



**SILVER SPRING GATEWAY
Building Statistics**

**1133 East-West Highway
Silver Spring, Maryland**



**The Pennsylvania State University
Department of Architectural Engineering
Senior Thesis 2007-2008**

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INTRODUCTION

The Silver Spring Gateway (Cover and Figure 1) is located at 1133 East-West Highway in Silver Spring, Maryland. The existing tight, flat urban brownfield site, surrounded by Blair Mill Road to the Northwest, East-West Highway to the South, and CSX Transportation, Inc. Railway to the Northeast was used primarily as a parking lot (Figure 2). The Silver Spring Gateway site currently abandons a section of Blair Mill Road, transforming the original trapezoidal shaped site to a more useable, rectangular shaped site (Figure 3). Construction of the fifteen-story, 766,459 square feet building was started in July 2006 and is scheduled to be completed in July 2008 with an estimated bid cost of \$89 million. The mixed-use, primarily residential, building owned by The JBG Companies was designed by Weihe Design Group (WDG) of Washington, D.C., and is being constructed under a gross mean price, design-build contract by multiple prime contractors, including general contractor and construction manager Turner Construction Company (Turner) of Washington, D.C. Tadjer, Cohen, Edelson Associates, Inc. (TCE) of Silver Spring, Maryland served as the structural engineering firm (See Appendix A for Project Team Directory).

DOCUMENT REVIEW AND SITE INVESTIGATION

The following documents, listed in ascending chronological order, were either furnished for review or otherwise considered:

- Geotechnical Report dated 13 May 2005 by GeoConcepts Engineering, Inc. (GCE)
- Construction Documents S1.01-S4.05 dated 31 August 2006 by TCE and WDG
- Construction Documents C1-C32 and S1 dated 3 November 2006 by Loiederman Soltesz Associates, Inc.
- Construction Documents and A1.01-A12.41 dated 17 November 2006 by WDG
- Shop Drawings F1.01-F15.02, B1.01-B1.03, C.01-C.39, L1.01-L1.08, PH.01-PH.07, W.01-W.05 dated 17 March 2006 by Harris Rebar
- Shop Drawings PT-0.00-PT-1.61 dated 12 August 2006 by Suncoast Post-Tension L.P.
- Specifications Sections 00001-14560 dated 6 April 2007 by WDG
- Site Photos taken 20 July 2007 (See Appendix B for Photos)

ARCHITECTURE DISCUSSION

According to the Urban Land Institute, a development containing “three or more significant revenue producing uses, significant functional and physical integration of the different uses, and conforms to a coherent plan” is defined as a mixed use development. The Silver Spring Gateway certainly exudes this quality as it contains 14,080 square feet of retail space located on the Ground Floor, 100,215 square feet of parking extending from the Basement Level (B1) to the Seventh Floor, and 395,439 square feet of residential space (condominiums and apartments) dispersed among the Second Floor through the Fifteenth Floor (Figure 4). The Basement Level is a rectangular space below grade completely dedicated to parking. The parking garage is sited in the rear of the building or northeast section and continues with

the same shape and overall size for eight floors. The Ground Floor is “L” shaped with the long leg parallel to and the short leg pointing toward the East-West Highway and accommodates the lobby, fitness center, and common spaces for the residents; as well as, the retail portion of the building (Figure 5). The retail space is located in the front of the building or south and southwest section along the East-West Highway and is divided by an internal street located at the southeast corner leading to the parking garage entrance. The service corridor and loading dock for the retail space acts as a buffer between the residential public and retail spaces and the parking garage. The service corridor, loading dock, and portions of the internal street utilize a heated ceiling system.

The second floor contains a portion of the residential space located toward the front of the building and a section of the parking garage located in the rear of the building. With a shape similar to the Ground Floor, the second floor also helps reconnect the portion of the building separated by the internal street with an enclosed pedestrian bridge spanning approximately 36 feet. Floors three through six follow the same layout and shape as the second floor except for the bridge area, which contains residential space. The Seventh Floor also maintains the same layout and shape as floors three through six; however, the floor initiates a shape and layout change through the parking garage section. The center portion of the last parking garage level will be open from above and will be surrounded on three sides by the remaining floors (Photo 2). The end portions of the parking garage will utilize a heated ceiling system similar to the Ground Floor.

The remaining eight floors are strictly for residential use and organized in a “figure four”. The corridor running through the center of the layout is doubly loaded. Starting on the Twelfth Floor, the southern tip of the building shortens and creates a restricted access roof for the remaining four floors. The penthouse roof maintains the “figure four” layout from below and contains several mechanical and electrical rooms, picnic areas, and a 1,000 square foot residential swimming pool with related functional amenities to complete the fifteen story mixed use development (Figure 6).

