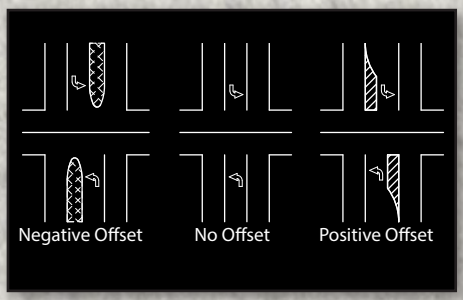
Quality Matters
Vol. III, Issue 1 – Spring 2013
from the Quality Assurance Branch (QAB) of Highway Design

Offset Left Turn Lanes

In Kentucky, roughly one-fourth of crashes happen at intersections. That equates to more than 32,000 crashes annually, with more than 10,000 injuries.

Overwhelmingly, intersection fatal crashes occur on arterial facilities. Therefore, it is critical we address access management and intersection design on highway projects. One weapon we have in our arsenal to improve the safety at intersections is the positive offset left turn lane design (offset left).



Removing left turning vehicles by using a left-turn lane can provide substantial safety and operational improvements. However, it is often difficult for a driver turning left to see oncoming traffic when a vehicle in the opposite direction is also turning left. This is especially critical at unsignalized locations and signalized intersections with a permitted left-turn phase. Due to poor visibility, drivers tend to hesitate when there is an adequate gap or begin a turn when the gap in opposing traffic is too small.

Wide median openings offer an opportunity to shift left turn lanes creating the offset effect. As a result, drivers are provided greater visibility and confidence in left turn decisions. In some cases, it also reduces the conflicts with the opposing left turning vehicles, which KYTC strongly supports. The Design, Traffic and Permits Memo, issued in 2009, states "positive offsets should be considered, as necessary, on all high speed roadways and high volume, congested corridors."

There are two types of offset left designs: parallel and tapered. In chapter nine of the AASHTO Green Book and in the KYTC memo some of the specific geometric design parameters are outlined.

A splitter island separates the left turn lane and the through vehicles. One consideration is whether to make the island raised or flush (painted). District Three has used both types but prefers the flush design because it allows drivers to recover if they inadvertently pass the entrance to the offset left.

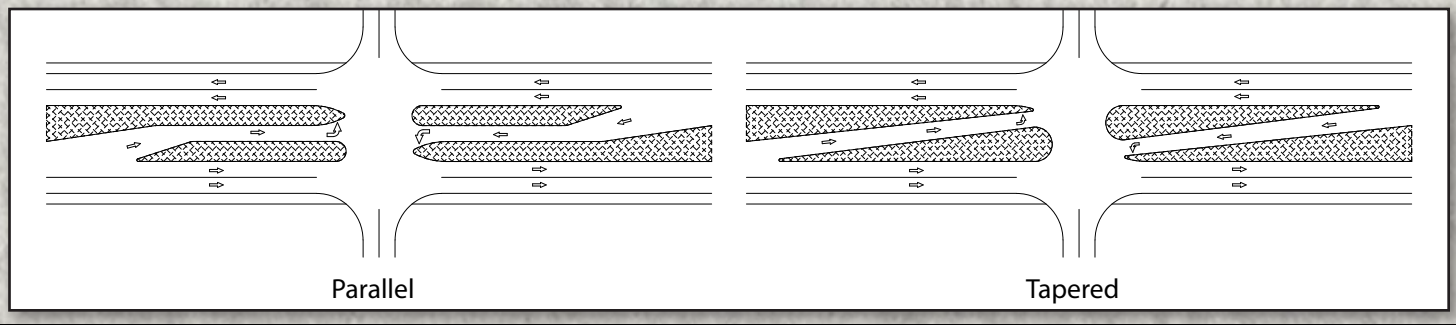
The tapered design often uses a 4-foot nose (raised concrete median) between the turning lane and opposing lanes. The tapered design also allows for a better turning radius for trucks with long rear overhangs, such as logging trucks. These designs can be used for signalized or unsignalized locations.

As with all intersections, wheel paths of turning movements, including U-turns should be checked. An offset design may require additional space on the outside shoulder to allow a U-turn movement.

Median widths of 18 feet or greater can easily accommodate offset lefts, allowing opposing left turning vehicles to be offset by a minimum of 2 feet. Specific offsets should be designed to accommodate horizontal intersection sight distance based on design speed and roadway curvature. For instance, a positive offset design may actually degrade sight distance when a large degree of curvature to the right exists.

When used appropriately, offset left turn lanes provide a key design strategy to maximize the safety and efficiency of highway projects.

by Brent A. Sweger, PE, AVS



News You Can Use:

Utilities in Design!

