Quality Matters
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Streamlining drainage

With a legacy that stretches back several decades prior to its official adoption, the drainage folder has consistently provided a trusted, centralized location for engineers to house project-specific drainage information. Historically a comprehensive collection of plan sheets, cross sections, correspondence, maps, and profiles, the drainage folder has been required since the 1980s for every project involving water-carrying systems, such as bridges, culverts, storm sewers, and ditches.

Unfortunately, the more engineers relied on the drainage folder, the more it increased in size, leading to problems with functionality and storage.

So in 2006, the Drainage Branch – led at that time by David Moses – decided to transform what had become an increasingly unwieldy physical publication into a sleek electronic PDF. This single change in format saved designers countless hours of preparation, especially when including documents larger than the standard 8 ½ x 11, and solved the previous problems related to document size.

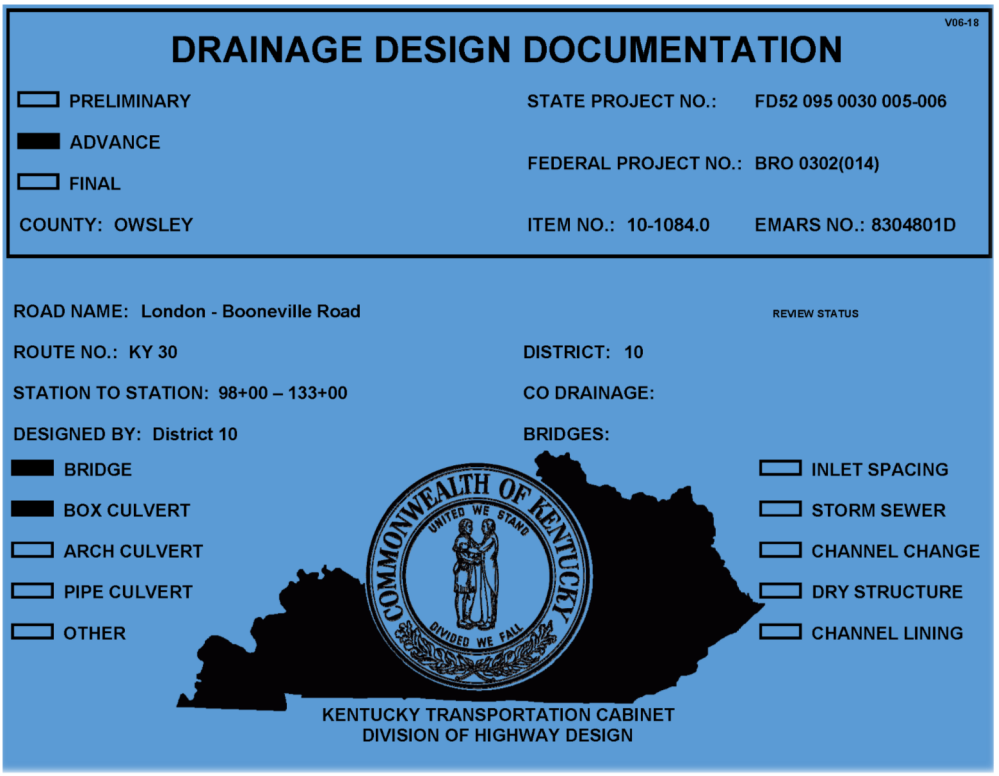
Ironically, however, implementation of the electronic format also led to an increase in documentation requirements, including the DES, an abbreviated plan set, and emails. It was so much easier to add information to an electronic document that drainage engineers just kept adding more. In fact, the typical drainage folder PDF became so large that it actually slowed the reviewer's computer because of the memory required to view it.

The unwieldy physical publication had become an unwieldy electronic publication.

Consequently, the Drainage Branch staff has spent considerable time brainstorming ways to streamline (pun intended) the drainage folder. At the 2017 Partnering Conference, the drainage folder "lite" was introduced. Rather than trying to include every piece of data within one PDF, the lite version will contain only the most critical drainage-related information: pipe sheets with a hydraulic discussion/justification of the structures, situation survey sheets, and the source files for the designed structures. Additionally, a new tier structure convention has been developed to assist designers with determining the amount of information required, depending on the type of structure being designed.

