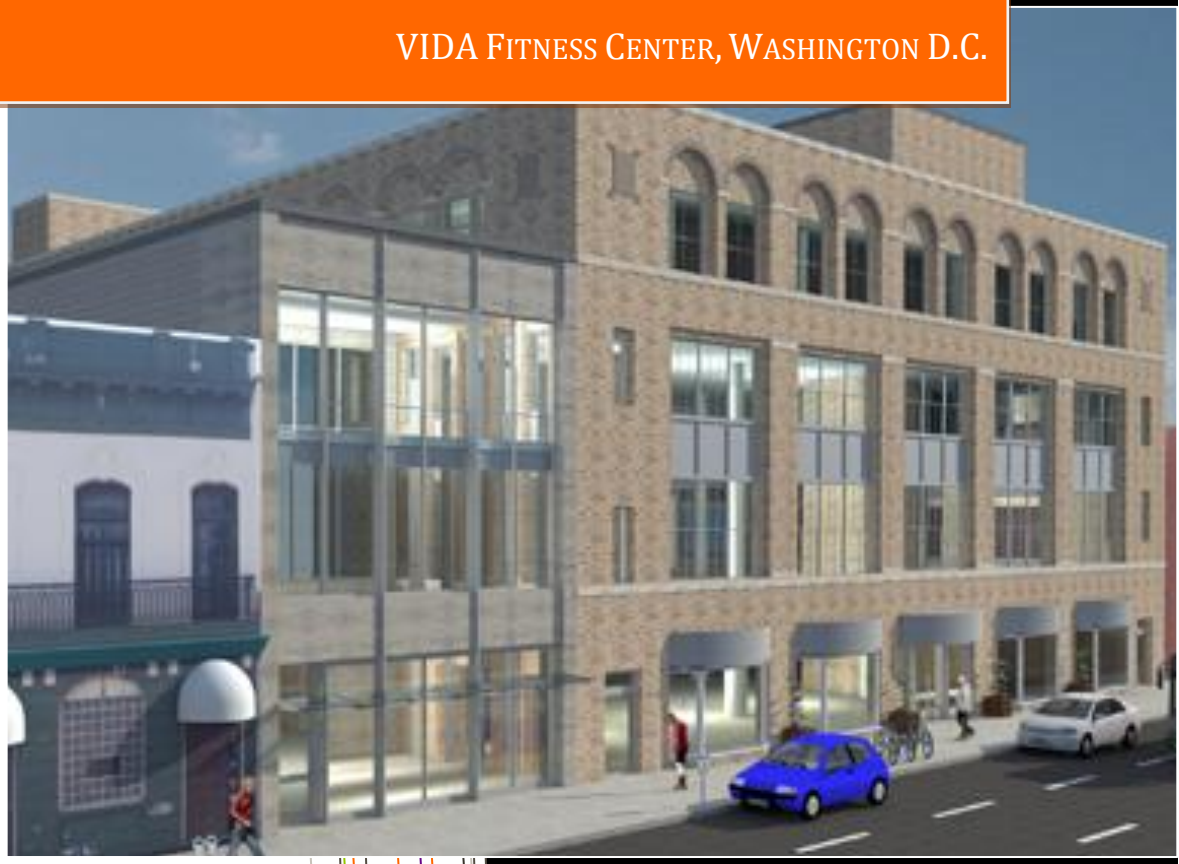
2011

TECHNICAL ASSIGNMENT TWO

VIDA FITNESS CENTER, WASHINGTON D.C.



Clara K Watson
Construction Option
Faculty Advisor: Dr. Leicht
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VIDA™ FITNESS

EXECUTIVE SUMMARY:

The following technical assignment is a comprehensive report analyzing key facets of the VIDA Fitness project that affect the project execution. Owner David von Storch is launching his new flagship building at 1612 U Street which will include the largest of his VIDA Fitness Centers, along with a new high end restaurant, Aura Spa, Bang Salon, and office space for his company, Urban Adventures. The 60,370 square foot project includes a 10,920 square foot, three-story addition and the renovation of an existing 49,450 square foot building. Located in the center of D.C., the restraints of a restricted site and tight schedule coupled with unforeseen hurdles that come with renovating a 100+ year old building created a unique and challenging project for Forrester Construction. In addition, the expansion began construction while the building was still occupied, as the existing Results Gym remained open and still had an active lease. When the gym closed and construction consumed the entire facility, parts of the building began to open in phases. Bang Salon was first to open, followed by two separate phases of the VIDA Fitness Center, with plans for the restaurant and spa to open in May 2012.

The project schedule was one of the key aspects for this project, mainly because the Owner lost nearly $100,000 for every week that the Fitness Center did not open. The extremely constricted project schedule was made even more demanding when unforeseen structural conditions delayed the project. This report contains a Detailed Project Schedule broken down into just over 200 activities. The construction schedule details project phasing, along with structural and MEP sequencing. It also includes key milestones and turnover dates important to both the Owner and the project team.

A Detailed Structural Systems Estimate along with a General Conditions Estimate are also included in this report. The Structural Systems Estimate, which includes all of the concrete structure and foundation for the new addition, totals $1,262,156. The General Conditions Estimate amounted to $1,705,462 and accounted for just under 15% of the total project cost.

Though LEED (Leader in Energy and Environmental Design) was not implemented on the VIDA Fitness project, an analysis was performed on the applicability of each point category and what points could be within reach for the project. It was found that 54 points were relatively easily achievable, which would certify the project at a LEED Silver Rating.

Lastly, a BIM (Building Information Modeling) Use Evaluation was performed to evaluate the appropriateness and value of implementing BIM into the varying project stages. It was established that though BIM would not be effective in every project stage, it should be implemented in the design, construction, and operation phases of the project by employing it for various uses.

After evaluating the five breadths included in this report, it was concluded that it will be beneficial to analyze different approaches of accelerating the construction schedule to reduce project cost. Researching different ways of achieving this is essential, and could include techniques such as sequencing the tasks differently, designing a more efficiently constructed structural system, or incorporating BIM into the project.

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DETAILED PROJECT SCHEDULE:

The Detailed Project Schedule can be found in Appendix A.

Overview

The project schedule was one of the main driving factors for this project, due to the fact that the Owner lost approximately $100,000 for every week that the Fitness Center did not open. The extremely tight project schedule was made even more stressful when unforeseen structural conditions delayed the project. The Detailed Project Schedule shown in Appendix A is a relatively thorough and sequential summary of the key activities throughout the project. This schedule does not reflect any delays during construction, but rather depicts the original projected project schedule.

Sequencing

This Detailed Project Schedule abridges the main areas for construction on the project. Phase 1 consists of procurement, preconstruction, and the base building of the new addition. Phase 2 consists of the renovation of the existing building, all interior work, and all roof work. The zones detailed on the project schedule are depicted in Figure 1 below and represent the differing construction areas.

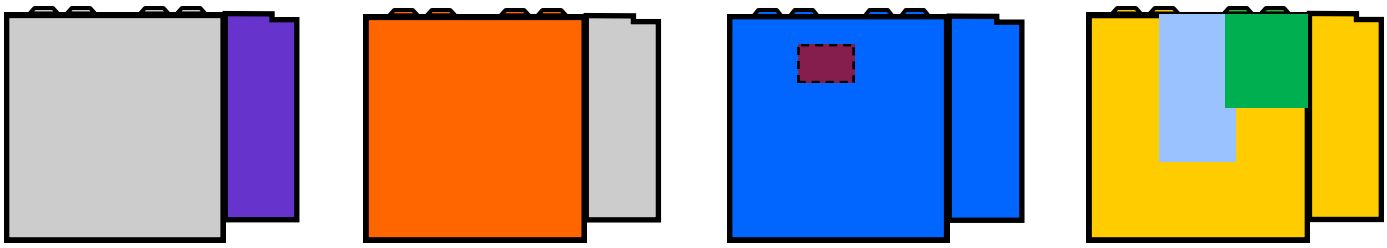


Figure 1: Construction Areas for the Detailed Project Schedule

These construction areas are ordered on the Detailed Project Schedule by start date; an overview of these zones with their construction dates can be seen in Figure 2 on the next page.

While these individual areas were relatively independent of each other, the tasks in these phases are almost all in sequential order. The delay of one task would push all those in that sequence back, delaying the project schedule. Overlapping shown between tasks was critical to the project being completed successfully on time. The building also opened to the public in varying stages, so delays in of one of the construction areas could potentially have delayed the opening of a portion of the building.

Task Name	Duration	Start	Finish
PHASE 1: New Addition Construction	**305 days**	**Wed 2/3/10**	**Tue 4/5/11**
Procurement / Preconstruction	305 days	Wed 2/3/10	Tue 4/5/11
New Addition Construction	116 days	Mon 10/18/10	Mon 3/28/11
PHASE 2: Renovation & Interiors	**197 days**	**Thu 12/16/10**	**Sat 9/17/11**
Roof	156 days	Thu 12/16/10	Fri 7/22/11
Fourth Floor	107 days	Tue 2/1/11	Thu 6/30/11
Monumental Stairs & Elevator	59 days	Tue 2/8/11	Fri 4/29/11
Second Floor	50 days	Mon 2/28/11	Fri 5/6/11
Third Floor	45 days	Mon 2/28/11	Fri 4/29/11
First Floor - Offices / Entry	59 days	Tue 2/22/11	Fri 5/13/11
First Floor - Future Spa / Restaurant	65 days	Tue 3/1/11	Mon 5/30/11
First Floor - Bang Salon	43 days	Tue 3/1/11	Fri 4/29/11
Project Close-Out	101 days	Fri 4/29/11	Sat 9/17/11

Table 1: Construction Zone Date Summary from the Detailed Project Schedule

DETAILED STRUCTURAL SYSTEMS ESTIMATE:

The Detailed Structural Systems Estimate can be found in Appendix B.

The existing building structure consists of concrete columns, beams, and two-way slabs. This structure received some upgrades due to the additional dead load of a pool on the roof of the building, including stripping existing concrete columns down to their outer surface of spiral ties and rewrapping with carbon fiber or concrete after additional reinforcing was added. In addition to these upgrades, all of the existing footings were enlarged to increase their load bearing capacity to the new weight.

Because there were no significant new structural elements added to the existing building, the Detailed Structural Systems Estimate was performed on the entire new addition. This 10,920 square foot addition has three floors with an accessible 3,640 square foot roof. The new addition superstructure was constructed of concrete columns and beams with post-tensioned slabs. This system rests on a foundation of CMU foundation walls, grade beams, pile caps, and micro-piles.

Foundation

Due to the fact that the new addition was constructed up to the adjacent neighboring building, underpinning could not be used for fear of compromising the foundation stability of the neighboring structure. Instead, 40 ton, 30 foot micro-piles were used for the new foundation system. A total of 50 steel micro-piles, grouped in fours or fives, were driven around the perimeter of the new addition. These groupings were topped off with pile caps. All piles were required to be pre-augered, meaning that the soil was broken up with a Pre-Auger prior to pile driving. This reduced the amount of vibrations associated with pile driving that could disrupt the close neighbors.

There were two types of pile caps utilized for the foundation that varied in length depending on whether or not they were capping four or five piles. Both types of pile caps used 3,000 PSI normal weight concrete with reinforcing and were cast on-site. These pile caps were centered under each concrete column in the new addition, and also served as the column footer.

Only two grade beams were placed at the North and South facing sides of the addition. These grade beams were 3,000 PSI and were placed on-site with normal weight reinforced concrete. Both support the stepped footing that is included with the slab-on-grade.

The masonry incorporated into the new addition was used for both the foundation walls and the three-story walls on the East and West sides of the addition. CMU also forms the 48" parapet walls around the accessible roof. All were reinforced, but the foundation walls were fully grouted whereas the above-ground CMU walls were grouted only where they had to be reinforced, every 48" o.c. Note that the reinforcement and grout are directly included in the CMU estimate.

Unlike the elevated slabs on the new addition, the slab-on-grade was not post-tensioned, but rather a typical 4,000 PSI cast-in-place slab. The detailed estimate for the reinforced slab includes the stepped footers, as they were cast as one unit.

Superstructure

All of the reinforced concrete columns were 4,000 PSI and supported all three floors of the new addition. All were cast-in-place, though two were rectangular columns rather than the typical round column used throughout the addition.

The beams and elevated slabs were cast-in-place reinforced concrete but were also post-tensioned, due to value engineering early in the design stages of the project. Post-tensioning these simultaneously placed beams and slabs allowed for the new addition to be a relatively open area, rather than one cluttered with columns; this served its purpose well, as two of the floors were open fitness areas. Because the roof for the new addition is accessible to the building occupants and open to VIDA Fitness members, the roof slab is the same as the elevated slabs calculated for the second and third floors.

Table 2 shows a summary comparison of the estimated costs (broken up by CSI MasterFormat division) and the actual costs, provided by Forrester Construction. A Detailed Structural Estimate with a breakdown of each item can be seen in Appendix B. Note that all of the individual structural estimates include materials, labor, and equipment, but do not include overhead and profit. All unit values were taken from RS Means or MC² Estimating, if RS Means values were unavailable.

	Estimated		Actual	
LINE ITEM	**$/SF**	**TOTAL COST**	**$/SF**	**TOTAL COST**
Structural Concrete	$ 67.93	$ 989,119.27	$ 49.29	$ 717,684.00
Masonry	$ 14.19	$ 206,661.38	$ 15.67	$ 228,113.00
Piles	$ 4.56	$ 66,375.00	$ 5.31	$ 77,300.00
Total		$1,262,155.65		$1,023,097.00

Table 2: Estimated vs. Actual Costs

Because the new addition was a manageable size, it allowed for the Detailed Structural Estimate to be performed on the entire addition, rather than using a sectional method and extrapolating across the square footage of the building. This estimate provided for more exact numbers, which is why the estimated and actual costs shown in the table above are similar. Table 3 on the next page is a bar chart comparing the estimated and actual values of the three main materials used to construct the structure of the new addition on the VIDA Fitness Center.

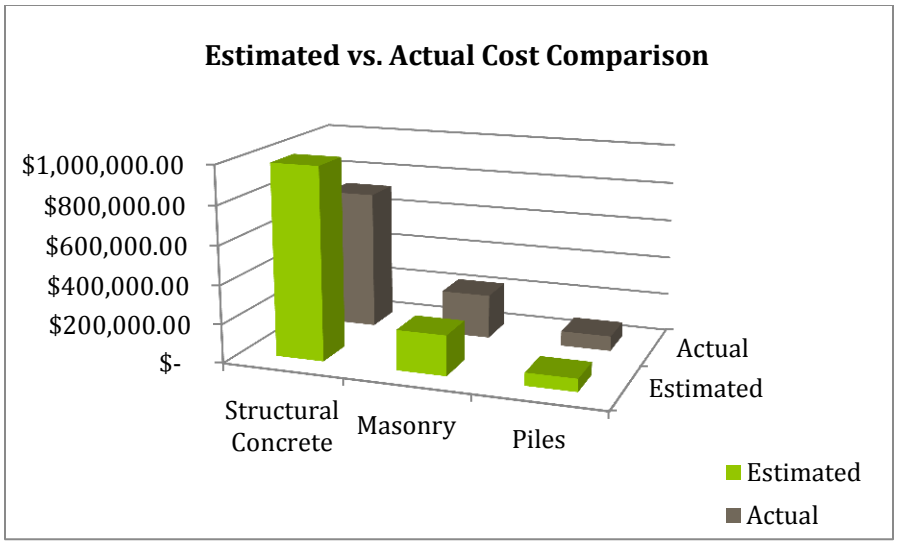


Table 3: Estimated vs. Actual Comparison

The differences between the estimated and actual costs are likely due to a combination of factors, namely the fact that the RS Means estimate did not account for formwork reuse, which comprised a large portion of the concrete estimate. Other factors include estimations on items that were not listed in either RS Means or MC². An example of this is the steel piles, where the closest item had to be taken for approximation because cost data was not listed for the actual micro-piles used in the foundation for VIDA. The pie chart in Table 4 below shows that material costs account for the majority of structural concrete costs on the new addition. Slight changes in these unit prices can also greatly influence the material price. Actual installation times vary and are site-specific, due to unique and differing site conditions. This too could affect the values presented for the Detailed Structural Systems Estimate.

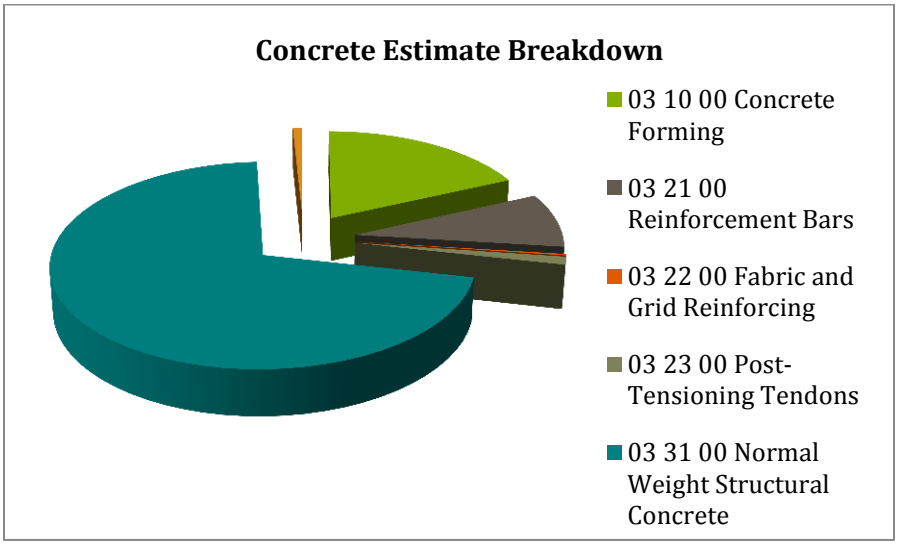


Table 4: Concrete Estimate Pie Chart Breakdown

Table 5 below depicts the Detailed Structural Estimate broken down by CSI Format line items. All waste factors are estimated values.

