Technical Assignment 1: Construction Project Management

Plaza East

Chantilly, Virginia

Steve Miller

Construction Management

Dr. David Riley

Table of Contents

Executive Summary

The report enclosed summarizes the existing construction conditions for the Plaza East Project, the buildings construction process, and scope of work. Information throughout the report is divided into eight sections: a project schedule, buildings systems summary, project cost evaluation, site plan of existing conditions, local conditions, client information, project delivery system, and a staffing plan.

Plaza East is a 5 story cast-in-place, core and shell office building located in Chantilly, Virginia, off the Westfeilds Blvd. exit of Rt. 28. It is a speculative office building built for the owner, Tishman Speyer, a global developer. Other primary members of the project include the architect HOK, and general contractor DAVIS Construction. The building was designed in 1999, and then put on hold until December 2005 for bidding due to the surrounding area not being heavily populated.

The purpose of this initial report is to lay down all the existing information of this project, of which further research will be based on. By obtaining the information in each of these sections, further analysis can be put into issues including varying construction methods or value engineering, which will be examined in technical reports to come.

Project Schedule Summary

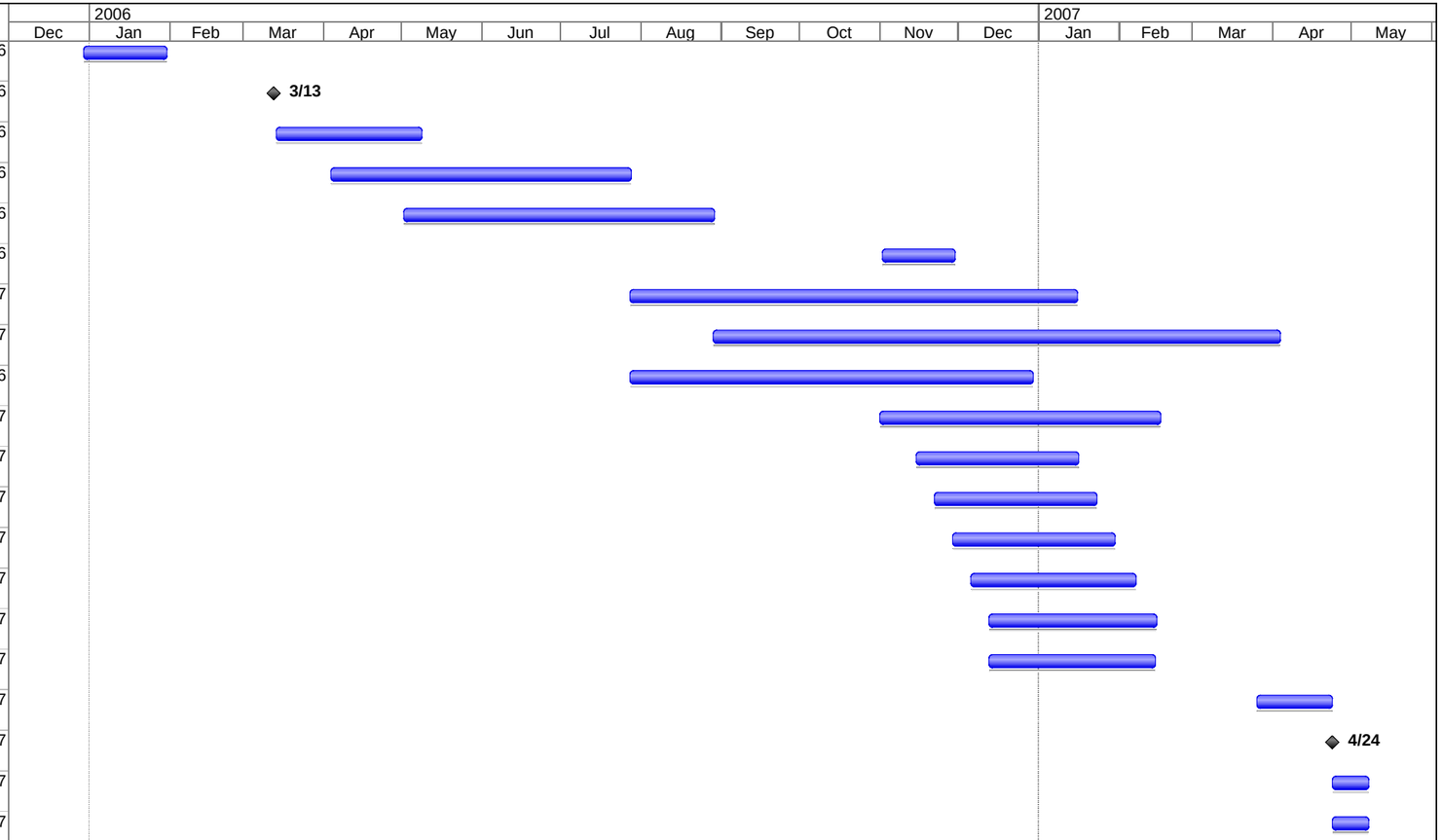
The project began back in 1999 with its design process. After years of being put aside Tishman Speyer bid the project out in December of 2005. January 2006 the Plaza East project was won by DAVIS Construction. There was no demolition to the site besides sparse trees and some vegetation, for the lot bare and fairly open. Both buildings were not far apart, with Building 1 a few weeks ahead of Building 2. Each were completed and inspected by the end of May 5, 2007.

