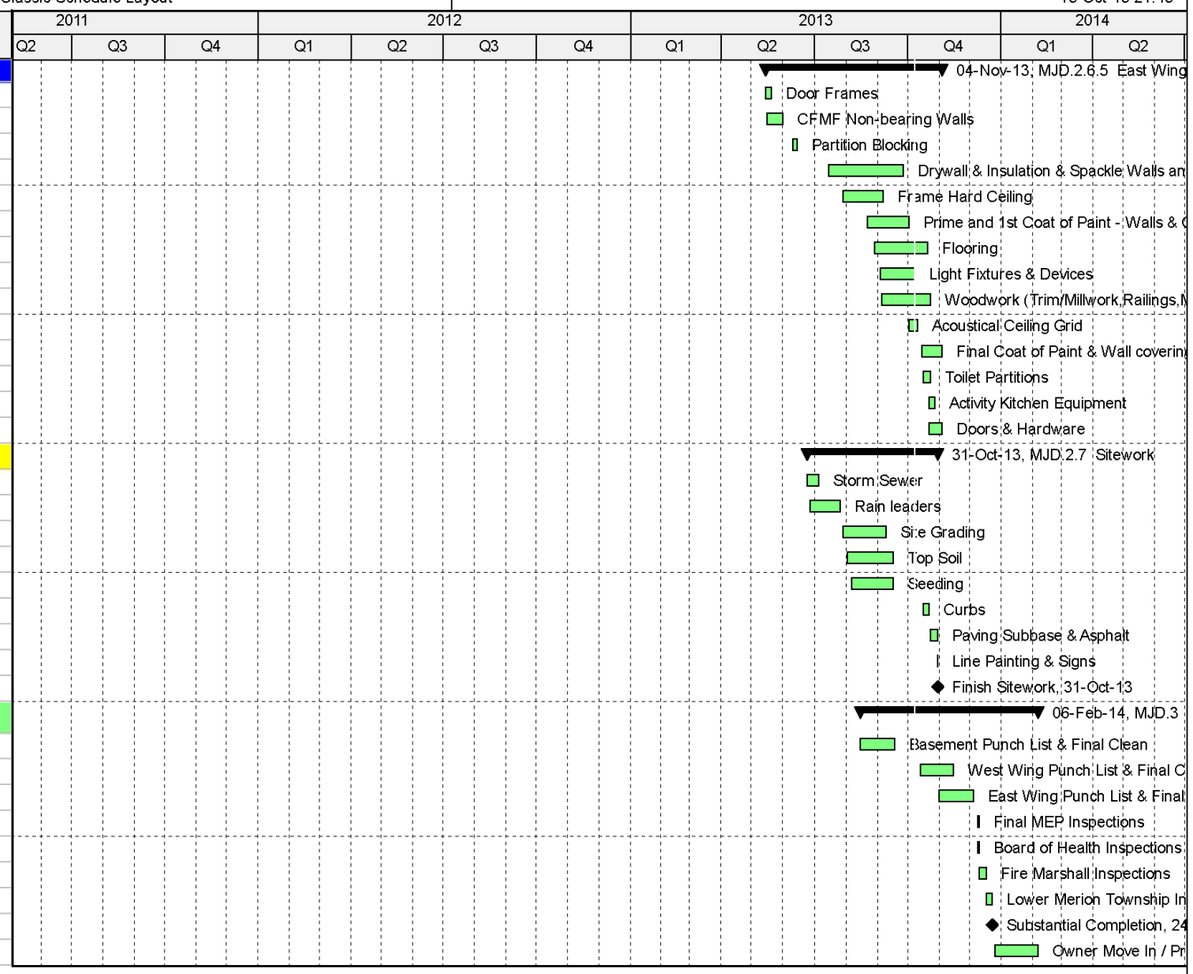
Actual Level of Effort | Remaining Work | Milestone
Actual Work | Critical Remaining Work | summary

Page 5 of 6

TASK filter: All Activities

MJD Assisted Living Additions | Classic Schedule Layout | 15-Oct-13 21:45

Activity ID	Activity Name	Original Duration	Start	Finish
MJD.2.6.5	East Wing - 2nd Floor	122	14-May-13	04-Nov-13
A3010	Door Frames	5	14-May-13	20-May-13
A3020	CFMF Non-bearing Walls	11	16-May-13	31-May-13
A3030	Partition Blocking	5	10-Jun-13	14-Jun-13
A3040	Drywall & Insulation & Spackle Walls and Ceilings	53	15-Jul-13	26-Sep-13
A3050	Frame Hard Ceiling	29	29-Jul-13	06-Sep-13
A3060	Prime and 1st Coat of Paint - Walls & Ceilings	29	22-Aug-13	02-Oct-13
A3070	Flooring	37	29-Aug-13	21-Oct-13
A3080	Light Fixtures & Devices	25	04-Sep-13	08-Oct-13
A3090	Woodwork (Trim/Millwork,Railings,Mouldings)	35	05-Sep-13	23-Oct-13
A3100	Acoustical Ceiling Grid	7	03-Oct-13	11-Oct-13
A3110	Final Coat of Paint & Wall coverings	15	15-Oct-13*	04-Nov-13
A3120	Toilet Partitions	5	17-Oct-13*	23-Oct-13
A3130	Activity Kitchen Equipment	5	22-Oct-13*	28-Oct-13
A3140	Doors & Hardware	10	22-Oct-13*	04-Nov-13
MJD.2.7	Sitework	92	24-Jun-13	31-Oct-13
A3150	Storm Sewer	9	24-Jun-13	05-Jul-13
A3160	Rain leaders	21	27-Jun-13	26-Jul-13
A3170	Site Grading	30	30-Jul-13	10-Sep-13
A3180	Top Soil	31	02-Aug-13	16-Sep-13
A3190	Seeding	29	07-Aug-13	17-Sep-13
A3200	Curbs	4	17-Oct-13*	22-Oct-13
A3210	Paving Subbase & Asphalt	6	23-Oct-13*	30-Oct-13
A3220	Line Painting & Signs	1	31-Oct-13*	31-Oct-13
A3320	Finish Sitework	0	31-Oct-13	
MJD.3	Final Inspections & Project Closeout	123	15-Aug-13	06-Feb-14
A3230	Basement Punch List & Final Clean	24	15-Aug-13	18-Sep-13
A3240	West Wing Punch List & Final Clean	25	14-Oct-13*	15-Nov-13
A3250	East Wing Punch List & Final Clean	24	01-Nov-13*	05-Dec-13
A3260	Final MEP Inspections	2	09-Dec-13*	10-Dec-13
A3270	Board of Health Inspections	3	09-Dec-13*	11-Dec-13
A3280	Fire Marshall Inspections	5	11-Dec-13*	17-Dec-13
A3290	Lower Merion Township Inspection	4	18-Dec-13*	23-Dec-13
A3300	Substantial Completion	0	24-Dec-13*	
A3310	Owner Move In / Project Completion	31	26-Dec-13*	06-Feb-14



Actual Level of Effort | Remaining Work | Milestone
Actual Work | Critical Remaining Work | summary

