

Whitmore Laboratory Renovation

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Background

Whitmore Laboratory is a four-floor building including the basement. It is located in University Park with gross area of 94,000 SF and net floor area of 88,721 SF. Whitmore serves as teaching and research laboratories for Elberly College of Science. The purpose of this project is to renovate the 52-year old building and upgrade the mechanical, plumbing and electrical systems to provide the proper space and instruments for better educational experience.

Project Schedule

As the number of students increased, the Chemistry Department requested an upgrade for their laboratories including Muller, South Frear and Whitmore. A letter from Office of Physical Plants went out in December 2011 to architecture firms describing the project. Stantec was awarded the project in April 2012 as the design party and Baton Malow as the CM agent in Fall 2012. The Bid Documents were completed in November 2014. Subcontractors' bids were conducted during July 2014. Actual construction started in May 2015 and phase one will be completed at the end of December 2015. Phase two will start right after phase one and is expected to complete in August 2016. Then the university will take over the building and prepare it for the students. The building will start operating regularly in mid-September 2016. A summary schedule is attached in the appendices.

Building Systems summary

Structural

Foundation is spread footings supporting reinforced concrete columns in the basement. The basement is reinforced concrete columns supporting concrete beams that carry a flat slab. For the first, second and third floor, the structural System is a steel frame with metal decking and concrete slab. The roof is supported by 24" steel joist spanning 42'. (Since the buildings was built in 1953, no detailed structural documents are available. However more details are requested)

Mechanical

The building is air conditioned by 8 Air Handler Unites each has capacity of 15000 CFM with a cooling tower. Mechanical equipment are located in the third floor and to be removed in this project. The new mechanical system will be tied to the campus central chiller that operates at 42 F during the summer and 48 F during the

winter. A heat exchanger will be installed in the basement that exchanges heat between the campus loop and the building loop. Fume hoods are expected to have a significant effect in the air balance, and HVAC system may be adjusted after installing and testing. Exhausted air from the fume hoods and the HVAC system will pass through a heat recovery in the roof to minimize energy consumption.

Electrical

The building is fully fed from campus grid and power is transformed from 1247 KV to 480 V by one transformer located outside the building. The main switchgear will be replaced to satisfy the new building load. All the conduits will be replaced with new EMT and flexible metal. Two electrical rooms are located in the basement and conduits branching out through building in EMT conduits. All conduits run in the plenum and in-slab conduits.

Project Cost Evaluation

Construction Cost (CC) and CC/SQFT

Construction cost including demolition and renovations for both phases is \$20,423,120. Cost per square foot will be \$217.27 ($\$20,423,120/94,000$ SQFT).

Total Cost (TC) and TC/SQFT

Total cost of the project including contingency, insurance, general conditions, and fee is \$24.5 M. Cost per square foot is \$260.64 ($24,500,000/94,000$ SQFT)

Individual Systems Cost/SQFT

Mechanical & Plumbing	\$84.84	Windows	\$7.86
Electrical	\$21.81	Lab Casework and Fume hoods	\$22.12
Masonry Restoration	\$3.94	Fire Protection	\$3.82
Steel	\$5.34	Roofing	\$3.13

Square Foot Estimation

Based on RSMeans Square Foot Estimate 2014, the project cost was calculated. The estimation came out to be \$26,911,050 with time factor of 1.16 and location factor of 0.936. This estimation is 9.85 above the actual project cost. However, the estimated cost is in the expected range as the square foot estimate is +/- 15% accurate. Details of calculations are shown in the appendices.

Site Logistics Plan and Existing Conditions

Construction in campus requires intensive coordination due to the restrictions from OPP, Parking office and the university administration. On the other hand, all utilities are available and ready to use including roads, water, power, and sewer. Whitmore laboratory can be accessed by vehicles from all sides except the north side. Another advantage Whitmore has is that it is located beside an existing parking lot and has a loading

deck in the same side. Mentioning that, CM and GC staff will share parking with the university faculty and staff. Since the building should have continuous operation, the fence will not surround the whole building, leaving the north and south entrances accessible by students. GC and CM staff will occupy two rooms in the basement and will move out later on when those rooms are scheduled for renovation. The east side of the building is the biggest portion of the fenced area and that is where equipment, staging area, facilities, dumpsters and scaffolding will be.