The foundation system for Plaza East used spread footings which were placed with concrete by the direct fall method. There are a total of 32 spread footings on the perimeter of each building

and 20 spread footings within the footprint of each building. Each footing attached to a column which leads up the length of the entire building. As explained before Building 1 started and finished before Building 2, but they were both being constructed at the same time. With the cast in place concrete floors it was easy to use the Short Interval Production Schedule (SIPS) method. Being able to start the next floor before finishing the one below not only helped speed up the process of production, but also helped the finishes proceed along quickly as well. With this method the topping out can happen within a few months after the foundation is poured.

NOTE: For the schedule below the design phase was left out due to the fact it happened in 1999. Being such a vast period of time between the design and procurement of construction services phase, the schedule was not legible enough to read if it was kept on there.

ID	Task Name	Duration	Start	Finish
1	Procurement of Construction Services	4.4 wks	Fri 12/30/05	Mon 1/30/06
2	Notice to Proceed in Field	0 days	Mon 3/13/06	Mon 3/13/06
3	Site Work Construction	8 wks	Tue 3/14/06	Mon 5/8/06
4	Concrete Building 1 (25,200 per floor)	16.7 wks	Tue 4/4/06	Fri 7/28/06
5	Concrete Building 2 (25,200 per floor)	17.1 wks	Tue 5/2/06	Tue 8/29/06
6	Landscaping	4 wks	Thu 11/2/06	Wed 11/29/06
7	Façade	24.4 wks	Fri 7/28/06	Mon 1/15/07
8	Sitework	31.2 wks	Tue 8/29/06	Tue 4/3/07
9	MEP Risers Floors 1-5, Penthouse Finishes (North Building only)	22.2 wks	Fri 7/28/06	Fri 12/29/06
10	Main Lobby	15.6 wks	Wed 11/1/06	Fri 2/16/07
11	1st Floor	8.9 wks	Wed 11/15/06	Tue 1/16/07
12	2nd Floor	8.9 wks	Wed 11/22/06	Tue 1/23/07
13	3rd Floor	8.9 wks	Wed 11/29/06	Tue 1/30/07
14	4th Floor	9.1 wks	Wed 12/6/06	Wed 2/7/07
15	5th Floor	9.3 wks	Wed 12/13/06	Thu 2/15/07
16	Perimeter Wall Fire Caulk, Frame, Hang Drywall and Finishes	46 days	Wed 12/13/06	Wed 2/14/07
17	INSPECTIONS	4.2 wks	Mon 3/26/07	Mon 4/23/07
18	Certificate of Occupancy	0 days	Tue 4/24/07	Tue 4/24/07
19	Punch List	2 wks	Tue 4/24/07	Mon 5/7/07
20	Final Cleaning	2 wks	Tue 4/24/07	Mon 5/7/07



Project: Project Schedule
Date: Thu 10/4/07

Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline

Building Systems Summary

Cast in Place Concrete – The entire structure of the building was made of cast in place concrete. The foundation used spread footings while the rest of the building included cast in place columns and slabs. The slabs also included post tensioned beams across the main columns. There was a mixture of short and long span areas over each floor slab ranging from 13'-6" up to 45'.