CSI MasterFormat Estimate Breakdown			
LINE ITEM	**WASTE FACTOR**	**COST**	**TOTAL COST**
03 10 00 Concrete Forming	1.05	$ 171,581.95	$ 180,161.05
03 21 00 Reinforcement Bars	1.05	$ 81,915.23	$ 86,010.99
03 22 00 Fabric and Grid Reinforcing	1.05	$ 2,241.79	$ 2,353.88
03 23 00 Post-Tensioning Tendons	1.03	$ 12,187.50	$ 12,553.13
03 31 00 Normal Weight Structural Concrete	1.08	$ 648,083.77	$ 699,930.47
03 35 00 Concrete Finishing		$ 8,109.75	$ 8,109.75
04 22 00 Concrete Unit Masonry	1.03	$ 200,642.12	$ 206,661.38
31 62 16 Steel Piles		$ 40,380.00	$ 40,380.00

Table 5: CSI MasterFormat Breakdown

The overall Detailed Structural Estimate cost breakdown along with quantity take-offs can be seen in Appendix B.

Estimate Assumptions

- Stirrups are included in the LF for each reinforcing steel calculation
- An average floor-to-floor height of 13.5 feet was used for vertical calculations
- Where there were two sizes of rebar used for one direction in a beam, the larger of the two sizes was used for estimation purposes
- Where the spacing varied between stirrups in a beam, the average spacing was used for estimation purposes

GENERAL CONDITIONS ESTIMATE:

The General Conditions Estimate can be found in Appendix C.

The General Conditions Estimate for the VIDA Fitness Project can be broken down into three main areas: Project Team & Personnel, Site Expenses, and Miscellaneous Costs. The Project Team & Personnel section of the General Conditions Estimate includes all of the management and support staff on the VIDA project. The Site Expenses section consists of costs relating to the site office, Owner sales trailer, and other various site construction costs. Last, the Miscellaneous Costs are made up of insurance, bonds, contingency, and permit costs. A summary of the General Conditions Estimate can be seen below in Table 6. A more detailed breakdown of each General Conditions line item is shown in Appendix C.

General Conditions Estimate Summary				
LINE ITEM	QUANTITY	UNIT	RATE	TOTAL COST
Project Team & Personnel	52.00	WKS	$ 10,996.92	$ 571,840.00
Site Expenses	52.00	WKS	$ 2,486.48	$ 129,296.97
Miscellaneous Costs	52.00	WKS	$ 19,313.94	$ 1,004,324.85
Total General Conditions Cost				**$ 1,705,461.82**

Table 6: General Conditions Estimate Summary

The $1,705,462 General Conditions Estimate was developed using both RS Means and MC^2 Estimating rates. For items where exact project rates were known, the actual rates were used instead of the estimated rates. Note that the total estimated cost in Table 6 includes Miscellaneous Costs. This number compares with the actual General Conditions Estimate provided by Forrester of $1,071,889 which also includes Miscellaneous Costs. As seen in Table 7, the Miscellaneous Costs make up approximately 59% of the General Conditions Costs. If these costs are removed, the estimated General Conditions Costs total $701,137, which compares with Forrester's estimate of $779,183.

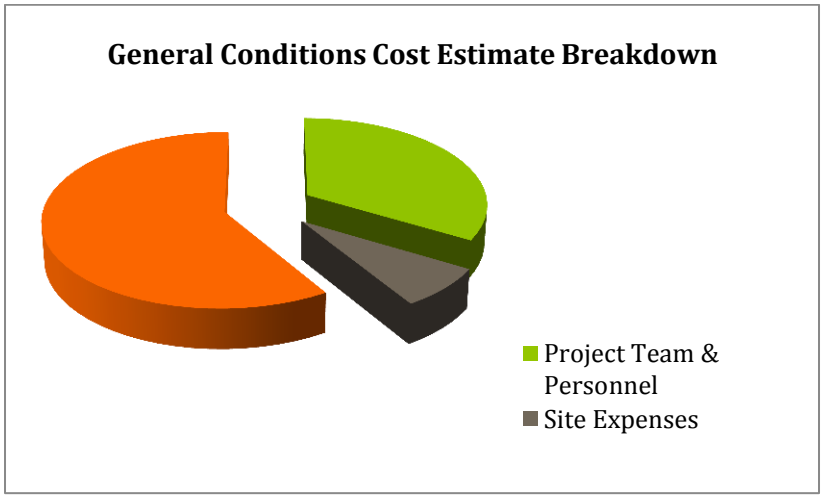


Table 7: General Conditions Cost Estimate Pie Chart

The $701,137 General Conditions Estimate is in comparison with an original contract value of $11,093,165 (excluding all change orders). The cost difference between the General Conditions Estimate detailed in Appendix C and Forrester's actual General Conditions Estimate is likely due to the percentage costs of insurance, bonds, contingency, and permits. These items are estimated by a percentage of the entire project cost; RS Means provides broad ranges for these percentages, which could cause the General Conditions Costs to vary greatly.

Due to the Owner's personal preference, several items that would normally be included in General Conditions Costs were instead bid out to subcontractors in Division 2 of the CSI MasterFormat. These costs included such items as construction fencing and site utilities and totaled an estimated $176,551. For a full line item breakout of these costs not included in the General Conditions Estimate, see Appendix C.

The $1,705,462 General Conditions amount accounts for approximately 15% of the project cost. This is high when compared to many projects, mainly because it is a renovation and because of the relationship between von Storch and the project team. This is the fourth VIDA constructed by Forrester, meaning that the project team knew what items would be needed in the General Conditions section and added them accordingly. The fact that this project is mainly a renovation rather than new construction would also increase the percentage of General Conditions Costs when compared to the Overall Project Cost. This is due to the fact that the structure of the building remained, meaning minimal project costs were associated with the structure, which is often an expensive component of a project. If the Overall Project Cost largely negates structural costs, the Overall Project Cost will be smaller in comparison to the General Conditions Costs, which will result in the increased percentage of General Conditions Costs.

Overall, General Conditions Costs account for approximately $32,797 a week (if Miscellaneous Costs are included) or $13,483 a week (if Miscellaneous Costs are not included). It is evident that monitoring the project schedule is critical for maintaining the project budget and not incurring any additional General Conditions Costs.

LEED EVALUATION:

The LEED Scorecard can be seen in Appendix D.

The common assumption is that it is too expensive to build a sustainable or green building for smaller commercial projects. Even if this were true, the money saved over the life of the building through reduced energy costs in the form of lower utility bills would far outweigh any additional cost of construction (Green Buildings). What are generally overlooked are the long-term maintenance costs that come with buildings that are not designed to be sustainable. When a sustainable building is designed and built, the efficiency with which the building and its site use and harvest energy, water, and materials is increased. Building impacts on human health and the environment are reduced through better design, construction, operation, and maintenance (Green Buildings). Going "green" through energy-efficient construction results in lower energy consumption, decreased utility bills, elevated inhabitant productivity, and healthier indoor air quality.

The United States Green Building Council (USGBC) developed the LEED (Leadership in Energy and Environmental Design) rating system to certify buildings according to points earned for implementing sustainable practices and materials on a building or project. The levels of certification vary according to the amount of points earned (USGBC).

Though LEED certification was not attempted on this project, there are and were many areas where materials or practices could have been adjusted to earn LEED points without significantly changing the project schedule or cost. These areas are discussed below, and refer to the completed LEED Checklist in Appendix D.

Sustainable Sites

The main purpose of the Sustainable Sites section of the LEED scorecard is to minimize pollution caused by construction by regulating erosion, sedimentation, and dust. The prerequisite for this subdivision includes creating an erosion and sediment control plan for the project before commencement of construction. Possible earned points in this category are from a variety of items, including community connectivity. VIDA could have received five points in this category because it is located on a previously developed site, is within ½ mile of a residential area and at least ten services, and has pedestrian access from the building to the services.

One of the ways the USGBC works to reduced automobile pollution is to offer points for the project's proximity to either bus stops (less than ¼ mile) or rail stations (less than ½ mile). The VIDA project fulfills both of these requirements. Along this same general line of thinking, additional points are offered for providing bicycle rack storage coupled with shower and changing facilities in the building. Both of these are offered at VIDA, which could provide the project with another potential LEED point. Though no preferred parking could be provided, no new parking was added on the project, which could have also provided one additional LEED point (and possibly a second).

One LEED point is offered for the reduction of light pollution emanating from a building. VIDA could have achieved this point simply by ensuring all non-emergency lights are switched off between the hours of 11:00PM and 5:00AM when the fitness club is closed to the general public.

Water Efficiency

The water efficiency section of the LEED checklist is designed to lessen the loads on wastewater systems and municipal water supply systems by decreasing the individual building's water usage. The prerequisite for the Water Efficiency subdivision is to decrease the total water usage by 20%.

Water saving fixtures could have easily been installed to reduce water usage by 30-40%, earning an additional two to four LEED points. These fixtures could also earn an additional two points by reducing the wastewater by 50%.

Energy and Atmosphere

The Energy and Atmosphere section of the LEED checklist requires that the energy systems used in the building first be commissioned before any of the points in this section can be earned. The intent of this requirement is to ensure that all of the building's energy systems are working properly and according to their design standards. Not only could commissioning energy systems reduce energy usage and operating costs, but it could also decrease contractor call-backs for maintenance or repair and increase occupant productivity. The second prerequisite for the Energy and Atmosphere subdivision is to demonstrate a 5% improvement in the building's performance rating after the completed renovation. The final prerequisite for this section is zero use of chlorofluorocarbon in any new HVAC of refrigeration systems.

Though a 5% improvement in the building's performance rating is required before any points can be earned in this section, increasing the performance rating by more than 5% can earn up to 19 additional points, depending on the percentage of improvement. Another two points could be earned for doing commissioning design and submittal reviews.

Because an all-water VAV system was utilized at VIDA, two more points could have been earned as there were no refrigerants used in the mechanical system.

Materials and Resources

Recycling for the entire building is already present at VIDA, which is the prerequisite for the Materials and Resources section of the LEED checklist. The main idea of this subdivision is to aid in diminishing the amount of solid waste that is disposed of in landfills. One of the possible areas to earn points for renovations in this section is to maintain the existing building structure or envelope. Up to three points can be earned, depending on the percentage of the existing building that is reused.

Recycling construction waste is a relatively easy way to earn up to two points, depending upon the percentage of waste that is recycled or salvaged. Using recycled new materials can also earn up to two points. This can be easily achieved by simply installing recycled carpet, windows, or other materials. Implementing materials that are manufactured locally (within 500 miles) can also provide an additional two LEED points for a project. Lastly, expending rapidly renewable materials for 2.5% of the building materials can provide another point. This would be easy for the VIDA project, as bamboo is a certified wood, qualifies for this category, and was used in many areas throughout VIDA.

Indoor Environmental Quality

There are two prerequisites for the Indoor Environmental Quality section of the LEED checklist. The first of these prerequisites is for mechanically ventilated buildings, which must be designed to local applicable codes. The second prerequisite is to prohibit smoking except in designated areas outside the building. The overall intent of the Indoor Environmental Quality section is to increase occupant health and comfort by increasing the building's indoor air quality (IAQ). Points can be earned in this area by monitoring CO_2 levels in occupied spaces or by increasing the ventilation to occupied spaces by 30% above the minimum required rates. Development of an IAQ management plan that must be implemented while the building is still under construction and/or pre-occupancy is another way to earn two points.

If low volatile organic compound (VOC) materials are chosen during the design of the building, other LEED points can be earned for the project. This is a relatively easy way to earn points, as most low VOC materials are readily available and do not have escalated prices. Low VOC materials that could easily be used include adhesives, paints, woods, and floorings. A total of four LEED points can be earned if low VOC materials are used for each of these categories.

If the building HVAC system is in compliance with ASHRAE's (American Society of Heating, Refrigerating, and Air-Conditioning Engineers) Thermal Comfort Conditions for Human Occupancy, then a LEED point can be earned for thermal comfort design.

Another LEED point can be netted if the natural daylight levels are monitored and recorded for the main occupied spaces of the building and more than 25 foot-candles of light are achieved. Additionally, one point can be gained for providing a direct line of sight outdoors for 90% of the regularly occupied areas in the building. Natural daylighting should also be optimized to reduce the need for artificial lighting that, in turn, saves energy and money on utility bills. This has already been achieved due to the large windows and storefront glass in VIDA's fitness areas.

Innovation in Design

The Innovation in Design section of the LEED scorecard allows design teams to earn points based upon their own innovation. A point in this category could be earned for VIDA because at least one member of the project team is a LEED accredited professional.

Regional Priority Credits

Regional Priority Credits encourage earning credits with emphasis on geographically specific environmental concerns. They are existing LEED credits labeled particularly significant for their areas by USGBC regional councils. Under the assumption that all of the previously proposed credits were earned, the VIDA project is eligible for one Regional Credit, MRc1.1: Building Reuse.

Critical Evaluation

Overall, the utilization of sustainable technology to achieve LEED certification takes a more environmentally-friendly approach in the way people choose to live. Sustainable buildings help to benefit occupants socially, economically, and environmentally and are an exceptional benefit to society. In the case of the VIDA project, there were several instances where LEED points could have been achieved with minimal effort by the project team. As seen in the LEED Project Checklist in Appendix D, approximately 54 points could have been earned to achieve a Silver level certification. The breakdown of possible points earned by category is shown below in Table 8.

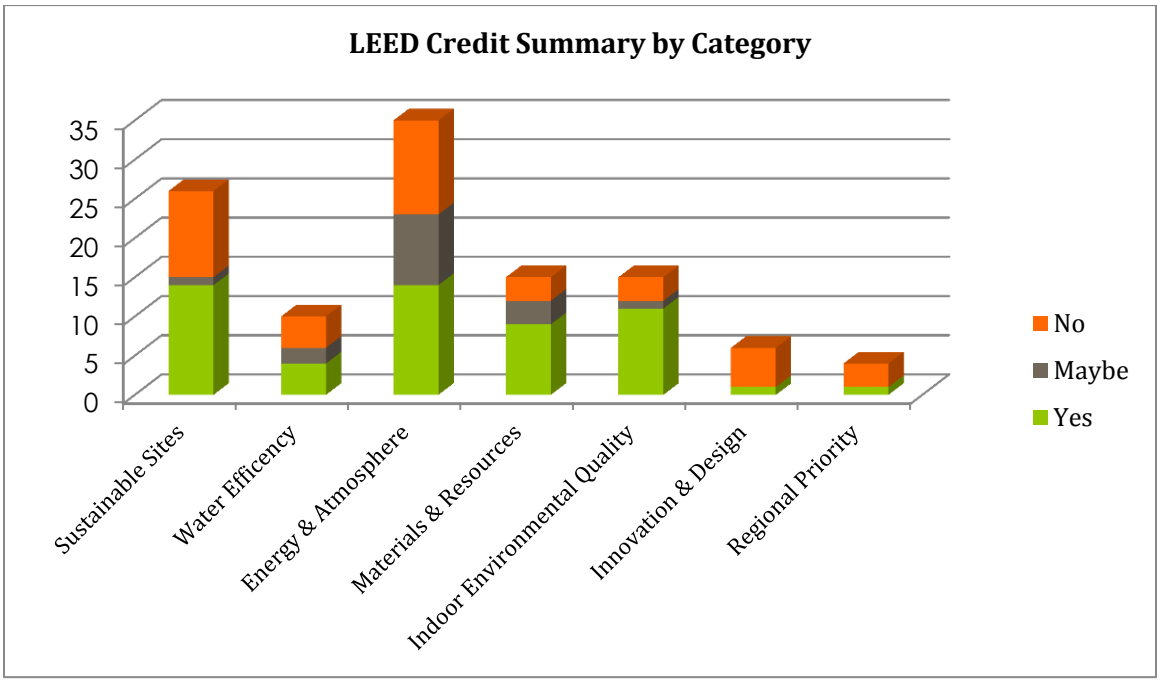


Table 8: LEED Credit Summary by Category

Designing green buildings can maximize environmental and economic performance and can lower energy usage and cost. Any type of green building will lower energy consumption and utility bills while producing higher inhabitant productivity and enhanced indoor air quality. As the VIDA Fitness Centers' focus is on improving health and well-being, the attainment of LEED certification and a display of the certification to customers would be an additional selling point for membership. It is for these reasons that it is recommended that the VIDA Fitness Owner and project team aim for LEED certification on their next VIDA Fitness project.

Note: All processes and methods discussed above for earning LEED points to achieve certification were taken from the USGBC website.