With reduced document requirements, as well as increased ease and efficiency, only one small change remains. When drainage folder lite begins implementation later this year, you'll see a new blue cover instead of the old burnt orange – which might just be the toughest adjustment of all for those seasoned drainage engineers.

by: Ron Matar, PE

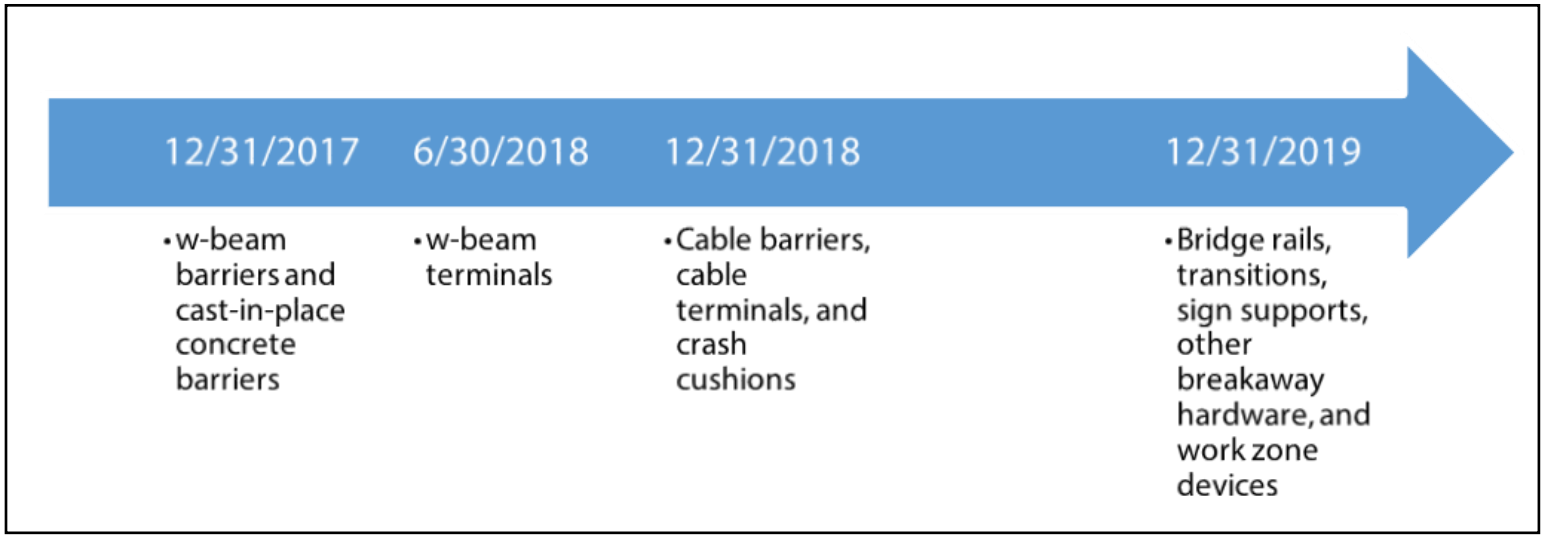


Clearing up the MASH

We've been hearing reports of confusion about *MASH* and its requirements, so we're going to try to set the record straight… at least as it stands today!

AASHTO's 2016 *Manual on Assessing Safety Hardware* (MASH) is the new methodology standard for crash testing roadside safety features such as guardrail and end treatments. MASH replaces the National Cooperative Highway Research Program (NCHRP) *Report 350,* published in 1993.

FHWA has prescribed a timeline for implementation and Kentucky is moving forward to meet it. The following deadlines have been prescribed to use AASHTO MASH evaluated hardware:



Additionally, FHWA has specified a new way to implement the testing program to ensure manufacturers' products meet the necessary safety standards. Formerly, different entities (private companies, state DOTs, AASHTO, etc.) paid certified organizations to test a product and document the results. Then, FHWA analyzed the test results. If the outcome was acceptable, FHWA would issue a letter certifying that the products met the safety requirements. The certification letter also made the cost of that hardware eligible for reimbursement on federally funded projects.