Precast Concrete – Precast concrete was only used for the curtain wall and the stairs throughout the building. The precast concrete panels were connected through embeds placed in the cast in place concrete slabs and columns. The precast panels were made in Canada and driven down to the jobsite on tractor trailers.

Mechanical System – The mechanical room for these facilities are located on the roofs and enclosed with a screen curtain wall to keep them from eyesight. Each penthouse stores one 17,000 CFM packaged, air cooled thru wall unit, a 16,800 CFM natural gas, outdoor air ventilation unit, and a cooling tower. This system is combined with five fan powered terminals, eight fans, three pumps, three water cooled A/C units, and four electrical heaters all located throughout each building.

Electrical System – The main power comes in from Westfields Boulevard. It connects with the main feeders of the area running along the street. It comes in on a 3 phase 480Y/270V circuit. The emergency power to Plaza east is supplied through a diesel power unit, producing 150 kW, 187.5 kVA at 480Y/277 Volts.

Curtain Wall – The curtain wall façade was made of precast concrete slabs, mullions, and vision and spandrel glass. Connections were made between the precast concrete and imbeds in the columns and slabs throughout the entire building. The curtain wall windows were designed by Arctec Precision Glazing and tested at ATI in York, PA.

Project Cost Evaluation

Total Area of Project = 246,000 SF 123,000 SF/Building

Building Construction Cost

General Conditions	$ 1,559,650
Concrete	$ 8,510,000
Masonry	$ 40,000
Metals	$ 430,000
Wood	$ 231,973
Waterproofing and Insulation	$ 558,564
Door, Windows, and Glass	$ 3,243,179
Finishes	$ 1,396,000
Specialties	$ 68,623
Equipment	$ 19,966
Furnishings	$ 60,655
Conveying Systems	$ 950,788
Mechanical	$ 3,925,000
Plumbing	w/ Mechanical
Electrical	$ 2,020,000
Total Work	**$23,014,398**
Labor Burden	w/ Above
Insurance and Taxes	$ 165,514
Bonds	$ 175,141
General Contractor Fee	$ 1,053,947
Grand Total without site work	**$24,409,000**
Construction Cost/ Square Foot	**$ 99.22/SF**

Total Project Cost $54,000,000

Total Project Costs/Square Foot **$ 219.51/SF**

Major System Cost

Mechanical	$ 3,925,000
Plumbing	w/ Mechanical
Mechanical & Plumbing/Square Foot	$ 15.96/SF
Electrical	$ 2,020,000
Electrical/Square Foot	$ 8.21/SF
Concrete	$ 8,510,000
Structural Concrete/Square Foot	$ 34.59/SF
Masonry	$ 40,000
	$ .16/SF

D4 Cost

Code	Division Name	%	Sq. Cost	Projected
0	Bidding Requirements	3.35	$4.33	$946,857.83
1	General Requirements	6.92	$8.95	$1,957,877.47
2	Site Work	6.43	$8.31	$1,817,312.17
3	Concrete	13.32	$17.21	$3,765,392.94
4	Masonry	3.13	$4.04	$883,750.12
5	Metals	13.52	$17.47	$3,822,232.06
6	Wood & Plastics	0.89	$1.14	$250,234.96
7	Thermal & Moisture Protection	2.28	$2.94	$643,327.39
8	Doors & Windows	11.53	$14.90	$3,259,979.34
9	Finishes	8.32	$10.75	$2,351,207.85
10	Specialties	1.50	$1.94	$425,036.19
11	Equipment	1.23	$1.59	$348,695.41
12	Furnishings	0.71	$0.92	$200,412.84
13	Special Construction	0.07	$0.10	$21,166.27
14	Conveying Systems	3.38	$4.36	$954,466.54
15	Mechanical	14.43	$18.64	$4,078,754.07
16	Electrical	9.01	$11.64	$2,546,604.71
	Total Building Costs	100	$129.24	$28,273,308.00
				$113.82/SF