Page 6 of 6

TASK filter: All Activities

Appendix B: Detailed Structural System Estimate

Division | Item	Description	Quantity 1	Quantity 2	Total O&P*	Total Cost	Cost Code* *RS Means 2013
Concrete | Spread Footings						
F2.0	2'-0"x2'-0"x12" 4000 PSI ,NW (1 to 5 CY)	1.00 ea.	0.15 CY	$390.00	$57.78	033053403825
F2.5	2'-6"x2'-6"x12" 4000 PSI ,NW (>5 CY)	1.00 ea.	0.23 CY	$296.00	$68.52	033053403850
F3.0	3'-0"x3'-0"x12" 4000 PSI ,NW	28.00 ea.	9.33 CY	$296.00	$2,762.67	033053403850
F3.5	3'-6"x3'-6"x12" 4000 PSI ,NW	12.00 ea.	5.44 CY	$296.00	$1,611.56	033053403850
F4.0	4'-0"x4'-0"x12" 4000 PSI ,NW	6.00 ea.	3.56 CY	$390.00	$1,386.67	033053403825
F4.5	4'-6"x4'-6"x12" 4000 PSI ,NW	3.00 ea.	2.25 CY	$390.00	$877.50	033053403825
F5.0	5'-0"x5'-0"x13" 4000 PSI ,NW	1.00 ea.	1.00 CY	$390.00	$390.00	033053403825
F5.5	5'-6"x5'-6"x14" 4000 PSI ,NW	1.00 ea.	1.31 CY	$390.00	$511.23	033053403825
F6.0	6'-0"x6'-0"x16" 4000 PSI ,NW	2.00 ea.	3.55 CY	$390.00	$1,383.20	033053403825
F6.5	6'-6"x6'-6"x17" 4000 PSI ,NW	1.00 ea.	2.22 CY	$390.00	$866.59	033053403825
F7.0	7'-0"x7'-0"x18" 4000 PSI ,NW	1.00 ea.	2.72 CY	$390.00	$1,061.67	033053403825
F7.5	7'-6"x7'-6"x20" 4000 PSI ,NW	1.00 ea.	3.48 CY	$390.00	$1,356.88	033053403825
F8.0	8'-0"x8'-0"x21" 4000 PSI ,NW	1.00 ea.	4.15 CY	$390.00	$1,617.78	033053403825
F8.5	8'-6"x8'-6"x22" 4000 PSI ,NW	1.00 ea.	4.90 CY	$390.00	$1,909.81	033053403825
F9.0	9'-0"x9'-0"x23" 4000 PSI ,NW	1.00 ea.	5.76 CY	$296.00	$1,704.96	033053403850
F9.5	9'-6"x9'-6"x25" 4000 PSI ,NW	1.00 ea.	6.95 CY	$296.00	$2,057.97	033053403850
F10.0	10'-0"x10'-0"x26" 4000 PSI ,NW	1.00 ea.	8.00 CY	$296.00	$2,368.00	033053403850
F10.5	10'-6"x10'-6"x27" 4000 PSI ,NW	1.00 ea.	9.19 CY	$296.00	$2,719.50	033053403850
F11.0	11'-0"x11'-0"x28" 4000 PSI ,NW	1.00 ea.	10.44 CY	$296.00	$3,090.79	033053403850
F11.5	11'-6"x11'-6"x30" 4000 PSI ,NW	1.00 ea.	12.46 CY	$296.00	$3,687.94	033053403850
F12.0	12'-0"X12'-0"x31" 4000 PSI ,NW	1.00 ea.	13.76 CY	$296.00	$4,072.96	033053403850
F5.0x10.0	5'-0"x10'-0"x28" 4000 PSI ,NW	1.00 ea.	4.31 CY	$390.00	$1,682.78	033053403825
Equipment - Concrete Pump	Pump		115.17 CY	$31.00	$3,570.12	033105702650
Subtotal - Concrete Spread Footings					**$40,816.84**	

Concrete | Spread Footing Reinforcing						
F2.0	2'-0"x2'-0"x12" 3-#4 each way bottom	12.00 ft.	0.00 ton	$2,300.00	$9.22	032110600500
F2.5	2'-6"x2'-6"x12" 4-#4 each way bottom	20.00 ft.	0.01 ton	$2,300.00	$15.36	032110600500
F3.0	3'-0"x3'-0"x12" 4-#4 each way bottom	672.00 ft.	0.22 ton	$2,300.00	$516.23	032110600500
F3.5	3'-6"x3'-6"x12" 6-#3 each way bottom	504.00 ft.	0.09 ton	$2,300.00	$217.93	032110600500
F4.0	4'-0"x4'-0"x12" 5-#4 each way bottom	240.00 ft.	0.08 ton	$2,300.00	$184.37	032110600500
F4.5	4'-6"x4'-6"x12" 5-#5 each way bottom	135.00 ft.	0.07 ton	$2,300.00	$161.93	032110600500
F5.0	5'-0"x5'-0"x13" 10-#4 each way bottom	100.00 ft.	0.03 ton	$2,300.00	$76.82	032110600500
F5.5	5'-6"x5'-6"x14" 8-#5 each way bottom	90.00 ft.	0.05 ton	$2,300.00	$107.95	032110600500
F6.0	6'-0"x6'-0"x16" 6-#6 each way bottom	144.00 ft.	0.11 ton	$2,300.00	$248.73	032110600500
F6.5	6'-6"x6'-6"x17" 10-#5 each way bottom	130.00 ft.	0.07 ton	$2,300.00	$155.93	032110600500
F7.0	7'-0"x7'-0"x18" 9-#6 each way bottom	126.00 ft.	0.09 ton	$2,300.00	$217.64	032110600500
F7.5	7'-6"x7'-6"x20" 7-#7 each way bottom	105.00 ft.	0.11 ton	$2,300.00	$246.81	032110600500
F8.0	8'-0"x8'-0"x21" 6-#8 each way bottom	96.00 ft.	0.13 ton	$1,800.00	$230.69	032110600550
F8.5	8'-6"x8'-6"x22" 7-#8 each way bottom	119.00 ft.	0.16 ton	$1,800.00	$285.96	032110600550
F9.0	9'-0"x9'-0"x23" 8-#8 each way bottom	144.00 ft.	0.19 ton	$1,800.00	$346.03	032110600550
F9.5	9'-6"x9'-6"x25" 11-#7 each way bottom	209.00 ft.	0.21 ton	$2,300.00	$491.28	032110600500
F10.0	10'-0"x10'-0"x26" 9-#8 each way bottom	180.00 ft.	0.24 ton	$1,800.00	$432.54	032110600550
F10.5	10'-6"x10'-6"x27" 8-#9 each way bottom	168.00 ft.	0.29 ton	$1,800.00	$514.08	032110600550
F11.0	11'-0"x11'-0"x28" 9-#9 each way bottom	198.00 ft.	0.34 ton	$1,800.00	$605.88	032110600550
F11.5	11'-6"x11'-6"x30" 12-#8 each way bottom	276.00 ft.	0.37 ton	$1,800.00	$663.23	032110600550
F12.0	12'-0"X12'-0"x31" 13-#8 each way bottom	312.00 ft.	0.42 ton	$1,800.00	$749.74	032110600550
F5.0x10.0	5'-0"x10'-0"x28" 9-#8 bottom | 6-#8 Top	150.00 ft.	0.20 ton	$1,800.00	$360.45	032110600550
Subtotal - Concrete Spread Footing Reinforcing					**$6,838.79**	
Concrete | Continuous Wall Footings						
Perimeter Wall Footing	assume average = height: 1.2' width: 3' length:2200'	7920.00 ft^3	293.33 CY	$264.00	$77,440.00	033053403950
Interior Wall Footing / Thickened Slab	assume average = height: 1.2' width: 2' length:4400'	10560.00 ft^3	391.11 CY	$300.00	$117,333.33	033053403940
Subtotal - Concrete Continuous Wall Footings					**$194,773.33**	
Concrete | Continuous Wall Footings Reinforcing						
Perimeter Wall Footing	(3) #5 Continuous, 2200'	6600.00 ft.	3.44 ton	$2,300.00	$7,916.37	032110600500
Interior Wall Footing / Thickened Slab	(3) #5 Continuous, 4400'	13200.00 ft.	6.88 ton	$2,300.00	$15,832.74	032110600500
Subtotal - Concrete Continuous Wall Footing Reinforcing					**$23,749.11**	

