



KS LTAP Newsletter

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GRS-IBS: A Strong and Economical Design Option for Bridges

By Chris Wichman and Lisa Harris

A new innovation in bridge construction is gaining traction around the nation and may soon be coming to Kansas. The Geosynthetic Reinforced Soil Integrated Bridge System, or GRS-IBS for short, is a simple bridge construction method that uses readily available, inexpensive materials and basic earthwork techniques to build bridges better, faster and cheaper. The technique is being promoted by the Federal Highway Administration's (FHWA) "Every Day Counts Initiative" that aims to identify innovations for shortening project delivery while enhancing roadway safety and protecting the environment. This article will give an overview of the GRS-IBS method and summarize thoughts about the technology from local agencies that have either implemented or are considering the technique.



Federal Highway Administration

Bowman Bridge in Defiance, County, Ohio, is a GRS-IBS structure. It was built in six weeks by one crew.

How it works

The GRS-IBS technique creates a substructure of closely-spaced alternating layers of compacted granular fill material and geosynthetic fabric reinforcement. Rather than drilling deep piles, the reinforced soil method builds up the substructure in a faster, simpler, and

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When You Just Have to Close Some Bridges...

Saline County's proactive approach is making the process less painful.

By Aliza Chudnow and Lisa Harris

In Kansas there are approximately 20,500 bridges on the local road system. Out of this number, over 4,000 of them are rated as structurally deficient. A structurally deficient bridge is incapable of carrying modern traffic loads (3 tons or more), and by federal law must be closed to traffic at all times. The bridge owner must then decide whether to keep the bridge closed or authorize the funds to remove or repair it. Many deficient bridges are located on very low volume roads in rural communities, and a community may consider closing

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less expensive way. The FHWA compares the technique to building a layer cake, with the fabric being the “filling” or frosting between the thicker cake layers.

The abutment construction process is as follows:

Step 1. Lay a row of facing blocks along the stream channel to contain fill.

Step 2. Place a layer of compacted fill (soil, etc.) behind the facing blocks.

Step 3. Top with a sheet of geosynthetic fabric.

Repeat from Step 1 until the desired height is achieved.

This low-tech approach continues until the abutment reaches the desired height, and the bridge beams are placed directly on top of the GRS abutment mass. An approach-way is then built behind the bridge abutment to transition the bridge deck to the roadway. No joint or cast-in-place concrete is needed. Since the bridge extends naturally out of the roadway, there is no “bump at the end of the bridge” caused by differential settlement between the bridge abutment and the approaching roadway.

Want to see one being built? The FHWA has produced a very informative 19-minute video showing the construction of a GRS-IBS bridge from start to finish, found at http://www.youtube.com/watch?v=w_5WFoAdoUw.

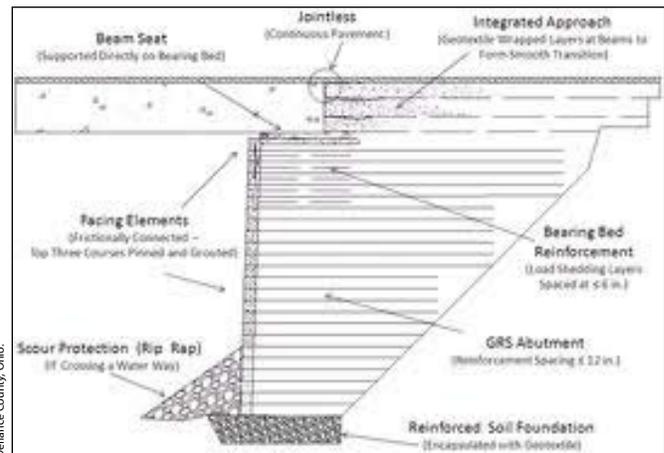
Benefits

The FHWA lists a number of advantages of GRS-IBS technology compared with conventional concrete abutments.

- **Shorter construction time.** A GRS-IBS abutment can be built in a shorter period of time compared with many other bridge designs; generally a few days rather than weeks or months. GRS-IBS technology is also appealing to the public because travel lanes are closed for a shorter amount of time.
- **Lower costs.** Construction costs are generally lower due to reduced construction time (labor hours), the use of inexpensive and common equipment and materials, and no need for highly skilled labor. The FHWA cites a 25 to 60 percent decrease in costs for a GRS-IBS bridge compared with traditional methods.
- **Smoother transition.** The faulting between the bridge deck and approach slab is eliminated.
- **Less susceptible to movement.** The flexible design makes GRS-IBS able to withstand both large lateral deformations and vertical settlement, adding to the long-term strength and durability of the bridge.