*See Appendix A for printout of D4 Cost Estimate

Square Foot Estimate

2007 R.S. Means , Using M.470 Office, 5-10 Story

= $139.38/SF

Location Modifier: Alexandria, Virginia = .93

R.S .Means SF Estimate = **$129.62/SF**

The estimate for Plaza East is lower than the R.S. Means estimate but is close to the D4 estimate. I ran two simulations for D4. The first comparison dealt with D4 not having many projects similar to Plaza East. Plaza East consists of two buildings and I tried coming up with similar buildings by looking for projects having 5 stories and the total square footing of each building combined, which proved to be a mistake. Realizing this I went back into D4 and used

either a 10 story building with the total square footing of each building on the project or a 5 story building with one of the buildings square footing. The difference in the estimate was not more the $15/SF. R.S. Means on the other hand proved to be different. It may have been higher because Tishman Speyer didn't do much with the interior. They constructed a core and shell office building to be sold or rented after it was built. So the building will be bare until they find a client who has specific wants and needs for their office space.

Site Plan

The site plan was developed in the beginning after the project was won by DAVIS Construction. They put together a plan which utilized the space given on the site very well. With all the space given there wasn't many problems with the site layout. The site plan below includes: temporary conditions, construction parking, access roads, hydrants, utility locations, construction fences, and much more.

LEGEND

- Electric
- Telephone
- Temporary Internet
- Temporary Power Supply
- 6' High Construction Fence
- 6' High Existing VDOT Fence
- DAVIS Jobsite Trailer
- Sub Jobsite Trailers & Laydown Areas
- Stabilized Construction Entrance
- Sub & Temporary Parking Areas
- Spoils & Topsoil Stockpiles With Erosion Control
- Construction Traffic / Loading & Unloading Zone
- Temporary Toilets

Westfields Blvd

8'-0" Wide
Construction Gate

BUILDING 1
5 STORY OFFICE
BLDG

BUILDING 2
5 STORY OFFICE
BLDG

Parking after Paving

Temp Water Meter on Hydrant

246' - 1"

Park Meadow Drive

Double Swing
Construction Gates

Temp Water Meter on Hydrant

N

Technical Assignment 1 - Site Plan
Plaza East

Steven M. Miller
Construction Management
Dr. Riley

1/32" = 1' - 0"

Local Conditions

According to the geotechnical report by ECS – Mid-Atlantic, LLC the majority of the site is mapped as Brecknock SILT Loam Undulating Phase and all soils found during their exploration are consistent with this type of soil. These soils consist of deep light-colored, well to moderately well drained soils that have formed in the residuum of baked Triassic shaley sandstone. It is a very vast site with no close neighboring buildings to demolish. This in turn has left plenty of space for construction parking and site layout.

With the soil encountered, ECS provided multiple methods including shallow and deep foundation alternatives of construction for this region. Based on the subsurface conditions encountered at the location sampled and their current understanding of the structural loads and building details, the on-site soils appear to be generally suitable for supporting the proposed buildings on shallow foundation systems, caisson foundations, or drilled piers. The latter are excellent deep foundation systems that can also be used if rather large or uneconomical shallow footing dimension are required. Caissons also have the advantage of being able to be readily constructed in almost any weather condition.

Shallow Foundation Alternative:

ECS says the proposed office buildings can be supported on a system of shallow foundations consisting of spread and/or continuous footings. Based on the assumed structural loading, SPT values, and pressuremeter data performed in the borings on-site, they recommend footings bearing on natural soils with a minimum SPT value of 11 blows per foot of penetration be designed using a net allowable bearing pressure of 3,000 pounds per square foot. For footings being placed on engineered fill placed in accordance with the earthwork operations section a net allowable bearing pressure of 3,000 pounds per square foot should also be used. In order to reduce the possibility of foundation bearing failure or

excess settlement due to local shear or “punching” action, they recommend that all continuous footings have a minimum width of 1.5 feet and that all isolated column footings have a minimum lateral dimension of 2.5 feet. In addition, footings should be placed at a depth to provide adequate frost cover protection. For this region, ECS recommend footings and grade beams, if any are being placed in heated areas, it should be at a minimum depth of 2 feet below the finished grade. If any Footings and grade beams are in unheated areas they should be placed at a minimum depth of 2.5 feet below the finished grade.

