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Construction Management
Dr. Messner
Franklin & Marshall College Row
Lancaster, PA
October 5, 2006
Technical Assignment 1



Table of Contents

A. Executive Summary.....	2
B. Project Schedule Summary.....	3
C. Building Systems Summary.....	4
D. Project Cost Evaluation.....	5-6
E. Site Plan of Existing Conditions.....	7
F. Local Conditions.....	8-9
G. Client Information.....	10
H. Project Delivery System.....	11-12
I. Staffing Plan.....	13

Executive Summary

Through completion of this technical assignment, the construction management processes, and the responsibilities that accompany a construction project, were further investigated. In this assignment, areas such as a summary schedule, building systems, project cost evaluations, a site layout plan, information important to the client, and project delivery were analyzed.

Franklin & Marshall College was facing a problem, campus growth and their need for more student housing. Franklin & Marshall bought on Campus Apartments in order to meet their needs and desires for a new student housing project. Design for College Row required special exceptions and variance from the City of Lancaster. Some of these include obtaining multiple permits for housing, restaurant, and retail, and variances such as increasing maximum building height to seventy feet, increasing the allowable unrelated persons in a non-family unit from three to four, and reducing front yard setbacks for each of the three buildings.

Another hurdle that Campus Apartments had to jump over was the demolition of two buildings on the construction site. The Federal Mogul Building needed to get clearance from the Pennsylvania Historic Museum Commission prior to its demolition. Part of the demolition conditions were that certain parts of the building be salvaged and sold at auctions and/or fundraisers. Windows and lead glass, was saved, along with precast concrete sills, moldings, and anything else of value. The pipe insulation in the buildings contained asbestos, which needed to be abated before any demolition could commence.

The delivery method on this project became important as the desired finish date grew closer. In order to have the project turned over to Franklin & Marshall in time for the Fall 2007 school year, a construction manager needed to be brought onto the project before design completion. Alexander Building Construction was brought on as a CM at Risk with a guaranteed maximum price contract. By doing this, Alexander was able to prepare early budgets and dictate part of the design and design-process. A GMP gives the price protection at an early stage in the project, allowing security in financing.

Being a construction project at a school, there were common safety considerations that had to be handled. The actual construction site is on the edge of Franklin & Marshall property and on the opposite side of Harrisburg Pike, so pedestrian traffic will not be a major concern. The biggest concern was that the college wanted a footbridge in the north corner of the construction site to remain open and usable. This will be covered by a tall construction fence blocking entrance for pedestrians onto the site.

Project Schedule Summary

Completing the foundations in a timely manner is very important in order for the structural work to begin on time. In this schedule, structural work begins five weeks after foundations has commenced, giving the foundation workers enough time to have enough of their work done in order to start the structural work. These are key items that must be kept on schedule in order for finishes to be completed on time. The finishes is a six-month job and with the college pressed to be completed before the Fall 2007 semester, the project has no room to fall behind.

The project summary schedule for Franklin & Marshall College Row is contained on the next two pages.

Project Schedule Summary










Franklin & Marshall College Row
Lancaster, PA

ID	Task Name	Duration	Start	Qtr 2, 2005			Qtr 3, 2005			Qtr 4, 2005			Qtr 1, 2006			Qtr 2, 2006			
				Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
1	Design Phase	316 days	Mon 4/11/05																
6	Sitework	40 days	Mon 7/17/06																
2	Purchasing	57 days	Thu 7/20/06																
5	Demolition	34 days	Wed 8/2/06																
8	Structural Steel	42 days	Wed 8/23/06																
9	Masonry	93 days	Mon 8/28/06																
22	U / G Plumbing	10 days	Mon 9/11/06																
7	Concrete	40 days	Wed 9/13/06																
10	Precast Plank	57 days	Tue 10/3/06																
3	PPL Power Relocation	1 day	Thu 10/5/06																
11	Exterior Studs / Metal Framing	72 days	Tue 10/10/06																
15	Miscellaneous Metal	58 days	Tue 10/10/06																
16	Interior Studs and Drywall	77 days	Tue 10/10/06																
17	MEP Trades	82 days	Tue 10/31/06																
13	Windows / Curtainwall	81 days	Tue 11/28/06																
12	Roofing	16 days	Wed 12/27/06																
24	Interior Finishes	124 days	Wed 1/10/07																
19	Start Switchgear Installation	1 day	Fri 1/12/07																
20	Building Enclosed	0 days	Wed 1/17/07																
21	Permanent Power	0 days	Thu 1/25/07																
23	Elevators	30 days	Fri 1/26/07																
4	Typical Apartment Mock-Up	1 day	Thu 2/1/07																
14	Metal Panels	40 days	Wed 3/7/07																
18	HVAC Start-Up/Test/Balance	8 days	Wed 7/18/07																
25	Owner Occupancy	0 days	Thu 7/26/07																
26	Interior Punchlist Complete	1 day	Wed 8/8/07																
27	Exterior Punchlist Complete	1 day	Wed 8/22/07																

