Quality Matters
Vol. V, Issue 2 – Fall 2015
from the Quality Assurance Branch (QAB) of Highway Design

Bridge Replacements Expedited

The Expedited Bridge Replacement Program was first envisioned three years ago as a means of quickly delivering contract plans on simple, straight-forward bridge projects. It was also created to help clear the backlog of projects that existed. The first fruits of this new program are now coming to bear.

Ten projects from across the state were selected. The bridges were required to be on roads with low traffic volumes, few expected conflicts with utilities or environmental issues, and no scour issues. Projects also had to have construction funds available within the first two years of the current highway plan.

To expedite the delivery, two consultants, J.M. Crawford and Strand Associates, were selected. Each consultant was assigned five projects to administer all project development functions. They included surveying, geotechnical investigation, roadway design, bridge design, utility coordination, and right-of-way negotiation. The district environmental coordinators assisted with the environmental review and permitting requirements.

The contracts for the services were negotiated and executed in December 2014. Currently, three of the bridge projects have advanced to construction. Paul Looney, Assistant State Highway Engineer, who is administering the program, expects that the rest will be let by September 2015, less than one year from beginning the design.

Mark Askin, project manager for Strand, attributes the success to his being able to closely manage all aspects of the project and complete different elements in a parallel schedule. For example, he received preliminary geotechnical information, prior to a final report, which led to the ability to finalize the bridge plans earlier than usual. His team was also able to purchase right-of-way and coordinate utility relocation while simultaneously finalizing the plan set. The contract started December 4, and the first bridge, located in Casey County, was let to construction in March 2015. It was designed and built in only 8 months.

In addition to a speedy completion, the negotiated rate for the services averaged about $127,000 per bridge. This lower than average rate can be partially attributed to the authority for delivery of all project functions by a single project manager.

Despite the straightforward nature of the projects, challenges did arise. The consultants worked closely with Mr. Looney and each District Project Development Manager through issues large and small. This coordination allowed quick resolution of a major gas transmission line conflict on one project and a parcel with multiple heirs on another. They also coordinated closely with the utility companies. Stuart McIntosh, project manager for Crawford, said his experience coordinating frequently with the utilities, including field visits with their staff, allowed for quick turnaround on utility relocations.

Bridge over Brush Creek in Casey County

As the first round of projects comes to a close, the program's success may lead to continued implementation when the next highway plan is developed in 2016. There were an additional 58 projects that qualified for the program and could advance once construction funds are established.

by Brent Sweger, PE

Flatten Slopes to Minimize Guardrail Hazards

On design projects, guardrail is often the lesser of two evils. It is common to install guardrail adjacent to roadways where hillsides exceed a 4 to 1 slope, protecting errant drivers from a treacherous descent. Guardrail is designed to deflect vehicles from roadside hazards, but injuries and vehicle damage can occur if hit. Given this risk, eliminating the need for guardrail is preferred.

One option often overlooked is the use of waste material to flatten slopes within the clear zone adjacent to the roadway shoulder. Waste material can also be used for fill within medians. Rather than paying to haul excess excavation material to a fill area outside of the project, material can be reused within the project limits.

During construction, District 3 engineers worked with the contractor to flatten slopes on an I-65 widening project from Park City to Cave City. They used the excess excavation material to flatten slopes on the edge of shoulders on the mainline, the bifurcated median, and interchange ramps. This change eliminated nearly 13,000 feet of guardrail, representing a savings of roughly $110,000. This win-win scenario not only saved construction cost and improved safety on this busy corridor, it also saved on the cost of future guardrail maintenance and replacement.

by Anthony Norman, EIT

New Road Diet Guide

FHWA has released a new guide on the ins and outs of implementing a road diet. Learn more about converting a worn out four-lane to a sleeker, safer, three-lane highway with the *FHWA Road Diet Informational Guide*.

Constructability Reviewer Needed

Do you know of someone retired from KYTC or an engineering company interested in still working part time? The Quality Assurance Branch is looking for someone with construction knowledge to review design plans for constructability issues. The position is classified Interim, which means that it is available for 9 months and then may be renewed after a 3 month hiatus. Interested individuals can contact *Brent Sweger*.

Helping Pedestrians Cross Safely

Learn about a technique to improve pedestrian safety on your project with Pedestrian Refuge Islands in our latest *Tech Brief*!