Deep Foundation Alternative:

Based on the information gained during their subsurface exploration, they believe that caisson foundations may be an economical and highly viable alternative. If the caisson foundations are used, they should be extended through the weathered rock materials and be founded in competent rock.
For design and bidding purposes, competent rock may be set at elevations approximately 3 feet below the average hollow stem auger refusal depth of nearby borings. They say all caissons shall have a minimum shaft length of 3 times their diameter, recommending a minimum diameter of 2.5, this results in shaft lengths of 7.5 feet or greater. This requirement will most likely not be an issue since most of the borings encountered auger refusal below 7.5 feet.
Caisson foundations found in competent rock may be designed for an allowable bearing pressure of 50 tons per square foot, which is inclusive of both base resistance and side friction components for compressive footings. Though technically feasible, the on-site siltstone rock materials do not lend themselves easily to belling of caissons. If a belled shaft system is used, the bell diameter should not be more than twice the caisson shaft diameter.
Where uplift capacity is required, the ultimate side friction resistance of 3,000 pounds per square foot may be used for that portion of that caisson below the hollow stem auger refusal depth and also at least two caisson diameters below

> the finished ground elevation. Hence, caissons requiring up lift capacities may need to be extended to elevations lower than those set by estimated competent rock elevation. Belled caissons can provide uplift capacity's though they are difficult to construct and should this design option be required they ask you to contact them at ECS for additional design recommendations.

> The settlement of individual footings or drilled piers, designed in accordance with ECS recommendations presented in this report, is expected to be small and within tolerable limits for the proposed buildings. Due to the relatively incompressible nature of the rock materials, it is technically feasible to use both drilled piers and spread footing foundations within the same building. Total and differential settlements for either foundation system is expected to be similar (about 1 inch total and ½ inch differential), and therefore, no special precautions for mixing of these foundation systems is expected.

Observations for groundwater were made during sampling and upon completion of the drilling operations at each boring location. Groundwater seepage was observed in only one boring during their subsurface exploration. Groundwater was found at 7.5 feet below existing grades for this boring. Because of the perched nature of the groundwater at this site, long term groundwater conditions can be deceptive. Although the true groundwater table can exist several hundred feet below the existing ground surface, groundwater located in streams and creeks, as a result of perched overland flow, creates the presence of an effective near surface groundwater table. Because the water is perched and flows at the interface between the soil and natural bedrock, water exiting fracture channels and cracks is common. Therefore, although all building excavations may appear dry at the time of completion, it is very common for fracture patterns in the rock, as a result of natural conditions or blasting to become natural springs for water flow. Therefore all buildings with basements or partial below grade areas should be designed with perimeter and underslab drain systems. Lucky for Plaza East there is no basement, so groundwater does not have much of an effect at this site.