Oh, yes…those utilities just won't go away, and now they are infiltrating the design process. Relocating utility facilities are a critical element of project development: they exist in all communities and are essential to the community. As a Cabinet, we are continually looking for ways to improve the process and we are taking a step toward that goal.

A Phase I pilot project in District Five (Item 5-481.00, KY 864) will be the first of many projects to include utility coordination as specific line items for the consultants to execute. On this project, consultants will identify the utilities in the area and locate the facilities in the project scope to Subsurface Utility Engineering (SUE) Quality Level B accuracy (providing accurate x and y locates). In areas where more accurate elevation locates are needed, consultants are tasked to locate the facilities to SUE Quality Level A (x, y and z). Further, they will meet with the involved utility companies to consider impact to schedule, cost and alignment. While earlier utility coordination is encouraged on all projects, SUE investigation and the quality levels used will vary depending on project need.

The Production Hour Worksheets for design have been revised to include line items addressing the above changes. For Phase II projects, the consultants are tasked with more coordination activities with the involved utility companies. The consultants can execute SUE locates, if not completed in Phase I, but are also expected to meet with the utility companies to produce a conceptual design of the proposed utility relocations. Finally, if acceptable to the utility company involved, the consultant may be expected to produce a complete relocation design.

These changes will streamline the utility relocation process, which historically initiates at the Right of Way Plan stage. Having this degree of information available prior to Right of Way Plan stage will give utility relocations a head start.

The production hour worksheet and descriptions are available on Highway Design's Intranet page under Roadway Design.

On the Horizon…

State law regarding underground locates has changed for the better. In July 2013, a design ticket can be requested from KY 811. This ticket will provide the requestor a list of utilities potentially in the area and contacts to secure facility data. The design ticket will be taken online at:

http://kentucky811.org/

More information will come this summer, however you can review the law at:

http://kentucky811.org/the-dig-law

by Jennifer McCleve, PE

UTILITIES & RAILS
KENTUCKY TRANSPORTATION CABINET

Upcoming Training:

Kentucky Engineering Center: (http://www.kyengcenter.org/)

- **April 2, 2013 – InRoads I (4 days)**
- **April 30, 2013 – MicroStation II V8i SS2 for Civil Professionals (3 days)**
- **June 6, 2013 – Spring Dendrology & Native Tree Identification (Bernheim Arboretum & Research Forest)**
- **June 10, 2013 – InRoads II (5 days)**

Kentucky Society of Professional Engineers

- **April 10-12, 2013 – 78th Annual KSPE Convention (Galt House Hotel)**

Lessons Learned

This is the fifth installment of the series titled "Lessons Learned from the Post Construction Review (PCR) Circuit." The Quality Assurance Branch (QAB) continues to meet with various divisions and districts to solicit input from KYTC staff, design consultants and contractors. We have chosen to highlight the following issues from the most recent discussions.

Structures and Roadway Coordination

Recently, we were informed about a set of plans that included a proposed cross drain and drop box inlets within 25 feet of a bridge end. However, the structure plans included a standard 25 feet long buried approach slab that conflicted with the drainage structures. Since culvert pipes and drop boxes are not typically detailed on structure plans, better coordination and cross checking is encouraged between roadway and structural designers.

Structures and Approach Drainage

Another structures and drainage tie-in issue involved an approach slab designed to be 4 inches lower than the 8-inch JPC shoulder. This caused differential settlement, which created an associated bump or drop. In this case, the Section Engineer lowered the 8-inch JPC shoulder 4 inches and placed a lift of base and a lift of surface on the next phase. Another option was to allow the 8-inch JPC shoulder to rest on the pavement notch of the end bent. The big issue on bridge end drainage is the settlement of the approach slab independent of the associated drainage boxes, rendering the boxes too high to drain the roadway. Another possible solution in lieu of the drop box/pipe system is to install a flume or channel lined ditch that discharges into a surface ditch. However, since flumes can create maintenance issues, a channel lined ditch at the bridge end might present a preferred, simple, easy to build and easy to maintain alternative.

Erosion Control on Steep Slopes Consisting of Poor Soils

District One has identified the most effective method of slope protection applicable in their District for steep slopes with poor soil is to place Erosion Control Blanket on the top 6 to 8 feet of slope and then line the remaining slope with Crushed Aggregate Size 3.

Wasting Diamond Grinding Along Shoulders

A recent pavement rehab project included a special note concerning disposal of waste related to the diamond grinding operation, which directed the contractor to dispose of material off site. During construction, the contractor proposed wasting said material along the shoulder of the roadway adjacent to the grinding operation. Upon approval by the FHWA Environmental Coordinator, the Project Delivery Team allowed this method which resulted in a reduction of the diamond grinding unit price. The disposal method had to additionally comply with KAR 30:301 Environmental Performance standards, which stated discharges could be no closer than 200 feet from a waterway.