Concrete | Concrete Piers						
P1	1.5' x 1.5' x 8.67' NW, 4000 PSI [4 ea.]	78.00 ft^3	2.89 CY	$1,225.00	$3,538.89	033053400800
P1	1.5' x 1.5' x 1.25' NW, 4000 PSI [6 ea.]	16.88 ft^3	0.63 CY	$1,225.00	$765.85	033053400800
P2	1.33' x .67' x 9.5' NW, 4000 PSI [4 ea.]	33.86 ft^3	1.25 CY	$1,225.00	$1,536.24	033053400800
P3	1.67' x 1.67' x 2' NW, 4000 PSI [8 ea.]	44.62 ft^3	1.65 CY	$1,225.00	$2,024.43	033053400800
P4	1.25' x 1.25' x 8'' NW, 4000 PSI [2 ea.]	2.10 ft^3	0.08 CY	$1,225.00	$95.28	033053400800
P5/P5A	1.83' x 1.83' x 8'' NW, 4000 PSI [14 ea.]	31.41 ft^3	1.16 CY	$1,225.00	$1,425.08	033053400800
P6	1.83' x 1.67' x 2' NW, 4000 PSI [8 ea.]	48.90 ft^3	1.81 CY	$1,225.00	$2,218.61	033053400800
Equipment - Concrete Pump	Pump		9.47 CY	$51.00	$483.12	033105700800
Subtotal - Concrete Piers					**$12,087.50**	
Concrete | Concrete Pier Reinforcing						
P1	1.5' x 1.5' (8) #6 vertical , #3 ties @ 12" o.c.	355.47 ft.	0.54 ton	$2,675.00	$1,443.91	032110600100
P2	1.33' x .67' (4) #5 vertical, #3 ties @ 12" o.c.	264.12 ft.	0.40 ton	$2,675.00	$1,072.85	000000000000
P3	1.67' x 1.67' (8) #6 vertical , #3 ties @ 12" o.c.	172.62 ft.	0.26 ton	$2,675.00	$701.19	000000000000
P4	1.25' x 1.25' (8) #6 vertical , #3 ties @ 12" o.c.	38.25 ft.	0.06 ton	$2,675.00	$155.37	000000000000
P5/P5A	1.83' x 1.83' (8) #6 vertical , #3 ties @ 12" o.c.	158.88 ft.	0.24 ton	$2,675.00	$645.39	000000000000
P6	1.83' x 1.67' (8) #6 vertical , #3 ties @ 12" o.c.	176.90 ft.	0.27 ton	$2,675.00	$718.56	000000000000
Subtotal - Concrete Pier Reinforcing					**$4,737.27**	
Concrete | Formwork						
Foundation SOG Formwork	SOG Formwork, re-use for other wing (use 25% per.)	2200.00 LF	1100.00 SFCA	$7.90	$8,690.00	031113351500
Floor Slab Formwork	Elevated Slab Formwork, Re-use for other wing	2200.00 LF	1100.00 SFCA	$6.20	$6,820.00	031113450150
Continuous Wall Footing Formwork	4 uses	4400.00 LF	5134.80 SFCA	$6.20	$31,835.76	031113450150
Beam Formwork	Re-use		4200.00 SFCA	$8.50	$35,700.00	031113202650
Piers Formwork	Re-use		775.00 SFCA	$8.50	$6,587.50	031113202650
Subtotal - Concrete Beams					**$89,633.26**	
Concrete | Concrete Beams						
CB-1	24"x22"x22' 4000 PSI ,NW	1.00 ea.	0.15 CY	$1,150.00	$170.37	033053400350
CB-2	24"x22"x22' 4000 PSI ,NW	1.00 ea.	0.23 CY	$1,150.00	$266.20	033053400350
CB-3	24"x22"x22' 4000 PSI ,NW	1.00 ea.	0.33 CY	$1,150.00	$383.33	033053400350
CB-4	24"x22"x22' 4000 PSI ,NW	1.00 ea.	0.45 CY	$1,150.00	$521.76	033053400350
CB-5	24"x22"x22' 4000 PSI ,NW	1.00 ea.	0.59 CY	$1,150.00	$681.48	033053400350
CB-6	8"x10"x6' 4000 PSI ,NW	2.00 ea.	1.50 CY	$1,300.00	$1,950.00	033053400300
CB-7	24"x22"x4' 4000 PSI ,NW	1.00 ea.	1.00 CY	$1,300.00	$1,300.00	033053400300
CB-8	12"x20"x4' 4000 PSI ,NW	1.00 ea.	1.31 CY	$1,300.00	$1,704.08	033053400300

CB-9	12"x15"24' 4000 PSI ,NW	1.00 ea.	1.77 CY	$1,150.00	$2,039.33	033053400350
Equipment - Concrete Pump	Pump		7.34 CY	$76.50	$561.77	033105700050
Subtotal - Concrete Beams					**$9,578.34**	
Concrete | Concrete Beam Reinforcing						
CB-1	24"x22"x22' (4) #7 cont. top & bottom	176.00 ft.	0.18 ton	$2,675.00	$481.16	032110600100
CB-2	24"x22"x22' (4) #7 cont. top & bottom	176.00 ft.	0.18 ton	$2,675.00	$481.16	032110600100
CB-3	24"x22"x22' (4) #7 cont. top & bottom	176.00 ft.	0.18 ton	$2,675.00	$481.16	032110600100
CB-4	24"x22"x22' (4) #8 cont. top & bottom	176.00 ft.	0.23 ton	$2,025.00	$475.79	032110600150
CB-5	24"x22"x22' (6) #8 cont. top & bottom	264.00 ft.	0.35 ton	$2,025.00	$713.69	032110600150
CB-6	8"x10"x6' (2) #4 cont. top & bottom	48.00 ft.	0.02 ton	$2,675.00	$42.89	032110600100
CB-7	24"x22"x4' (4) #7 cont. top & bottom	32.00 ft.	0.03 ton	$2,675.00	$87.48	032110600100
CB-8	12"x20"x4' (2) #7 cont. top & bottom	16.00 ft.	0.02 ton	$2,675.00	$43.74	032110600100
CB-9	12"x15"x24' (2) #6 cont. top & bottom	96.00 ft.	0.07 ton	$2,675.00	$192.86	032110600100
Subtotal - Concrete Beam Reinforcing					**$2,999.93**	
Concrete | Slab on Grade						
Slab on Grade, SOG	4" Thick, NW, 4000 PSI, #4 @ 16" o.c.	36000.00 SF	444.44 CY	$231.00	$102,666.67	000000000000
Slab on Grade, Reinforcing	assume 16" of #4 in 1SF of slab area	48000.00 ft.	16.03 ton	$2,200.00	$35,270.40	032110600600
Slab on Grade, WWF	6x6-W2.1xW2.1	36000.00 SF	360.00 CSF	$59.50	$21,420.00	032205500200
Equipment - Concrete Pump	Pump		444.44 CY	$35.00	$15,555.56	033105704350
Subtotal - Slab on Grade					**$174,912.62**	
Concrete | Elevated Floor Slab						
Elevated Floor Slab, SOD	6" Thick, NW, 4000 PSI, #4 @ 12" o.c.	36000.00 SF	444.44 CY	$325.00	$144,444.44	033053404050
Elevated Floor Slab, Reinforcing #4 @12" o.c.	assume 24" of #4 in 1SF of slab area	72000.00 ft.	24.05 ton	$1,975.00	$47,494.80	032110600400
Elevated Floor Slab, WWF	6x6-W2.1xW2.1	36000.00 SF	360.00 CSF	$59.50	$21,420.00	032205500200
Equipment - Concrete Pump	Pump		444.44 CY	$32.50	$14,444.44	033105701400
Subtotal - Elevated Floor Slab					**$227,803.69**	
Concrete | Basement						
Basement Slab	6" thick, NW, 4000 PSI, #4 @ 16" o.c.	3000.00 SF	37.04 CY	$325.00	$12,037.04	033053404050
Basement Slab, Reinforcing	assume 16" of #4 in 1SF of slab area	6000.00 ft.	2.00 ton	$1,975.00	$3,957.90	032110600400
Elevated Floor Slab, WWF	6x6-W2.1xW2.1	3000.00 SF	300.00 CSF	$59.50	$17,850.00	032205500200
Equipment - Concrete Pump	Pump		37.04 CY	$32.50	$1,203.70	033105701400
Subtotal - Basement					**$35,048.64**	