Project: Project1 Date: Mon 11/6/06	Task	Milestone	External Tasks
	Split	Summary	External Milestone
	Progress	Project Summary	Deadline

Project Schedule Summary
Franklin & Marshall College Row
Lancaster, PA

ID	Task Name	Duration	Start	Qtr 3, 2006			Qtr 4, 2006			Qtr 1, 2007			Qtr 2, 2007			Qtr 3, 2007		
				Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	Design Phase	316 days	Mon 4/11/05															
6	Sitework	40 days	Mon 7/17/06	█	█	█												
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Project: Project1 Date: Mon 11/6/06	Task		Milestone		External Tasks	
	Split		Summary		External Milestone	
	Progress		Project Summary		Deadline	

Building Systems Summary

Demolition -

The Federal Mogul Building's demolition had to be approved by the Pennsylvania Historic Museum Commission, which conditioned that certain parts, including lead glass, precast sills, and moldings, to be sold at auction and/or fundraisers. Both the Federal Mogul and the warehouse that were to be demoed contained asbestos pipe insulation that had to be abated prior to demolition. Demolition was carried out with the use of large track excavators with various attachments.

Structural Steel Frame -

The structural system is a steel frame with composite slab on deck for the second floor slab and load-bearing block and precast concrete plank from the second through to the roof. Bracing methods used are lateral and moment bracing. Steel erection was completed with the use of a truck-mounted hydraulic crane with a 200 ton capacity.

Precast Concrete -

Room for precast lay down and erection will not be an issue given the size of the construction site. The precast erection will be by crane.

Mechanical System -

The mechanical system includes 3 Roof top air conditioning units - direct expansion (total of 4200 CFM). The bulk of the mechanical equipment is located on the roof of the building, in three main groupings. Sprinklers are outfitted throughout the building, and are designed to Ordinary Group II.

Electrical System -

The electrical system includes 800A, 480/277V, 3-phase, 4W Distribution Panel, ¾" to 2-4", 60-800A copper feeders, and dry type transformers, including primary - 480V, secondary - 208/120V, and ranging 9-500kVA. Lighting consists of fluorescents and halides used, ranging from 120-277V, which are common throughout the building. The electrical room is located on the first floor of the building, in the east corner.

Exterior Wall -

The exterior veneer wall is made up of three main materials: calcium silicate masonry units (CSMU), metals shingles, and brick veneer.

Excavation Support -

Excavated soil is to be either trenched or vertical with bracing. Also used will be compaction grouting to support the foundation.

Project Cost Evaluation

The following data is a cost evaluation for Franklin & Marshall College Row in Lancaster, PA. Included is building costs, total project costs, and various systems costs. Also, there is a square foot estimate comparison using D4 software and R.S. Means pricing.