Today, FHWA no longer certifies results from safety testing. They may offer an opinion on test results through what they call an eligibility letter, but the responsibility of certifying crash worthiness of a safety device now falls in the lap of each individual state. Each state must develop a methodology for this process that is acceptable to FHWA. (FHWA internal memo, dated 4.9.2018)

The Bottom Line for Designers:

Design Memo 06-17, issued by the Division of Highway Design in December 2017, addressed initial implementation on design projects for the first two deadlines. With that, several standard drawings were revised and issued as sepias. Beginning in 2018, applicable sepias are to be included for all current and future highway projects.

Despite the changes to the standard drawings, the memo states that "designers will not lay out guardrail recommendations for a project any differently." This includes the length of need for guardrail and grading for end treatments. However, "additional shoulder widening along normal guardrail installations is no longer required."

The memo specifies that plans calling for Type 1 or Type 4A end treatments must contain a note requiring the contractor to provide particular documentation that will be evaluated by the construction engineer.

All said, the changes for designers are pretty straightforward. Expect additional guidance, including new revised sepias, to be issued for the items listed under the last two deadlines. We hope this clears up any confusion, but contact us if you have additional questions. We'll also keep you up to date as things progress.

by: Brent Sweger, PE

Reducing roadway runoff

Summer heat and humidity – often accompanied by showers and thunderstorms – have arrived in Kentucky. While the rain is frequently a welcome relief, consider this: A single storm dropping one inch of rain along a one-mile stretch of a paved-shoulder, two-lane road is capable of producing over 130,000 gallons of quick-moving stormwater runoff. Add that to a nearby stream – in addition to the runoff from nearby roads, rooftops, driveways, and parking lots – and the increased volume and resultant erosion can be devastating, not only to the waterway but also to property downstream. Quick runoff, as opposed to natural absorption into the ground, can also affect groundwater supply, sometimes diminishing local drinking water.

Many urban areas have implemented regulations for commercial and residential development to help reduce stormwater runoff volume. Detention basins or other methods are frequently required to meter the discharge slowly; however, highway runoff is oftentimes discharged directly into ditches or storm sewers that lead straight to waterways.

To assist transportation designers with addressing this issue on urban projects, the National Cooperative Highway Research Program (NCHRP) commissioned a study on reducing the volume of highway runoff in urban areas. NCHRP Report 802 (available for free download) details a five-step process for designers to use when selecting the volume reduction approaches (VRA) best suited for an individual site and project.

Nine different VRAs are included in the report, along with their benefits, constraints, and long-term maintenance considerations. An example of one of the approaches is the use of permeable roadway shoulders to allow infiltration of roadway runoff into a stone reservoir below. A Volume Performance Tool is also available to aid designers with estimating the performance of a selected VRA.

Although stormwater may not always be at the forefront of your mind, it's definitely worthwhile to spend some time considering runoff accumulation, path, and volume management when designing your next project.

by: Brent Sweger, PE

Pavement design updates

Pavement design just got a little easier with implementation of a simplified design submittal and approval process for new full-depth construction projects.

Rather than requiring submittal of a detailed folder, the Pavement Design Branch has adopted the use of a web-based program that allows for storage and easy approval of pavement designs. KYTC project managers need only to confirm that their Geotech and Traffic information are in ProjectWise and attach typicals or other documents to be reviewed.

A major highlight of the web-based program is the inclusion of a new catalog of pavement thicknesses derived from thousands of AASHTOWare PaveME runs and calibration coefficients from surrounding states. These PaveME runs have been verified using data collected from 46 calibration sites across the state. Your pavement designs may be different than what you have seen in the past, so if you have an old pavement design, it may be worthwhile to check it again with the new program.

Warrants for selecting asphalt mixtures have also been updated, including a switch from Equivalent Single Axle Loads (ESALs) to Average Annual Daily Truck Traffic (AADTT). Also notable is the use of 1.5-inch asphalt surface for all new builds and rehabilitation projects, 1.0-inch nominal max aggregate size for asphalt base in the majority of cases, and a lowered PG76-22 threshold of 3,000 AADTT (about 10,000,000 ESALs).

The pavement design application for new full-depth construction projects can be accessed online. If you have questions or need additional information, contact Joe Tucker.

by: Joe Tucker, PE

Partnering conference ideas

The Transportation Cabinet is seeking presentation ideas, speakers, and moderators for the 2018 ACEC-KY/FHWA/KYTC Partnering Conference, Sept. 4-6, 2018, in Louisville, Kentucky.