BUILDING INFORMATION MODELING USE EVALUATION:

The BIM Project Execution Plan can be seen in Appendix E.

BIM Execution Integration

Incorporating the use of Building Information Modeling (BIM) on a project can produce many varying benefits in the best interest of both the project and project team, irrespective of project size. Contrary to popular belief inside and outside of the industry, BIM is more than just a 3D model of a building and its system components; it is rather a "process that includes the designing, analyzing, integrating, and documenting of a building's lifecycle by developing an intelligent virtual prototype of the building which includes a central database of information" (Dubler). If implemented properly, BIM can be executed for system coordination, clash detection, material and submittal tracking, sequencing, 4D scheduling, and record modeling, among many other things.

Though the employment of BIM from project conception to completion often generates the most profitable results and provides the most value, the total benefit depends upon the stages of the project in which BIM is assimilated and the uses for which it is engaged. To discover these proper areas, the BIM team should analyze appropriate stages for how implementation can be measured against value maximization and cost minimization (Computer Integrated Construction). The most effective way to do this is to develop a BIM Execution Plan for the project in question. This plan fashions a framework for the global picture of BIM usage on the project and will define the scope, process flows, information exchanges, and team infrastructure for the project (Computer Integrated Construction).

The stages to develop a BIM Execution Plan include identifying goals and uses, designing the project execution process, developing information exchanges, and finally, defining the supporting infrastructure for its implementation (Computer Integrated Construction). Though BIM was not utilized on the VIDA Fitness Center project, a theoretical Execution Plan was developed to analyze the positives and negatives of its use, had it been implemented. The steps for defining major goals and objectives and developing process maps for BIM uses are detailed in the following discussion.

Defining Major BIM Goals and Uses

Because every project has unique characteristics and challenges, it is difficult to properly define goals and appropriate areas for BIM integration. The Goals and Uses Chart created specifically for the VIDA project can be seen on page 51 of Appendix E. This chart describes some of the major goals with BIM integration and also the potential BIM uses that are tied to each goal. It then ranks the goal on level of priority (high, medium, or low). To better analyze these potential uses, the BIM Use Analysis Worksheet (seen on page 52 of Appendix E) was created to weigh each use against its value to the project and responsible party. It also thoroughly discusses resources and competencies that would be required for BIM employment with each described use, and ultimately allows for the final decision on whether or not the use should be executed (depicted with a 'yes', 'no', or 'maybe').

The second BIM Uses Chart can be seen on page 53 of Appendix E and shows the final BIM uses that were chosen for the project along with their appropriate phase of construction.

Phase Planning or 4D Modeling is one of the most common BIM uses and can typically be done during the planning, designing, constructing, or operating stages of a project. Because the Owner and Facility Manager would have little need for 4D Modeling after project completion, this BIM use was only chosen to be implemented in the plan, design, and construction phases of the VIDA project. 4D Modeling is essentially a 3D model of a building and its components that has been tied to the construction schedule. This model can be utilized for phased occupancy planning and would benefit the VIDA project team for coordination with VIDA's General and Facility Managers because the building was opened to the public in phases. 4D Modeling could have also been used for better construction visualization against the project schedule for von Storch, his employees, and potential VIDA Fitness members. The Process Map for 4D Modeling can be viewed on page 56 of Appendix E (Computer Integrated Construction).

Design Authoring includes using 3D software to develop a Building Information Model. This model is generated during the design phase of construction and is established on conditions essential to the conception of the building's design. This BIM Use is a precursor to Design Reviews (discussed next). The Design Authoring Process Map can be seen on page 57 of Appendix E (Computer Integrated Construction).

Comparable to its name, Design Reviews is a BIM Use that occurs during the design phase of a project and was selected for implementation on the VIDA project. This process is essentially a virtual 3D mock-up that allows any project stakeholders along with the project and design teams to envision certain areas or spaces of the building. Many aspects can be examined, including materials and finishes, space lighting, layout, and constructability. Because von Storch liked to personally approve each material and finish before it was installed, this could greatly aid in his visualization of different finishes and decrease the number of changes made to unsatisfactory finishes. Design Reviews could also potentially benefit the project team by considering constructability of different systems and building components. The Design Reviews Process Map displaying the process step stages is on page 58 of Appendix E (Computer Integrated Construction).

3D Coordination is one of the major BIM uses chosen for application on the VIDA project because of its high value to the project team and other involved parties. 3D Coordination takes place during the design and construction phases of this project and is a process where the 3D model that includes major building systems is analyzed with clash detection software depicting any conflicts between the systems prior to construction. 3D Coordination greatly reduces on-site conflicts because it spots many problem areas that could be overlooked with 2D drawings. The reduction in on-site conflicts can increase productivity and reduce the number of project change orders, which could lead to a reduced construction time and decreased construction cost on the VIDA project. The 3D Design Coordination Process Map showing the process step stages is on page 59 of Appendix E (Computer Integrated Construction).

Site Utilization Planning takes place during the construction phase of a project and includes using the 4D model to represent and visualize on-site facilities in coordination with the construction

schedule. Along with both temporary and permanent facility representation, this model can contain the location of major equipment, labor and material resources, and deliveries. This BIM use was chosen for implementation on the VIDA project because it could greatly aid the project team and subcontractors in coordinating their deliveries, storage areas, and layout areas and identify any limiting factors such as schedule or space. The Site Utilization Planning Process Map is depicted on page 60 of Appendix E and shows the detailed process steps for this BIM use (Computer Integrated Construction).

Record Modeling is a BIM use that takes place in both the construction and operation stages of a project. Similar to the idea of As-Built drawings, Record Modeling includes the process of representing actual physical conditions of a completed building. Though it received only a "maybe" on the BIM Analysis Worksheet, this BIM Use was chosen for employment because it could greatly aid the Owner and/or Facility Manager. A model for this project could include MEP and structural systems along with key architectural features, and provide documentation of the facility and environment for any future modeling, renovations, or other future uses. This model could also record warranties and maintenance history for system equipment, which would aid the Owner or Facility Manager in building maintenance and upkeep. The Record Modeling Process Map can be seen on page 61 of Appendix E and shows the detailed process steps for this BIM use (Computer Integrated Construction).

Mapping the BIM Project Execution Process

The idea behind mapping the individual BIM uses is for the project team to appreciate the process behind how each use is integrated into the project. The creation of the process maps will detail the exchange of information between involved parties and define the components of the processes both for each BIM use and the overall BIM implementation.

The mapping process first requires the project team to create a Level 1 BIM Overview Map. The BIM Overview Map created for VIDA can be seen on page 55 of Appendix E. This Process Map includes the relationships between BIM Uses through the main stages of the project along with any information exchange between involved parties. After this Overview Map was designed, Level 2 Detailed BIM Use Process Maps were formed for each BIM use chosen to be implemented on the VIDA project. These Detailed Process Maps delineate the processes to be performed for the individual BIM Use employment along with the exchange of information between involved parties and any referenced information. The Detailed BIM Use Process Maps for the five BIM Uses chosen to be implemented on VIDA are shown on pages 56-61 of Appendix E.

Responsible Parties for BIM Development and Integration

A BIM team should be amassed during the planning stages of a project to begin development of the BIM Execution Plan. This team should be comprised of members from every major party on the project, including the owner, designers, general contractor, main subcontractors, and engineers. In the case of the VIDA project, this team would include the Project Manager, Project Superintendent, BIM Manager, Project Owner, Base Building Architect, Interiors Architect, MEP Engineer, Structural Engineer, Structural Steel Subcontractor, Structural Concrete Subcontractor, Mechanical

Subcontractor, Electrical Subcontractor, Plumbing Subcontractor, and Fire Protection Subcontractor. A detailed list of these roles along with contact names and information can be seen in Appendix E on page 50.

Critical Evaluation

With this assembly of people, each party would create their own portion of the model and bring it to a coordination meeting for Forrester Construction to assemble. Individual meetings could be held between Forrester and appropriate parties should the need arise for a certain BIM Use. With this arrangement, Forrester would be in possession of the overall 4D model, and would continue its compilation from the project planning phase through the construction phase of the project, after which the model would be passed over to the Owner for Record Modeling usage.

BIM was most likely not utilized on this project because of the cost associated with it and because of the size of the project. The project team likely thought it was not worth the cost of incorporating BIM onto the project, especially considering the project was relatively small. Though the use of BIM from project planning to operation usually provides the most value to the project, the total advantages are governed by the project stages and uses for which BIM is employed. In reference to both the BIM Use list and Level 1 Process Map, BIM should be implemented in the VIDA Fitness project because it provides numerous benefits to all involved parties.

Note: All processes, methods, and charts discussed or used above are courtesy of Computer Integrated Construction at The Pennsylvania State University.

RESOURCES:

Computer Integrated Construction Research Program. (2010). "BIM Project Execution Planning Guide – Version 2.0." July, The Pennsylvania State University, University Park, PA, USA.

Dubler, Craig. "BIM Execution Planning." AE 473. Penn State University, State College. 4 Oct. 2011. Lecture.

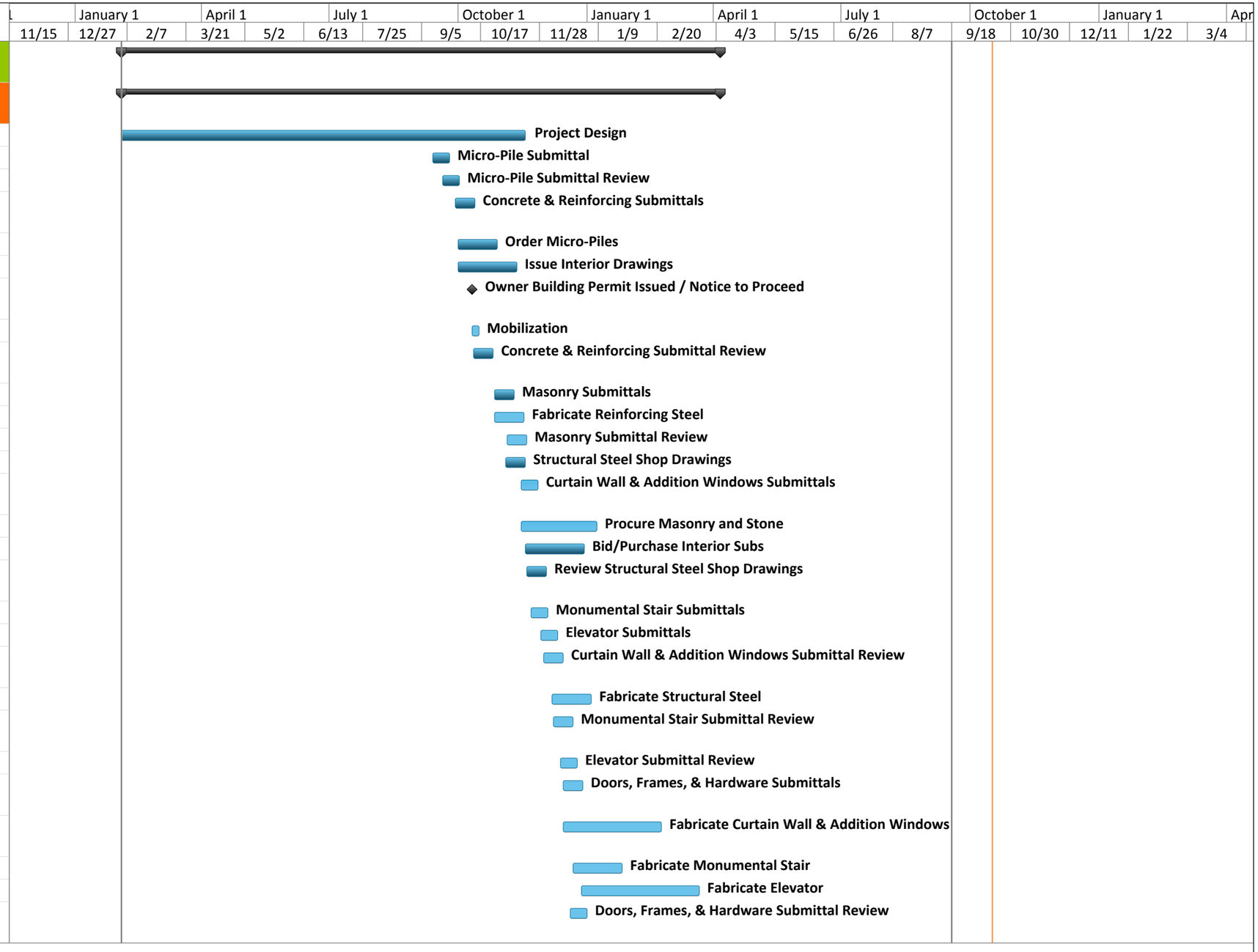
"Green Buildings." U.S. Environmental Protection Agency. 1 Sept. 2006. Environmental Protection Agency. <http://www.epa.gov/greenbuilding/>.

"USGBC: What LEED Is." *USGBC: U.S. Green Building Council*. Web. 13 Oct. 2011. <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1988>.

APPENDIX A

DETAILED PROJECT SCHEDULE

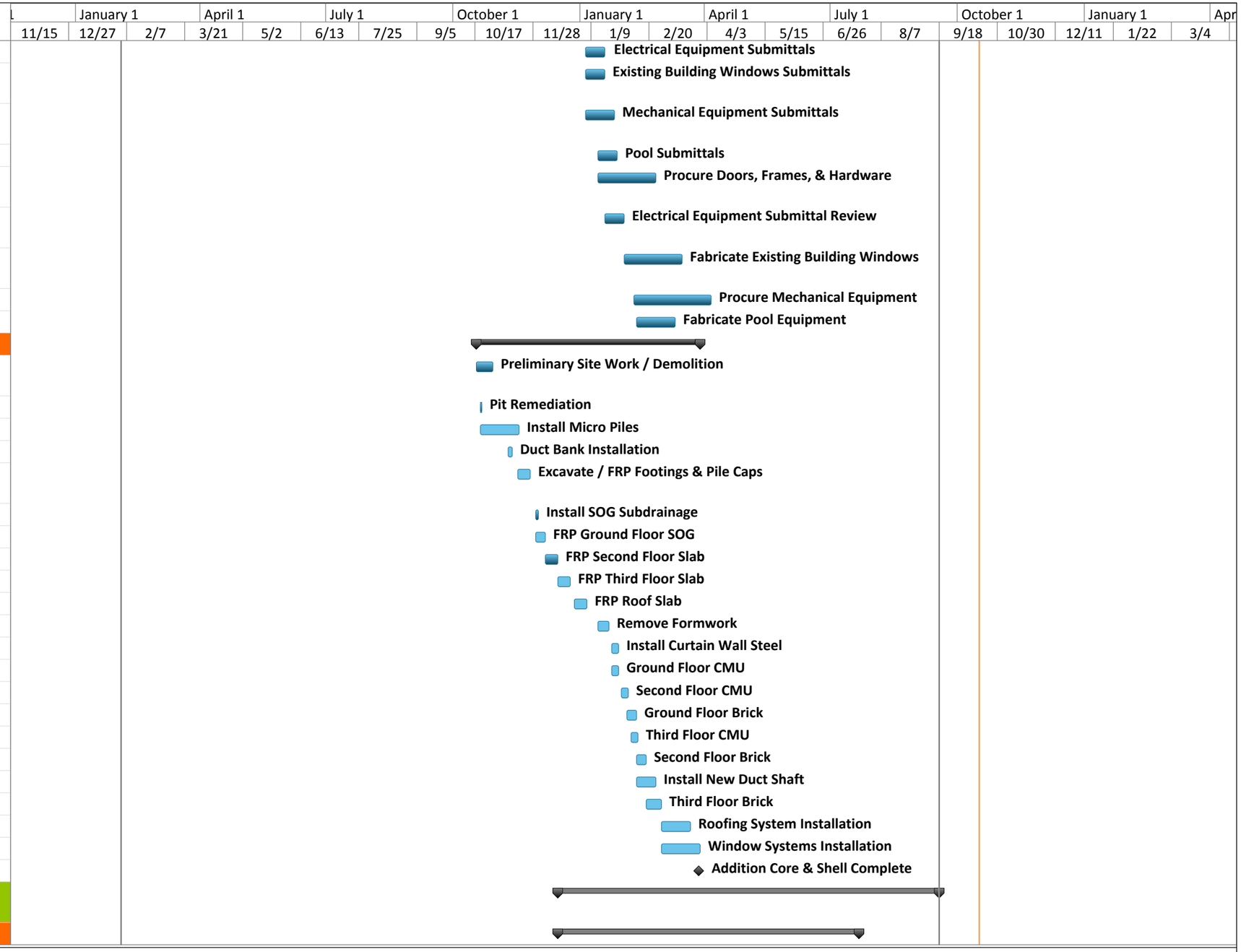
ID	Task Name	Duration	Start
1	**PHASE 1: New Addition Construction**	**305 days**	**Wed 2/3/10**
2	**Procurement / Preconstruction**	**305 days**	**Wed 2/3/10**
3	Project Design	206 days	Wed 2/3/10
4	Micro-Pile Submittal	10 days	Mon 9/13/10
5	Micro-Pile Submittal Review	10 days	Mon 9/20/10
6	Concrete & Reinforcing Submittals	10 days	Wed 9/29/10
7	Order Micro-Piles	20 days	Fri 10/1/10
8	Issue Interior Drawings	30 days	Fri 10/1/10
9	Owner Building Permit Issued / Notice to Proceed	0 days	Mon 10/11/10
10	Mobilization	5 days	Mon 10/11/10
11	Concrete & Reinforcing Submittal Review	10 days	Tue 10/12/10
12	Masonry Submittals	10 days	Wed 10/27/10
13	Fabricate Reinforcing Steel	15 days	Wed 10/27/10
14	Masonry Submittal Review	10 days	Fri 11/5/10
15	Structural Steel Shop Drawings	10 days	Thu 11/4/10
16	Curtain Wall & Addition Windows Submittals	10 days	Mon 11/15/10
17	Procure Masonry and Stone	40 days	Mon 11/15/10
18	Bid/Purchase Interior Subs	30 days	Thu 11/18/10
19	Review Structural Steel Shop Drawings	10 days	Fri 11/19/10
20	Monumental Stair Submittals	10 days	Mon 11/22/10
21	Elevator Submittals	10 days	Mon 11/29/10
22	Curtain Wall & Addition Windows Submittal Review	10 days	Wed 12/1/10
23	Fabricate Structural Steel	20 days	Tue 12/7/10
24	Monumental Stair Submittal Review	10 days	Wed 12/8/10
25	Elevator Submittal Review	10 days	Mon 12/13/10
26	Doors, Frames, & Hardware Submittals	10 days	Wed 12/15/10
27	Fabricate Curtain Wall & Addition Windows	50 days	Wed 12/15/10
28	Fabricate Monumental Stair	25 days	Wed 12/22/10
29	Fabricate Elevator	60 days	Tue 12/28/10
30	Doors, Frames, & Hardware Submittal Review	10 days	Mon 12/20/10