Actual Building Costs -

Construction Cost - \$13,500,000

Square Foot Cost - \$120.92/SF

Total Project Costs -

Construction Cost - \$15,048,000

Square Foot Cost - \$134.78/SF

Structural System Costs -

Construction Cost - \$3,258,990

Square Foot Cost - \$29.19/SF

Mechanical System Costs -

Construction Cost - \$863,379

Square Foot Cost - \$7.73/SF

Electrical System Costs -

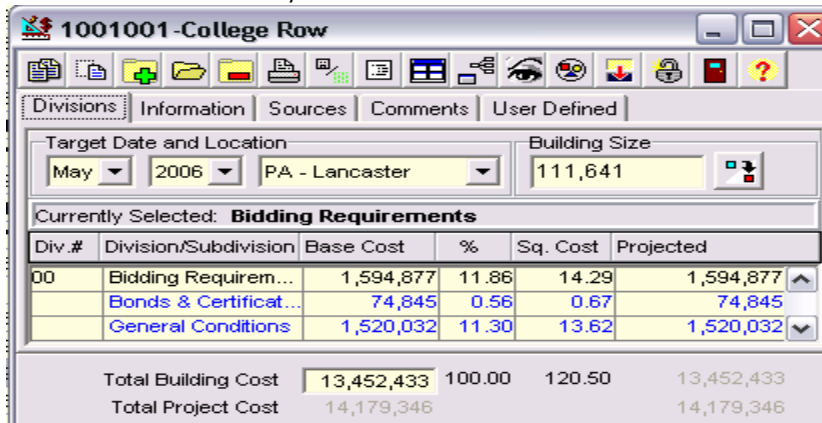
Construction Cost - \$1,133,976

Square Foot Cost - \$10.16/SF

D4 Estimate -

Construction Cost - \$13,452,433

Square Foot Cost - \$120.50/SF



The screenshot shows the D4 software interface for project '1001001-College Row'. The 'Divisions' tab is active, displaying a table of bidding requirements. The table includes columns for Division/Subdivision, Base Cost, %, Sq. Cost, and Projected. The total building cost is \$13,452,433 and the total project cost is \$14,179,346.

Div.#	Division/Subdivision	Base Cost	%	Sq. Cost	Projected
00	Bidding Requirem...	1,594,877	11.86	14.29	1,594,877
	Bonds & Certificat...	74,845	0.56	0.67	74,845
	General Conditions	1,520,032	11.30	13.62	1,520,032
Total Building Cost		13,452,433	100.00	120.50	13,452,433
Total Project Cost		14,179,346			14,179,346

R.S. Means Square Foot Estimate -

	Area (SF)	\$/SF	Perimeter (LF)	Additives	Location Factor	Total Cost
Retail	21,081	\$88.90	651	N/A	.93	\$1,742,913.84
Residential	90,560	\$129.30	651	\$351,760	.93	<u>\$11,216,886.24</u>
						\$12,959,800.08

Prices were taken from R.S. Means Square Foot Estimating 2006. Retail values were taken from the Commercial/Industrial/Institutional - Store, Retail for the first floor of the building. Residential values were acquired from the Commercial/Industrial/Institutional - Apartment, 4-7 Story. Additives in this estimate included 65 free standing cooking ranges, 65 microwave ovens, 65 dishwashers, 65 refrigerators, and two 3500 pound capacity elevators.

Costs Assessment -

The D4 and the R.S. Means estimates that were run both came within 4% of the estimate provided by the construction manager. The reason for these estimates being similar is the repetition of the second through sixth floors, the apartments. Also, the building does not include anything decorative as far as architecture or other features.

Site Plan of Existing Conditions



Location Map showing Franklin & Marshall College Campus and adjacent construction site

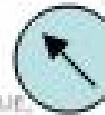
Above is an overhead picture of the Franklin & Marshall College Row project in Lancaster, PA. The project is located on the opposite side of Harrisburg Pike from the college. Harrisburg Pike is a main route in Lancaster and has been taken into consideration with the location of the construction site fence, as well as the site entrance/exit. On the following page is a site plan. Also parts of the site plan are the following items:

- No pedestrian traffic along Harrisburg Pike in area of construction site
- Pedestrian traffic to continue in north corner of construction site where there is an existing footbridge crossing over the railroad tracks
- Existing water and communication lines run underneath Harrisburg Pike and will branch into new building
- Existing gas and electric lines run east/west on construction site and will be relocated running parallel behind the new buildings
- Lighting along Harrisburg Pike will remain during construction
- The warehouse and Federal Mogul Building are to be demolished

Site Layout
Franklin & Marshall College Row
Aimee Bashore

EA# 4.47 AC. (194,789 S.F.)