GRS-IBS spells success in Ohio

Defiance County in Ohio was an early adopter of the technology. In 2005, FHWA began working with the County’s engineering department to provide guidance on GRS abutment design. “After seeing a presentation on the technology and meeting with FHWA representatives to learn more, we modified our plans from using traditional abutments to building ones with GRS,” said Warren Schlatter, Defiance County engineer. The county’s first bridge using GRS-IBS technology was completed that same



Typical cross section of a GRS-IBS abutment face wall.



year. Since then, Defiance County has built a total of 27 bridges using GRS-IBS, and the 28th is under way.

Schlatter is drawn to the simplicity of the GRS building process. “Now that our crews are comfortable with the process, we can build an abutment in three days. It is convenient for us to build them ourselves with materials that are easy to manage, do not take up much room, and do not expire. We order the geo-synthetic fabric in bulk and are able to store it easily. We use our local quarry for the fill material and a local manufacturer for facing blocks so we are never caught waiting around for materials to be delivered,” Schlatter said. This allows the department a lot of flexibility in scheduling bridge-project construction.

Defiance County has also used contractors for a few GRS-IBS projects that were funded by FHWA grants. Schlatter said contractors had no trouble picking up the GRS building method. “One of our contractors budgeted 10 days for each abutment since they had never done it before. It ended up taking them five days for each abutment,” he said.

Schlatter said the GRS construction method takes a little getting used to, “but it is pretty hard to mess up.”

GRS-IBS in Kansas

Currently there are no GRS-IBS bridges in Kansas, but some local agencies are interesting in building them. FHWA and KS LTAP held Webinars on the topic in Wichita and Topeka last February, and there was a presentation about GRS IBS at the KCHA/APWA joint meeting in Newton this past May. We spoke with a few local agencies that are becoming familiar with the technology.

Sedgwick County bridge engineer, Penny Evans, said that while her relatively urban county probably will not install a GRS-IBS bridge, she sees the value of the technology for counties that are seeking economical ways to build bridges on low volume roads in areas without significant scour problems. Sedgwick County has higher than average



Federal Highway Administration

Bowman Bridge abutments under construction.



traffic volumes and relatively sandy, scourable soil. Evans said “I have seen scour up to 4 ft deep all over the place” in the Arkansas River basin. The Arkansas River flooded countywide a few years ago. In her county, to prevent scour, Evans said a concrete pad would have to be poured, and “the way I see it, if you’re pouring the pad you might as well go ahead and pour a concrete box,” she said.

Evans said she was impressed with the aesthetic quality of the GRS-IBS product as shown in the FHWA video. “When I heard about how it was constructed, I was not expecting to see something that nice,” she said.

Justin Mader, **McPherson County** project engineer, is very interested in the technology and hopes to build a GRS-IBS bridge using in-house staff within the next few years. He sees the technology as a good solution for replacement of bridges that span 40-60 ft on very low volume roads. This span range is “too big for a KDOT standard-size box and too small for the expense of putting in a haunched slab,” he said.

Mader is considering their first location for a GRS-IBS project on a stream with relatively low velocity and on a road with very low traffic volume—just a few vehicles a week, he said. He explained that they have some areas that are dependent on a bridge for access, and closing the bridge is not an option they want to consider.

Mader said putting in a low water crossing is another

alternative at those kinds of locations, but “in many cases you really want a span bridge—to hold down the maintenance required after a rain event.” A GRS-IBS bridge is an economical solution for a span bridge because, for other types of span bridges, a crane would be required to drive deep foundation piles. “That gets pretty darned expensive,” Mader said.

Mader sees very few disadvantages to the GRS-IBS technology at the proper locations, but downsides include the initial learning process when building the first bridge, and the time taken away from other county activities while the county crew is constructing it. If his commissioners approve using the technology, his first project will be relatively short and low until the crew becomes more comfortable with the construction process.