Client Information

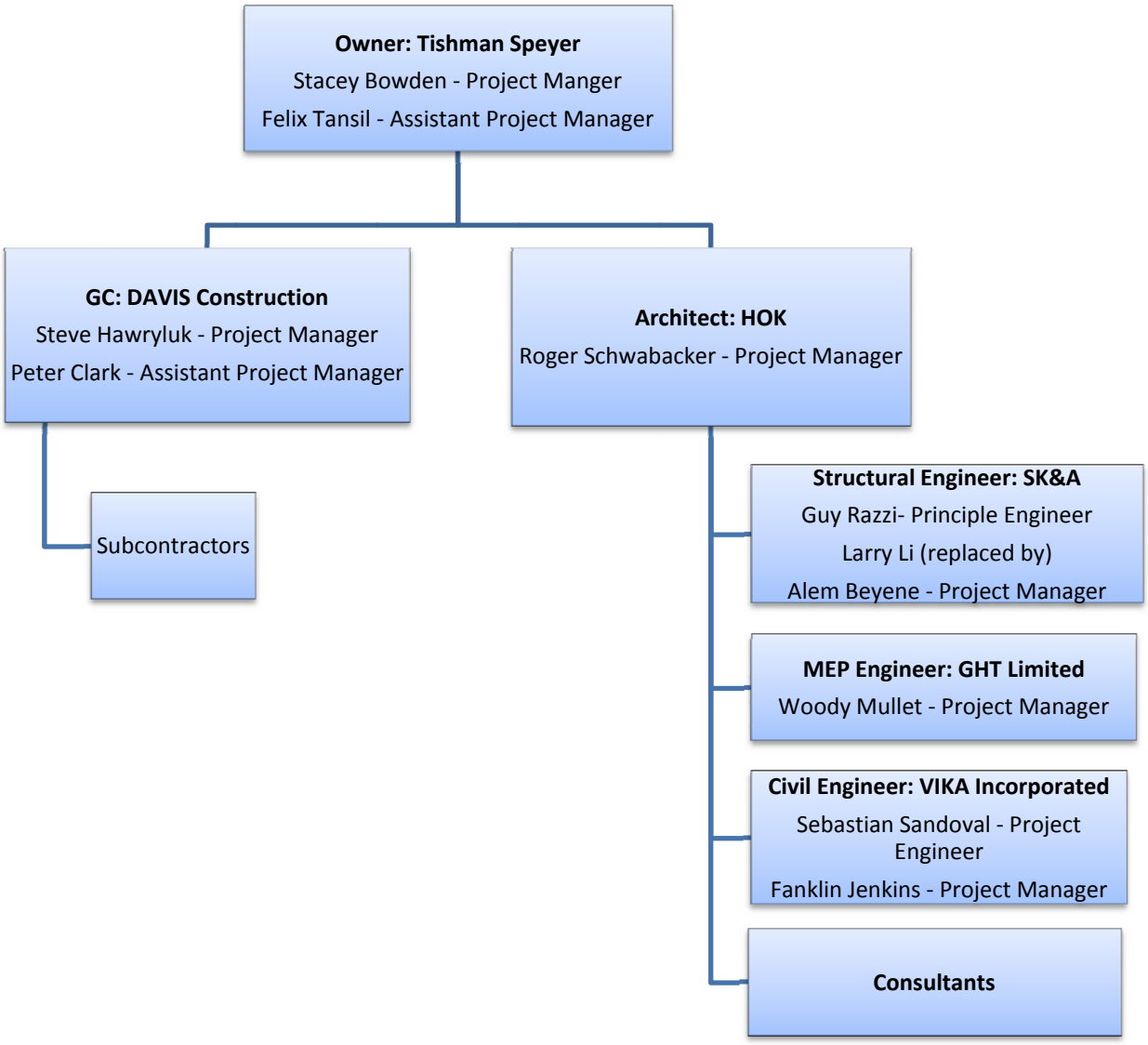
Tishman Speyer is a developer located around the world. Their Headquarters is located at Rockefeller Center in New York, New York. Tishman Speyer builds many office buildings to either rent out to tenants and manage or sell them off for a profit. Plaza East is a speculative building that they had HOK design back in 1999. The building construction was pushed back a few years until 2005 and updated to fit the 2003 Business Code. Tishman Speyer wanted to wait for the area around the building to blow up economically.

Tishman Speyer is very devoted to their high quality standard. Safety is their number one concern. They also have a standard for wanting nothing but the best in their material and in the contractors they put bids out to. They only build Class A buildings and will not downgrade for any reason. It does not matter if the building is put in a Class B or Class C area. With that in mind they made sure to have a Fire Safety Consultant and a Building Code Consultant on the Plaza East project in order to follow the Fairfax, fire, jurisdiction, and building codes. They did not have any sequencing issues. They left that up to the general contractor, DAVIS Construction. As long as their standards are followed their projects, such as Plaza East, will be built to their satisfaction.