Concrete | Shoring						
Shoring	assume 15' span average (20 ea./900 sf)		1640.00 ea	$106.00	$173,840.00	031505701920
Subtotal - Basement					**$173,840.00**	
TOTAL CONCRETE					**$996,819.31**	

Steel | Infinity System Load Bearing Panels						
West Wing Infinity Panels	Load-Bearing Metal Framing (assume 130 ft/panel)	262.00 ea.	34060.00 ft.	$19.00	$647,140.00	054113305140
East Wing Infinity Panels	Load-Bearing Metal Framing (assume 130 ft/panel)	252.00 ea.	32760.00 ft.	$19.00	$622,440.00	054113305140
Subtotal - Infinity System Load Bearing Panels					**$1,269,580.00**	
Steel | Structural Steel						
Structural Steel | Beams/Columns	HSS 4x4x1/2		4.00 ea.	$345.00	$1,380.00	051223174500
Structural Steel | Beams/Columns	HSS 4x4x1/4		4.00 ea.	$345.00	$1,380.00	051223174500
Structural Steel | Beams/Columns	HSS 4x4x1/4		4.00 ea.	$345.00	$1,380.00	051223174500
Structural Steel | Beams/Columns	HSS 4x4x1/4		8.00 ea.	$345.00	$2,760.00	051223174500
Structural Steel | Beams/Columns	HSS 4x4x1/4		8.00 ea.	$345.00	$2,760.00	051223174500
Structural Steel | Beams/Columns	HSS 4x4x1/4		18.00 ea.	$345.00	$6,210.00	051223174500
Structural Steel | Beams/Columns	HSS 4x4x1/4		2.00 ea.	$345.00	$690.00	051223174500
Structural Steel | Beams/Columns	HSS 5x5x3/8		8.00 ea.	$345.00	$2,760.00	051223174500
Structural Steel | Beams/Columns	HSS 6x4x3/16		2.00 ea.	$505.00	$1,010.00	051223174550
Structural Steel | Beams/Columns	HSS 6x4x3/16		4.00 ea.	$505.00	$2,020.00	000000000000
Structural Steel | Beams/Columns	HSS 6x4x3/16		4.00 ea.	$505.00	$2,020.00	000000000000
Structural Steel | Beams/Columns	HSS 6x4x3/16		4.00 ea.	$505.00	$2,020.00	000000000000
Structural Steel | Beams/Columns	HSS 6x4x3/16		2.00 ea.	$505.00	$1,010.00	000000000000
Structural Steel | Beams/Columns	HSS 6x4x3/16		2.00 ea.	$505.00	$1,010.00	000000000000
Structural Steel | Beams/Columns	HSS 6x6x1/4		18.00 ea.	$505.00	$9,090.00	000000000000
Structural Steel | Beams/Columns	HSS 8x4x1/4		2.00 ea.	$965.00	$1,930.00	051223174600
Structural Steel | Beams/Columns	HSS 8x4x1/4		4.00 ea.	$965.00	$3,860.00	051223174600
Structural Steel | Beams/Columns	HSS 8x4x1/4		4.00 ea.	$965.00	$3,860.00	051223174600
Structural Steel | Beams/Columns	HSS 8x4x1/4		4.00 ea.	$965.00	$3,860.00	051223174600
Structural Steel | Beams/Columns	HSS 8x4x1/4		2.00 ea.	$965.00	$1,930.00	051223174600
Structural Steel | Beams/Columns	HSS 8x4x1/4		2.00 ea.	$965.00	$1,930.00	051223174600
Structural Steel | Beams/Columns	W10x12	1.00 ea.	18.00 LF	$29.50	$531.00	051223750600
Structural Steel | Beams/Columns	W10x15	2.00 ea.	20.00 LF	$34.00	$680.00	051223750620

Structural Steel | Beams/Columns	W10x15	4.00 ea.	80.00 LF	$34.00	$2,720.00	051223750620
Structural Steel | Beams/Columns	W10x15	2.00 ea.	44.00 LF	$34.00	$1,496.00	051223750620
Structural Steel | Beams/Columns	W10x15	1.00 ea.	26.00 LF	$34.00	$884.00	051223750620
Structural Steel | Beams/Columns	W10x22	1.00 ea.	26.00 LF	$45.00	$1,170.00	051223750700
Structural Steel | Beams/Columns	W10x22	1.00 ea.	35.00 LF	$45.00	$1,575.00	051223750700
Structural Steel | Beams/Columns	W12x16	1.00 ea.	35.00 LF	$32.50	$1,137.50	051223751100
Structural Steel | Beams/Columns	W12x19	3.00 ea.	117.00 LF	$32.50	$3,802.50	051223751100
Structural Steel | Beams/Columns	W12x22	2.00 ea.	48.00 LF	$42.00	$2,016.00	051223751300
Structural Steel | Beams/Columns	W12x22	2.00 ea.	78.00 LF	$42.00	$3,276.00	051223751300
Structural Steel | Beams/Columns	W12x22	1.00 ea.	40.00 LF	$42.00	$1,680.00	051223751300
Structural Steel | Beams/Columns	W12x26	1.00 ea.	39.00 LF	$48.50	$1,891.50	051223751500
Structural Steel | Beams/Columns	W12x40	2.00 ea.	70.00 LF	$87.00	$6,090.00	051223751560
Structural Steel | Beams/Columns	W12x40	2.00 ea.	78.00 LF	$87.00	$6,786.00	051223751560
Structural Steel | Beams/Columns	W12x45	1.00 ea.	39.00 LF	$87.00	$3,393.00	051223751560
Structural Steel | Beams/Columns	W8x10	2.00 ea.	16.00 LF	$26.50	$424.00	051223750300
Structural Steel | Beams/Columns	W8x10	2.00 ea.	34.00 LF	$26.50	$901.00	051223750300
Structural Steel | Beams/Columns	W8x10	5.00 ea.	125.00 LF	$26.50	$3,312.50	051223750300
Structural Steel | Beams/Columns	W8x18	1.00 ea.	10.00 LF	$43.50	$435.00	051223750350
Structural Steel | Beams/Columns	W8x18	4.00 ea.	56.00 LF	$43.50	$2,436.00	051223750350
Structural Steel | Beams/Columns	W8x18	2.00 ea.	32.00 LF	$43.50	$1,392.00	051223750350
Structural Steel | Beams/Columns	W8x18	4.00 ea.	72.00 LF	$43.50	$3,132.00	051223750350
Structural Steel | Beams/Columns	W8x18	1.00 ea.	20.00 LF	$43.50	$870.00	051223750350
Structural Steel | Beams/Columns	W8x18	2.00 ea.	42.00 LF	$43.50	$1,827.00	051223750350
Structural Steel | Beams/Columns	W8x18	4.00 ea.	96.00 LF	$43.50	$4,176.00	051223750350
Structural Steel | Beams/Columns	W8x18	2.00 ea.	54.00 LF	$43.50	$2,349.00	051223750350
Structural Steel | Beams/Columns	W8x18	1.00 ea.	30.00 LF	$43.50	$1,305.00	051223750350
Structural Steel | Beams/Columns	W8x18	5.00 ea.	170.00 LF	$43.50	$7,395.00	051223750350
Structural Steel | Beams/Columns	W8x18	1.00 ea.	35.00 LF	$43.50	$1,522.50	051223750350
Structural Steel | Plates	PL 3/8" x 4" x 6"	116.00 ea.	19.33 SF	$22.00	$425.33	051223650300
Structural Steel | Plates	PL 3/8" x 4" x 9"	60.00 ea.	15.00 SF	$22.00	$330.00	051223650300
Structural Steel | Plates	PL 3/4" x 12" x 12"	46.00 ea.	46.00 SF	$44.00	$2,024.00	051223650450
Structural Steel | Plates	PL 1/4" x 4" x 4"	36.00 ea.	4.00 SF	$14.60	$58.40	051223650100
Structural Steel | Plates	PL 1/2" x 7" x 7"	18.00 ea.	6.13 SF	$29.00	$177.63	051223650400
Structural Steel | Plates	PL 1/4" x 6" x 6"	18.00 ea.	4.50 SF	$14.60	$65.70	051223650100