Clark Rusco, **Barton County** engineer, said his county is considering using the GRS-IBS technology in the future. He said his county has many aging bridges built between 1930

and 1960 that are going to need replacement and that have a replacement-span size that meets GRS-IBS criteria. For these particular bridges, Rusco said there is little worry of saturation or scour. There is currently no time-line for constructing their first GRS-IBS bridge, but the county has applied for a grant under the statewide program for off-system bridges to build a GRS-IBS demonstration project. (See page 13 for a description of this funding source.) If awarded, KDOT would bid the project and a contractor would be responsible for building the project, while the county road-bridge crew would be on-hand to view the process and be trained in the GRS-IBS method. The crew would then build smaller bridges until comfortable with the construction methods and eventually move on to bigger projects.

Rusco sees the benefits to his county of GRS-IBS technology as:

- Extends the construction season; abutments can be built in winter and early spring;
- Can use in-house labor, rather than contracting construction crews;
- Can use in-house equipment, aside from crane rental to set beams for longer span bridges.

KDOT has been considering GRS-IBS projects at a few

Continued on next page



Sources:

- Federal Highway Administration GRS-IBS Resources. http://www.fhwa.dot.gov/everydaycounts/technology/grs_ibs/.
- Building the Bridge of the Future with GRS Technology. <http://www.fhwa.dot.gov/publications/focus/06apr/01.cfm>.
- Geosynthetic Reinforced Soil Integrated Bridge System. CA-LTAP Tech Transfer Newsletter. Fall 2010. <http://www.techtransfer.berkeley.edu/newsletter/10-4/edc-grs-ibs.php>.
- Phone interview: Warren Schlatter, Defiance County engineer, June 21, 2012.
- Phone Interview: Clark Rusco, Barton County engineer, June 20, 2012.
- Phone interview: Penny Evans, Sedgwick County bridge engineer, June 25, 2012.
- Phone interview: Justin Mader, McPherson County project engineer, June 25, 2012.



GRS-IBS *Continued from page 3*

locations, and may build one on I-70 in western Kansas.

FHWA has an aggressive goal of having one GRS-IBS project built in 50 percent of the states by December of this year. While Kansas will not have a project on the ground by that time, Norbert Muñoz, FHWA's Kansas Division assistant division administrator, is pleased with the interest he's hearing in Kansas about the technology.

"I was very happy with the participation in the webinars. It was more than we expected," he said. "There was good give and take and participants had a lot of good ideas to share." Muñoz said that once a project is in place in Kansas and people see it, he expects the technology to really take off.

Conclusion

Although the GRS-IBS technology is not right for every situation, the FHWA says it can be a good solution for low-volume, single span bridges of less than 120 feet. Kansas local agencies that are becoming educated on the technology recommend careful attention to the potential for scour

and to consider scour prevention measures in determining the cost effectiveness of the technology at your particular locations. Defiance County's Schlatter advises that a deep enough foundation be put in place to reduce the risk of water getting underneath the abutment. Proper drainage is essential to avoid the problem of creep, which can happen if the soil-fabric and fill material become saturated with water. The potential for scour can be addressed by various design solutions outlined by FHWA. With appropriate countermeasures, the potential for creep and scour can be mitigated, and the benefits of cost- and time-savings of using GRS-IBS technology can be achieved.

For more information

For a good range of resources on GRS-IBS bridges, visit Defiance County's GRS site at <http://www.defiance-county.com/engineer/GRS.htm> and FHWA's GRS-IBS web site—see the first listing in the sources for this article on page 3. ■

Closing a bridge *Continued from page 1*

some of them permanently. However, for some farmers and landowners, these bridges maintain convenient access to their properties.

There are practical, economic and political considerations in making a decision to close a bridge. This article will highlight a proactive and systematic way Saline County has been addressing these considerations—a way that takes some of the politics and appearance of being arbitrary out of the equation.

Practical considerations

Saline County has had a lot of experience closing bridges in recent years. Their county engineer, Neil Cable, said they have closed about 30 bridges since 2008. He explained: "We had bridges from as far back as 1889 that were built during the age of horse and buggies," he said. "Those bridges were still in use, but by much heavier vehicles, including semi-trailer trucks. The possibility of failure due to loads far in excess of the original design loads presented an unacceptable risk of failure."