The exterior façade of the Silver Spring Gateway is comprised of several different systems. The primary system is a Norwegian and Engineer brick masonry cavity wall with cold formed light gauge steel back-up framing. The Ground Floor utilizes a similar system, however, is expressed differently with prairie stone along with an aluminum storefront curtain wall system for retail areas. Small portions of the building also exhibit Centria aluminum faced composite panels and metal screen walls near the penthouse level and on the parking garage elevation for acoustical concerns. The owner has also opted to incorporate a moisture control initiative with extensive flashing details and unorthodox elevation construction.

As a mixed use building, the Montgomery County Zoning Ordinance mandates the following requirements for the non-historical Commercial Business District (CBD-2) Zone:

Zoning Ordinance	Requirement	Actual
Minimum Net Lot Area	22,000 square feet	111,274 square feet
Maximum Total Gross Floor Area	584,185 square feet	523,428 square feet
Maximum Floor Area Ratio (FAR)	5.0	4.48
Dwelling Units	536	457
Dwelling Units/Acre	200	170
Total Public Use Space (% of Net Lot)	20%	22%
Total Public Use Space	23,510 square feet	24,508 square feet
Maximum Building Height	143 feet	143 feet
Setbacks	0 feet	Varies

Montgomery County has also adopted the following model codes to govern the design of Silver Spring Gateway:

- International Building Code of 2003 (IBC 2003)
- International Mechanical Code of 2003 (IMC 2003)
- Washington Suburban Sanitary Commission (WSSC) Plumbing Code
- National Electrical Code 2002 (NEC 2002)
- National Fire Protection Association 101/1997 (NFPA 101/1997)
- International Energy Conservation Code of 2003 (IECC 2003)

STRUCTURAL SYSTEM DISCUSSION

With the Silver Spring Gateway located approximately seven miles from Washington, D.C., it comes as no surprise that the primary structural material is concrete. Per the geotechnical report published by GCE, the foundation system utilizes caissons ranging from 30 inches to 66 inches in diameter with a minimum depth of 10'-0" below grade. Exterior grade and transfer girder beams ranging in size from 12 inches by 30 inches to 54 inches by 66 inches were needed to avoid the 72 inches in diameter storm line that travels through the site. A four inches thick slab on grade and spread footings were also employed where appropriate.

While the basement level and ground floor systems are 8 inches or 12 inches thick normal weight cast in place reinforced concrete, the remaining floors utilize a 7 to 9 inches thick two way flat plate post tensioned concrete system. One hundred and seventy-six reinforced concrete columns support the selected floor systems. The lower level columns have 10 feet by 10 feet by 5 ½ inches thick drop panels. Several columns are sloped to realign the upper floor grid with the lower floor grid. While the bay dimensions are not consistent throughout the building with rotated columns and radial column lines, the longest span of the two way flat plate post tensioned floor slab is approximately 27 to 30 feet. The lateral load resisting system consists of three 12 inches thick concrete shear walls located in the north, east, and south corners of the building.

Although most of the Silver Spring Gateway structure is cast in place reinforced or post tensioned concrete, the enclosed pedestrian bridge and canopy structures are exposed structural steel. The bridge system in particular is constructed of a 6 ½ inches thick composite concrete slab on six steel trusses composed of W14x114 chords and W12x210s, W12x190s, and W10x45 web members spanning approximately 36 feet (Photo 7). Several W16, W14, and W12 composite infill beams, along with the steel trusses, are moment connected utilizing full penetration welds (Photo 8). Composite W14x257 steel columns encased in a two feet by two feet concrete column supports the entire bridge structure. The canopy members and wall panel supports are typically tube shaped steel members.

ENGINEERING SYSTEMS DISCUSSION

The Silver Spring Gateway has many other engineered systems to maintain a safe and comfortable operation. The main systems include mechanical, electrical, fire suppression, and security. The rent for residential spaces does not include utilities; therefore, each system was designed to maintain individual control and chargeability.

Mechanical System

The mechanical system for the entire building is rather simplistic and individualized. The private spaces, such as apartments and condominiums, use a split system heat pump in each unit. The system is comprised of a gas-fired hot water heater that produces 110°F for normal water usage and 140°F water for an air-handling unit that conditions the space. The gas supplying the hot water heaters for each of the 457 units enters the building in the basement, routed to a unit specific meter, and then directed to the unit through six to eight bundled risers. The unit mechanical system does not have an automation system. Tenants must use their own thermostat to monitor the space condition. Three gas-fired rooftop air-handling units condition with one hundred percent outside air and positively pressurize the public spaces, such as corridors, elevator lobbies, and common areas. The Silver Spring Gateway does not contain any chillers or boilers.