Structural Steel | Plates	PL 3/8" x 5" x 5"	8.00 ea.	1.39 SF	$22.00	$30.56	051223650300
Structural Steel | Plates	PL 3/8" x 6" x 6"	8.00 ea.	2.00 SF	$22.00	$44.00	051223650300
Structural Steel | Plates	PL 3/4" x 6 1/2"	6.00 ea.	1.50 SF	$44.00	$66.00	051223650450
Structural Steel | Plates	PL 3/4" x 6" x 12"	4.00 ea.	2.00 SF	$44.00	$88.00	051223650450
Structural Steel | Plates	PL 3/4" x 7" x 7"	4.00 ea.	1.36 SF	$44.00	$59.89	051223650450
Structural Steel | Plates	PL 1/4" x 3" x 3"	58.00 ea.	3.63 SF	$14.60	$52.93	051223650100
Structural Steel | Plates	PL 1/4" x 3" x 3"	10.00 ea.	0.63 SF	$14.60	$9.13	051223650100
Structural Steel | Plates	PL 1/4" x 3" x 3"	12.00 ea.	0.75 SF	$14.60	$10.95	051223650100
Structural Steel | Plates	PL 3/8" x 6" x 6"	2.00 ea.	0.50 SF	$22.00	$11.00	051223650300
Structural Steel | Plates	PL 1/4" x 2 1/2" x 7"	4.00 ea.	0.49 SF	$14.60	$7.10	051223650100
Structural Steel | Steel Decking	Epicore MSR Composite 2" x 22 GA		72000.00 SF	$2.82	$203,040.00	053113505200
Strcutural Steel | Roof Deck	4.5" x 16 GA		38000.00 SF	$3.86	$146,680.00	000000000000
Subtotal - Structural Steel					**$478,656.10**	
TOTAL STEEL					**$1,748,236.10**	

Total Concrete	**$996,819.31**
Total Structural Steel	**$1,748,236.10**
Total	**$2,745,055.41**

Appendix C: Assemblies MEP Estimate

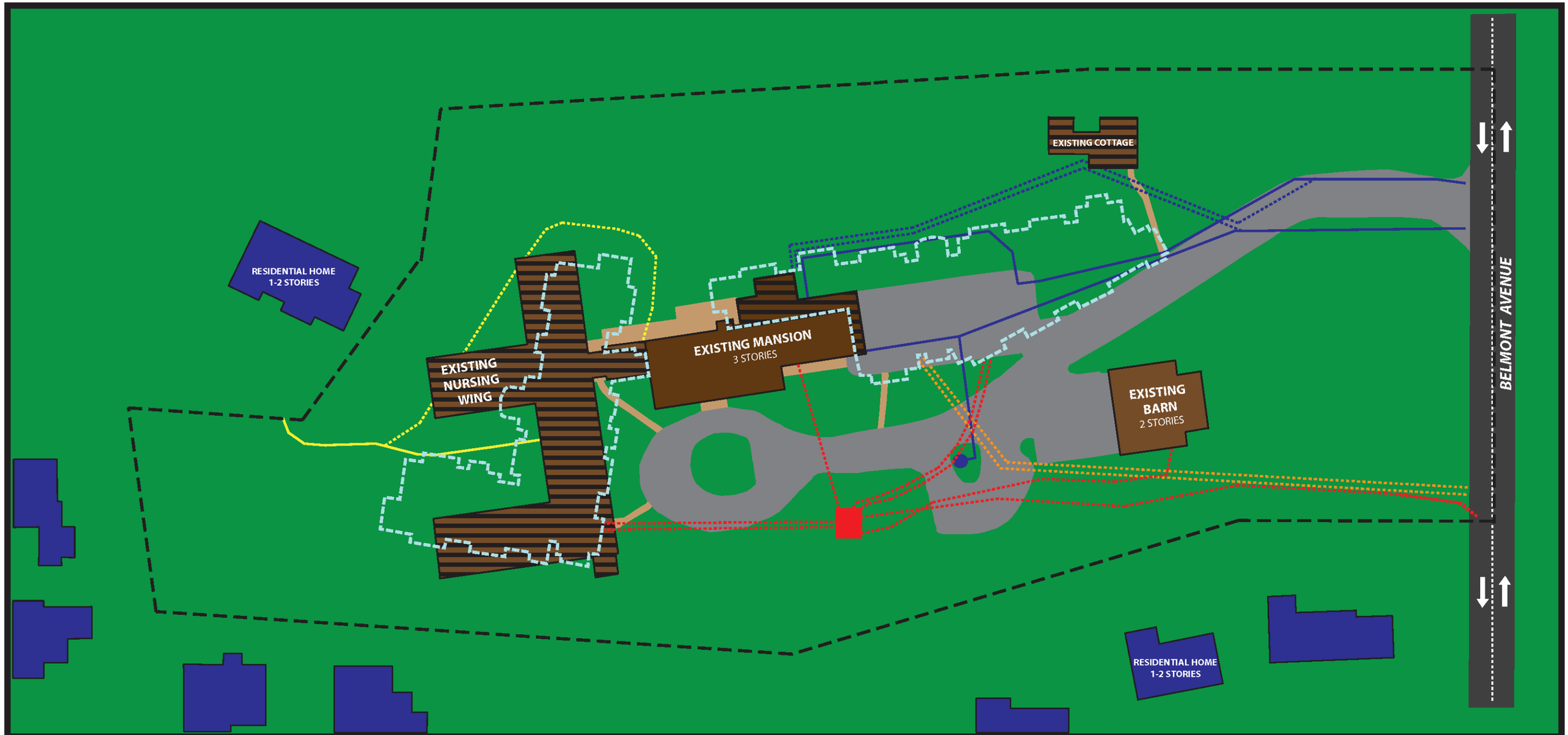
Mary J. Drexel Home Assisted Living Additions - Assembly Estimate Data Release: Year 2013 Quarter 3					
Quantity	**Assembly Number**	**Description**	**Unit**	**Total O&P**	**Ext. Total O&P**
90	D20101102160	Water closet, vitreous china, bowl only with flush valve, floor mount, 18" high bowl, ADA compliant	Ea.	$ 1,759.20	$ 158,328.00
1	D20101102160	Water closet, vitreous china, bowl only with flush valve, floor mount, 18" high bowl, ADA compliant	Ea.	$ 1,759.20	$ 1,759.20
4	D20101102160	Water closet, vitreous china, bowl only with flush valve, floor mount, 18" high bowl, ADA compliant	Ea.	$ 1,759.20	$ 7,036.80
36	D20103102160	Lavatory w/trim, wall hung, vitreous china, 18" x 15"	Ea.	$ 1,720.67	$ 61,944.12
80	D20104102120	Kitchen sink w/trim, countertop, steel, enameled, 24" x 21" single bowl	Ea.	$ 1,923.35	$ 153,868.00
116	D20104102120	Kitchen sink w/trim, countertop, steel, enameled, 24" x 21" single bowl	Ea.	$ 1,923.35	$ 223,108.60
80	D20107101840	Shower, stall, fiberglass 1 piece, three walls, 36" square	Ea.	$ 2,083.79	$ 166,703.20
2	D20202502140	Gas fired water heater, commercial, 100< F rise, 300 MBH input, 278 GPH	Ea.	$ 17,987.55	$ 35,975.10
13	D20402101960	Roof drain, DWV PVC, 3" diam, 10' high	Ea.	$ 1,246.56	$ 16,205.28
130	D20402102000	Roof drain, DWV PVC, 3" diam, for each additional foot add	Ea.	$ 32.50	$ 4,225.00
35000	D30501551440	Rooftop, multizone, air conditioner, apartment corridors, 25,000 SF, 45.80 ton	S.F.	$ 12.69	$ 444,150.00
35000	D30501551440	Rooftop, multizone, air conditioner, apartment corridors, 25,000 SF, 45.80 ton	S.F.	$ 12.69	$ 444,150.00
5000	D30501551280	Rooftop, multizone, air conditioner, apartment corridors, 3,000 SF, 5.50 ton	S.F.	$ 16.78	$ 83,900.00
8	D30201081100	Heating Systems, Unit Heaters	Ea.	$ 6,576.00	$ 52,608.00