Project: VIDA Project Schedule
Date: Mon 10/17/11

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

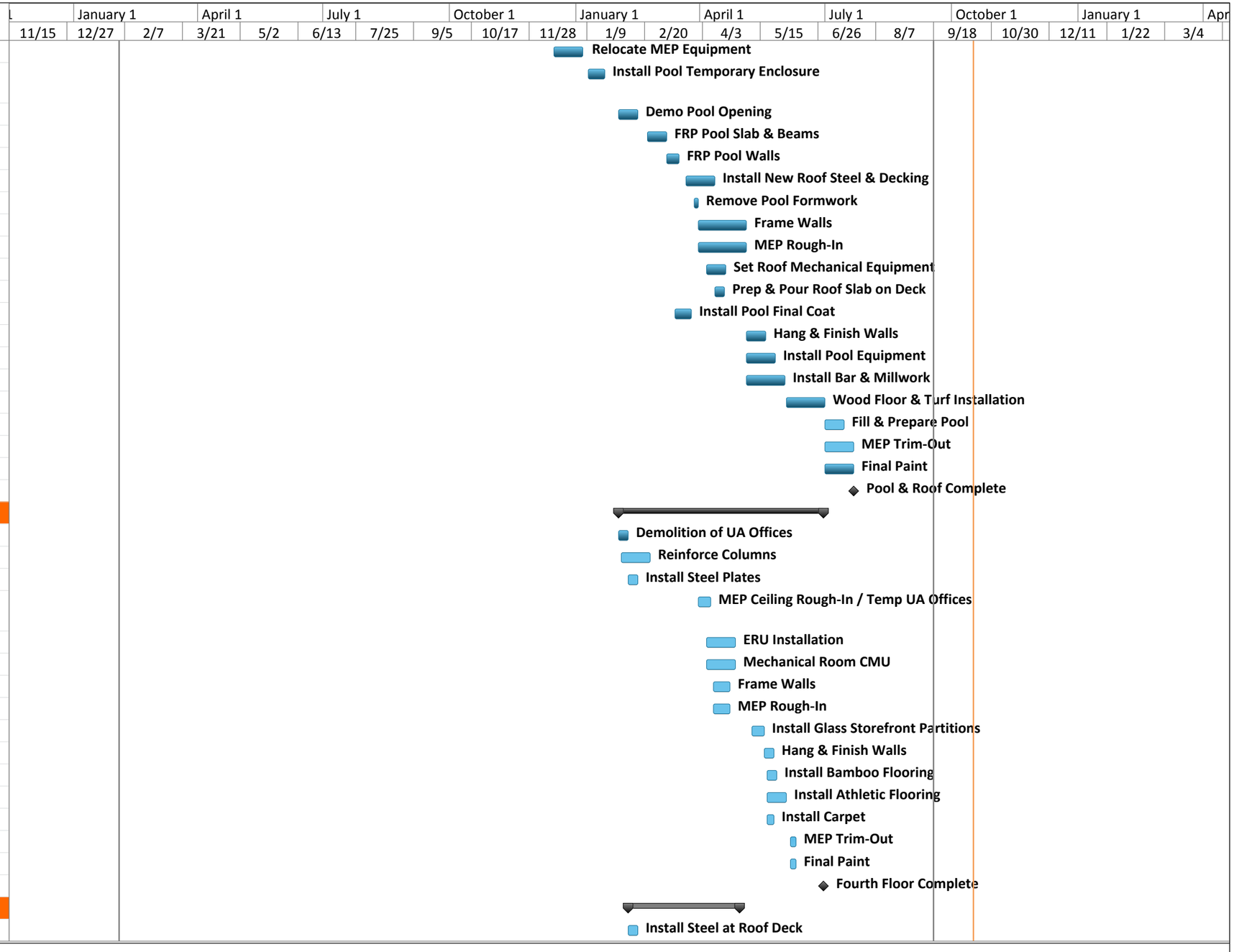
ID	Task Name	Duration	Start
31	Electrical Equipment Submittals	10 days	Wed 1/5/11
32	Existing Building Windows Submittals	10 days	Wed 1/5/11
33	Mechanical Equipment Submittals	15 days	Wed 1/5/11
34	Pool Submittals	10 days	Fri 1/14/11
35	Procure Doors, Frames, & Hardware	30 days	Fri 1/14/11
36	Electrical Equipment Submittal Review	10 days	Wed 1/19/11
37	Fabricate Existing Building Windows	30 days	Wed 2/2/11
38	Procure Mechanical Equipment	40 days	Wed 2/9/11
39	Fabricate Pool Equipment	20 days	Fri 2/11/11
40	**New Addition Construction**	**116 days**	**Mon 10/18/10**
41	Preliminary Site Work / Demolition	10 days	Mon 10/18/10
42	Pit Remediation	1 day	Thu 10/21/10
43	Install Micro Piles	20 days	Thu 10/21/10
44	Duct Bank Installation	3 days	Wed 11/10/10
45	Excavate / FRP Footings & Pile Caps	7 days	Wed 11/17/10
46	Install SOG Subdrainage	2 days	Tue 11/30/10
47	FRP Ground Floor SOG	5 days	Tue 11/30/10
48	FRP Second Floor Slab	7 days	Tue 12/7/10
49	FRP Third Floor Slab	7 days	Thu 12/16/10
50	FRP Roof Slab	7 days	Tue 12/28/10
51	Remove Formwork	6 days	Fri 1/14/11
52	Install Curtain Wall Steel	5 days	Mon 1/24/11
53	Ground Floor CMU	5 days	Mon 1/24/11
54	Second Floor CMU	5 days	Mon 1/31/11
55	Ground Floor Brick	5 days	Fri 2/4/11
56	Third Floor CMU	5 days	Mon 2/7/11
57	Second Floor Brick	5 days	Fri 2/11/11
58	Install New Duct Shaft	10 days	Fri 2/11/11
59	Third Floor Brick	7 days	Fri 2/18/11
60	Roofing System Installation	15 days	Tue 3/1/11
61	Window Systems Installation	20 days	Tue 3/1/11
62	Addition Core & Shell Complete	0 days	Mon 3/28/11
63	**PHASE 2: Renovation & Interiors**	**197 days**	**Thu 12/16/10**
64	**Roof**	**156 days**	**Thu 12/16/10**



Project: VIDA Project Schedule
Date: Mon 10/17/11

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

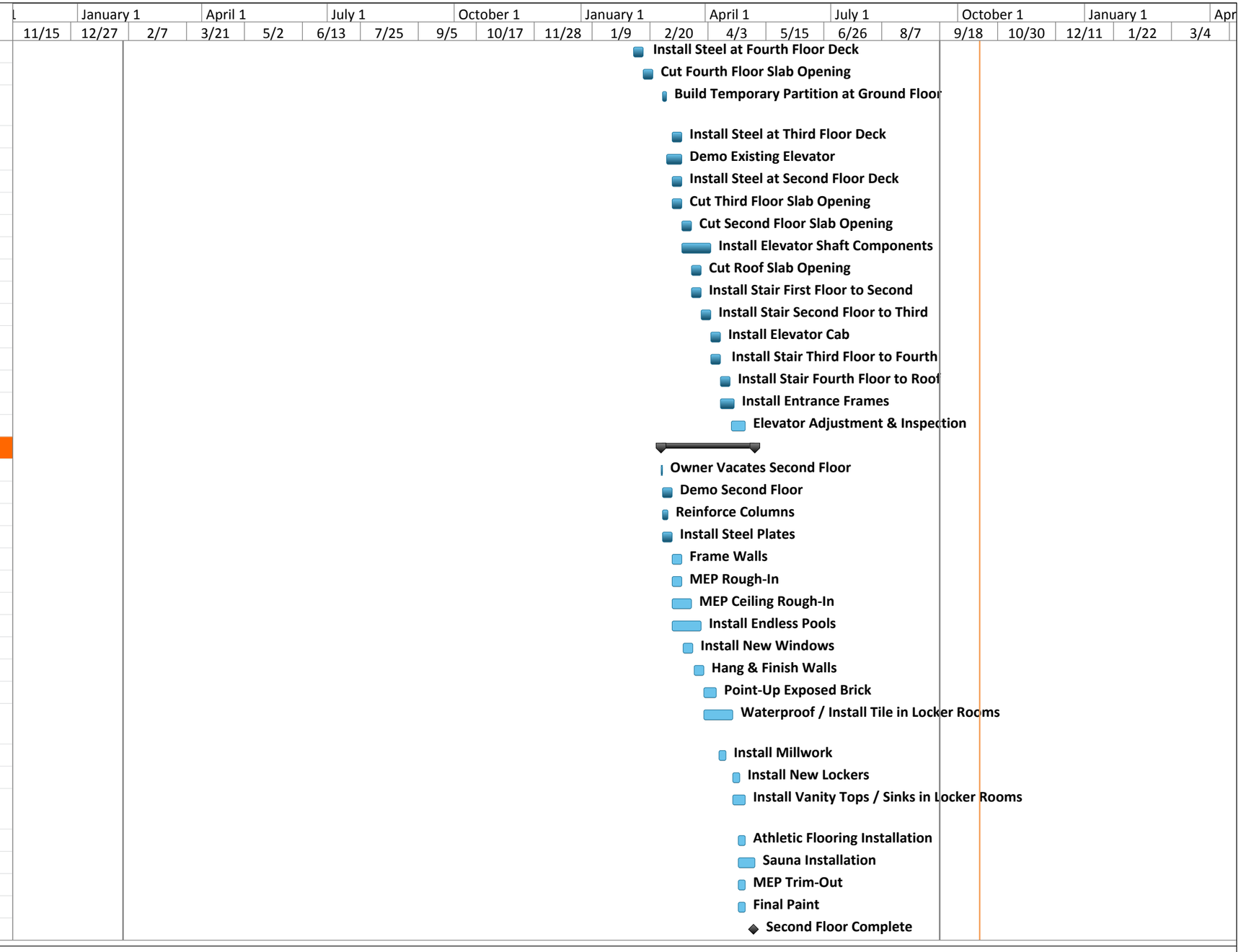
ID	Task Name	Duration	Start
65	Relocate MEP Equipment	15 days	Thu 12/16/10
66	Install Pool Temporary Enclosure	10 days	Mon 1/10/11
67	Demo Pool Opening	10 days	Tue 2/1/11
68	FRP Pool Slab & Beams	10 days	Tue 2/22/11
69	FRP Pool Walls	7 days	Tue 3/8/11
70	Install New Roof Steel & Decking	15 days	Tue 3/22/11
71	Remove Pool Formwork	3 days	Mon 3/28/11
72	Frame Walls	25 days	Thu 3/31/11
73	MEP Rough-In	25 days	Thu 3/31/11
74	Set Roof Mechanical Equipment	10 days	Wed 4/6/11
75	Prep & Pour Roof Slab on Deck	5 days	Tue 4/12/11
76	Install Pool Final Coat	10 days	Mon 3/14/11
77	Hang & Finish Walls	10 days	Thu 5/5/11
78	Install Pool Equipment	15 days	Thu 5/5/11
79	Install Bar & Millwork	20 days	Thu 5/5/11
80	Wood Floor & Turf Installation	20 days	Fri 6/3/11
81	Fill & Prepare Pool	10 days	Fri 7/1/11
82	MEP Trim-Out	15 days	Fri 7/1/11
83	Final Paint	15 days	Fri 7/1/11
84	Pool & Roof Complete	0 days	Fri 7/22/11
85	**Fourth Floor**	**107 days**	**Tue 2/1/11**
86	Demolition of UA Offices	5 days	Tue 2/1/11
87	Reinforce Columns	15 days	Thu 2/3/11
88	Install Steel Plates	5 days	Tue 2/8/11
89	MEP Ceiling Rough-In / Temp UA Offices	7 days	Thu 3/31/11
90	ERU Installation	15 days	Wed 4/6/11
91	Mechanical Room CMU	15 days	Wed 4/6/11
92	Frame Walls	10 days	Mon 4/11/11
93	MEP Rough-In	10 days	Mon 4/11/11
94	Install Glass Storefront Partitions	7 days	Mon 5/9/11
95	Hang & Finish Walls	5 days	Wed 5/18/11
96	Install Bamboo Flooring	5 days	Fri 5/20/11
97	Install Athletic Flooring	10 days	Fri 5/20/11
98	Install Carpet	3 days	Fri 5/20/11
99	MEP Trim-Out	4 days	Mon 6/6/11
100	Final Paint	4 days	Mon 6/6/11
101	Fourth Floor Complete	0 days	Thu 6/30/11
102	**Monumental Stairs & Elevator**	**59 days**	**Tue 2/8/11**
103	Install Steel at Roof Deck	5 days	Tue 2/8/11