Electrical System

The building electrical system is rather basic and runs on two 120/208V transformers for the residential units and one 277/480V transformer for the common areas and elevators. Similar to the individualized mechanical system, each floor containing residential space contains one electrical room housing the distribution panels that operate each unit on that floor. The building also contains an emergency diesel generator that operates with automatic power transfer and must be one hundred percent operational in ten seconds.

Fire Suppression System

The owner of Silver Spring Gateway elected to utilize a sprinkler system throughout the entire building. The sprinkler system is wet and operates on a triplex system with fire pumps separate from the standard booster pumps for regular plumbing needs. There are two smoke detectors per residential unit that operate locally; where as, each lobby and common area contains global smoke detectors that can trip the building fire alarm.

Security System

Currently, no major security system, such as cameras or monitoring rooms, is in place at the Silver Spring Gateway. Card access for residential spaces is the extent of security. While this mixed-used building is not high profile and does not contain luxury residential units, security is not a paramount system to contrive; however, security cannot be ignored and a proper investigation of an efficient system is recommended.

CONCLUSION

While most of the engineering systems utilize a simplistic and individualized design, the general architectural and structural schemes are very complex and challenging. The Silver Spring Gateway is a mixed used building containing parking, retail space, and residential space with several amenities including a fitness center and penthouse swimming pool. Due to the building's proximity to Washington, D.C., the main structural system employs cast in place post-tensioned and reinforced concrete to maximize the number of floors and floor-to-floor height. Overall, the Silver Spring Gateway is a perfect, new asset to the surrounding area in both function and aesthetic appeal.

APPENDIX A – PROJECT TEAM DIRECTORY

Role	Firm	Website
Owner	The JBG Companies 4445 Willard Ave., Suite 400 Chevy Chase, MD 20815	www.jbg.com
Architect	WDG Architecture 1025 Connecticut Ave., Suite 300 Washington, DC 20036	www.wdgarch.com
Civil Engineer	Loiederman Soltesz Associates, Inc. 1390 Piccard Drive, Suite 100 Rockville, MD 20850	www.LSAssociates.net
Structural Engineer	Tajder-Cohen-Edelson Associates, Inc. 1109 Spring Street Silver Spring, MD 20910	www.tadgerco.com
Landscape Architect	Hord Coplan Macht 750 E. Pratt Street, Suite 1100 Baltimore, MD 21202	www.hcm2.com
Interior Designer	Carlyn and Company 746 Walker Road, Suite 22 Great Falls, VA 22066	www.carlynco.com
Environmental Consultant	Environmental Resolutions, Inc. 14609 Jaystone Drive, Suite 100 Silver Spring, MD 20905	
Geotechnical Consultant	GeoConcepts Engineering, Inc. 19955 Highland Vista Drive, Suite 170 Ashburn, VA 20147	www.geoconcepts-eng.com
Acoustics Engineer	Cerami & Associates, Inc. 1250 Connecticut Ave., N.W. Washington, DC 20036	www.ceramiassociates.com
Mechanical Engineer	Atlas Air Conditioning Company 10693 Wakeman Ct. Manassas, VA 20110	www.atlascusa.com
Electrical Engineer	Power Design, Inc. 11207 S. Danka Blvd., Suite A St. Petersburg, FL 33716	www.powerdesigninc.us
Construction Manager	Turner Construction Company 10400 Little Patuxent Pkwy., Suite 200 Columbia, MD 21044	www.tcco.com
Seismic Monitoring	Seismic Surveys P.O. Box 1185 Frederick, MD 21702	www.seismicsurveys.net

APPENDIX B – PHOTOS



Photo 1: Overall view of Southeast elevation of Silver Spring Gateway.



Photo 2: Partial view of courtyard from the top level of the parking garage.



Photo 3: Partial view of the Southwest elevation.



Photo 4: Partial view of the inside corner between the Southwest elevation and a small portion of the West elevation.



Photo 5: Partial view of lower floor construction on East-West Highway elevation (Southwest).



Photo 6: Interior View of the parking garage.



Photo 7: Interior view of pedestrian bridge steel structure.



Photo 8: Typical full penetration welded connection of the bridge truss structure.



Photo 9: Interior view of a typical residential corridor.



Photo 10: View of post-tensioning cables prior to jacking force application.

APPENDIX C – FIGURES



Figure 1: Architectural Rendering of Silver Spring Gateway from the corner of East-West Highway and Blair Mill Road.



Figure 2: Original site (red hatch) and surrounding streets, railway, and buildings.



Figure 3: Current site (red hatch) abandons a portion of Blair Mill Road.