17000	D40104101080	Wet pipe sprinkler systems, steel, ordinary hazard, 1 floor, 10,000 SF	S.F.	$ 4.87	$ 82,790.00
50000	D40104101100	Wet pipe sprinkler systems, steel, ordinary hazard, each additional floor, 50,000 SF	S.F.	$ 4.29	$ 214,500.00
4	D40203100560	Wet standpipe risers, 4" diameter pipe, one floor	Floor	$ 8,523.00	$ 34,092.00
4	D40203100580	Wet standpipe risers, 4" diameter pipe, one floor	Floor	$ 2,272.85	$ 9,091.40
80	D40909100040	Other Fire Protection Systems, Detectors	Ea.	$ 151.01	$ 12,080.80
1	D50101301050	Underground service installation, includes excavation, backfill, and compaction, 100' length, 4' depth, 3 phase, 4 wire, 277/480 volts, 2000 A	Ea.	$ 70,531.90	$ 70,531.90
300	D50102300480	Feeder installation 600 V, including RGS conduit and XHHW wire, 1200 A	L.F.	$ 406.94	$ 122,082.00
100	D50102300360	Feeder installation 600 V, including RGS conduit and XHHW wire, 600 A	L.F.	$ 202.96	$ 20,296.00
500	D50102300360	Feeder installation 600 V, including RGS conduit and XHHW wire, 600 A	L.F.	$ 202.96	$ 101,480.00
800	D50102300280	Feeder installation 600 V, including RGS conduit and XHHW wire, 200 A	L.F.	$ 58.60	$ 46,880.00
800	D50102300240	Feeder installation 600 V, including RGS conduit and XHHW wire, 100 A	L.F.	$ 31.92	$ 25,536.00
11	D50102501020	Panelboard, 4 wire w/conductor & conduit, NQOD, 120/208 V, 100 A, 1 stories, 25' horizontal		$ 4,273.38	$ 47,007.18
8	D50102501080	Panelboard, 4 wire w/conductor & conduit, NQOD, 120/208 V, 225 A, 0 stories, 0' horizontal		$ 4,736.96	$ 37,895.68
2	D50102503060	Panelboard, 4 wire w/conductor & conduit, NQOD, 120/208 V, 600 A, 1 stories, 25' horizontal		$ 16,871.08	$ 33,742.16
8	D50102502060	Panelboard, 4 wire w/conductor & conduit, NQOD, 120/208 V, 400 A, 0 stories, 0' horizontal		$ 7,022.58	$ 56,180.64

2	D50102400320	Switchgear installation, incl switchboard, panels & circuit breaker, 120/208 V, 1200 A	Ea.	$ 23,614.08	$ 47,228.16
750	D50201250560	Receptacle duplex 120 V grounded, 20 A with box, plate, 3/4" EMT & wire	Ea.	$ 335.08	$ 251,310.00
250	D50201250640	Receptacle duplex G.F.I. 20 A with box, plate, 3/4" EMT & wire	Ea.	$ 368.33	$ 92,082.50
400	D50201250720	Toggle switch single pole, 20 A with box, plate, 3/4" EMT & wire	Ea.	$ 334.06	$ 133,624.00
200	D50201250800	3 way switch, 20 A with box, plate, 3/4" EMT & wire	Ea.	$ 348.67	$ 69,734.00
20000	D50202100500	Fluorescent fixtures recess mounted in ceiling, 0.8 watt per SF, 20 FC, 5 fixtures @32 watt per 1000 SF	S.F.	$ 3.28	$ 65,600.00
35000	D50202160240	Incandescent fixtures recess mounted, type A, 2 watt per SF, 16 FC, 12 fixtures per 1000 SF	S.F.	$ 6.01	$ 210,350.00
200	D50902100480	Generator Sets, w/battery, charger, muffler and transfer switch, gasoline operated, 200 kW	kW	$ 548.42	$ 109,684.00

Subtotal	
D20 Plumbing	$ 829,153.30
D30 HVAC	$ 1,377,362.20
D50 Electrical	$ 1,541,244.22
Total	**$ 3,747,760**

Appendix D: Site Layout Plans



PLAN LEGEND

- PROPERTY LINE
- EXISTING BUILDING
- PART OF BUILDING DEMOLITION
- EXISTING NEIGHBORHOOD BUILDINGS
- CURRENT ACCESS ROAD
- EXISTING GAS LINE
- NEW GAS LINE
- EXISTING ELECTRIC LINE
- NEW ELECTRIC LINE
- EXISTING WATER LINE
- NEW WATER LINE
- NEW TELECOM & CABLE WIRING
- EXISTING FIRE HYDRANT
- NEW BUILDING FOOTPRINT