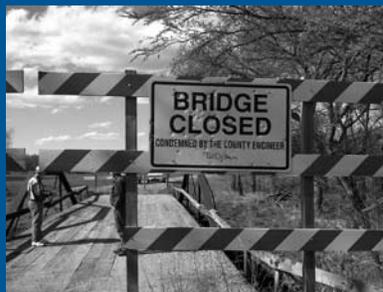
To help the county address this situation, the Board of Commissioners

approved a primary route system based on a two-mile grid. This set the stage for bridge closings in a way the majority of the public could accept. Cable explained that the county's road system was built in a one mile grid, suitable for horse-drawn vehicles to get around the county in a reasonable amount of time. But cars and trucks move much faster. "It

takes a modern vehicle two minutes to travel an extra mile," he said. "Not a big difference."

The Engineering Division of the county's Road and Bridge Department considered different grids for the system—four miles, three miles and two miles—and settled on two miles, which was presented to the County

Authority for Closing a Bridge



Kansas Statute 68-1126 states that whenever the county engineer deems any bridge or culvert unsafe for traffic, the engineer should post signs on the bridge that it is condemned. The county engineer should also immediately report the condition of the bridge to the Board of County Commissioners (BOCC) whose job is to decide whether to repair or remove the bridge.

But what if your county is one of the 83 counties in Kansas that doesn't have a county engineer? Norm Bowers of the Kansas Association of Counties says, in that case, the BOCC will typically order the bridge to be closed to traffic. Bowers said that, by law, a bridge inspector must inspect a bridge every year, and if the inspector recommends closure, it is in the commission's best interest to agree with the bridge inspector because of the liability to the county.



Commissioners. After the grid was established, deficient bridges not on the new primary rural road system were closed when they could no longer be certified to carry the federally required three ton minimum load.

Financial considerations

Lack of sufficient funds for bridge maintenance is a major factor in deciding to close bridges. By closing more than 30 bridges, Saline County has saved millions of tax dollars in maintenance and replacement costs. The county has also saved money on road maintenance because the roads leading to and from closed bridges receive less traffic.

The county is even making money on their closed bridges by demolishing them for salvage. “We save the timbers for other projects and sell the metal for scrap,” Cable said. “We can make thousands of dollars per bridge by selling the metal.”

Political considerations

A pending bridge closing can easily become a political topic as farmers in rural counties talk to their elected officials about the need to maintain convenient access to their fields. Landowners argue for their own financial well-being if a bridge is closed. It will mean higher costs for operating their vehicles to travel on new, longer routes. This must be weighed against the financial well-being of the entire county, most of whose residents will never use or even see the specific bridge. Tom Mulinazzi, professor at the University of Kansas, is currently leading a K-TRAN research project that will approximate the vehicle-related costs incurred when a bridge is closed, based on extra mileage traveled and

The Argument for Having a Primary Rural Road System

Saline County’s primary rural road system was established as a safety and economic measure at the recommendation of the county engineer, Neil Cable. Cable said when he first started as the county engineer in late 2005, he inherited plans to replace bridges and upgrade roads. But the county didn’t have funds allocated to carry through with those plans.

“When I compared the plan to the available amount of money we had, I saw a tremendous disconnect,” Cable said. “That’s when I started playing with the idea of reducing infrastructure,” he said. “I gave some PowerPoint presentations to the Board of County Commissioners and tried to gently bring them to my thinking.” It wasn’t long before Cable’s idea became a reality.

In 2008, the primary rural road system (PRRS) was adopted in Saline County. After its adoption, deficient bridges across major streams on alternate roads were closed, leaving a two mile grid of through-roads. Not only was the PRRS in the public’s best interest, but it also enabled a logical prioritization of investment of the county’s limited funds to maintain road surfaces and repair or replace bridges. According to Cable, the PRRS didn’t change the total number of road-miles the county maintains (about 1,100 miles), but it does enable the county to direct more maintenance to some roads and less to others, and close some bridges, saving money.

Cable said Saline County’s situation is not unique. There are more roads and bridges in Kansas than can be realistically maintained with tax dollars. This illustrates the economic value of the PRRS. “The PRRS is just a logical way to prioritize the infinite number of things we have to do with very finite resources,” Cable said. “I personally think it makes tremendous sense.”

type of vehicle driven. This will give commissioners some information for talking with their constituents when considering the pros and cons of closing a bridge.