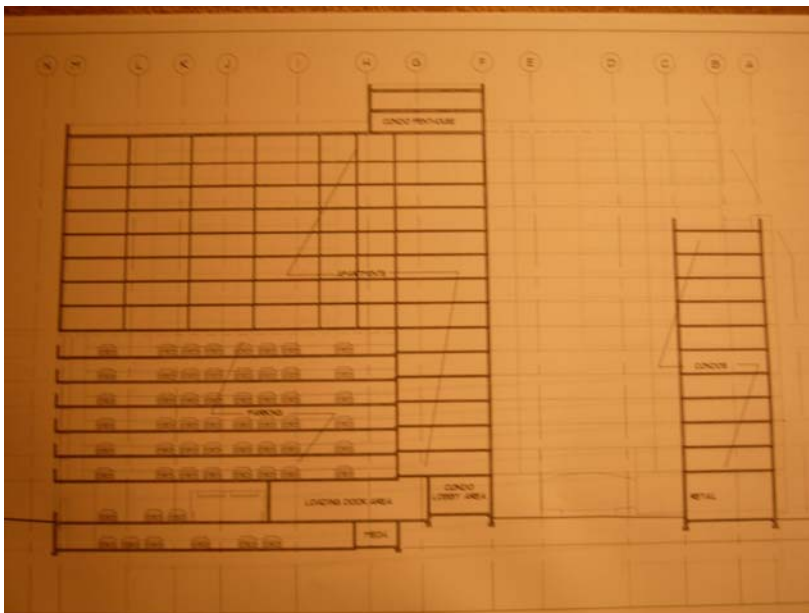


Figure 4: Building section showing occupancies per floor.

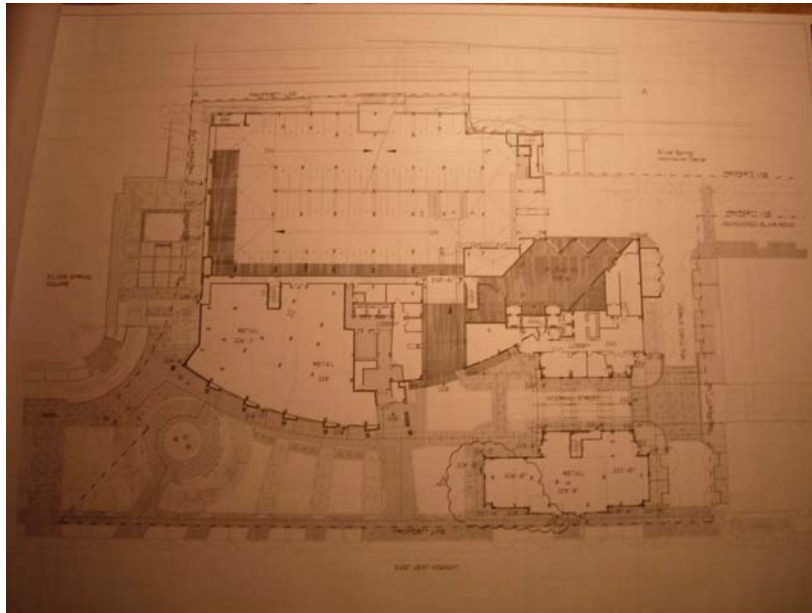


Figure 5: First Floor and Overall Site Plan showing overall shape for lower floors.

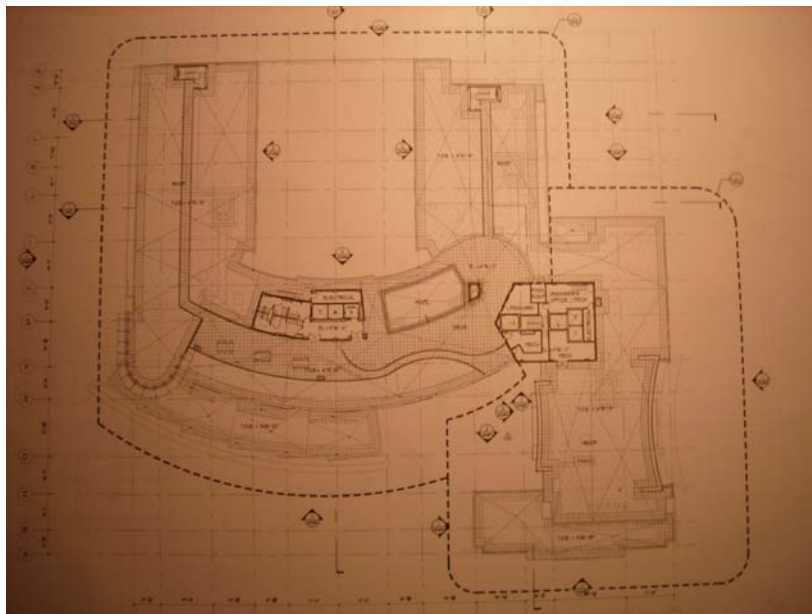


Figure 11: Penthouse Roof Plan showing overall shape of the upper floors and location of penthouse amenities.