RELOCATED COLLEGE AVENUE
 EXTENDED (6,000.16 S.F.)



Parking

Construction Management
 Jobsite Trailer

Owner Jobsite Trailer

Construction
 Fence and
 Property
 Boundary

Parking

LOT #2

LOT #2



NO LATER THAN
 10:00 AM
 ON DAY OF DEMOLITION

Traffic Flow

hydrant

HARRISBURG AVENUE

Building A 6-Story	Building B 5-Story	Building C 1-Story	Federal Mogul 2-Story (to be demanded)	Warehouse 2-Story (to be demanded)
-----------------------	-----------------------	-----------------------	--	--

* OFF BENCHMARK
 3' CUT ON FLANGE, REST ON THE HORIZONTAL
 DIMENSION-176.16 LARG. OFF 24.16

Local Conditions

Preferred Construction Methods -

There are no significant concerns from the City of Lancaster overall. Some variances had to be obtained by the City of Lancaster in order to construct the buildings preferred by Franklin & Marshall College. Such variances included that the maximum building height be increased to seventy feet, to increase the allowable unrelated persons in a non-family unit from three to four, and reduction of front yard setbacks for each of the three buildings.

Structural steel and block & plank construction was designed for this project as the preferred construction method. The structural steel accommodates the wide open and high ceiling spaces for the retail areas on the ground floor. Block and plank construction is a good design for student housing as it is rigid and allows for less noise transmission between units.

Construction Parking Availability -

Alexander Building Construction is responsible for making accommodations for all construction parking on site. At the beginning of the construction process, a new parking lot was completed behind Building A and was turned over to Franklin & Marshall College. In return, the college has given about fifty spaces for construction parking.

Waste Management -

A thirty cubic yard open-top dumpster is provided by Edie Waste, Inc. located in nearby Columbia. Charge per pull is \$119, in addition is a \$10 fuel surcharge and a \$51 disposal charge.

Soil/Subsurface Water Condition -

The following information concerns the soil and subsurface water conditions determined based on test borings taken by a geotechnical testing agency. Performing these tests prior to sitework is key to ensuring the use of the designed excavation and foundations systems.

Topsoil was found in seven test borings in depths ranging from one to eight inches and averaging five inches. Asphalt pavement was found in two test borings, with the asphalt/aggregate base section extending to depths up to one foot. Fill material was encountered in eleven test borings, with depths ranging from one and a half to six feet, average of four feet. Residual soil was found below either topsoil and/or fill material,

extending to depths ranging from six to as deep as twenty-nine feet, average of twelve feet.

Decomposed rock was found in four borings, beneath the residual soil. Intact rock was found in each of the test borings, at depths ranging from eight and a half to twenty-nine feet, average of fourteen feet.

Groundwater was not encountered in any of the test borings taken. Moist soil conditions were encountered in several of the tests prior to reaching the intact rock surface, which does not represent a groundwater table.