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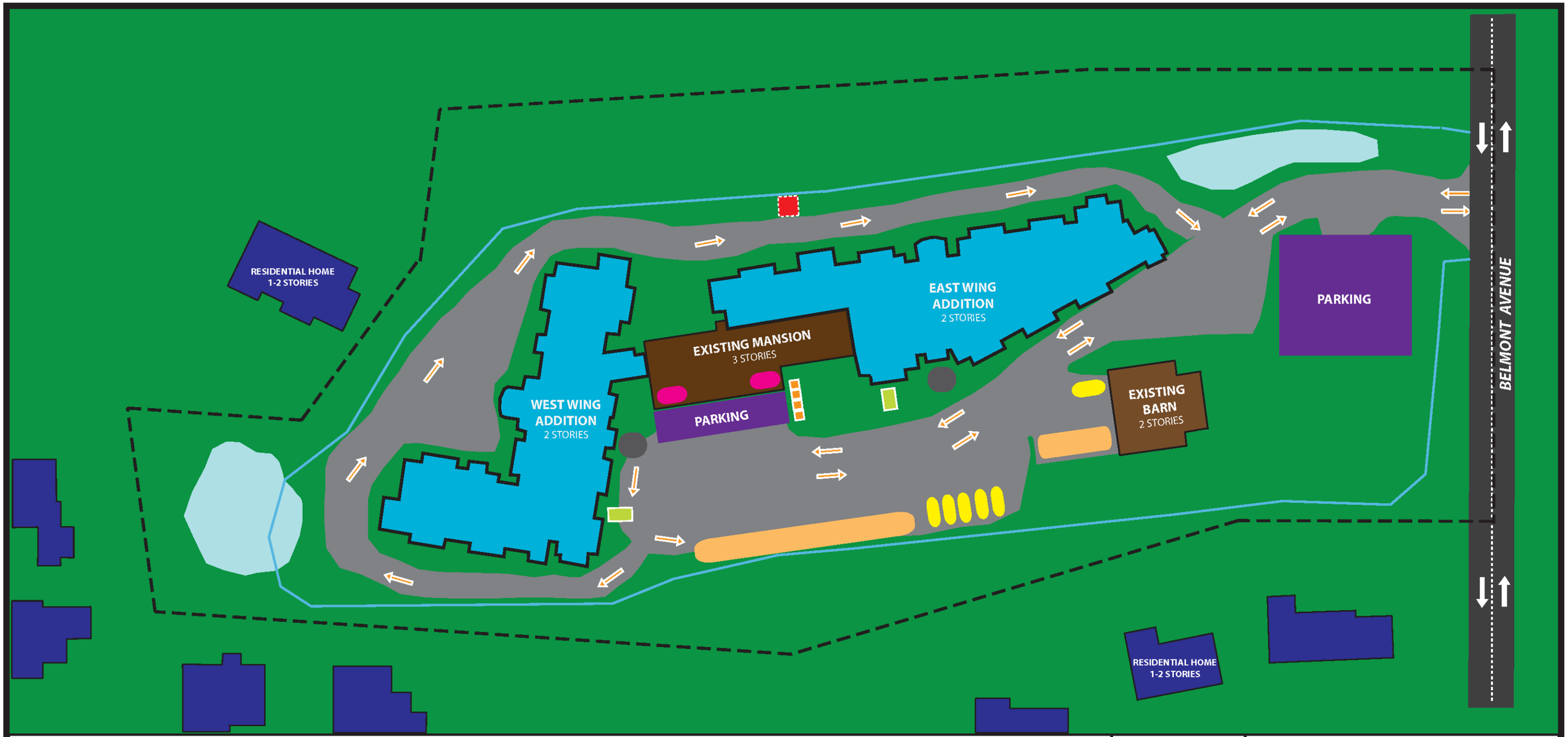
THE MARY J. DREXEL HOME ASSISTED LIVING ADDITIONS

238 BELMONT AVENUE
BALA CYNWYD, PA 19004

LOWER MERION TOWNSHIP MONTGOMERY COUNTY PENNSYLVANIA

EXISTING CONDITIONS & DEMOLITION



PLAN LEGEND

- PROPERTY LINE
- EXISTING BUILDING
- NEW BUILDING ADDITIONS
- EXISTING NEIGHBORHOOD BUILDINGS
- CONSTRUCTION ACCESS ROAD
- CONSTRUCTION TRAFFIC
- DUMPSTERS
- PORTABLE TOILET
- GC/CM TRAILER (IN MANSION)
- SUB TRAILERS
- STAGING AREA
- PARKING
- TEMPROARY XFMER
- CONCRETE PUMP TRUCK LOCATION
- SILT FENCE (CONSTRUCTION BOUNDARY)
- RETENTION DEPRESSION

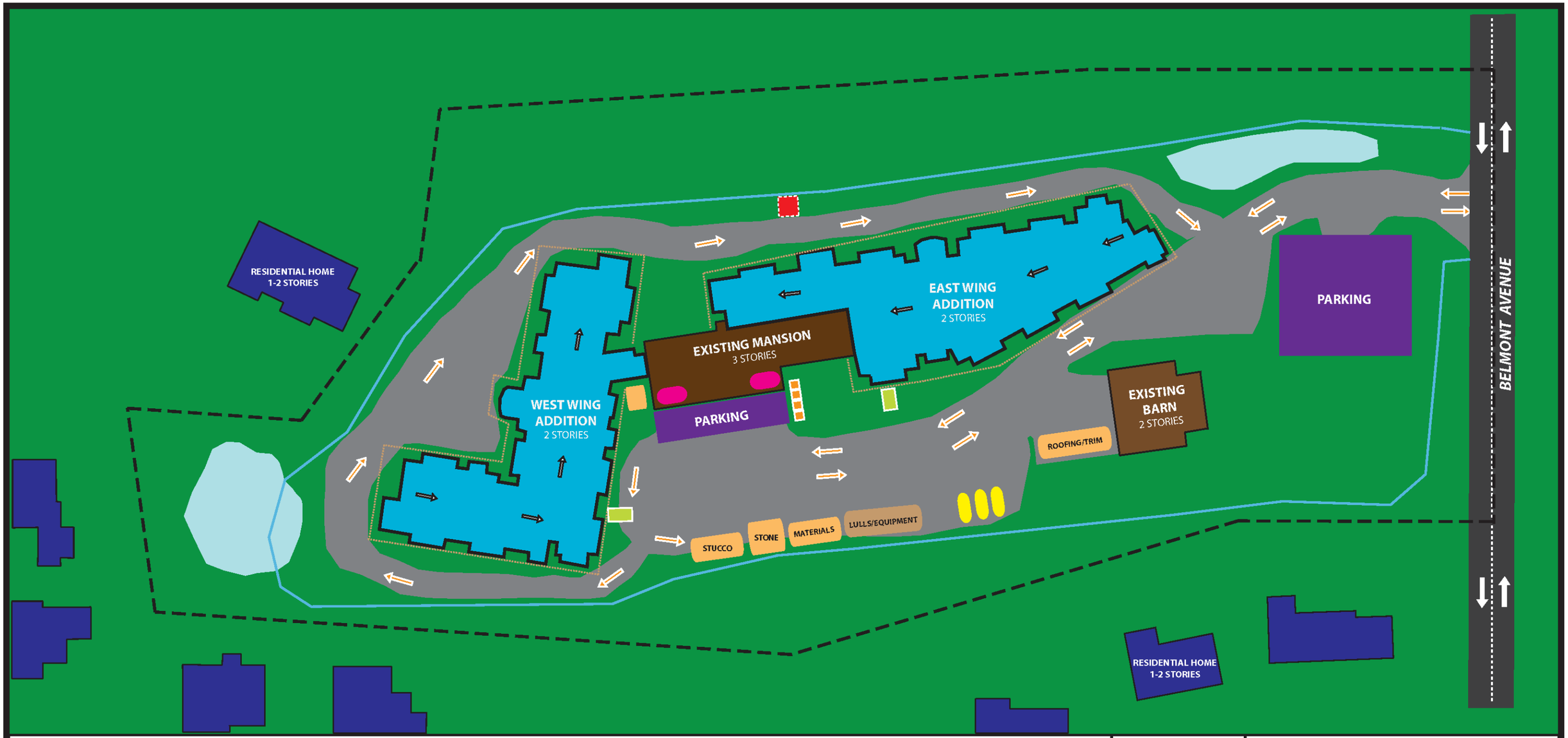
N

THE MARY J. DREXEL HOME ASSISTED LIVING ADDITIONS

238 BELMONT AVENUE
BALA CYNWYD, PA 19004

LOWER MERION TOWNSHIP | MONTGOMERY COUNTY | PENNSYLVANIA

SUPERSTRUCTURE SITE PLAN



PLAN LEGEND

- Property Line
- Existing Building
- New Building Additions
- Existing Neighborhood Buildings
- Construction Access Road
- Construction Traffic
- Dumpsters
- Portable Toilet
- GC/CM Trailer (in mansion)
- SUB Trailers
- Staging Area
- Parking
- Temproary Xfmer
- Lulls/Hoists/EquipmenT
- Retention Depression
- Silt Fence (construction boundary)
- Workflow Direction
- Hoist/Lull Travel