Project Delivery System

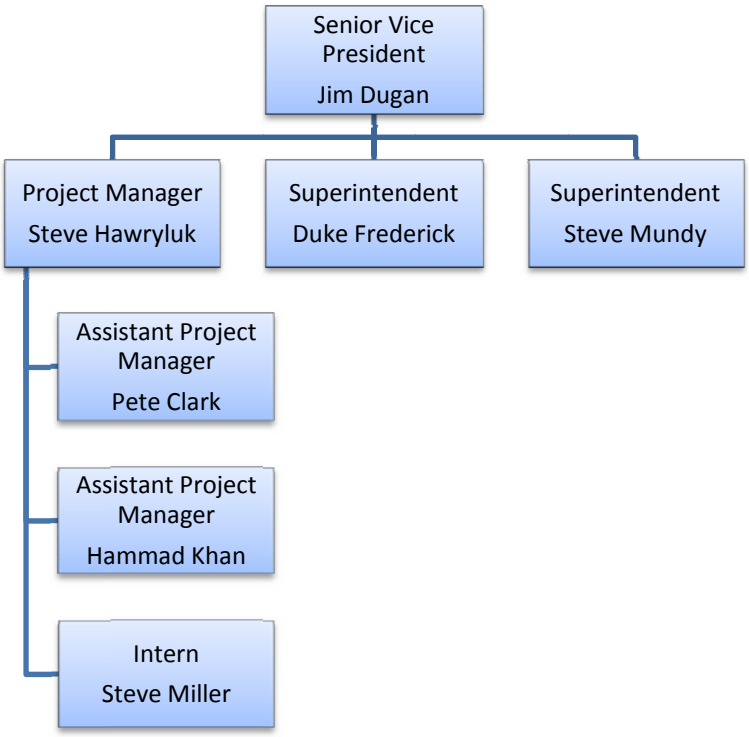
Plaza East was delivered by design-bid-build. Tishman Speyer has used this method to get the best price and scope of work for the project. This project was pushed back about six years after its design process in 1999. They choose from multiple architects depending on the type of building and their portfolios. For Plaza East they chose HOK with a lump sum contract. After those six years there was a four month period of upgrading the drawings to the 2003 Building Code status in 2005. Bids went out to three major contractors in December of 2005. After a month, Tishman Speyer contracted DAVIS Construction in January of 2006 for Plaza East. The contract was Lump Sum with DAVIS with a bond of 1- 1 ½% of construction cost. DAVIS has

a few insurances on Plaza East also, including, Builders Risk, Workers Comp, Labor, and Material Insurances. DAVIS Construction typically only held bonds on subcontractors whose contract value is over $500,000 or whose scope of work included structural elements that require engineering on the part of the subcontractor (ie: window washing roof davits or similar equipment).


Owner: Tishman Speyer
Stacey Bowden - Project Manger
Felix Tansil - Assistant Project Manager
GC: DAVIS Construction
Steve Hawryluk - Project Manager
Peter Clark - Assistant Project Manager
Subcontractors
Architect: HOK
Roger Schwabacker - Project Manager
Structural Engineer: SK&A
Guy Razzi- Principle Engineer
Larry Li (replaced by)
Alem Beyene - Project Manager
MEP Engineer: GHT Limited
Woody Mullet - Project Manager
Civil Engineer: VIKA Incorporated
Sebastian Sandoval - Project Engineer
Fanklin Jenkins - Project Manager
Consultants

Staffing Plan

James G. DAVIS Construction Corporation



James G. DAVIS Construction has multiple Vice Presidents. Project Plaza East was being handled under VP Jim Dugan and his group. Mr. Dugan's project manager for Plaza East is Steve Hawryluk, who was then followed by two assistant project managers, Pete Clark and Hammad Khan. They all had help for their intern Steven Miller, who performed many tasks including submittals, updating drawings, and supervising the curtain wall mockup at ATI in York, PA. The two superintendents, who headed up the field side of operations under Mr. Dugan were, Duke Frederick and Steve Mundy. All five of these men worked with the subcontractors on board for this project.