Photo by Dan Burden

Auxiliary Through Lanes:

Gaining Capacity and Reducing Delay at Signalized Intersections

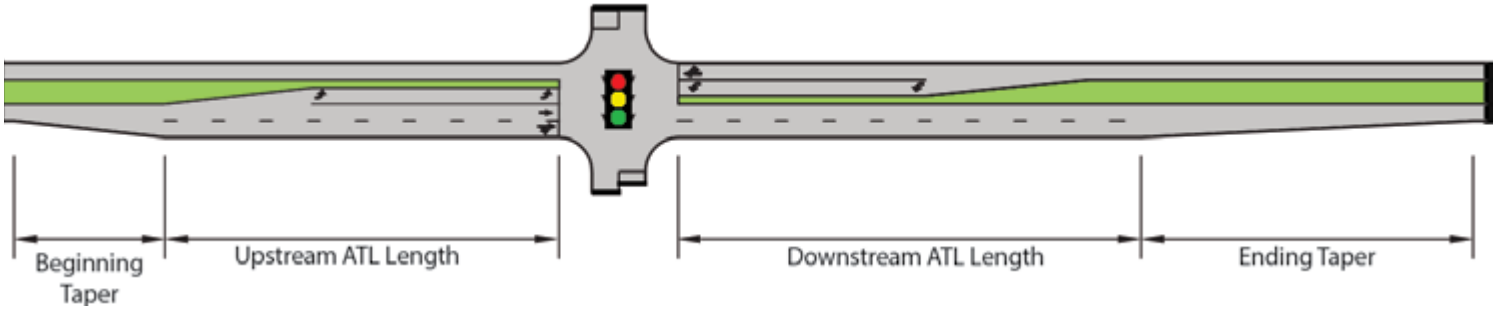
An auxiliary through lane (ATL) is a limited-length through lane added upstream and ending downstream of a signalized intersection as an intermediate-cost treatment to reduce recurring bottlenecks. They are best for locations where additional through capacity is desired, but construction of a continuous through lane (CTL) is not feasible. They increase capacity by allowing through traffic to disperse across an additional lane at signalized intersections, increasing throughput during the green time of the signal cycle. This, in turn, reduces delay and queuing for mainline through vehicles at the intersection. The ATL will be utilized the most when the intersection capacity is saturated rather than when traffic is light.

The upstream, or beginning length of the ATL should be long enough to adequately contain the maximum expected queue in the ATL and be longer than the maximum expected queue in the adjacent CTL to ensure that drivers have access to the ATL. It should also accommodate deceleration from the approaching CTL to the back of the queue in the ATL, and be visible early enough for approaching motorists to make informed decisions.

The downstream, or ending length of the ATL should be long enough to enable drivers starting from a stopped queue in the ATL to accelerate to a safe merging speed and allow drivers traveling through the intersection during the green phase to find a suitable gap for merging into the adjacent CTL traffic stream: this occurs typically between ¼ to ½ mile away from the intersection since a longer downstream length encourages more drivers to utilize the ATL. Signage is needed to indicate when the lane begins and ends, the direction of the lanes, and an advance indicator of merging. Pavement markings should indicate lane usage and the merging area.

The NCHRP Report 707, Guidelines on the Use of Auxiliary Through Lanes at Signalized Intersections, details formulas to calculate usage, design guidelines on geometric design, pavement markings, and signing. There is also an accompanied computational spreadsheet available to estimate performance under different scenarios.

by Anthony Norman, EIT



Roller-Compacted Concrete

A trip to any destination in Kentucky will lead you down scenic roadways that are composed of asphalt, jointed plain concrete pavements (JPC), or a combination of the two. Asphalt is beloved for the ease of placement and low cost while JPC is beloved for rigidity and long life cycle. If only there were a pavement type out there as easy to place as asphalt, but rigid to prevent rutting and long lasting like JPC. It turns out there is, and states like South Carolina have taken great interest in the potential of roller-compacted concrete (RCC) to improve their roadways.

RCC was first used in the U.S. for an airport runway in Yakima, Washington in the early 1940's. It was developed further by the US Army Corps of Engineers for use at military facilities in the U.S. RCC is a drier, stiffer mix than concrete used for JPC and looks similar to damp aggregate when initially placed. Unlike JPC, RCC can be placed with standard asphalt pavement equipment and, as the name implies, rolled with vibratory roller just like those used for asphalt pavements. Using a standard asphalt paver also allows for the use of a Safety Edge commonly used on asphalt paving projects to provide a traversable pavement edge.

Placement of RCC has significant advantages over placement of JPC pavement that translates to time and cost savings. JPC can typically be opened to traffic in seven days; whereas, RCC pavements require only 3 days. JPC requires forms and steel reinforcement to tie slabs together; however, while RCC requires saw cut joints to control cracking, costly forms and steel reinforcement are not needed. Similar to JPC, RCC can be placed in a single lift up to 10 inches deep, the maximum capacity of standard pavers. Unlike JPC, RCC has a finished texture similar to asphalt pavement once rolled.

One major consideration for the use of RCC is the attention needed to obtain rideability. RCC has been proven to be a good tool for an industrial setting for the movement of heavy loads at low speed; however, once rolled, RCC may not meet IRI needed for higher speeds. To improve rideability on high speed roadways the surface can be diamond ground or covered with a lift of asphalt pavement to obtain the desired IRI.