The Cabinet asks that you submit your recommendations for topics by July 2, 2018, to this link: https://form.jotform.com/81134430506143.

In addition, submittals for KYTC Project Excellence Awards are due by Aug. 10, 2018. KYTC project managers can find submittal guidelines at KYTC Project Excellence Awards.

A silver lining

Deficient stormwater or sanitary sewer lines can be the dark cloud overshadowing a roadway project, negatively impacting timelines and resources as pipes are removed and replaced. However, there is a silver lining – literally – as "trenchless" technologies have become an alternative to costly pipe replacement.

Consider a recent project in District 6 where an interchange ramp needed widening. Complexity to maintenance of traffic caused by heavy traffic on the ramp, as well as the existing topography, complicated the replacement of a deficient culvert pipe. As an alternative, designers chose to use a pipe liner to add strength and improve hydraulic capacity of the pipe that was already in the ground. With that, they could keep traffic flowing unimpeded while they extended the pipe to allow for widening.

One method known as Cured-in-Place Pipe (CIPP) involves use of a felt tube reinforced with fiberglass and coated with plastic. Installers insert the tube – impregnated with resin – into the host pipe. Once inserted, the liner is expanded to fit the existing pipe. Installers then use either hot water, steam, or ultraviolet light to cure the liner in place, hardening the resin and forming a joint-less pipe-within-a-pipe.

One of the benefits of CIPP is the flexibility of the liner to negotiate sharp bends before the line is cured. CIPP also increases the structural integrity of an existing pipe and is suitable for moderate-size pipes (36-60").

Another popular trenchless technique is centrifugally cast concrete pipe (CCCP) lining: the application of thin coats of fiber-reinforced, cementitious material by a spin-casting machine. The material impacts the existing pipe at a high velocity causing it to adhere tightly and form a waterproof, structural-enhancement layer. The layer thickness for a given pipe is determined by the structural stability of the existing pipe. CCCP lining can be used in pipes 36" and greater.

There are several other trenchless techniques available, including grouting minor cracks or joint defects, slip lining, and full replacement using pipe bursting. A comprehensive report Clemson University developed outlines culvert renewal technologies and includes recommendations based on 12 different scenarios defined by pipe size, material, and problem.

Trenchless rehabilitation and replacement technology has advanced significantly and offers a designer multiple options for pipe improvement at a fraction of the cost as compared to full-pipe replacement. Additionally, trenchless alternatives can greatly reduce the user-delay costs incurred by the traveling public during construction. Given the number of existing roadway projects, trenchless technology looks like a silver lining for everyone.

by: Brent Sweger, PE

Purpose and need workshop

KYTC, in partnership with Neel-Schaffer, Inc., will present half-day workshops this fall on writing purpose and need (P&N) statements. Participants will learn the why and how of crafting a rock-solid P&N statement that can serve as the strong foundation for any project. The workshop will also help project development professionals identify the true transportation need of a project so that project managers can effectively measure the performance of project alternatives and choose a value-rich solution. Be on the lookout soon for a schedule of classes.

Upcoming training

- **MicroStation I for Civil Professionals**
  7/31/2018 » 8/3/2018
  Frankfort 8:00 a.m. to 4:30 p.m.
- **MicroStation II**
  8/21/2018 » 8/24/2018
  Frankfort 8:00 a.m. to 4:30 p.m.
- **KY Bike Walk Summit**
  8/16/2018 » 8/17/2018
  Lexington
- **2018 ACEC-KY/FHWA/KYTC Partnering Conference**
  9/4/2018 » 9/6/2018
  Louisville
- **InRoads I V8i SS4**
  9/25/2018 » 9/28/2018
  Frankfort 8:00 a.m. to 4:30 p.m.
- **InRoads II SS4**
  10/16/2018 » 10/19/2018
  Frankfort 8:00 a.m. to 4:30 p.m.
- **InRoads III SS4**
  11/13/2018 » 11/16/2018
  Frankfort 8:00 a.m. to 4:30 p.m.

KYTC employees should register through **Perry Semones** *for all classes.*

Consultants will only need to register through **Perry Semones** *if the class is held at KYTC. Otherwise, consultants should contact the Kentucky Engineering Center.*

All times are local.

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