Project: VIDA Project Schedule
Date: Mon 10/17/11

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

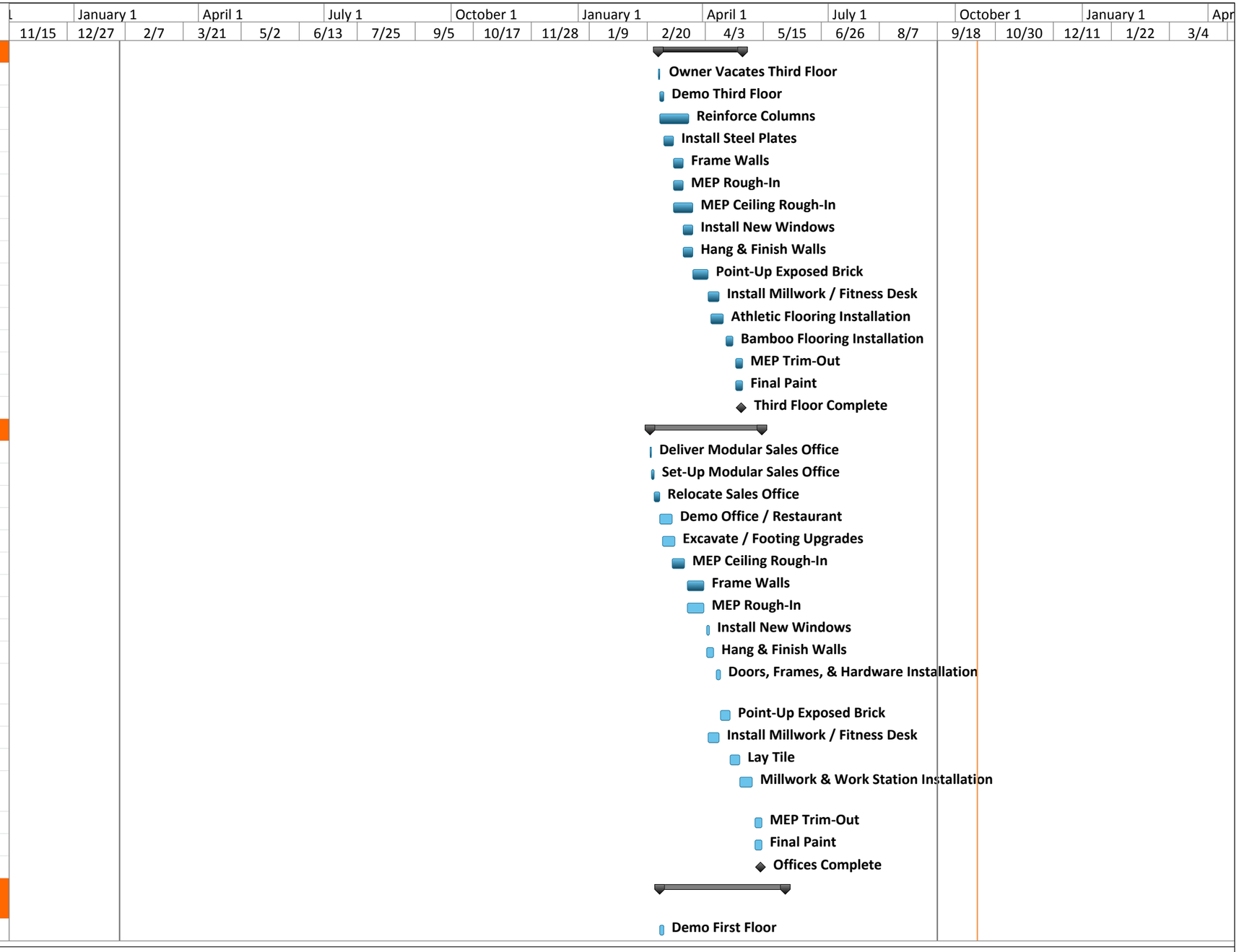
ID	Task Name	Duration	Start
104	Install Steel at Fourth Floor Deck	5 days	Tue 2/8/11
105	Cut Fourth Floor Slab Opening	5 days	Tue 2/15/11
106	Build Temporary Partition at Ground Floor	3 days	Tue 3/1/11
107	Install Steel at Third Floor Deck	5 days	Tue 3/8/11
108	Demo Existing Elevator	7 days	Fri 3/4/11
109	Install Steel at Second Floor Deck	5 days	Tue 3/8/11
110	Cut Third Floor Slab Opening	5 days	Tue 3/8/11
111	Cut Second Floor Slab Opening	5 days	Tue 3/15/11
112	Install Elevator Shaft Component	15 days	Tue 3/15/11
113	Cut Roof Slab Opening	5 days	Tue 3/22/11
114	Install Stair First Floor to Second	5 days	Tue 3/22/11
115	Install Stair Second Floor to Thir	5 days	Tue 3/29/11
116	Install Elevator Cab	5 days	Tue 4/5/11
117	Install Stair Third Floor to Fourt	5 days	Tue 4/5/11
118	Install Stair Fourth Floor to Roof	5 days	Tue 4/12/11
119	Install Entrance Frames	8 days	Tue 4/12/11
120	Elevator Adjustment & Inspectio	8 days	Wed 4/20/11
121	**Second Floor**	**50 days**	**Mon 2/28/11**
122	Owner Vacates Second Floor	1 day	Mon 2/28/11
123	Demo Second Floor	5 days	Tue 3/1/11
124	Reinforce Columns	4 days	Tue 3/1/11
125	Install Steel Plates	5 days	Tue 3/1/11
126	Frame Walls	5 days	Tue 3/8/11
127	MEP Rough-In	5 days	Tue 3/8/11
128	MEP Ceiling Rough-In	10 days	Tue 3/8/11
129	Install Endless Pools	15 days	Tue 3/8/11
130	Install New Windows	5 days	Wed 3/16/11
131	Hang & Finish Walls	5 days	Thu 3/24/11
132	Point-Up Exposed Brick	7 days	Thu 3/31/11
133	Waterproof / Install Tile in Locker Rooms	15 days	Thu 3/31/11
134	Install Millwork	5 days	Mon 4/11/11
135	Install New Lockers	3 days	Thu 4/21/11
136	Install Vanity Tops / Sinks in Locker Rooms	7 days	Thu 4/21/11
137	Athletic Flooring Installation	5 days	Mon 4/25/11
138	Sauna Installation	10 days	Mon 4/25/11
139	MEP Trim-Out	5 days	Mon 4/25/11
140	Final Paint	5 days	Mon 4/25/11
141	Second Floor Complete	0 days	Fri 5/6/11



Project: VIDA Project Schedule
Date: Mon 10/17/11

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

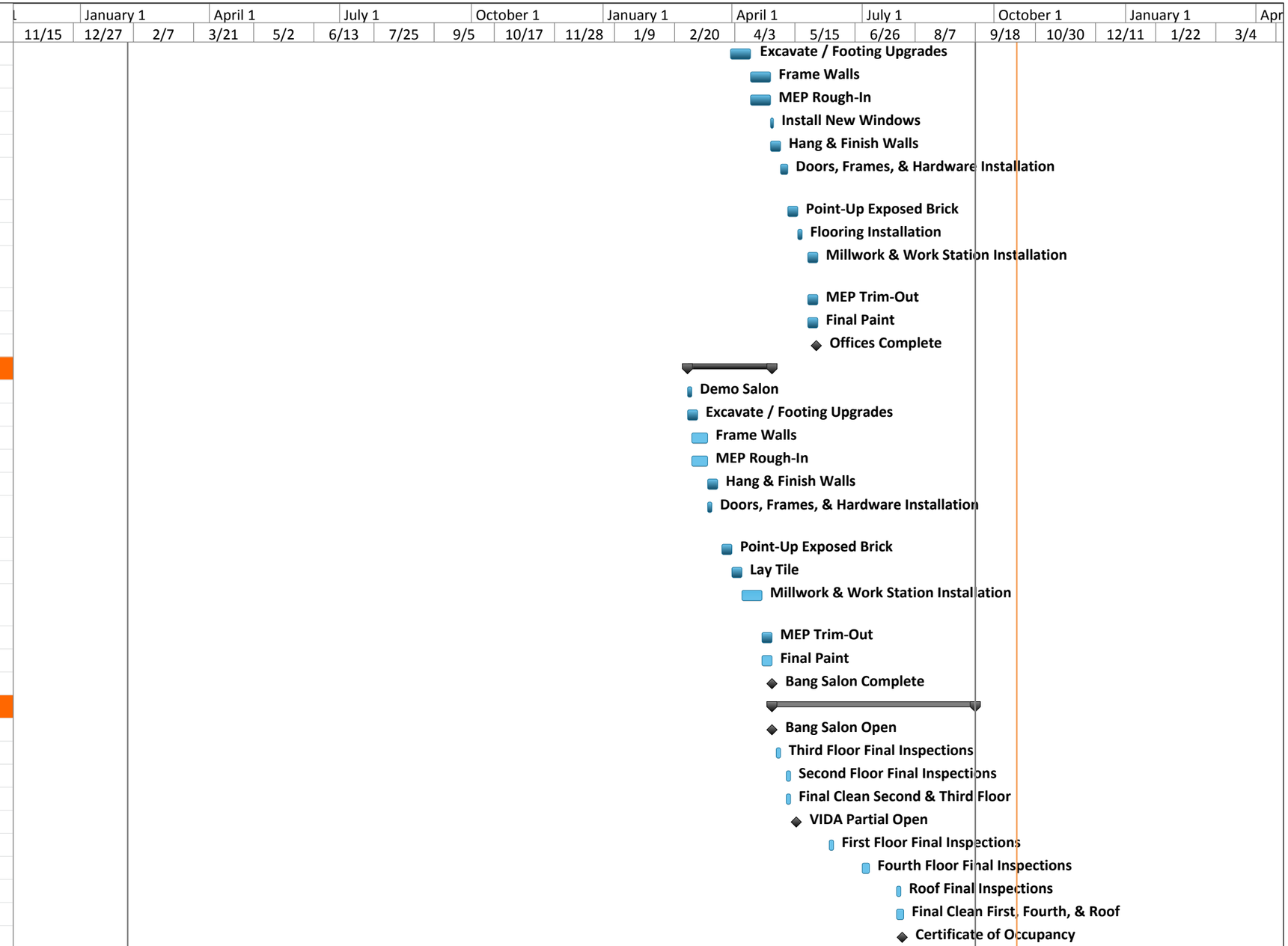
ID	Task Name	Duration	Start
142	**Third Floor**	**45 days**	**Mon 2/28/11**
143	Owner Vacates Third Floor	1 day	Mon 2/28/11
144	Demo Third Floor	3 days	Tue 3/1/11
145	Reinforce Columns	15 days	Tue 3/1/11
146	Install Steel Plates	5 days	Fri 3/4/11
147	Frame Walls	5 days	Fri 3/11/11
148	MEP Rough-In	5 days	Fri 3/11/11
149	MEP Ceiling Rough-In	10 days	Fri 3/11/11
150	Install New Windows	5 days	Fri 3/18/11
151	Hang & Finish Walls	5 days	Fri 3/18/11
152	Point-Up Exposed Brick	7 days	Fri 3/25/11
153	Install Millwork / Fitness Desk	6 days	Tue 4/5/11
154	Athletic Flooring Installation	7 days	Thu 4/7/11
155	Bamboo Flooring Installation	5 days	Mon 4/18/11
156	MEP Trim-Out	5 days	Mon 4/25/11
157	Final Paint	5 days	Mon 4/25/11
158	Third Floor Complete	0 days	Fri 4/29/11
159	**First Floor - Offices / Entry**	**59 days**	**Tue 2/22/11**
160	Deliver Modular Sales Office	1 day	Tue 2/22/11
161	Set-Up Modular Sales Office	2 days	Wed 2/23/11
162	Relocate Sales Office	2 days	Fri 2/25/11
163	Demo Office / Restaurant	7 days	Tue 3/1/11
164	Excavate / Footing Upgrades	7 days	Thu 3/3/11
165	MEP Ceiling Rough-In	7 days	Thu 3/10/11
166	Frame Walls	10 days	Mon 3/21/11
167	MEP Rough-In	10 days	Mon 3/21/11
168	Install New Windows	2 days	Mon 4/4/11
169	Hang & Finish Walls	5 days	Mon 4/4/11
170	Doors, Frames, & Hardware Installation	3 days	Mon 4/11/11
171	Point-Up Exposed Brick	5 days	Thu 4/14/11
172	Install Millwork / Fitness Desk	6 days	Tue 4/5/11
173	Lay Tile	5 days	Thu 4/21/11
174	Millwork & Work Station Installation	7 days	Thu 4/28/11
175	MEP Trim-Out	5 days	Mon 5/9/11
176	Final Paint	5 days	Mon 5/9/11
177	Offices Complete	0 days	Fri 5/13/11
178	**First Floor - Future Sauna / Restaurant**	**65 days**	**Tue 3/1/11**
179	Demo First Floor	3 days	Tue 3/1/11



Project: VIDA Project Schedule
Date: Mon 10/17/11

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

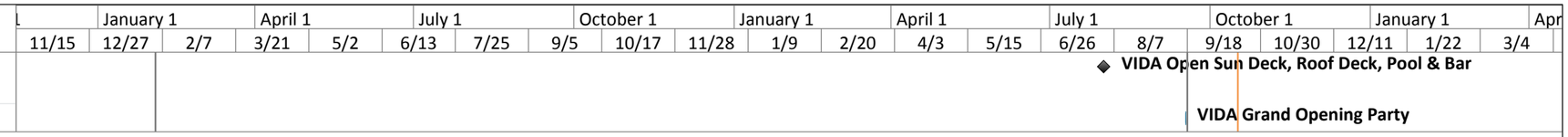
ID	Task Name	Duration	Start
180	Excavate / Footing Upgrades	10 days	Thu 3/31/11
181	Frame Walls	10 days	Thu 4/14/11
182	MEP Rough-In	10 days	Thu 4/14/11
183	Install New Windows	2 days	Thu 4/28/11
184	Hang & Finish Walls	5 days	Thu 4/28/11
185	Doors, Frames, & Hardware Installation	3 days	Thu 5/5/11
186	Point-Up Exposed Brick	5 days	Tue 5/10/11
187	Flooring Installation	3 days	Tue 5/17/11
188	Millwork & Work Station Installation	5 days	Tue 5/24/11
189	MEP Trim-Out	5 days	Tue 5/24/11
190	Final Paint	5 days	Tue 5/24/11
191	Offices Complete	0 days	Mon 5/30/11
192	**First Floor - Bang Salon**	**43 days**	**Tue 3/1/11**
193	Demo Salon	3 days	Tue 3/1/11
194	Excavate / Footing Upgrades	5 days	Tue 3/1/11
195	Frame Walls	7 days	Fri 3/4/11
196	MEP Rough-In	7 days	Fri 3/4/11
197	Hang & Finish Walls	5 days	Tue 3/15/11
198	Doors, Frames, & Hardware Installation	3 days	Tue 3/15/11
199	Point-Up Exposed Brick	5 days	Fri 3/25/11
200	Lay Tile	5 days	Fri 4/1/11
201	Millwork & Work Station Installation	10 days	Fri 4/8/11
202	MEP Trim-Out	5 days	Fri 4/22/11
203	Final Paint	5 days	Fri 4/22/11
204	Bang Salon Complete	0 days	Fri 4/29/11
205	**Project Close-Out**	**101 days**	**Fri 4/29/11**
206	Bang Salon Open	0 days	Fri 4/29/11
207	Third Floor Final Inspections	3 days	Mon 5/2/11
208	Second Floor Final Inspections	3 days	Mon 5/9/11
209	Final Clean Second & Third Floor	3 days	Mon 5/9/11
210	VIDA Partial Open	0 days	Mon 5/16/11
211	First Floor Final Inspections	3 days	Wed 6/8/11
212	Fourth Floor Final Inspections	3 days	Fri 7/1/11
213	Roof Final Inspections	3 days	Mon 7/25/11
214	Final Clean First, Fourth, & Roof	5 days	Mon 7/25/11
215	Certificate of Occupancy	0 days	Fri 7/29/11



Project: VIDA Project Schedule
Date: Mon 10/17/11

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

ID	Task Name	Duration	Start
216	VIDA Open Sun Deck, Roof Deck, Pool & Bar	0 days	Mon 8/1/11
217	VIDA Grand Opening Party	1 day	Sat 9/17/11



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

APPENDIX B

DETAILED STRUCTURAL SYSTEMS ESTIMATE

03 10 00 Concrete Forming and Accessories							
Beams							
ID	Quantity	Width (IN)	Length (FT)	Depth (IN)	Total SFCA	Cost/SF	Total Cost/SF
B2-1	1	36.00	25.00	18.00	150.00	$ 11.25	$ 1,687.50
B2-2	4	36.00	25.00	18.00	600.00	$ 11.25	$ 6,750.00
B2-3	1	30.00	25.00	18.00	137.50	$ 11.25	$ 1,546.88
B2-4	2	24.00	13.50	18.00	135.00	$ 11.25	$ 1,518.75
B2-5	6	24.00	17.25	18.00	517.50	$ 11.25	$ 5,821.88
B2-6	4	24.00	17.75	18.00	355.00	$ 11.25	$ 3,993.75
B3-1	1	36.00	25.00	18.00	150.00	$ 11.25	$ 1,687.50
B3-2	4	36.00	25.00	18.00	600.00	$ 11.25	$ 6,750.00
B3-3	1	30.00	25.00	18.00	137.50	$ 11.25	$ 1,546.88
B3-4	2	24.00	13.50	18.00	135.00	$ 11.25	$ 1,518.75
B3-5	6	24.00	17.25	18.00	517.50	$ 11.25	$ 5,821.88
B3-6	4	24.00	17.75	18.00	355.00	$ 11.25	$ 3,993.75
B4-1	1	36.00	25.00	18.00	150.00	$ 11.25	$ 1,687.50
B4-2	3	36.00	25.00	18.00	450.00	$ 11.25	$ 5,062.50
B4-3	1	36.00	25.00	18.00	150.00	$ 11.25	$ 1,687.50
B4-4	1	36.00	25.00	18.00	150.00	$ 11.25	$ 1,687.50
B4-5	2	24.00	13.50	18.00	135.00	$ 11.25	$ 1,518.75
B4-6	2	24.00	17.25	18.00	172.50	$ 11.25	$ 1,940.63
B4-7	4	24.00	17.25	18.00	345.00	$ 11.25	$ 3,881.25
B4-8	2	24.00	17.75	18.00	177.50	$ 11.25	$ 1,996.88
B4-9	2	24.00	7.75	18.00	77.50	$ 11.25	$ 871.88
BR-1	1	24.00	25.00	30.00	175.00	$ 9.60	$ 1,680.00
BR-2	3	24.00	25.00	30.00	525.00	$ 9.60	$ 5,040.00
BR-3	1	24.00	25.00	30.00	175.00	$ 9.60	$ 1,680.00
BR-4	1	10.00	25.00	72.00	320.83	$ 13.35	$ 4,283.13
BR-5	2	8.00	13.50	72.00	342.00	$ 13.35	$ 4,565.70
BR-6	2	8.00	17.25	72.00	437.00	$ 13.35	$ 5,833.95
BR-7	4	8.00	17.25	72.00	874.00	$ 13.35	$ 11,667.90
BR-8	2	24.00	17.75	36.00	284.00	$ 9.60	$ 2,726.40
BR-9	2	24.00	7.75	34.00	118.83	$ 9.60	$ 1,140.80
BR-10	2	24.00	17.75	36.00	284.00	$ 9.60	$ 2,726.40
BR-11	2	24.00	7.75	34.00	118.83	$ 9.60	$ 1,140.80
TOTAL							$ 105,456.95