N

The Mary J. Drexel Home Assisted Living Additions

238 Belmont Avenue
Bala Cynwyd, PA 19004

Lower Merion Township Montgomery County Pennsylvania

BUILDING ENVELOPE & FINISHES SITE PLAN

Appendix E: General Conditions Estimate

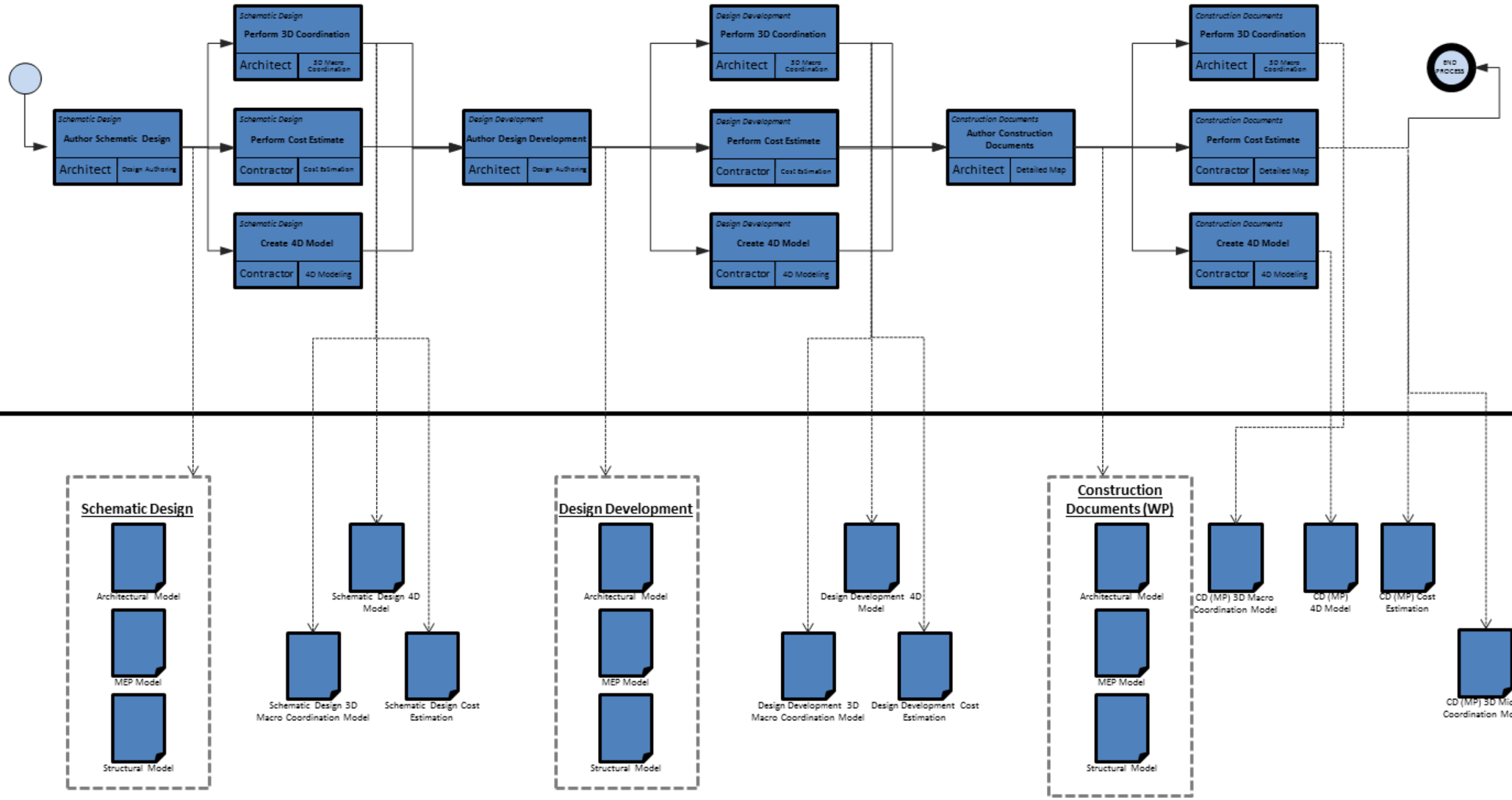
General Conditions Estimate *Project Duration - 14 Months - 56 Weeks*				
Description	**Quantity**	**Unit**	**Cost**	**Amount**
Project Management Team				**$776,250**
Project Executive (10%)	14	Mo.	$2,050.00	$28,700
Field Operations Manager (10%)	14	Mo.	$1,700.00	$23,800
Project Manager	14	Mo.	$16,000.00	$224,000
Superintendent	14	Mo.	$15,500.00	$217,000
Project Engineer	14	Mo.	$11,200.00	$156,800
Project Assistant (50%)	14	Mo.	$4,000.00	$56,000
Accountant	250	Hr.	$55.00	$13,750
Contract Administrator	100	Hr.	$80.00	$8,000
Safety Manager	165	Hr.	$80.00	$13,200
Laborer (50%)	14	Mo.	$2,500.00	$35,000
Site Conditions				**$95,455**
Temporary Power	1	LS	$7,500.00	$7,500
Temporary Fence	500	LF	$10.00	$5,000
Temporary Phone	14	Mo.	$750.00	$10,500
Temporary Toilets (4)	14	Mo.	$600.00	$8,400
Drinking Water	14	Mo.	$150.00	$2,100
Temporary Stair & Rails	1500	LF	$10.00	$15,000
Dumpsters (2)	14	Mo.	$2,500.00	$35,000
Signage	100	SF	$26.50	$2,650
Small Tools & Equip	14609579	LS	0.05%	$7,305
Job Photos	4	Set	$500.00	$2,000
Insurance				**$200,151**
Builder's Risk	14609579	($)	0.15%	$21,914
General Liability	14609579	($)	0.75%	$109,572
MEP Liability Insurance (based on GMP)	14609579	($)	0.47%	$68,665
Field Operations				**$86,334**
Field Office/Trailer - use existing facilities	0	Mo.	$0.00	$0
Storage Trailers - use existing facilities	0	Mo.	$0.00	$0
Final Cleaning	76,000	SF	$0.50	$38,000
Computer Equipment	1	LS	$3,500.00	$3,500
Job Office Supplies	14	Mo.	$77.40	$1,084
Drawings & Blueprints	65	Ea.	$150.00	$9,750
Safety Equipment	1	LS	$3,000.00	$3,000
Protect New Work	76,000	SF	$0.25	$19,000
Layout (Own Forces)	3	Wk	$4,000.00	$12,000
Contingency	14609579	($)	3.00%	**$438,287**
			TOTAL	**$1,596,477**

Appendix F: BIM Process Map

LEVEL 1: BIM EXECUTION PLANNING PROCESS
Project Title

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

BIM USES



INFO EXCHANGE