Client Information

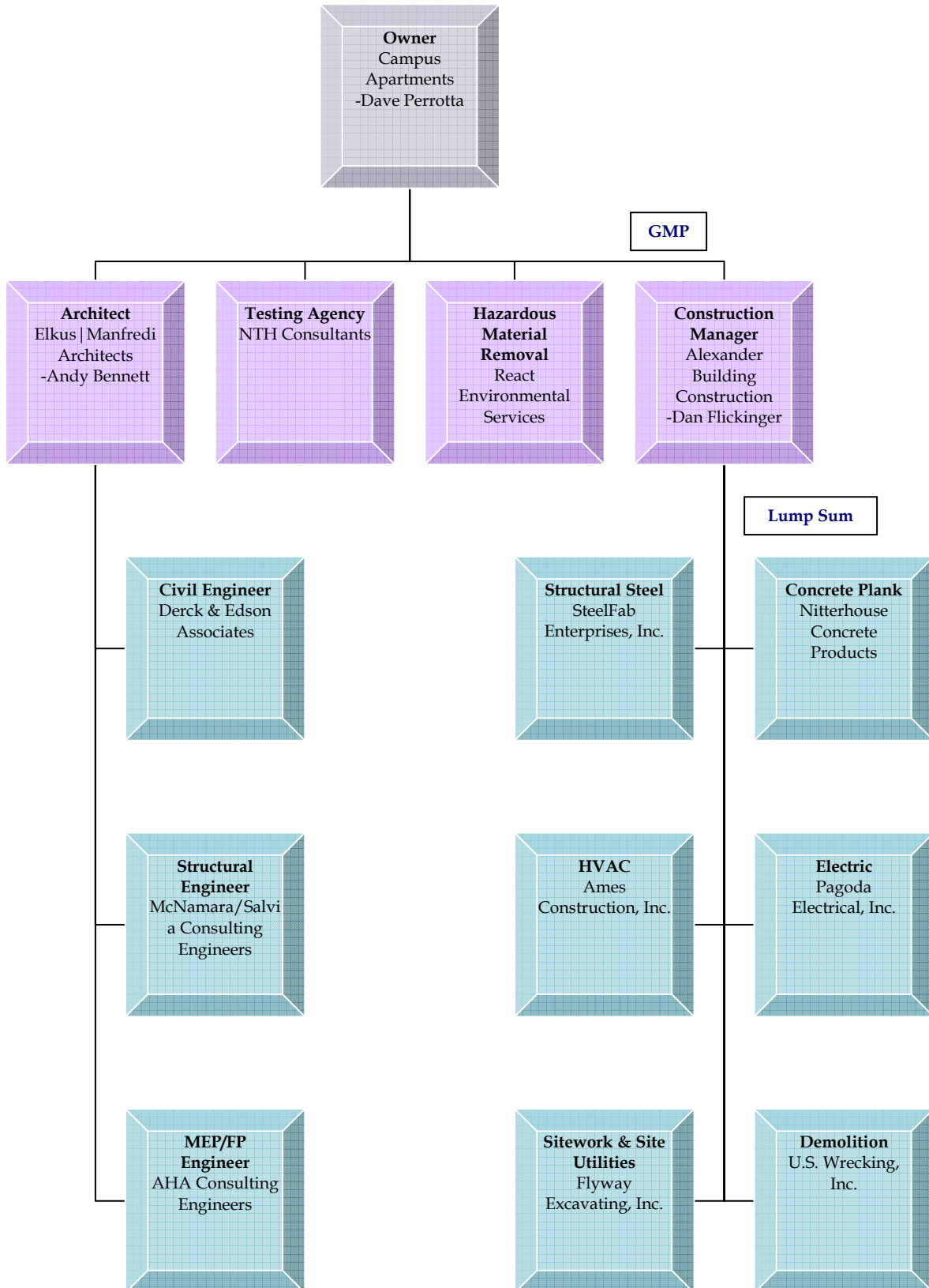
Franklin & Marshall College is building College Row as a response to increased demand for campus housing. Along with the need for more housing, they saw an opportunity in the buildings' location along Harrisburg Pike. Franklin & Marshall will be leasing the first floor of Buildings A and B and Building C will become a grocery store. In order to satisfy their wishes, Franklin & Marshall hired Campus Apartments, Inc. to help them obtain a high-end university housing building project.

Preconstruction and design efforts on the entire project was a year-long process. During that time, Campus Apartments, Franklin & Marshall College, Elkus | Manfredi Architects, and Alexander Building Construction, LLC, worked closely to find means of minimizing costs through efficient design, while ensuring that the quality aspects of the design were not compromised. Keeping those items in mind, the construction contract came out to over \$26 million. This amount reflects the costs required to complete the project. Cost overruns of any significance are not anticipated. Construction is scheduled to be fifteen months in duration, with a substantial completion of July 31, 2007.

Being a college campus, student safety is a major concern. Measures have been taken to ensure safety for everyone both during construction and after the project is turned over to the owner. During construction, OSHA guidelines are expected to be followed for construction workers' safety. Items such as site fencing and traffic control have made the general construction area safe for everyone. Safety elements incorporated into the project design are lighting, access control, security monitoring, and life safety protection such as fire alarms and fire suppression systems, which are beyond the requirements of the local building codes.