Sensitivity to the public

To ease the public into the decision to close bridges, Saline County held extensive public meetings about the need for either bridge closures or raising taxes. They received public support from editorials in the local paper. “We expected a meltdown of the phone lines when we finally went ahead with the bridge closures,” Cable said. But there wasn’t really a big reaction; the public was understanding, he said.

Saline County’s first step in closing their bridges was to barricade them with wooden posts drilled into the ground on either end, to block vehicular traffic. They left the bridges intact for awhile before taking steps to demolish them. “We didn’t start right away with removing any of the bridges we closed,”

Cable said. “We felt it would have been too harsh, like ‘poking people in the eye.’” But now Saline County is well along in removing bridges to eliminate liability and chances for the closed bridges to collect debris and cause water back-up.

Conclusion

Because the process of creating a primary road system and closing bridges in Saline County has been successful, other counties have started to look seriously into the same process. “Our decisions have served us well for four years,” Cable said. “It was quite a process we went through, and we’re healthier for the weight we lost.”

For more information

Cable is happy to answer questions about Saline County’s bridge closing program and two-mile grid. He can be reached at Neil.Cable@saline.org or at (785) 826-6527. ■



Sources:

- Interview with Tom Mulinazzi, University of Kansas, May 30, 2012.
- Interview with Neil Cable, Saline County, May 31, 2012.
- Kansas State Statute 68-1126. http://kansasstatutes.lesterama.org/Chapter_68/Article_11/#68-1126.



Bottomless Culverts Worth a Look

By Aliza Chudnow

These structures can save you money and are better for the environment.

A bottomless culvert is an alternative to a common four-sided culvert. It is a U-shaped structure, installed (inverted) directly on top of the water channel, so the “floor” of the culvert is the undisturbed stream bed. This design allows aquatic organisms to pass through with ease.

Bottomless culverts have spans ranging from less than 1.5 feet to more than 35 feet. The culverts are typically supported on wide footings that distribute loads to the surrounding soil and rock.

This article will explain the benefits of building a bottomless culvert as well as some solutions to potential scour at these structures. We’ll also include comments from officials in Douglas and Johnson counties who have experience installing bottomless culverts.

Benefits

A main advantage to placing a precast bottomless culvert is its quick overall installation time. Douglas County’s engineer, Keith Browning, said “A conventional concrete culvert might take a couple of months to install, but for a bottomless culvert, it might take a few *weeks* and as little as one week to get the old structure out and the new culvert in.” Because the bottomless culvert is precast, once the site is prepared, the structure itself can be set in just one day, allowing traffic back on the road more quickly.

Although the price of a bottomless concrete culvert is competitive with other options for large structures, Browning said a bottomless culvert can be easily installed by in-house construction crews, saving money on labor. And the shorter construction time creates labor advantages too. “The short construction period of three to four weeks allows our crews the ability to be accomplishing other county work during the construction season,” Browning said. “It is an efficient use of our manpower.”

A bottomless culvert’s



Douglas County, KS

This bottomless culvert in Douglas County spans 16 ft. The floor of the culvert is the natural streambed, allowing easy passage for aquatic organisms.



environmentally-friendly design expedites environmental approvals. “If we used a traditional Reinforced Concrete Box structure (RCB), we would have to set it one foot below the flow line of the creek and then put in a foot of dirt so it would have a natural bottom,” Browning said. “It can be difficult getting one foot of dirt in some RCBs.” Because aquatic organisms can pass through bottomless culverts, environmental officials favor them, Browning said.

Potential for scour

The downside to having water pass through any structure is potential scour, or erosion around the piers and abutments that can occur due to the velocity of water and turbulence during a flood event. While scour can occur at most culverts, bottomless culverts have a greater risk. Johnson County’s engineer Don Hovey explained that since bottomless culverts don’t have a concrete floor, the stream bed could erode and cause the footings to be undermined, which can then lead to the failure of the structure. A main concern for the design engineer then, is evaluating how the natural stream bed will react with the structure during all expected flows. Protective measures might be necessary to keep a bottomless

culvert from scour, particularly at the entrance of the structure.

Preventing scour

Riprap can help prevent scour from happening. Hovey said that Johnson County has installed two bottomless culverts in the past two years, and so far has seen no signs of scour. “We put a bunch of riprap on the floor of the culvert because we knew we had to protect it against scour,” Hovey said. “Big riprap interlocks and doesn’t move, it protects the underlying substrate from moving up into the culvert.” Hovey said riprap can also be used to correct an existing scour problem. See the sidebar on page 7 for other ideas for preventing scour at bottomless culverts.