Partial Depth Patching on Concrete Pavement

On a recent project review, partial depth patching was established in the contract applicable to specified locations and conditions. However, the project engineer decided partial depth patching was not appropriate and marked all areas for full depth repair. The partial depth patching item was not used and was removed from the contract with a

QAB Sees Nathan Off... From Quality to Rehab

Nathan Wilkinson has been the Lessons Learned Coordinator and creator for QAB's hub of GIS. His contribution to the Quality Assurance Branch has been a tremendous boost. He basically started from scratch, building the Lessons Learned GIS database to what it is today. His articles in the Quality Matters newsletters shared insight to designers, construction and maintenance folks. Wilkinson is only 30 yards away from us and works in the Roadway Rehabilitation Branch of the Division of Highway Design. Nevertheless, we will miss him and his expertise. If you would like to contact him, his email remains the same:

nathan.wilkinson@ky.gov

change order. In general, it was mentioned during the review that partial depth patching is typically not effective on concrete pavement sections, especially in severely deteriorated condition.

Concrete Pavement Striping

On one recent job, the project documents directed the contractor to install permanent striping -- paint on concrete pavements. According to the PCR team, permanent paint usually does not adhere well to concrete pavements causing it to fade quickly. On this project, the Cabinet decided to install permanent striping -- tape to replace the paint. Designers should consider specifying either a durable tape type 2 or HD21 paint for striping on concrete pavement. The PCR team also recommended using water blasting for concrete striping removal. A special note could be included for concrete pavements requiring the removal of the curing compound by water blasting prior to paint installation promoting a sufficient bond.

Follow Up on Tying Curb and Gutter into Approach Roads

Sheet 4 of our Quality Matters Vol. II, Issue 2 – Summer 2012 edition included the blurb, "Tying Curb and Gutter into Approach Roads." While the article focused on including intersection detail sheets to provide profiles around intersection radii, we received a related follow up question from a design consultant. The question also pertained to curb and gutter, specifically curb as it curves from one edge of pavement to the other on simple intersection scenarios that do not require compound curves, or other imaginable complexities.

The consultant asked if we had encountered many instances of designers not making the curve in these scenarios tangent to the edge of pavement. This scenario might cause some issues upon construction because of an assumption that those points are tangent. The consultant said she had engaged in various discussions and received varying opinions regarding whether an assumption that the points are tangent should be made.

Based upon a consensus of the sources polled, the opinion was that normally the assumption should be that Curb and Gutter is tangent at some point with the approach road edge of pavement alignment. Additionally, if the proposed Curb and Gutter ends prior to reaching a tangent point it should be noted on the plans along with the end stationing/offset. This issue, much like transition curb elevations, could also be addressed on a development sheet.

On a related note, we also received recommendations that the station/offset be given for radii points on intersections skewed and/or where the mainline or approach are in a curve. With Curb and Gutter, designers should also include the station/offset for the tangent point as well as the endpoint. If this information is not included on the plans, it is difficult and time intensive to perform these calculations in the field using just the centerline alignments and lane widths. On the other hand, while the plans are being developed in MicroStation, it is relatively easy to snap to these points and get the coordinates and station/offsets in a matter of seconds.

Utility Relocations Conflicting with Diversions

During several recent Post Construction Review meetings, issues were reported concerning utility relocations conflicting with proposed diversion alignments. Frequently, utilities are moved to clear the way for the proposed roadway alignment only to be relocated directly in the path of the planned diversion. Increased coordination efforts are needed with Utility companies illustrating clearly the impact of temporary diversions on utility relocations.

Sight Distance Issues at New Intersections

One common plan issue that has been reported to the Quality Assurance Branch is insufficient sight distance at new intersections due to steep cuts within the sight triangle. During construction, sight distance is typically improved by either installing the stop bar closer to the intersection or laying the cut slopes back if sufficient Right of Way is available. In general, designers need to be aware of the potential intersection sight distance issues resulting from "typical" cut sections.

by Nathan Wilkinson

Staff

Look for us on the 5th floor of TCOB, email, or call (502) 564-3280

Boday Borres, PE, AVS
Quality Assurance Branch Manager
Boday.Borres@ky.gov
ext. 3362

Vacant
Lessons Learned Coordinator

Brent Sweger, PE, AVS
Value Engineering Coordinator
Brent.Sweger@ky.gov
ext. 3356

Vacant
Post-Construction Review Coordinator

Jonathan West, PE
Constructability Review Coordinator
Jonathan.West@ky.gov
ext. 3349

Graphic Designer

Dawn Morrow
Graphic Designer Coordinator
Division of Graphic Design & Printing
Dawn.Morrow@ky.gov
502-564-3880 x4296

Lessons Learned Database Available Online

http://transportation.ky.gov/Highway-Design/Pages/Lessons-Learned.aspx