03 10 00 Concrete Forming and Accessories Continued							
Grade Beams							
ID	Quantity	Length (FT)	Width (FT)	Depth (FT)	Total SFCA	Cost/SF	Total Cost/SF
GB-1	1	125			125	$ 8.80	$ 1,100.00
GB-2	1	150			125	$ 8.80	$ 1,100.00
TOTAL:							$ 2,200.00
Pile Caps							
ID	Quantity	Length (FT)	Width (FT)	Depth (FT)	Total SFCA	Cost/SF	Total Cost/SF
PC-4	4				104	$ 4.10	$ 426.40
PC-5	5				128	$ 4.10	$ 524.80
TOTAL:							$ 951.20
Columns							
ID	Quantity	Size (IN)	Height (LF)	Depth(FT)	Total SFCA	Cost/LF	Total Cost/LF
F-1.5	2	24 Round	40.50			$ 15.50	$ 1,255.50
F-2.5	2	20 Round	40.50			$ 13.00	$ 1,053.00
F-3.2	2	20 Round	40.50			$ 13.00	$ 1,053.00
F-3.8	2	20 Round	40.50			$ 13.00	$ 1,053.00
F-4.5	2	20 Round	40.50			$ 13.00	$ 1,053.00
F-5.1	2	24 x 18	40.50		567.00	$ 13.90	$ 7,881.30
TOTAL:							$ 13,348.80
One Way Slabs							
ID	Quantity	Width (FT)	Length (FT)	Depth(FT)	Total SFCA	Cost/SF	Total Cost/SF
S2-1	4	17.25	25	0.42	1808.33	$ 6.00	$ 10,850.00
S2-2	2	17.75	25	0.58	945.83	$ 6.00	$ 5,675.00
S3-1	4	17.25	25	0.42	1808.33	$ 6.00	$ 10,850.00
S3-2	2	17.75	25	0.58	945.83	$ 6.00	$ 5,675.00
S4-1	6	17.25	25	0.58	2762.50	$ 6.00	$ 16,575.00
TOTAL:							$ 49,625.00

03 21 00 Reinforcement Bars

Beams

ID	Quantity	Width (IN)	Length (FT)	Rebar Type Against Length	Length Total LF	LBS / LF	Rebar Type Against Width	Width Total LF	LBS / LF	Total (LBS)	Cost/LB	Total Cost/LB
B2-1	1	36.0	25.0	(11) #9	275	3.4	#4 7" o.c.	385.7	0.67	1193.4	$ 0.99	$ 1,181.49
B2-2	4	36.0	25.0	(11) #9	1100	3.4	#4 7" o.c.	1542.9	0.67	4773.7	$ 0.99	$ 4,725.98
B2-3	1	30.0	25.0	(10) #8	250	2.67	#4 7" o.c.	342.9	0.67	897.2	$ 0.99	$ 888.24
B2-4	2	24.0	13.5	(8) #6	216	1.50	#4 7" o.c.	324.0	0.67	541.1	$ 1.32	$ 714.23
B2-5	6	24.0	17.3	(8) #6	828	1.50	#4 7" o.c.	1242.0	0.67	2074.1	$ 1.32	$ 2,737.86
B2-6	4	24.0	17.8	(10) #8	710	2.67	#4 7" o.c.	852.0	0.67	2466.5	$ 0.99	$ 2,441.87
B3-1	1	36.0	25.0	(11) #9	275	3.4	#4 7" o.c.	385.7	0.67	1193.4	$ 0.99	$ 1,181.49
B3-2	4	36.0	25.0	(11) #9	1100	3.4	#4 7" o.c.	1542.9	0.67	4773.7	$ 0.99	$ 4,725.98
B3-3	1	30.0	25.0	(10) #8	250	2.67	#4 7" o.c.	342.9	0.67	897.2	$ 0.99	$ 888.24
B3-4	2	24.0	13.5	(8) #6	216	1.50	#4 7" o.c.	324.0	0.67	541.1	$ 1.32	$ 714.23
B3-5	6	24.0	17.3	(8) #6	828	1.50	#4 7" o.c.	1242.0	0.67	2074.1	$ 1.32	$ 2,737.86
B3-6	4	24.0	17.8	(10) #8	710	2.67	#4 7" o.c.	852.0	0.67	2466.5	$ 0.99	$ 2,441.87
B4-1	1	36.0	25.0	(11) #9	275	3.4	#4 7" o.c.	385.7	0.67	1193.4	$ 0.99	$ 1,181.49
B4-2	3	36.0	25.0	(11) #9	825	3.4	#4 7" o.c.	1157.1	0.67	3580.3	$ 0.99	$ 3,544.48
B4-3	1	36.0	25.0	(13) #9	325	3.4	#4 7" o.c.	385.7	0.67	1363.4	$ 0.99	$ 1,349.79
B4-4	1	36.0	25.0	(10) #9	250	3.4	#4 7" o.c.	385.7	0.67	1108.4	$ 0.99	$ 1,097.34
B4-5	2	24.0	13.5	(8) #6	162	1.50	#4 7" o.c.	324.0	0.67	460.1	$ 1.32	$ 607.31
B4-6	2	24.0	17.3	(8) #6	207	1.50	#4 7" o.c.	414.0	0.67	587.9	$ 1.32	$ 776.00
B4-7	4	24.0	17.3	(8) #6	414	1.50	#4 7" o.c.	828.0	0.67	1175.8	$ 1.32	$ 1,552.00
B4-8	2	24.0	17.8	(8) #7	248.5	2.04	#4 7" o.c.	426.0	0.67	792.4	$ 1.32	$ 1,045.92
B4-9	2	24.0	7.8	(8) #7	108.5	2.04	#4 7" o.c.	186.0	0.67	346.0	$ 1.32	$ 456.67
BR-1	1	24.0	25.0	(8) #8	200	2.67	#4 12" o.c.	225.0	0.67	684.8	$ 0.99	$ 677.90
BR-2	3	24.0	25.0	(8) #8	600	2.67	#4 12" o.c.	675.0	0.67	2054.3	$ 0.99	$ 2,033.71
BR-3	1	24.0	25.0	(8) #8	200	2.67	#4 12" o.c.	225.0	0.67	684.8	$ 0.99	$ 677.90
BR-4	1	10.0	25.0	(6) #8	200	2.67	#4 12" o.c.	341.7	0.67	762.9	$ 0.99	$ 755.29
BR-5	2	8.0	13.5	(8) #9 2L	432	3.4	#4 12" o.c.	360.0	0.67	1710.0	$ 0.99	$ 1,692.90
BR-6	2	8.0	17.3	(8) #9 2L	552	3.4	#4 12" o.c.	460.0	0.67	2185.0	$ 0.99	$ 2,163.15
BR-7	4	8.0	17.3	(8) #9 2L	1104	3.4	#4 12" o.c.	920.0	0.67	4370.0	$ 0.99	$ 4,326.30
BR-8	2	24.0	17.8	(11) #9	390.5	3.4	#4 12" o.c.	355.0	0.67	1565.6	$ 0.99	$ 1,549.89
BR-9	2	24.0	7.8	(8) #8	124	2.67	#4 12" o.c.	149.8	0.67	431.5	$ 0.99	$ 427.15
BR-10	2	24.0	17.8	(8) #8	284	2.67	#4 12" o.c.	355.0	0.67	996.1	$ 0.99	$ 986.17
BR-11	2	24.0	7.8	(8) #8	124	2.67	#4 12" o.c.	149.8	0.67	431.5	$ 0.99	$ 427.15
TOTAL:										50376.13		$ 52,707.89

Columns

ID	Quantity	Size (IN)	Height (FT)	Vertical Rebar Type	Vertical Total LF	LBS/LF	Horizontal Rebar Type	Horizontal Total LF	LBS/LF	Total (LBS)	Cost/LB	Total Cost/LB
F-1.5	2	24 Round	40.50	(8) #9	648	3.4	#3 18" o.c.	54	0.38	2223.72	$ 1.37	$ 3,046.50
F-2.5	2	20 Round	40.50	(8) #9	648	3.4	#3 18" o.c.	46	0.38	2220.68	$ 1.37	$ 3,042.33
F-3.2	2	20 Round	40.50	(8) #9	648	3.4	#3 18" o.c.	46	0.38	2220.68	$ 1.37	$ 3,042.33
F-3.8	2	20 Round	40.50	(8) #9	648	3.4	#3 18" o.c.	46	0.38	2220.68	$ 1.37	$ 3,042.33
F-4.5	2	20 Round	40.50	(8) #9	648	3.4	#3 18" o.c.	46	0.38	2220.68	$ 1.37	$ 3,042.33
F-5.1	2	24 x 18	40.50	(8) #8	648	2.67	#3 16" o.c.	270	0.38	1832.76	$ 1.37	$ 2,510.88
TOTAL:										12939.20		$ 17,726.70

03 21 00 Reinforcement Bars Continued

One-Way Slabs

ID	Quantity	No. Per Slab Length	No. Per Slab Width	Type	LBS/LF	Total (LBS)	Cost/LB	Total Cost/LB
S2-1	4	16.67	11.50	#4	0.67	75.49	$ 0.99	$ 74.73
S2-2	2	21.43	15.21	#4	0.67	49.10	$ 0.99	$ 48.61
S3-1	4	16.67	11.50	#4	0.67	75.49	$ 0.99	$ 74.73
S3-2	2	21.43	15.21	#4	0.67	49.10	$ 0.99	$ 48.61
S4-1	6	21.43	17.25	#8	2.67	619.63	$ 0.99	$ 613.43
TOTAL:						868.81		$ 860.12

Grade Beams

ID	Quantity	Total Length (FT)	Type	LBS/LF	Total (LBS)	Cost/LB	Total Cost/LB	Total Cost/LB
GB-1	1	125	#6	1.5	187.5	$ 1.12	$ 210.00	$ 210.00
GB-2	1	150	#7	2.04	306	$ 1.12	$ 342.72	$ 342.72
TOTAL:					493.5		$ 552.72	$ 552.72

Pile Caps

ID	Quantity	Length (FT)	Type	LBS/LF	Total (LBS)	Cost/LB	Total Cost/LB	Total Cost/LB
PC-4	4	155	#8	2.67	1655.4	$ 1.12	$ 1,854.05	$ 1,854.05
PC-5	5	252	#8	2.67	3364.2	$ 1.12	$ 3,767.90	$ 3,767.90
TOTAL:					5019.6		$ 5,621.95	$ 5,621.95

03 21 00 Reinforcement Bars

ID	No. Per 24" o.c.	Height (FT)	Type	LBS/LF	Total (LBS)	Cost/LB	Total Cost/LB	Total Cost/LB
	156.87	45	#4	0.67	4729.63	$ 0.94	$ 4,445.85	$ 4,445.85
TOTAL:					4729.63		$ 4,445.85	$ 4,445.85

03 22 00 Fabric and Grid Reinforcing

Slab-on-Grade

Floor	Area (CSF)	Sheets	WWF	Cost/CSF	Total Cost/CSF
FL-1	32.97	6 x 6	W2.9 x W2.9	$ 68.00	$ 2,241.79
TOTAL:					$ 2,241.79

03 23 00 Post-Tensioning Tendons

One-Way Slabs

ID	Quantity	Width (FT)	Length (FT)	Area (SF)	Cost/SF	Total Cost/SF
S2-1	4	17.25	25	431.25	$ 1.56	$ 2,691.00
S2-2	2	17.75	25	443.75	$ 1.56	$ 1,384.50
S3-1	4	17.25	25	431.25	$ 1.56	$ 2,691.00
S3-2	2	17.75	25	443.75	$ 1.56	$ 1,384.50
S4-1	6	17.25	25	431.25	$ 1.56	$ 4,036.50
TOTAL:						$ 12,187.50

03 31 00 Normal Weight Structural Concrete								
Beams								
ID	Quantity	Width (IN)	Length (FT)	Depth (IN)	Concrete (CY)	Material Cost/CY	Placement Cost/CY	Total Cost/SF
B2-1	1	36.00	25.00	18.00	4.17	$ 113.00	$ 51.50	$ 685.42
B2-2	4	36.00	25.00	18.00	16.67	$ 113.00	$ 51.50	$ 2,741.67
B2-3	1	30.00	25.00	18.00	3.47	$ 113.00	$ 51.50	$ 571.18
B2-4	2	24.00	13.50	18.00	3.00	$ 113.00	$ 51.50	$ 493.50
B2-5	6	24.00	17.25	18.00	11.50	$ 113.00	$ 51.50	$ 1,891.75
B2-6	4	24.00	17.75	18.00	7.89	$ 113.00	$ 51.50	$ 1,297.72
B3-1	1	36.00	25.00	18.00	4.17	$ 113.00	$ 51.50	$ 685.42
B3-2	4	36.00	25.00	18.00	16.67	$ 113.00	$ 51.50	$ 2,741.67
B3-3	1	30.00	25.00	18.00	3.47	$ 113.00	$ 51.50	$ 571.18
B3-4	2	24.00	13.50	18.00	3.00	$ 113.00	$ 78.00	$ 573.00
B3-5	6	24.00	17.25	18.00	11.50	$ 113.00	$ 78.00	$ 2,196.50
B3-6	4	24.00	17.75	18.00	7.89	$ 113.00	$ 78.00	$ 1,506.78
B4-1	1	36.00	25.00	18.00	4.17	$ 113.00	$ 51.50	$ 685.42
B4-2	3	36.00	25.00	18.00	12.50	$ 113.00	$ 51.50	$ 2,056.25
B4-3	1	36.00	25.00	18.00	4.17	$ 113.00	$ 51.50	$ 685.42
B4-4	1	36.00	25.00	18.00	4.17	$ 113.00	$ 51.50	$ 685.42
B4-5	2	24.00	13.50	18.00	3.00	$ 113.00	$ 51.50	$ 493.50
B4-6	2	24.00	17.25	18.00	3.83	$ 113.00	$ 51.50	$ 630.58
B4-7	4	24.00	17.25	18.00	7.67	$ 113.00	$ 51.50	$ 1,261.17
B4-8	2	24.00	17.75	18.00	3.94	$ 113.00	$ 51.50	$ 648.86
B4-9	2	24.00	7.75	18.00	1.72	$ 113.00	$ 51.50	$ 283.31
BR-1	1	24.00	25.00	30.00	4.63	$ 113.00	$ 51.50	$ 761.57
BR-2	3	24.00	25.00	30.00	13.89	$ 113.00	$ 51.50	$ 2,284.72
BR-3	1	24.00	25.00	30.00	4.63	$ 113.00	$ 51.50	$ 761.57
BR-4	1	10.00	25.00	72.00	4.63	$ 113.00	$ 51.50	$ 761.57
BR-5	2	8.00	13.50	72.00	4.00	$ 113.00	$ 51.50	$ 658.00
BR-6	2	8.00	17.25	72.00	5.11	$ 113.00	$ 51.50	$ 840.78
BR-7	4	8.00	17.25	72.00	10.22	$ 113.00	$ 51.50	$ 1,681.56
BR-8	2	24.00	17.75	36.00	7.89	$ 113.00	$ 51.50	$ 1,297.72
BR-9	2	24.00	7.75	34.00	3.25	$ 113.00	$ 51.50	$ 535.13
BR-10	2	24.00	17.75	36.00	7.89	$ 113.00	$ 51.50	$ 1,297.72
BR-11	2	24.00	7.75	34.00	3.25	$ 113.00	$ 51.50	$ 535.13
TOTAL:					207.95			$ 34,801.18

03 31 00 Normal Weight Structural Concrete Continued

Pile Caps

ID	Quantity	Width (FT)	Length (FT)	Depth(FT)	Concrete (CY)	Material Cost/CY	Placement Cost/CY	Total Cost/SF
PC-4	4	3	11.5	4	20.44	$ 109.00	$ 23.50	$ 2,708.89
PC-5	5	3	14.5	4	32.22	$ 109.00	$ 23.50	$ 4,269.44
TOTAL:					52.67			$ 6,978.33

Grade Beams

ID	Quantity	Width (FT)	Length (FT)	Depth(FT)	Concrete (CY)	Material Cost/CY	Placement Cost/CY	Total Cost/SF
GB-1	1	1.5	25	2	2.78	$ 109.00	$ 18.90	$ 355.28
GB-2	1	1.25	25	2.5	2.89	$ 109.00	$ 18.90	$ 370.08
TOTAL:					5.67			$ 725.36

Slab-on-Grade

Floor	Quantity	Width (FT)	Length (FT)	Depth(FT)	Area (SF)	Material Cost/CY	Placement Cost/CY	Total Cost/SF
FL-1	1	25	131.87		3296.75	$ 113.00	$ 14.30	$ 419,676.28
TOTAL:								$ 419,676.28

Columns

ID	Quantity	Size (IN)	Height (FT)	Depth (IN)	Concrete (CY)	Material Cost/CY	Placement Cost/CY	Total Cost/SF
F-1.5	2	24 Round	40.50		254.47	$ 113.00	$ 41.00	$ 39,188.32
F-2.5	2	20 Round	40.50		177.42	$ 113.00	$ 41.00	$ 27,323.08
F-3.2	2	20 Round	40.50		177.42	$ 113.00	$ 41.00	$ 27,323.08
F-3.8	2	20 Round	40.50		177.42	$ 113.00	$ 41.00	$ 27,323.08
F-4.5	2	20 Round	40.50		177.42	$ 113.00	$ 41.00	$ 27,323.08
F-5.1	2	24 x 18	40.50		243.00	$ 113.00	$ 41.00	$ 37,422.00
TOTAL:					1207.16			$ 185,902.62

03 35 00 Concrete Finishing

One-Way Slabs

Floor	Quantity	Width (FT)	Length (FT)	Area (SF)	Cost/SF	Total Cost/SF
S2-1	4	17.25	25	431.25	$ 0.73	$ 1,259.25
S2-2	2	17.75	25	443.75	$ 0.73	$ 647.88
S3-1	4	17.25	25	431.25	$ 0.73	$ 1,259.25
S3-2	2	17.75	25	443.75	$ 0.73	$ 647.88
S4-1	6	17.25	25	431.25	$ 0.73	$ 1,888.88
TOTAL:						$ 5,703.13

Slab-on-Grade

Floor	Quantity	Width (FT)	Length (FT)	Area (SF)	Cost/SF	Total Cost/SF
FL-1		25	131.87	3296.75	$ 0.73	$ 2,406.63
TOTAL:						$ 2,406.63

04 22 00 Concrete Unit Masonry					
Structural CMU Walls					
Total SF	Cost/SF		Total Cost/SF		
13394	$	14.98	$	200,642.12	
TOTAL:			$	200,642.12	

31 62 16 Steel Piles						
Micro-piles						
ID	Quantity	Length (LF)	Total LF	Cost/LF	Total Cost/LF	
MP-1	50	30	1500	$ 26.92	$	40,380.00
TOTAL:					$	40,380.00

Note: All item ID's for the Detailed Structural Estimate were taken from the project drawings.