In addition to direct cost savings when compared to JPC and extended life when compared to asphalt pavements, the use of RCC in Kentucky can stimulate competition amongst contractors and suppliers to potentially lower cost for all pavement types. Additionally, the flexibility to use RCC could lead to a reduction in demand for asphalt binders that frequently have costs that fluctuate making the exact cost of asphalt pavement hard to pinpoint.

Learn more! *RCC case studies*.

by Shawn Russell PE, AVS

Lessons Learned

Some of the most common comments on constructability reviews stem from older plans developed before 2012. Those plans will typically reflect 2008 Standard Specifications, rather than the 2012 Standard Specifications and accompanying supplemental specifications the project will be let under. Our reviewers take this opportunity to highlight a few.

Pipeline Video Inspection

Current Specification Section 701.03.08 requires that video inspections are to be performed on projects with more than 250 linear feet of pipe and an ADT greater than 1000. This specification offers guidance on projects that require video inspection as well as an increase in the amount required to be inspected under the roadway. Applicable projects require video inspection for 100% of pipes under the roadway and 50% of the pipes not under the roadway.

Seeding and Protection

Current seeding and protection specifications Section 212 have evolved to ensure a better and quicker stand of vegetation. The specifications change some items that were once incidental to individual pay items. Those most commonly overlooked include:

- **Initial Fertilizer:** This item is for 100 lb/acre of nitrogen, phosphorous, and potash paid by the ton.
- **Agricultural Limestone:** When Engineer deems necessary at a rate of 3 tons/acre paid by the ton.
- **20-10-10 Fertilizer:** Apply this at a rate of 11.5 lbs per 1000 SF or 500 lb per acre.

Right of Way Monuments

Right of Way (R/W) monumentation has gone through some changes in recent years. The most recent being in 2012 (See 2012 Standard Specifications Section 726) with the addition of R/W Monuments Type 3, 3A and 4, which are all for newly acquired R/W that will belong to a Local Public Agency, such as a county fiscal court or municipality. These added types mirror the type 1, 1A and 2, but omits the word "KYTC" from the disc. See Design Memo 02-12 and Sepia Drawing 005 for more information.

Right of Way and witness monuments should be identified on plan sheets with station and offset, and documented on coordinate control sheets with northing, easting, station and offset. The coordinate control sheets should be a part of the right-of-way and construction plans.

There are 6 types of monuments now used for Kentucky R/W.

- **R/W Monument Type 1:**
  The most frequently used type, is used for most all normal accessible locations of R/W points.
- **R/W Monument Type 1A:**
  Used for accessible R/W points that are in concrete headwalls, concrete aprons or asphalt pavement that is not possible or feasible to drive the type 1 bases into.
- **Witness R/W Monument Type 2:**
  Used for locations in which the actual R/W point is not accessible such as a point in a creek, tree etc. In this situation a Witness R/W Monument Type 2 is placed on each R/W line that will intersect at the inaccessible R/W point.
- **R/W Monument Type 3 & 3A:**
  These two types are a mirror of the Types 1 and 1A with the exception that these are for R/W acquired for a Local Public Agency such as a county fiscal court or municipality.
- **Witness R/W Monument Type 4:**
  This type is a mirror of the Type 2 Monument with the exception that these are for R/W acquired for a Local Public Agency such as a county fiscal court or municipality.

The Licensed Land Surveyor is also encouraged to place a Witness Post where practical and feasible, and if at all possible at least 3 on each project.

by Mike Spain

Staff

Brent Sweger, PE
Quality Assurance Branch Manager
Brent.Sweger@ky.gov
(502) 782-4912

Shawn Russell, PE, AVS
Program Coordinator
Shawn.Russell@ky.gov
(502) 782-4926

~VACANT~
Program Coordinator
Advertised, Summer 2015.

Anthony Norman, EIT
Lessons Learned Coordinator
Anthony.Norman@ky.gov
(502) 782-4928

Shannon Martin
Kentucky Design & Print Services
Graphic Designer Coordinator
ShannonL.Martin@ky.gov
502-782-4718

Visit Our Website!

Upcoming Training:

MicroStation I for Civil Professionals
9/22-9/25/2015 - 8:00 a.m. to 4:30 p.m.
Frankfort

20th Annual KY Engineers' Golf Classic
9/23/2015 - 12 Noon - Lexington

Higway Capacity Analysis using HCM 2010 and HCS 2010
9/29-10/1/2015 - 9:00 a.m.to 4:00 p.m.
Frankfort

Somerset One Day Fall Seminar
9/30/2015 - 8:00 a.m. to 5:00 p.m.
Somerset

KYTC employees should contact **Kevin Martin** *to schedule training.*