Client Information

The building is an asset of Pennsylvania State University and Office of Physical Plant is the representative of Penn State. The priority of this project rose as the number of students grew, which created the need for upgrade to the laboratories. OPP approved this proposal and included it in Penn State Master Plan. It is expected to serve at least 1,200 students annually from different departments. The building will include research laboratories too. Execution of this project does not close the building but the renovations are kept in one side while the other side is functioning. Upon completion of that side the renovations move to the opposite side. It is expected to transform the lab to an upper level that makes it comparable with peer institutions. It is also expected to serve for the next thirty years. One of the labs in the second floor has 76 fume hoods.

Project Delivery System

Design-Bid-Build was the method used to deliver the project.

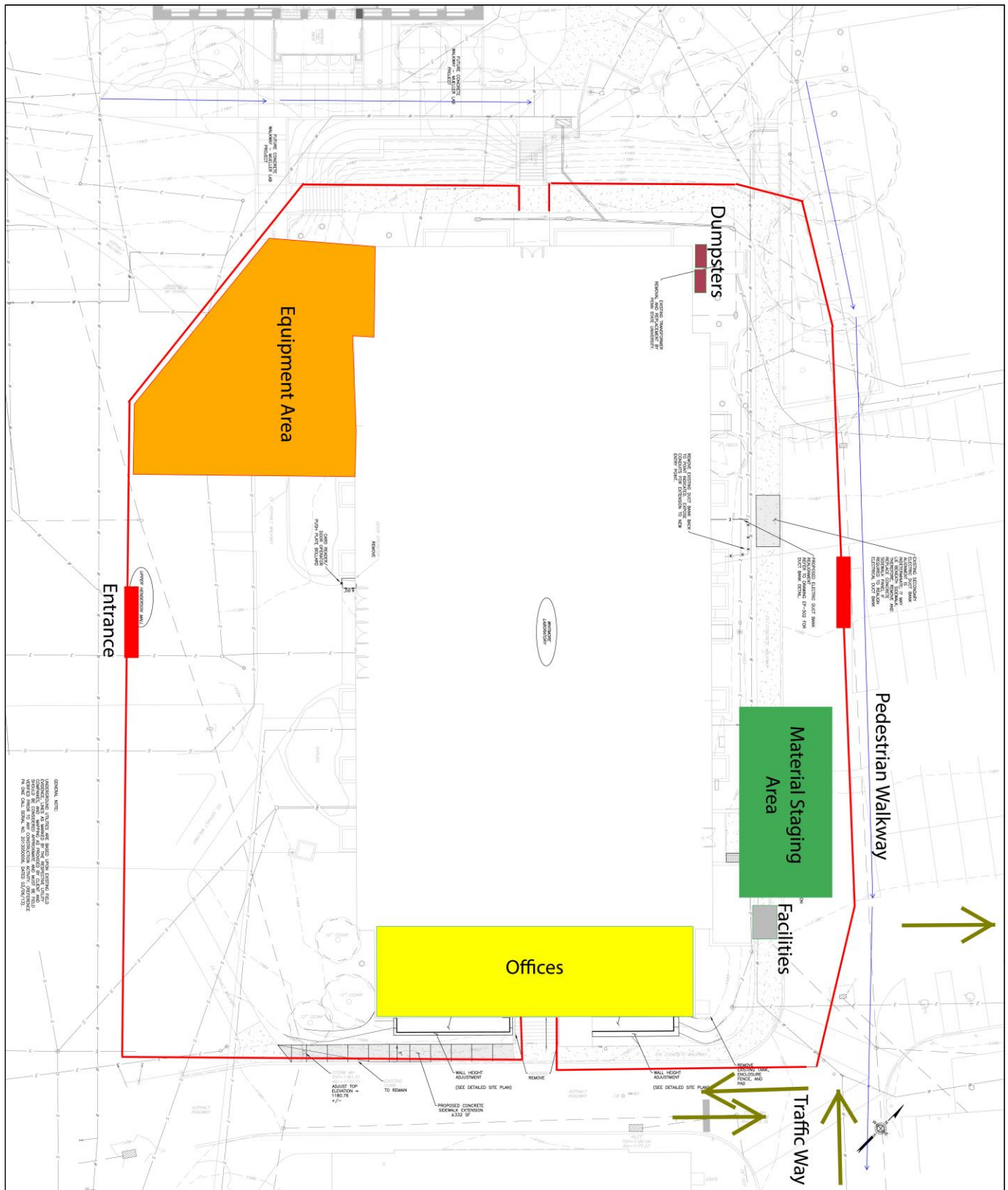
OPP has two separate contracts, one with Stantec (A/E) and the other one with Barton Malow (CM). J.C Orr (GC) is a subcontractor for Barton Malow. Meanwhile, Barton Malow manages the subcontractors. Subcontractors were awarded by the best value ensuring that scopes are fully comprehended. Every subcontractor is required to carry their own insurance. In addition, Barton Malow has a subcontractor default insurance. Penn State keeps its own contingency in case of large issues occurs. Barton Malow's contingency is used to cover unexpected expenses such as overtime labor. (Organizational chart is attached in the appendices)