Appendix A

Estimate of Probable Cost

Plaza East - Jan 2006 - VA - Alexandria

Prepared By:	**Steven Miller**	Prepared For:	**Dr. Riley**
	136 East Fairmont		
	State College, PA 16801		**,**
	717 451 5825 Fax:		**Fax:**
Building Sq. Size:	**218773**	Site Sq. Size:	**444008**
Bid Date:	**12/30/2005**	Building use:	**Office**
No. of floors:	**5**	Foundation:	**CON**
No. of buildings:	**2**	Exterior Walls:	**CUR**
Project Height:	**78**	Interior Walls:	**GYP**
1st Floor Height:	**12.5**	Roof Type:	**BUP**
1st Floor Size:	**25200**	Floor Type:	**CON**
		Project Type:	**NEW**

Division		Percent	Sq. Cost	Amount
00	**Bidding Requirements**	**3.35**	**4.33**	**946,858**
	Bidding Requirements	3.35	4.33	946,858
01	**General Requirements**	**6.92**	**8.95**	**1,957,877**
	General Requirements	6.92	8.95	1,957,877
02	**Site Work**	**6.43**	**8.31**	**1,817,312**
	Site Work	6.43	8.31	1,817,312
03	**Concrete**	**13.32**	**17.21**	**3,765,393**
	Concrete	13.32	17.21	3,765,393
04	**Masonry**	**3.13**	**4.04**	**883,750**
	Masonry	3.13	4.04	883,750
05	**Metals**	**13.52**	**17.47**	**3,822,232**
	Metals	13.52	17.47	3,822,232
06	**Wood & Plastics**	**0.89**	**1.14**	**250,235**
	Wood & Plastics	0.89	1.14	250,235
07	**Thermal & Moisture Protection**	**2.28**	**2.94**	**643,327**
	Thermal & Moisture Protection	2.28	2.94	643,327
08	**Doors & Windows**	**11.53**	**14.90**	**3,259,979**
	Doors & Windows	11.53	14.90	3,259,979
09	**Finishes**	**8.32**	**10.75**	**2,351,208**
	Finishes	8.32	10.75	2,351,208
10	**Specialties**	**1.50**	**1.94**	**425,036**
	Specialties	1.50	1.94	425,036
11	**Equipment**	**1.23**	**1.59**	**348,695**
	Equipment	1.23	1.59	348,695
12	**Furnishings**	**0.71**	**0.92**	**200,413**
	Furnishings	0.71	0.92	200,413
13	**Special Construction**	**0.07**	**0.10**	**21,166**
	Special Construction	0.07	0.10	21,166
14	**Conveying Systems**	**3.38**	**4.36**	**954,467**
	Conveying Systems	3.38	4.36	954,467
15	**Mechanical**	**14.43**	**18.64**	**4,078,754**
	Mechanical	14.43	18.64	4,078,754
16	**Electrical**	**9.01**	**11.64**	**2,546,605**
	Electrical	9.01	11.64	2,546,605
Total Building Costs		**100.00**	**129.24**	**28,273,308**

Total Non-Building Costs	**100.00**	**0.00**	**0**
Total Project Costs	**--**	**--**	**28,273,308**

Building Division Notes

Plaza East - Jan 2006 - VA - Alexandria

Bidding Requirements	Averaged subdivision. Used in 4 of 7
General Requirements	Averaged subdivision. Used in 6 of 7
Site Work	Averaged subdivision. Used in 7 of 7
Concrete	Averaged subdivision. Used in 7 of 7
Masonry	Averaged subdivision. Used in 6 of 7
Metals	Averaged subdivision. Used in 7 of 7
Wood & Plastics	Averaged subdivision. Used in 7 of 7
Thermal & Moisture Protection	Averaged subdivision. Used in 7 of 7
Doors & Windows	Averaged subdivision. Used in 7 of 7
Finishes	Averaged subdivision. Used in 7 of 7
Specialties	Averaged subdivision. Used in 7 of 7
Equipment	Averaged subdivision. Used in 2 of 7
Furnishings	Averaged subdivision. Used in 5 of 7
Special Construction	Averaged subdivision. Used in 1 of 7
Conveying Systems	Averaged subdivision. Used in 7 of 7
Mechanical	Averaged subdivision. Used in 7 of 7
Electrical	Averaged subdivision. Used in 7 of 7