

Dulles Metro is Coming



A Guide to Guideways
Winter 2011



Construction of bridge spans using a giant horizontal crane continues along Route 123 near the Capital Beltway in Tysons Corner
Photo by Igor Scherbakov, Dulles Transit Partners

A Guide to Bridge Span Construction in Tysons

Construction is under way on what can best be described as “bridges” over Tysons.

Three giant horizontal cranes (trusses) are being used to construct the aerial guideways that will carry the tracks in Tysons Corner. They are very visible. Two are bright yellow and blue and the third is white. Each weighs approximately 366 tons or more. The trusses are used to build spans between piers that now dot Route 123.

One of the bright yellow trusses is now working where the Dulles Connector Road crosses over Route 123 to the northwest side of that busy roadway. Two others are located on each side of the Capital Beltway (I-495) crossing of Route 123. One of those two is working between I-495 and the Westpark Bridge which connects Tysons Corner Center with Westpark Drive. That horizontal yellow crane is building bridge spans high in the air, lifting concrete segments one at a time in a complicated process. The second one is white and is being assembled to build spans across the Beltway, using what’s called a balanced cantilever construction process that differs from the process being used by the yellow cranes.



Segments are manufactured off-site at a precast facility near Dulles Airport.
Photo by Dulles Corridor Metrorail Project

Eventually, one of the yellow cranes will move to the median of the Dulles Airport Access Highway/Dulles Toll Road to build bridge spans to carry tracks from that highway median to Route 7 and eventually along the median of Route 7.

Here is some specific information about construction of the spans across I-495. During the coming weeks and months, this work will require closings of single, multiple and all lanes of this busy interstate highway. The total closings will take place in July with ample advance notice to the public.

Building across the Beltway

Construction of the bridge spans across the Capital Beltway is now beginning.

- The horizontal crane that will do that work is located on the north side of Route 123, just inside the Beltway, near the Capital One headquarters.
- Construction of this section of aerial bridges will be done using a "balanced cantilever" technique.
- Cantilevers are horizontal, aerial structures that are only supported on one pier.
- This means that the spans will be built using each pier as a central support system during construction. The partially constructed spans will be temporary cantilevers, but in the end will be permanently stressed and joined to form the bridge, connecting the spans.
- Each pier will support one pair of segments (one pair = up-station & down-station), they will "meet" the cantilevers from the next pier and be joined to form the span.
- The construction operations over the Beltway will be performed at night only. Overnight closings of all or some lanes will be required from time to time.
- Beltway crossing operations are scheduled to last through most of 2011.

A Guide to Spans in Tysons Corner

Q. What is a guideway?

A. A guideway is a structure that supports trains or other vehicles that ride over it. This project features both at-grade and aerial guideways.

Q. How many miles of this project are aerial guideway?

A. Of the entire Phase 1 alignment of 11.7 miles, three miles each of inbound and outbound guideway will be aerial – or a total of six miles of aerial track.

Q. What is the average height of the guideway (from ground level to the base of the guideway)?

A. The average above-ground height is 35.7 feet.

Q. What is the tallest point of the guideway?

A. Approximately 55 feet above the southbound entrance from Route 123 to I-495.

Q. Where are the aerial guideways being built?

A. Aerial guideways will be at the Dulles Connector Road and Route 123, along Route 123 including crossing the Capital Beltway to Tysons Boulevard; along Route 7 between Route 123 and the Dulles Toll Road and from Route 7 to the median of the Dulles International Airport Access Highway/Toll Road. These will all be built with horizontal trusses.



Aerial guideways at I-66 and the Dulles Connector Road where the rail extension connects with Metro's existing Orange Line are being constructed using traditional bridge-building methods.

The precast concrete segments are erected by the truss in Tysons Corner.

Photo by Dulles Corridor Metrorail Project

Q. How is the aerial construction in Tysons Corner being built?

A. The guideway is constructed by connecting more than 2,700 concrete segments, each weighing 25 to 40 tons, using massive pieces of equipment called trusses.

Q. What is a truss? How much do they weigh? How big are they?

A. A truss is a large, rigid structure that erects and pieces together the segments of the aerial guideways. The first truss that is used has a total weight (structure and supports) of 366 tons.

Q. How and where are the trusses assembled? How will they be moved along the alignment?

A. Trusses are self-propelling mechanisms that erect spans between each pier. They are assembled at the locations where the segmental erection will begin.

Q. What is a segment? How big are they?

A. A "segment" is a large, unique piece of reinforced precast concrete designed to interlock with other segments to form a "span" between two piers. The segments are held together



Crews use this white horizontal crane, or truss, to build spans of the aerial bridges for tracks near the Capital Beltway in Tysons Corner. In the background is the Capital One headquarters.

Photo by Chuck Samuelson, Dulles Corridor Metrorail Project

with steel cables, called post-tensioning strands. Spans make up the guideway.

Q. Where are the segments being made? How many are needed; what is the process?

A. The segments are all being fabricated off-site at a precast facility located in a remote area of Dulles Airport. More than 2,700 segments will be constructed and trucked to sites along the alignment. Each segment is custom engineered to fit a specific location along the alignment.

Q. How are they connected?

A. The truss' lifting mechanisms hoist the segments into place in the alignment, where they are sealed, joined and aligned. The spans have steel tendons (post-tensioning strands) running through the interior of each segment that "string" the segments together into place.

Q. How big are the piers that support the guideway?

A. Piers vary in height ranging from about 16' to 65' high.

Q. Who is the subcontractor? Describe their experience building guideways for other transit systems.

A. Rizzani de Eccher, headquartered in Italy, is the subcontractor that is fabricating the precast segments. The aerial team consists of leadership from Dulles Transit Partners (design/build contractor) and Rizzani's U.S. division. This team brings a combined experience of 50-plus years working on worldwide aerial and bridge projects.

Q. Will the work be done at night or during daylight hours?

A. Work is done both day and night. Night work will be required for all crossings over the busy roadways.

Q. The aerial guideway is being built where cars and pedestrians are constantly present. What are safety procedures?

A. Traffic will be stopped momentarily when the truss moves over a roadway in between piers, and when the truss lifts segments from a truck onto its portion of the alignment. In some cases, to ensure everyone's safety, support work requires overnight closures of some main roadways. Employees adhere to a formal safety program.

Q. Cost of the aerial guideway construction?

A. \$170 million.