As a point of view, this type of contract that involves a specialty engineers and the CM in an early stage in the project optimizes the quality of the product. Design-Bid-Build takes longer but results with better output.

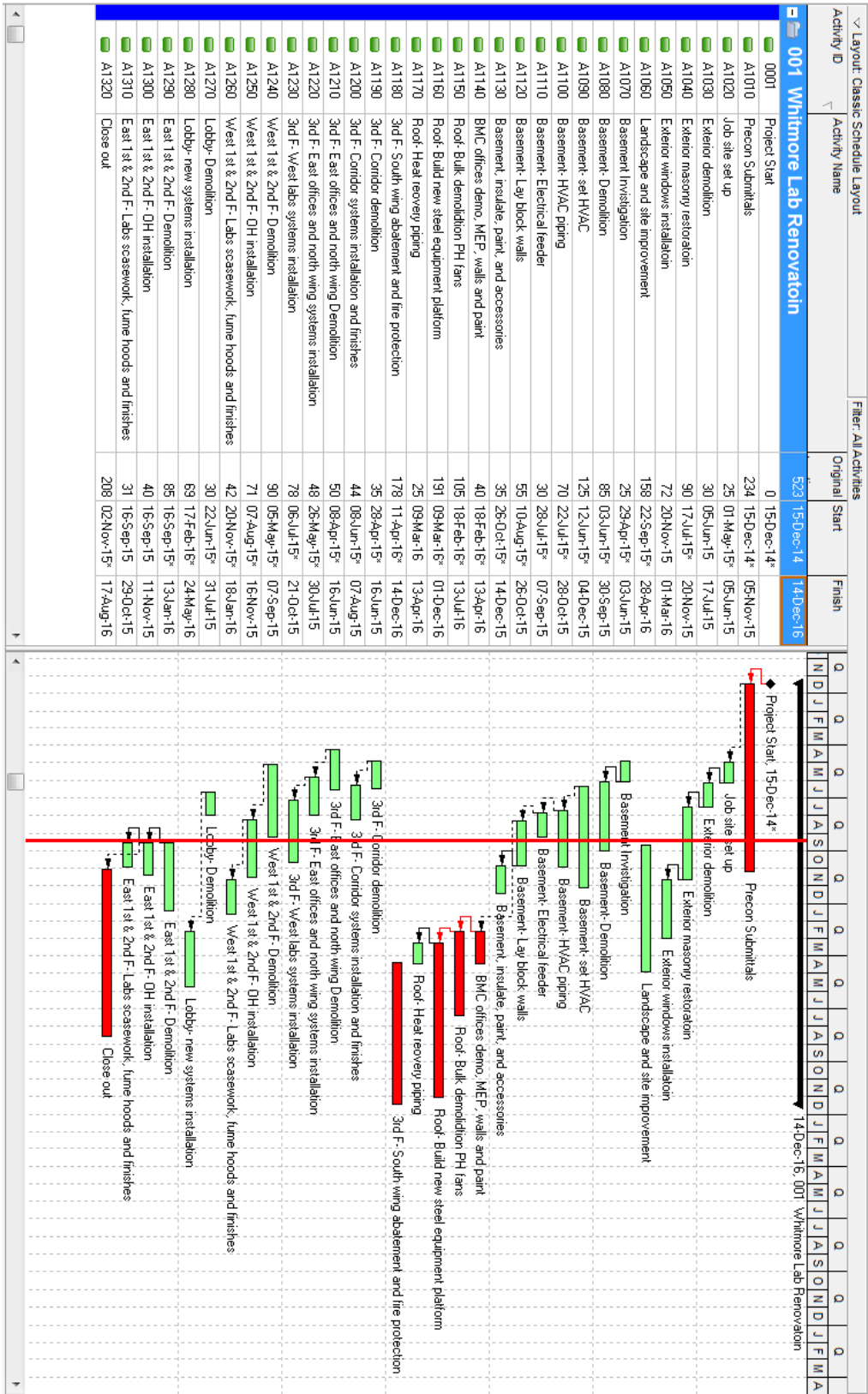
Staffing Plan

Owner requires all parties involved in the project to work in collaboration and bring their expertise if issue arises. That is to ensure all parties obtain accurate project information concerning program, quality, cost, schedule. Additionally, parties are not allowed to create partnership and individuals are accountable for their performance, non-performance, and error. The CM staffing plan is requested and will be added to this document upon reception.