APPENDIX C

GENERAL CONDITIONS ESTIMATE

LINE ITEM	QUANTITY	UNIT	RATE	TOTAL COST
Project Team & Personnel				
Project Manager	26.00	WKS	$ 3,175.00	$ 82,550.00
Assistant Project Manager	52.00	WKS	$ 2,750.00	$ 143,000.00
Intern	12.00	WKS	$ 640.00	$ 7,680.00
Lead Superintendent	52.00	WKS	$ 3,375.00	$ 175,500.00
Ass't Superintendent	8.00	WKS	$ 2,675.00	$ 21,400.00
Vice President	0.50	WKS	$ 8,004.00	$ 4,002.00
Project Executive	1.00	WKS	$ 6,546.00	$ 6,546.00
Administrative Assistant	20.00	WKS	$ 1,400.00	$ 28,000.00
Carpenter	12.00	WKS	$ 1,600.00	$ 19,200.00
Laborer	12.00	WKS	$ 2,075.00	$ 24,900.00
Cost Engineer	2.00	WKS	$ 1,988.00	$ 4,000.00
Purchasing Project Manager	2.00	WKS	$ 3,557.00	$ 7,114.00
Project Accountant	20.00	WKS	$ 2,312.00	$ 46,240.00
Safety Inspections	7.00	EA	$ 244.00	$ 1,708.00
Site Expenses				
Computers (Two)	52.00	WKS	$ 33.14	$ 1,723.28
Site Company Truck & Expenditures	52.00	WKS	$ 244.64	$ 12,721.28
Drawings & Specifications	1.00	LS	$ 5,000.00	$ 5,000.00
Tests & Inspections	1.00	LS	$ 33,861.00	$ 33,861.00
Postage & Shipping	32.00	WKS	$ 75.00	$ 2,400.00
Project Signs	1.00	EA	$ 1,200.00	$ 1,200.00
CPM Schedule	1.00	EA	$ 4,852.00	$ 4,852.00
Trailer Rental	52.00	WKS	$ 157.53	$ 8,191.56
Site Office Equipment	32.00	WKS	$ 84.11	$ 2,691.52
Cell Phones	52.00	WKS	$ 22.64	$ 1,177.28
Site Telephone	7.00	MOS	$ 48.95	$ 342.65
Sanitary Facilities	7.00	MOS	$ 135.00	$ 945.00
Dumpsters	32.00	EA	$ 600.00	$ 19,200.00
Daily Clean-Up	52.00	WKS	$ 234.45	$ 12,191.40
Final Clean-Up	60,000.00	SF	$ 0.38	$ 22,800.00
Miscellaneous Costs				
Builder's Risk Insurance	0.25	%	$ 11,159,165.00	$ 27,897.91
General Liability Insurance	0.75	%	$ 11,159,165.00	$ 83,693.74
Subcontractor Default Insurance	1.25	%	$ 11,159,165.00	$ 139,489.56
Payment & Performance Bonds	1.00	%	$ 11,159,165.00	$ 111,591.65
Contingency	5.00	%	$ 11,159,165.00	$ 557,958.25
Permits	0.75	%	$ 11,159,165.00	$ 83,693.74
Total General Conditions Cost				**$ 1,705,461.82**

LINE ITEM	QUANTITY	UNIT	RATE	TOTAL COST
Costs Not Included in the General Conditions Estimate				
Site Utilities	6,000.00	CSF	$ 11.67	$ 70,024.74
Construction Fencing	300.00	LF	$ 7.13	$ 2,139.00
Entrance Gates	1.00	Each	$ 953.47	$ 953.47
Site Drinking Water	52.00	WK	$ 30.00	$ 1,560.00
Personal Protective Equipment	52.00	WK	$ 100.00	$ 5,200.00
Misc. Construction Tools & Supplies	0.15	%	$ 11,159,165.00	$ 167,387.48
Fire Extinguishers	52.00	WK	$ 76.23	$ 3,963.96
Total Costs				**$ 176,551.44**

APPENDIX D

LEED PROJECT CHECKLIST

LEED 2009 for New Construction and Major Renovations

VIDA Fitness Project Checklist

14	1	11		**Sustainable Sites**	Possible Points:	**26**
Y	?	N	d/C			
Y			C	Prereq 1	Construction Activity Pollution Prevention	
		1	d	Credit 1	Site Selection	1
5			d	Credit 2	Development Density and Community Connectivity	5
		1	d	Credit 3	Brownfield Redevelopment	1
6			d	Credit 4.1	Alternative Transportation—Public Transportation Access	6
1			d	Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1
		3	d	Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3
1	1		d	Credit 4.4	Alternative Transportation—Parking Capacity	2
		1	C	Credit 5.1	Site Development—Protect or Restore Habitat	1
		1	d	Credit 5.2	Site Development—Maximize Open Space	1
		1	d	Credit 6.1	Stormwater Design—Quantity Control	1
		1	d	Credit 6.2	Stormwater Design—Quality Control	1
		1	C	Credit 7.1	Heat Island Effect—Non-roof	1
		1	d	Credit 7.2	Heat Island Effect—Roof	1
1			d	Credit 8	Light Pollution Reduction	1

4	2	4		**Water Efficiency**	Possible Points:	**10**
Y	?	N				
Y			d	Prereq 1	Water Use Reduction—20% Reduction	
		4	d	Credit 1	Water Efficient Landscaping	2 to 4
					Reduce by 50%	2
					No Potable Water Use or Irrigation	4
2			d	Credit 2	Innovative Wastewater Technologies	2
2	2		d	Credit 3	Water Use Reduction	2 to 4
				2	Reduce by 30%	2
					Reduce by 35%	3
					Reduce by 40%	4

14	9	12		**Energy and Atmosphere**	Possible Points: **35**
Y	?	N			
Y			C	Prereq 1	Fundamental Commissioning of Building Energy Systems
Y			d	Prereq 2	Minimum Energy Performance
Y			d	Prereq 3	Fundamental Refrigerant Management
10	**9**		d	Credit 1	Optimize Energy Performance 1 to 19
					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 4
					Improve by 20% for New Buildings or 16% for Existing Building Renovations 5
					Improve by 22% for New Buildings or 18% for Existing Building Renovations 6
					Improve by 24% for New Buildings or 20% for Existing Building Renovations 7
					Improve by 26% for New Buildings or 22% for Existing Building Renovations 8
					Improve by 28% for New Buildings or 24% for Existing Building Renovations 9
				10	Improve by 30% for New Buildings or 26% for Existing Building Renovations 10
					Improve by 32% for New Buildings or 28% for Existing Building Renovations 11
					Improve by 34% for New Buildings or 30% for Existing Building Renovations 12
					Improve by 36% for New Buildings or 32% for Existing Building Renovations 13
					Improve by 38% for New Buildings or 34% for Existing Building Renovations 14
					Improve by 40% for New Buildings or 36% for Existing Building Renovations 15
					Improve by 42% for New Buildings or 38% for Existing Building Renovations 16
					Improve by 44% for New Buildings or 40% for Existing Building Renovations 17
					Improve by 46% for New Buildings or 42% for Existing Building Renovations 18
					Improve by 48%+ for New Buildings or 44%+ for Existing Building Renovations 19
		7	d	Credit 2	On-Site Renewable Energy 1 to 7
					1% Renewable Energy 1
					3% Renewable Energy 2
					5% Renewable Energy 3
					7% Renewable Energy 4
					9% Renewable Energy 5
					11% Renewable Energy 6
					13% Renewable Energy 7
2			C	Credit 3	Enhanced Commissioning 2
2			d	Credit 4	Enhanced Refrigerant Management 2
		3	C	Credit 5	Measurement and Verification 3
		2	C	Credit 6	Green Power 2

Y	?	N				
9	3	3		**Materials and Resources**	Possible Points:	**14**
Y			d	Prereq 1	Storage and Collection of Recyclables	
3			C	Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3
					Reuse 55%	1
					Reuse 75%	2
					3 Reuse 95%	3
		1	C	Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Elements	1
1	**1**		C	Credit 2	Construction Waste Management	1 to 2
					1 50% Recycled or Salvaged	1
					75% Recycled or Salvaged	2
		2	C	Credit 3	Materials Reuse	1 to 2
					Reuse 5%	1
					Reuse 10%	2
1	**1**		C	Credit 4	Recycled Content	1 to 2
					10% of Content	1
					20% of Content	2
1	**1**		C	Credit 5	Regional Materials	1 to 2
					10% of Materials	1
					20% of Materials	2
2			C	Credit 6	Rapidly Renewable Materials	1
1			C	Credit 7	Certified Wood	1

Y	?	N				
11	1	3		**Indoor Environmental Quality**	Possible Points:	**15**
Y			d	Prereq 1	Minimum Indoor Air Quality Performance	
Y			d	Prereq 2	Environmental Tobacco Smoke (ETS) Control	
1			d	Credit 1	Outdoor Air Delivery Monitoring	1
1			d	Credit 2	Increased Ventilation	1
1			C	Credit 3.1	Construction IAQ Management Plan—During Construction	1
1			C	Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
1			C	Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
1			C	Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
1			C	Credit 4.3	Low-Emitting Materials—Flooring Systems	1
1			C	Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1
		1	d	Credit 5	Indoor Chemical and Pollutant Source Control	1
		1	d	Credit 6.1	Controllability of Systems—Lighting	1
		1	d	Credit 6.2	Controllability of Systems—Thermal Comfort	1
1			d	Credit 7.1	Thermal Comfort—Design	1
	1		d	Credit 7.2	Thermal Comfort—Verification	1
1			d	Credit 8.1	Daylight and Views—Daylight	1
1			d	Credit 8.2	Daylight and Views—Views	1

Y	?	N				
1	0	5		**Innovation and Design Process**	Possible Points:	**6**
		1	d/C	Credit 1.1	Innovation in Design: Specific Title	1
		1	d/C	Credit 1.2	Innovation in Design: Specific Title	1
		1	d/C	Credit 1.3	Innovation in Design: Specific Title	1
		1	d/C	Credit 1.4	Innovation in Design: Specific Title	1
		1	d/C	Credit 1.5	Innovation in Design: Specific Title	1
1			d/C	Credit 2	LEED Accredited Professional	1

Y	?	N				
1	0	3		**Regional Priority Credits**	Possible Points:	**4**
1			d/C	Credit 1.1	Regional Priority: MRc1.1	1
		1	d/C	Credit 1.2	Regional Priority: EAc1	1
		1	d/C	Credit 1.3	Regional Priority: EAc2	1
		1	d/C	Credit 1.4	Regional Priority: WEc3	1

54	16	41		**Total**	Possible Points:	**110**

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

APPENDIX E

BIM PROJECT EXECUTION PLAN

BIM PROJECT EXECUTION PLAN

VERSION 2.0

FOR

[VIDA Fitness Center]

DEVELOPED BY

[Clara Watson]

[Forrester Construction Company]

This template is a tool that is provided to assist in the development of a BIM project execution plan as required per contract. The template plan was created from the buildingSMART alliance™ (bSa) Project "BIM Project Execution Planning" as developed by The Computer Integrated Construction (CIC) Research Group of The Pennsylvania State University. The bSa project is sponsored by The Charles Pankow Foundation (http://www.pankowfoundation.org), Construction Industry Institute (CII) (http://www.construction-institute.org), Penn State Office of Physical Plant (OPP) (http://www.opp.psu.edu), and The Partnership for Achieving Construction Excellence (PACE) (http://www.engr.psu.edu/pace). The BIM Project Execution Planning Guide can be downloaded at http://www.engr.psu.edu/BIM/PxP.

SECTION A: BIM PROJECT EXECUTION PLAN OVERVIEW

To successfully implement Building Information Modeling (BIM) on a project, the project team has developed this detailed BIM Project Execution Plan. The BIM Project Execution Plan defines uses for BIM on the project (e.g. design authoring, cost estimating, and design coordination), along with a detailed design of the process for executing BIM throughout the project lifecycle.

SECTION B: PROJECT INFORMATION

1. **PROJECT OWNER:** David von Storch [Urban Adventures Company]
2. **PROJECT NAME:** VIDA Fitness Addition and Renovation
3. **PROJECT LOCATION AND ADDRESS:** 1612 U Street NW, Washington D.C., 20009
4. **CONTRACT TYPE:** NEGOTIATED
5. **BRIEF PROJECT DESCRIPTION:** Owner David von Storch is launching his new flagship building at 1612 U Street which will include the largest of his VIDA Fitness Centers, along with a new high end restaurant, Aura Spa, Bang Salon, and office space for his company, Urban Adventures. The 60,370 square foot project includes a 10,920 square foot three-story addition and the renovation of an existing 49,450 square foot building. Located in the center of D.C., the restraints of a restricted site and tight schedule coupled with unforeseen hurdles that come with renovating a 100+ year old building created a unique and challenging project for Forrester Construction. In addition, the expansion began construction while the building was still occupied, as the existing Results Gym remained open and still had an active lease. When the gym closed and construction consumed the entire facility, parts of the building began to open in phases. Bang Salon was first to open, followed by two separate phases of the VIDA Fitness Center, with plans for the restaurant and spa to open in May 2012.
6. **ADDITIONAL PROJECT INFORMATION:** The BIM Execution Process for this project details the strengths and weaknesses of BIM implementation in the varying stages of the project.
7. **PROJECT NUMBERS:**

PROJECT INFORMATION	NUMBER
PROJECT NUMBER:	10-20-0008

8. PROJECT SCHEDULE / PHASES / MILESTONES:

PROJECT PHASE / MILESTONE	ESTIMATED START DATE	ESTIMATED COMPLETION DATE	PROJECT STAKEHOLDERS INVOLVED
PRELIMINARY PLANNING	1/4/2010	2/3/2010	Owner, GC, Architects
DESIGN DOCUMENTS	2/3/2010	11/17/2010	Owner, GC, Architects
CONSTRUCTION DOCUMENTS	2/3/2010	4/5/2011	Owner, GC, Architects, Subcontractors
CONSTRUCTION	10/18/2010	7/22/2011	Owner, GC, Architects, Subcontractors, Occupants
OPERATION	4/29/2011	Ongoing	Owner, Occupants

SECTION C: KEY PROJECT CONTACTS

Role	Organization	Contact Name	E-Mail	Phone
Project Manager	Forrester Construction	Seth Glinski	sglinski@forresterconstruction.com	240.882.4838
Project Superintendent	Forrester Construction	Luis Ortiz	lortiz@forresterconstruction.com	240.375.4525
BIM Manager	Forrester Construction	Ryan Major	rmajor@forresterconstruction.com	240.688.8967
Project Owner	Urban Adventures Companies	David von Storch	david@uacompanies.com	202.939.2565
Base Building Architect	Core Architects	Rod Sellers	rws@coredc.com	202.466.6116
Interiors Architect	Stoneking von Storch	Stephen von Storch	svonstorch@s-vs.com	434.295.4204
MEP Engineer	Allen & Shariff	Mike O'Boyle	moboyle@allenshariff.com	443.545.1102
Structural Engineer	Rathgeber Goss Associates	Brad Ehlers	bme@rath-goss.com	301.590.0071
Structural Steel Subcontractor	Specialty Steel	Brian Steele	bsteele@structural.net	410.796.5000
Structural Concrete Subcontractor	Southland Concrete	Jeremiah Smith	jeremiah@southlandconcrete.com	703.471.4444
Mechanical Subcontractor	MDS	Jerry Burch	jburch@mds-hvac.com	301.877.9600
Electrical Subcontractor	W&W Electric	Bruce Bentley	bbentley.ww@verizon.net	301.565.4141
Plumbing Subcontractor	RV Carey	Shawn Carey	shawn@rvcareys.com	301.915.4091
Fire Protection Subcontractor	American Automatic	Rick Moore	rmoore@aasc-fp.com	703.929.2492

SECTION D: PROJECT GOALS / BIM USES

1. MAJOR BIM GOALS / OBJECTIVES:

PRIORITY (HIGH/MED/LOW)	GOAL DESCRIPTION	POTENTIAL BIM USES
High	Increase on-site worker productivity and effectiveness	3D Coordination, Layout Control and Planning, Site Utilization Planning, Space Management Tracking
High	Reduce number of RFI's generated that pertain to coordination problems in the field	Design Authoring, 3D Coordination
High	Track progress against the project schedule throughout construction	4D Modeling
Medium	Provide Owner and future occupants with a 4D visualization of completed project prior to construction	4D Modeling
Medium	Improve design effectiveness and overall quality	Design Reviews, 3D Coordination
Medium	Identify phasing concerns with partial occupancy	4D Modeling, Site Utilization Planning
Low	Produce record model for owner's use after project's completion	Record Modeling, Maintenance Scheduling
Low	Visualize and calculate cost for any potential change orders	Cost Estimation, 4D Modeling

2. **BIM USE ANALYSIS WORKSHEET:** Please see next page.

