

PRESS RELEASE
THREE INNOVATIVE BRIDGES AT I-64/RT 258 INTERCHANGE IN CITY OF HAMPTON, VIRGINIA
2007 ACEC/MD ENGINEERING EXCELLENCE HONOR AWARD

Alvi Associates was tasked by the Virginia Department of Transportation (VDOT) with designing three bridges for this project. Unusual complexity resulted from multiple design challenges such as very high traffic volumes, tight construction work space, demanding roadway geometry, deep fills, and sensitive subsurface utilities.

These challenges required the development of innovative design solutions which brought together unique combinations of state-of-the-art techniques. As a result, each bridge is believed to be the first of its kind in either the region or the entire US.

Benefits of these innovative designs shared by VDOT and the public include reduced traffic impacts during construction, enhanced public safety, substantial savings in construction and maintenance costs, and pleasing aesthetics.

VDOT has enthusiastically described these bridges as “innovative,” “cost saving,” and “beautiful,” and has indicated that, with respect to schedules and overall performance, **Alvi Associates** “executed this contract very well.”

The project has also been very well received at technical conferences, with a great deal of audience interest. As a result, we are hopeful that many of the design concepts developed for this project will be adopted by others, thereby helping to advance the bridge engineering profession. Each bridge is described further below.

I-64 BRIDGE OVER RT 258 – A new replacement bridge was required to carry I-64 over RT 258. Challenges included a very large width to carry 11 lanes of traffic, need to avoid conflicts with existing piles and numerous major utilities, need for staged construction with very high traffic volumes on both roadways, need for a very slender superstructure, and very limited space for construction.



The solution **Alvi Associates** developed is a three-span steel I-girder bridge with a long center span combined with unusually short end spans anchored against uplift by counterweight abutments.

This span arrangement eliminates the traffic hazard associated with a median pier, provides pleasing open aesthetics, and reduces cost by over \$1.2 million as compared to a conventional design. To further reduce cost, high-performance steel is used for the girders to save about \$330,000, and special lightweight backfill is used behind

the abutments. The net cost savings due to all of these innovations is about \$1.7 million, or about 28% of the \$6 million cost of the bridge. *This is believed to be the first counterweight abutment bridge on the US east coast.*

MAGRUDER BOULEVARD BRIDGE OVER I-64 – A new replacement bridge was required to carry Magruder Boulevard over I-64. Challenges included the need to avoid conflicts with existing piles, long span requirements due to crossing five lanes in each direction at high skew, and a very high traffic volume of 135,000 vehicles per day on I-64.

Considering the complex geometry of this bridge, conventional curved steel I-girders were virtually infeasible and the solution **Alvi Associates** developed is a two-span curved steel box girder bridge.



Features include long girder spans, cost-saving high-performance steel, cost-saving radial MSE abutments, and an elegant and unusual capless pier with individual columns supporting each girder.

To enable rapid girder erection, and thereby greatly reduce traffic impacts, the box girders were designed with the innovative feature of omitting steel diaphragms external to the boxes, except at the abutments. The interiors of the box girders are also painted white and provided with lighting to facilitate inspection and maintenance. *This is believed to be the first curved box girder bridge in the US to use high-performance steel.*

FLYOVER RAMP J BRIDGE OVER RAMP B - A new horizontally-curved bridge was required for a flyover ramp crossing a loop ramp at sharp skew. The solution **Alvi Associates** developed is a two-span curved steel I-girder bridge with unique fully-integral construction.

The radial pier has an atypical post-tensioned integral cap and the radial integral abutments are wrapped with cost-saving MSE walls.

This unique design results in enhanced structural efficiency, and elimination of all joints and bearings, thereby



reducing cost and greatly reducing maintenance needs, while also providing graceful sweeping aesthetics. *This is believed to be the first fully-integral curved steel girder bridge in the US.*