Project Information and Background

Project Information:

Plaza East includes two 5 story cast-in-place, core and shell office buildings 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.

Each building has 123,000 sq ft for a total of 246,000 sq ft, and around 25,000 sq ft per floor. These office buildings are two of the same. Mirroring each other on a ninety degree angle these rectangular shaped buildings have precast concrete slabs and windows covering the exterior wall. Each floor has large windows interrupted by concrete columns and rows running up and along the building. Except for half of the fifth floor, which has a horizontal display of glass, the building is only separated by mullions and then covered by the precast towards the roof. The first floor has a large lobby which extends through the entire building. The lobby leads to the core of the office building which houses the elevators. Two stair cases are located in the center of each side of the building. Other than the lobby, the first floor along with each other floor is open for the tenant to place walls wherever they please.

The entire facade of the building is a curtain wall consisting of precast concrete, mullions, and large panes of vision and spandrel glass. There is a large wall protruding from each side of the building and above, but not connecting across the roof, almost making the appearance that the building is sectioned into two. This wall is covered by precast concrete panels and is completely for show. The roof houses a large mechanical screen wall to block the view of any mechanical and elevator equipment rooms. The roof is built up above a concrete slab with insulation followed by a topping of gravel. The mechanical system runs from the roof down through building by ducts and cutouts in the slabs.

Client Information:

Tishman Speyer is a very large developer with many locations around the world. Their Headquarters is located at Rockefeller Center in New York, New York. Tishman Speyer builds many office buildings to either rent to tenants and manage, or sell them for a profit. Plaza East is a speculative building which HOK designed back in 1999. The building construction was delayed a few years until 2005 and updated to meet the 2003 Business Code. Tishman Speyer wanted to wait for the area around the building to become more economically sustainable.

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 hire. 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:

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 delayed about six years after its design process in 1999. They choose from multiple architects based on the type of building and project comparisons with the individual architect's 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 a lump sum contract 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). There are many subcontractors to list but only a few are in the hierarchy on **Figure 1**.