BIM USE ANALYSIS WORKSHEET - VERSION 2.0

BIM Use	Value to Project	Responsible Party	Value to Resp Party	Capability Rating			Additional Resources	Competencies Required to Implement	Proceed with Use
	High / Med / Low		High / Med / Low	Scale 1-3 (1 = Low)					YES / NO / MAYBE
				Resources	Competency	Experience			
Maintenance Scheduling	Low	Facility Manager	Medium	1	1	1	Design review software to view Record Model and components, Building Automation System (BAS) linked to Record Model, Computerized Maintenance Management System (CMMS) linked to Record Model, User-Friendly Dashboard Interface linked to Record Model to provide building performance information and/or other information to educate building users	Understand and manipulate CMMS and building control systems with Record Model, understand typical equipment operation and maintenance practices, manipulate, navigate, and review a 3D Model	**No**
Record Modeling	Low	GC & Subs	Medium	2	3	2	3D Model manipulation	Ability to manipulate, navigate, and review 3D model, use BIM modeling application for facility updates, thoroughly understand site processes to ensure correct input	**Maybe**
		Facility Manager	High	1	2	1			
		Designers	Low	3	3	3			
Cost Estimation	Medium	GC	Medium	2	3	2	Model-based estimating software, design authoring software, cost data	Ability to define specific design modeling procedures which yield accurate quantity take-off information, identify quantities for the appropriate estimating level (e.g. ROM, SF, etc.) upfront	**Maybe**
4D Modeling	High	GC	High	3	3	3	3D Model manipulation, scheduling software, 4D Modeling Software	Knowledge of construction scheduling and general construction process, manipulate, navigate, and review a 3D model, knowledge of 4D software	**Yes**
Site Utilization Planning	High	GC	High	3	3	3	3D Model manipulation, design authoring software, scheduling software	Ability to manipulate, navigate, and review 3D model, manipulate and asses construction schedule with 3D model, understand typical construction methods	**Yes**
Space Management Tracking	Medium	Facility Manager	Med	1	1	1	3D Model manipulation, content management application	Ability to manipulate, navigate, and review record model, assess current space and assets and manage appropriately for future needs	**No**
Design Authoring	High	GC	Medium	3	3	3	3D Model manipulation	Ability to manipulate, navigate, and review a 3D model, knowledge of construction means and methods, design and construction experience	**Yes**
		Subcontractors	High	2	2	2			
		Designers	High	3	3	3			
3D Coordination	High	GC	High	3	3	3	3D Model manipulation, model review application	Ability to deal with people and project challenges, manipulate, navigate, and review a 3D model, knowledge of BIM model applications for facility updates, knowledge of building systems.	**Yes**
		Subcontractors	High	2	2	2			
Design Reviews	Medium	GC	High	3	3	3	3D Model manipulation, design Review Software, interactive review space	Ability to manipulate, navigate, and review a 3D model, model photo realistically including textures, colors and finishes and easily navigable by using different software or plug-ins.	**Maybe**
		Designers	Medium	3	3	3			

Note: Chart, BIM Uses, Resources, and Competencies are courtesy of Computer Integrated Construction at The Pennsylvania State University

3. BIM USES:

X	PLAN	X	DESIGN	X	CONSTRUCT	X	OPERATE
	PROGRAMMING	X	DESIGN AUTHORING	X	SITE UTILIZATION PLANNING		BUILDING MAINTENANCE SCHEDULING
	SITE ANALYSIS	X	DESIGN REVIEWS		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	X	RECORD MODELING	X	RECORD MODELING
			MECHANICAL ANALYSIS				
			OTHER ENG. ANALYSIS				
			SUSTAINABLITY (LEED) EVALUATION				
			CODE VALIDATION				
X	PHASE PLANNING (4D MODELING)	X	PHASE PLANNING (4D MODELING)	X	PHASE PLANNING (4D MODELING)		PHASE PLANNING (4D MODELING)
	COST ESTIMATION		COST ESTIMATION		COST ESTIMATION		COST ESTIMATION
	EXISTING CONDITIONS MODELING		EXISTING CONDITIONS MODELING		EXISTING CONDITIONS MODELING		EXISTING CONDITIONS MODELING

SECTION E: ORGANIZATIONAL ROLES / STAFFING

1. BIM USE STAFFING:

BIM Use	Organization	Number of Total Staff for BIM Use	Estimated Worker Hours	Location(s)	Lead Contact
3D Coordination	MEP Subs, Structural Engineer, MEP Engineer	5	40	On-site coordination meetings	Mike O'Boyle
4D Modeling	Forrester Construction (GC)	2	20	Main office	Seth Glinski
Design Reviews	MEP Engineer, Structural Engineer, GC	5	20	On-site coordination meetings	Mike O'Boyle
Record Modeling	MEP Subs	3	25	On-site coordination meetings	Luis Ortiz
Site Utilization Planning	Forrester Construction (GC)	2	5	On-site coordination meetings	Seth Glinski
Space Management / Tracking	Forrester Construction (GC)	2	10	On-site coordination meetings	Seth Glinski

SECTION F: BIM PROCESS DESIGN

1. LEVEL ONE PROCESS OVERVIEW MAP: Please see next page.

2. LIST OF LEVEL TWO – DETAILED BIM USE PROCESS MAP(S): See pages 55-60.

a. Phase Planning (4D Modeling)
b. Design Authoring
c. Design Reviews
d. 3D Coordination
e. Site Utilization Planning
f. Record Modeling

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

Planning
Validate Program
Owner | Programming

Schematic Design
Author Schematic Design
Architect | Design Authoring

Schematic Design
Perform 3D Coordination
Architect | 3D Macro Coordination

Schematic Design
Develop Virtual Prototypes
Architect | Virtual Prototyping

Schematic Design
Create 4D Model
Contractor | 4D Modeling

Design Development
Author Design Development
Architect | Design Authoring

Design Development
Perform Design Review
Contractor | Design Reviews

Design Development
Perform 3D Coordination
Architect | 3D Macro Coordination

Design Development
Develop Virtual Prototypes
Architect | Virtual Prototyping

Design Development
Create 4D Model
Contractor | 4D Modeling

Construction Documents
Author Construction Documents
Engineer | Design Authoring

Construction Documents
Perform Site Utilization Planning
Contractor | Site Utilization Planning

Construction Documents
Perform 3D Coordination
Architect | 3D Macro Coordination

Construction Documents
Develop Virtual Prototypes
Architect | Virtual Prototyping

Construction Documents
Create 4D Model
Contractor | 4D Modeling

Operations
Compile Record Model
Contractor | Record Model

End Process

INFO. EXCHANGE

Program Model

Schematic Design
Architectural Model
MEP Model
Structural Model
Civil Model

Schematic Design 4D Model

Schematic Design 3D Macro Coordination Model

Schematic Design Virtual Prototypes

Design Development
Architectural Model
MEP Model
Structural Model
Civil Model

Design Development 4D Model

Design Development 3D Macro Coordination Model

Design Development Virtual Prototypes

Construction Documents (WP)
Architectural Model
MEP Model
Structural Model
Civil Model

Site Utilization Plan 4D Model

Construction Documents (WP) 4D Model

Construction Documents (WP) 3D Macro Coordination Model

Construction Documents (WP) Virtual Prototypes

Construction Documents (WP) 3D Micro Coordination Model

Record Model

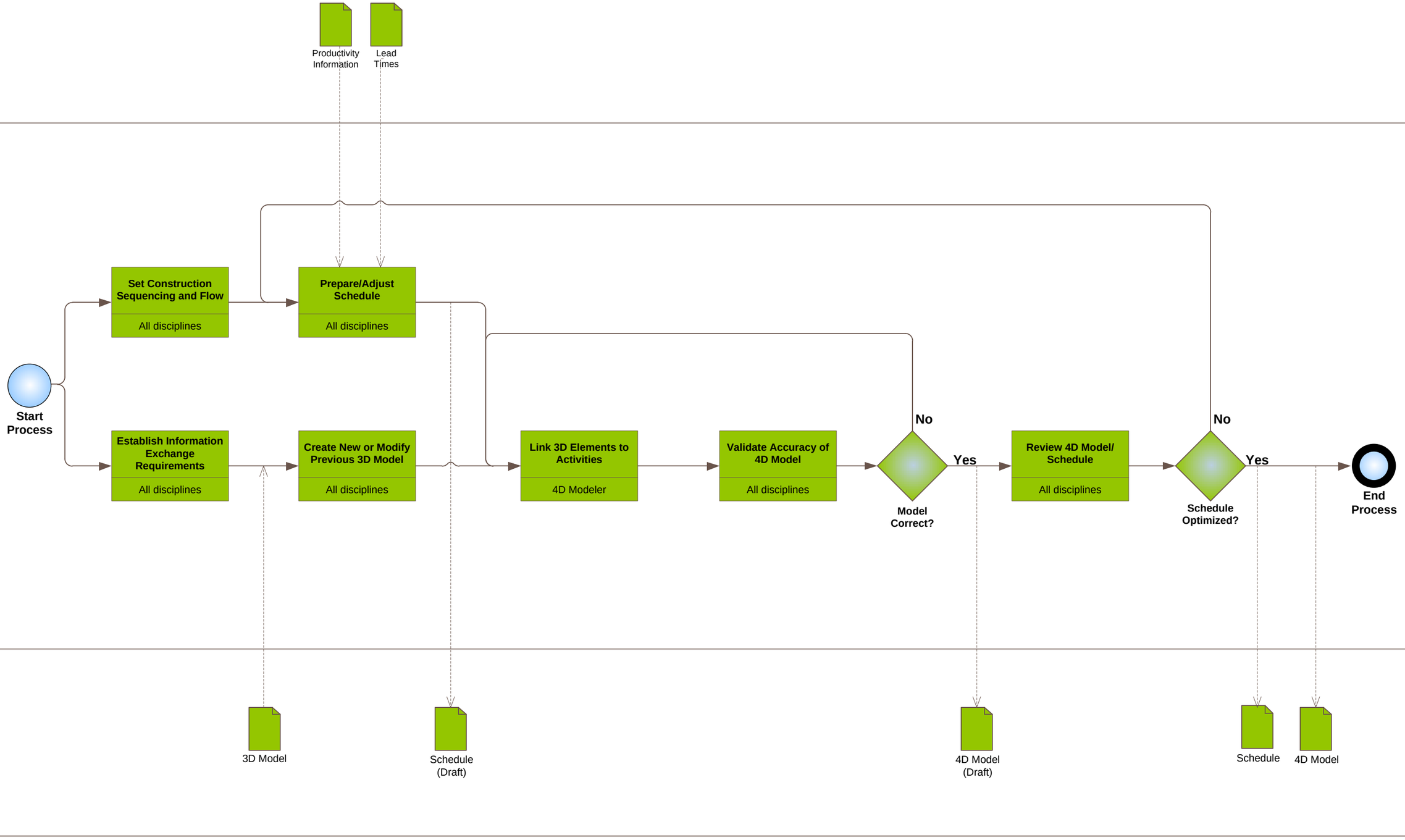
Level 2: 4D Modeling Process Map
VIDA Fitness Center

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

REFERENCE INFO.

PROCESS

INFO. EXCHANGE



Level 2: Design Authoring Process Map

VIDA Fitness Center

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

REFERENCE INFO.

Parametric Modeling Content

PROCESS

Start Process

Identify Models Required — All Disciplines

Identify Content for Model Creation — All Disciplines

Develop Intitial Architecture Model — Architect

Create Schematic Design Architecture Model — Architect

Create Schematic Design Structural Model — Engineer

Create Schematic Design MEP Model — Engineer

Create Other Models (as needed) — All Disciplines

Does the model meet the requirements? — No / Yes

Create Design Development Architecture Model — Architect

Create Design Development Structural Model — Engineer

Create Design Development MEP Model — Engineer

Create Other Models (as needed) — All Disciplines

Does the model meet the requirements? — No / Yes

Create Schematic Design Architecture Model — Architect

Create Schematic Design Structural Model — Engineer

Create Schematic Design MEP Model — Engineer

Create Other Models (as needed) — All Disciplines

Does the model meet the requirements? — No / Yes

End Process

INFO. EXCHANGE

Program Model

Preliminary Architecture Model

Schematic Design
- Architectural Model
- Structural Model
- MEP Model
- Other

Design Development
- Architectural Model
- Structural Model
- MEP Model
- Other

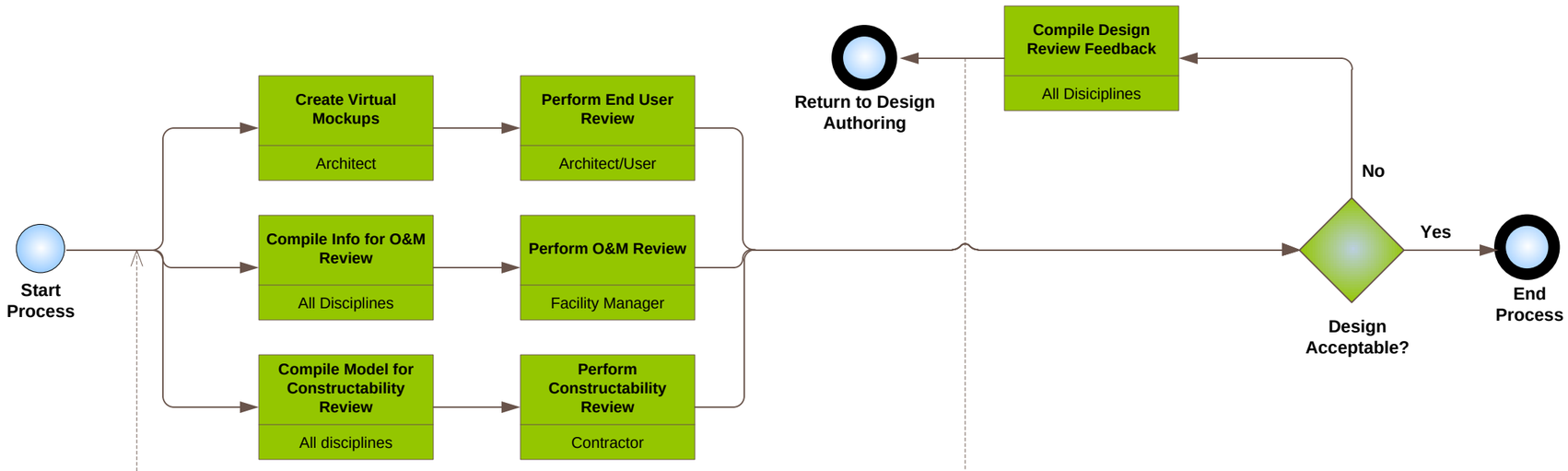
Construction Documentation
- Architectural Model
- Structural Model
- MEP Model
- Other

Level 2: Design Review Process Map
VIDA Fitness Center

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

REFERENCE INFO.

PROCESS



INFO. EXCHANGE

Level 2: 3D Design Coordination Process Map

VIDA Fitness Center

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

REFERENCE INFO.

Company Implementation Standards

Contract Requirements

Information Exchange Requirements

PROCESS

Start Process

Create Model Sharing System
BIM Coordinator

Define Coordination Meeting Location
BIM Coordinator

Define Information for Discipline Models
All Disciplines

Define the Areas of Coordination
All Disciplines

Develop Schedule for Coordination
All Disciplines

Establish a Protocol to Address Collisions
All Disciplines

Start Design Coordination Process

Create Discipline Models
All Disiciplines

Compile Composite Model
BIM Coordinator

Perform Collision Detection
BIM Coordinator

Any Collisions?

Yes

Identify Solutions to Collisions
All Disciplines

No

End Process

INFO. EXCHANGE

Design Model

Coordination Model by Discipline

Coordination Model

Level 2: Site Utilization Planning Process Map

VIDA Fitness Center

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

REFERENCE INFO.

Schedule

Construction Equipment Libraries

PROCESS

Start Process

Identify Construction Phases
Contractor

Add Construction Equipment
Contractor

Determine Temporary Facilities
Contractor

Insert Phased Staging Areas
Contractor

Are All Phases Analyzed? (Occurs for each Phase)

No

Yes

Analyze Site Layout for Phase Transition
Contractor

Analyze Site Layout for Space and Time Conflict
Contractor

Is Plan Acceptable?

No

Yes

Distribute Plan to Various Parties
Contractor

End Process

INFO. EXCHANGE

Design Model

Existing Site Conditions Model

Site Utilization Plan

Level 2: Record Modeling Process Map
VIDA Fitness Center

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

REFERENCE INFO.

PROCESS

INFO. EXCHANGE