Appendix I



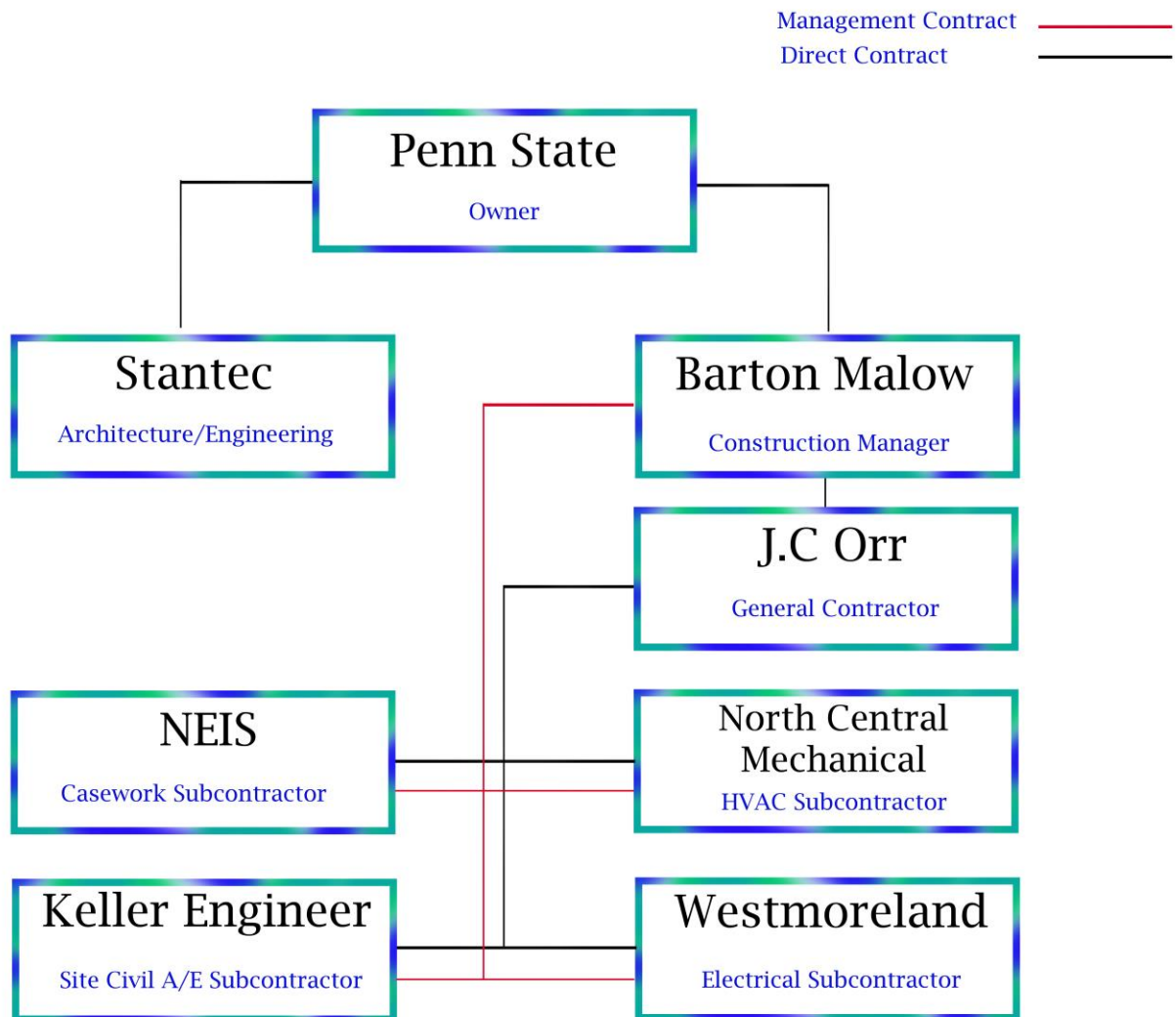
Appendix II



Appendix III

Description	Unit	Quantity	Cost/Unit	Total Cost
HVAC	S.F	94000	20.45	1922300
Electrical	S.F	94000	16.19	1521860
Plumbing	S.F	94000	37.51	3525940
Fire Protection	S.F	94000	3.16	297040
Roof	S.F	94000	5.72	537680
Wall finishes		940000	6.09	5724600
Floor Finishes		940000	6.1	5734000
Windows		94000	2.43	228420
Doors	S.F	94000	2.19	205860
Equipment	S.F	94000	1.39	130660
Subtotal				19828360
Location Factor		0.936		18559345
Time Factor		1.16		21528840
A/E Fee (10%)				2152884.015
Contractor Fees (15%)				3229326.023
			Total	26911050

Appendix IV



Appendix V

CURRENT SCHEDULE IS AS FOLLOWS (TBC)

<i>Task Name</i>	<i>Start</i>	<i>Finish</i>
<i>Whitmore</i>	<i>Fri 3/8/13</i>	<i>8/22/16</i>
<i>Schematic Design</i>	<i>Fri 3/8/13</i>	<i>6/28/2013</i>
<i>BM Cost estimate, PDRB Cycle & OPP Review</i>	<i>7/1/2013</i>	<i>7/30/2013</i>
<i>Design Development</i>	<i>7/31/2013</i>	<i>2/14/2014</i>
<i>OPP Review</i>	<i>2/20/2014</i>	<i>2/21/2014</i>
<i>Issue for Bid (IFB) Construction Documents</i>	<i>2/24/2014</i>	<i>6/11/2014</i>
<i>BM Bid, PDRB Cycle & OPP Review</i>	<i>6/12/2014</i>	<i>6/16/2014</i>
<i>BOT Review and Approval</i>	<i>7/10/2014</i>	<i>7/11/2014</i>
<i>Issue for Construction (IFC) Documents</i>	<i>7/14/2014</i>	<i>11/26/2014</i>
<i>Construction</i>	<i>1/5/2015</i>	<i>7/15/2016</i>
<i>Occupancy</i>	<i>7/18/2016</i>	<i>8/12/2016</i>