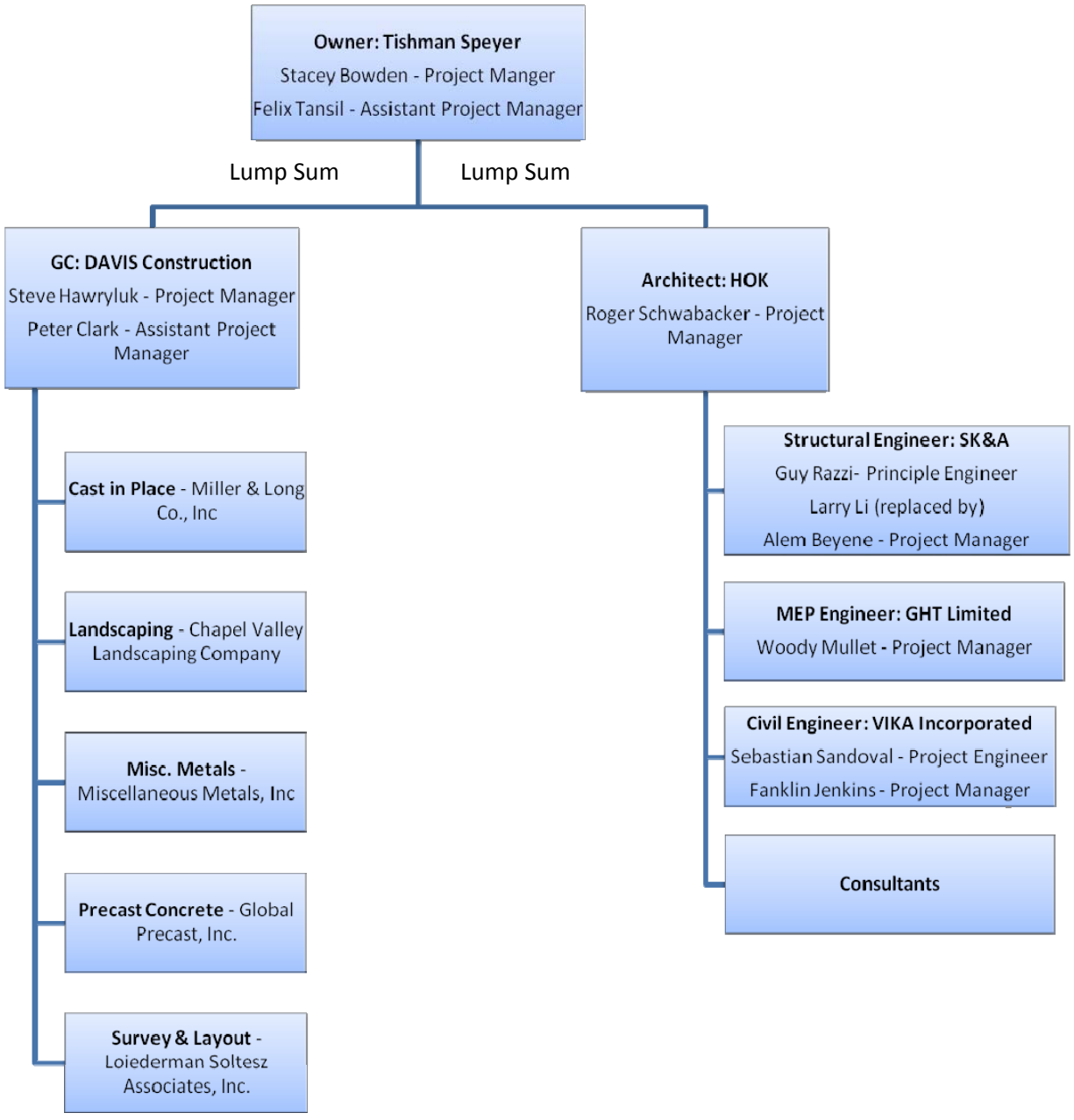

Fig 1

Project Team:

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 from 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 progression under Mr. Dugan were, Duke Frederick and Steve Mundy. All five of these men worked with the subcontractors on board for this project. All can be seen in **Figure 2** below.

Plaza East ran very smoothly and it could be because of the appropriate staffing on the job. They had the project work load spread evenly throughout the employees to get the job done well.

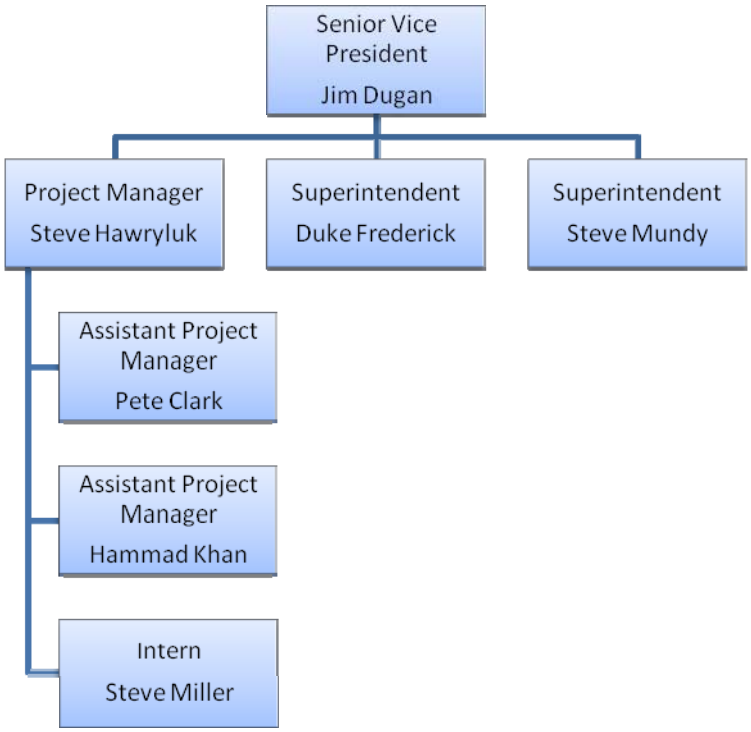

Fig 2

Building Systems Summary:

Structural Cast in Place Concrete:

The entire structure of the building was made of Cast in Place, post tensioned concrete, 80 lb/sq ft live load, 20 lb/sq ft partition load capacity. 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 with bays ranging from 45' X 20' at the perimeter and 27' X 20' typical interior bay. The roof was a hot - applied rubberized asphalt system with a 15-year system warranty. Crane and bucket was the typical pouring method for the foundation and columns. A pump truck was used for each floor slab. Using both methods helped with time and efficiency. The slab on grade was a 5" thick, 3,500 psi normal weight concrete, reinforced with 6x6-W1.4xW1.4 welded wire fabric on a 6 millimeter polyethylene sheet over 6" wash crushed stone. Each additional floor slab was post-tensioned beam and non-post-tensioned one-way slab construction with 4,000 psi normal weight concrete with 7" thick slabs. Each was reinforced as shown on each structural floor plan. Concrete canopies only occur at second floor level.

Precast Concrete/Curtain Wall:

Precast concrete was 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. The curtain wall façade consisted of precast architectural spandrel panels and column covers with mullions, vision and spandrel glass; 1-inch thin slat Venetian blinds provided for perimeter windows. The curtain wall windows were designed by Arctec Precision Glazing and tested at ATI in York, PA.

Mechanical System:

Each typical floor has a 90-ton A/C unit capable of providing the equivalent capacity ratio of one ton for each 254 sq. ft of usable floor area. There are approximately 17 fan

powered VAV boxes with re-heat coils and 8 cooling only VAV boxes to provide sufficient conditioned air to each floor. The self contained A/C unit has a variable frequency drive that allows the fan motor to adjust speed to meet current cooling load demands, with multiple compressors, and economizer coil that allows for free cooling based on outside air and humidity, medium efficiency filters, integrated control panel compatible with the building DDC control system. The supply air ductwork is constructed to medium pressure SMACNA standards as part of the base building.