Overall, there are no sequencing issues of grave importance to the owner. Any sequencing issues that may arise would be handled by Alexander. College Row is three separate buildings, but given the duration for completion, these buildings will have to be under construction simultaneously, with the substantial completion of the project, in its entirety, of July 31, 2007. There are no phased occupancy requirements on this project. Keys to completing College Row to the owner's satisfaction, simply put, are commitment and professionalism.

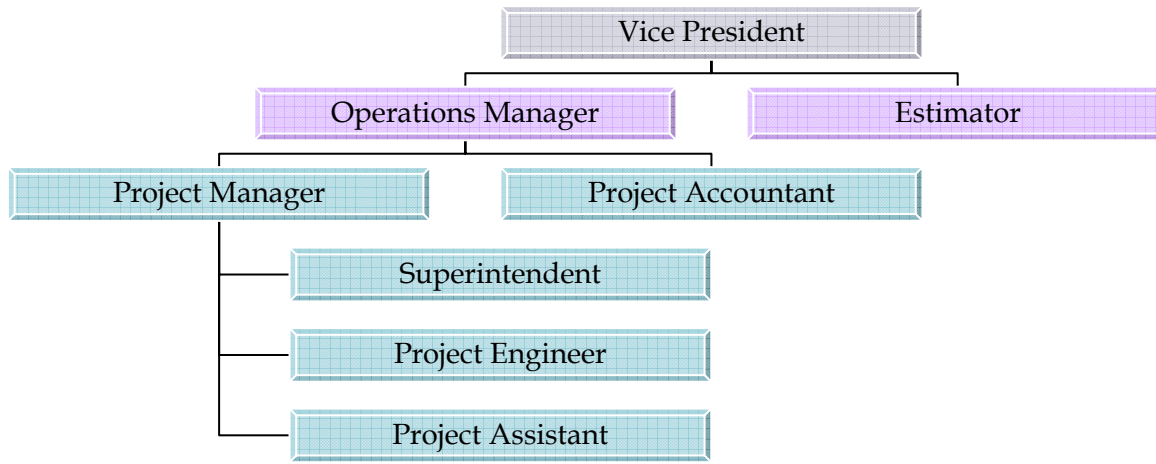
Project Delivery System



The delivery of this project is construction management at risk with a guaranteed maximum price contract. Alexander was brought on during the schematic drawing level. With a GMP, Alexander was able to prepare early budgets and dictate part of the design and design-process. A GMP gives the price protection at an early stage in the project, allowing security in financing. This was also very important based on the need for the project to be completed by next summer.

Contractors are requested to bid by Alexander and the bids are submitted to Alexander. Scopes are then reviewed and a formal "proposal record" is prepared for the owner. With the owner's signature, Alexander enters into contract with the contractor. Acceptation or rejection of a contractor's bid can be made by both Alexander and Campus Apartments. Certificates of insurance are required by each of the contractors before they can perform any work on site. A contractor is required to be bonded depending on the size of the contract.

Staffing Plan



Vice President - The Vice President oversees all aspects of the project.

Operations Manager - The Operations Manager is involved in all aspects of the project, with a focus on the operations on-site.

Project Manager - The Project Manager is the main contact with the Owner and is responsible for the overall performance on the project, from preconstruction to turnover to the Owner.

Estimator - The Estimator is brought on at the preconstruction stage of the project and prepares estimates, bid packages, and evaluates subcontractor bids.

Project Accountant - The Project Accountant is responsible for the cash flow on the project including Owner invoices, subcontractor and supplier invoices and payments, and project cost tracking.

Superintendent - The Superintendent is responsible for work in the field, overseeing subcontractors and operations in the field, including scheduling, and safety and quality control.

Project Engineer - The Project Engineer is responsible for checking shop drawings for accuracy, processing Requests for Information, and maintaining and organizing subcontractor submittals.

Project Assistant - The Project Assistant is responsible for acquiring Certificates of Insurance, the arrival and departure of shop drawings, and coordinating meetings.