Electrical/Lighting System:

The building power distribution system will be derived from Dominion Virginia Power transformers located on a concrete pad adjacent to the building. The power throughout the building will be distributed from one (1) 4000 (this should be 3000 per Dominion) amp 277/480V switchboards located in ground floor switchboard room. The power to base building loads will be distributed by conduit and wire risers. The power to tenant floors will be provided from one 3000 amp bus duct and associated bus duct plug in units. The emergency power to Plaza east is supplied through a diesel power unit, producing 150 kW, 187.5 kVA at 480Y/277 Volts. Lighting and telecommunications will be put in on behalf of the tenants and was not under contract of the GC.

Conveying System:

Each building contains one three car group of 350 fpm traction passenger elevators. Each group is provided with two 350 fpm @ 3500 lbs. (passenger) and one 350 fpm @ 4000 lbs. (passenger/freight). The elevators will have an elevator card key access to all floors combined with a perimeter access security to each building. Each floor has emergency exits with stairs located centrally in each half of the building.

Fire Protection System:

Plaza East will be provided with a complete installation for a new Class A system with Style D, Style 6, and Style Z circuit types for multi-plex addressable, fire alarm system with all alarm, audio, elevator recall, mechanical units control, remote station notification, and security system interface. The installation of the project's fire alarm system shall conform to the

applicable sections of the NFPA-72 Virginia State Uniform Building Code, requirements of BOCA, NEC, and the Fairfax county Fire Marshal.

Project Cost Summary:

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

General Conditions Estimate:

Plaza East had a combination of general conditions, insurance and taxes, bonds, and a general contractor fee estimate equaling $3,265,638 in its proposal. This comes out to be 11.8% of the total construction cost according to their proposal. The breakdown of the General Conditions was done by dividing the total cost given by the weeks of the project. Anything not divided by the duration of the project was considered a Lump Sum. Below, **Table 1**, is a summary of the General Conditions Estimate.

For a detailed breakdown of the General Conditions Estimate see Appendix A

General Conditions Summary	
Labor	$1,107,214.00
Material	$692,152.00
Equipment	$71,670.00
Insurance and Taxes	$165,514.00
Bonds	$175,141.00
General Contractors Fee	$1,053,947.00
Total =	$3,265,638.00

Table 1

Detailed Project Schedule:

Plaza East is a fairly simple project. The duration for this project was planned to span less than 58 weeks. There was no need for multiple complex phases to the project. Each building was being erected at the same time, with building 1 slightly ahead of building 2. On the next page are some key dates from the original schedule put together back in 10/24/2005. The Notice to Proceed came later than expected which pushed some of the dates back. The project still has not been handed over to a tenant for occupancy yet and is still owned by Tishman Speyer.

For the Detailed Project Schedule see Appendix B

Key Project Dates

Notice to Proceed	3/13/06
Complete Excavation	3/27/06
Concrete Complete on Tower #1	6/15/06
Concrete Complete on Tower #2	7/13/06
Complete MEP Risers	11/13/06
Complete All Façade Installation	11/23/06
Complete Main Lobby	12/26/06
Complete All Finishes	12/26/06
Complete All Site Works	2/8/07
Substantial Completion	3/7/07
Building #1 Complete	4/13/07*
Building #2 Complete	5/14/07*

*Project Dates have changed from original schedule

Site Layout Planning

Plaza East was built on a very large lot with no close surrounding buildings. This in turn gave the project plenty of room for whatever was needed during each aspect of the project. There was always plenty of room for parking, material storage, equipment, trailers, etc.

For Excavation Site Plan See Appendix C.1

The first site layout plan for this project is the site work and excavation plan. There wasn't much excavation for these two buildings. The excavation included shallow footings and leveling the ground for the SOG. This in turn made this first phase fairly quick and simple. During excavation, materials were being brought in to begin the structural aspects of the buildings. The majority of materials consisted of cables (for post-tensioning), rebar, and formwork. The traffic was not as strict during this phase and had plenty of room to move

around. Cars would enter the site and head left to park. Some cars parked in front of the trailers the entire duration of the project.

For Superstructure Site Plan See Appendix C.2

The second site layout plan demonstrates where everything was placed for the majority of the project. The materials were placed in the same areas as before. After the parking lot was paved, there was plenty of area for everybody's cars. During this phase you can see the traffic direction became stricter, which eventually helped keep the path as a one-way traffic area.

Research: Implementation of Software for Steel Buildings

An important issue facing the construction industry today is the implication of building information modeling (BIM) to projects. It is a growing technology and is not being implemented in the present time as much as it could be. If this software is used more often it can lead to better quality buildings and quicker turnovers.

Problem Statement:

What are the benefits of implementing BIM software into construction projects, particularly with steel lead times? Concrete is often used on a project, when considering lead time, over steel. If BIM can be used to lessen steel delivery lead time, it can be used more frequently than concrete.

Research Goal:

BIM is a growing technology and it is getting past its beginning stages of progression. The goal is to speak to a company who has used BIM for its structural steel erection and to explain how it has helped them speed up the process. Research will be done on other case studies to prove how it has helped speed up the design and lead time process. BIM shall also be