Know your site

Browning said that before installing a bottomless culvert, you need to have good geotechnical information about the site. “It is important to hire a geotechnical firm to go out and classify the geological materials to determine whether you are dealing with rock or soil,” he said.

Browning said that a bottomless culvert should only be placed when rock material or something extremely firm is fairly close to the surface. “It’s important



Scour Research and Countermeasures for Scour at Bottomless Culverts

The Federal Highway Administration (FHWA) conducted research to validate and improve an existing methodology developed by the Maryland State Highway Association for estimating scour in bottomless culverts. Phase One of the study focused on measuring maximum scour depths at the culvert entrance and developing a procedure to approximate pre-scour hydraulic parameters. Phase Two expanded the investigation to include scour measurements at the entrance and outlets for submerged flow conditions. Results showed that scour is generally deepest near the corners of the upstream entrance to a culvert because of the contraction or narrowing of the water flow.

For more information on the FHWA case study, go to <http://www.fhwa.dot.gov/publications/research/infrastructure/hydraulics/07026/index.cfm#toc>

Contech Systems published an article by Colorado State researchers Scholl and Thornton that describes the process of scour at any structure and countermeasures that may be appropriate for a bottomless culvert. The researchers mentioned that riprap or grouted riprap might not be indicated in every case. Other options discussed include articulating concrete block (ACB) systems, concrete armor units, gabions, grout-filled bags and mattresses, and geotextile containers. (For more information, see the first link below, under "Sources.")

to make sure you have a leveling pad beneath the footing," Browning said. "We use rock and then bring a concrete leveling pad to the bottom of the footing to make sure it's all level."

Seven bottomless culverts have been placed in Douglas County. Browning, who first learned about these culverts from a vendor at the Kansas Asphalt Paving Conference, said there has been no scour issue since installing the bottomless culverts three years ago. Browning said the county plans to monitor the structures more closely than other types, especially after large run-off events. "Although the issue of scour is a concern to us, we know what to look out for," Browning said. "In my opinion, the advantages to



Douglas County, KS

Douglas County uses a concrete leveling pad beneath each footing of the culvert structure to make sure the structure is level.

using a bottomless culvert outweigh the disadvantages."

Hovey agrees with Browning, saying that although bottomless culverts are a little more expensive than cast-in-place structures, they work just as well

and are quick to install. "The speed of installation is key," he said. "Plus, during construction you don't have to divert water from the main channel to install the floor."

Where to purchase precast bottomless culverts

Check with your precast concrete vendor(s) to see if they carry this kind of culvert structure. Both Browning and Hovey purchased their bottomless culverts from Oldcastle Precast in Topeka. Browning said Douglas County recently purchased two more bottomless culverts from Cretex Concrete Products in Bonner Springs. Cretex's sales director, Jason Duncan, said the company has also placed these structures in the City of Leavenworth.

If you have questions about the bottomless culverts placed in Douglas County and Johnson County, contact Keith Browning at kbrowning@douglas-county.com or Don Hovey at don.hovey@jocogov.org. ■



Sources:

- Bryan N. Scholl and Christopher I. Thornton, Ph.D., P.E. Scour in Bottomless Culverts. Contech Construction Professional Development Series, December 2008. <http://www.conteches.com/Knowledge-Center/PDH-Credits/PDH-Article-Series/Scour-in-Bottomless-Culverts.aspx>.
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- FHWA Design Guideline 18: Riprap Protection for Bottomless Culverts. <http://www.fhwa.dot.gov/engineering/hydraulics/pubs/09112/page18.cfm>.
- Kansas Local Road Management Book: Definition of Scour. <http://www2.ku.edu/~kutc/pdffiles/KLRMHandbook2011.pdf>.
- Interview with Don Hovey, Johnson County, June 5, 2012.
- Interview with Keith Browning, Douglas County, June 4, 2012.



A Leg Up

Local Requirements for ADA Compliance

By Chris Wichman

Title II of the federal Americans with Disabilities Act (ADA) requires that local governments make their facilities and services accessible to persons with disabilities. This requirement applies to all state and local governments regardless of size. An ongoing self-evaluation is a local government's primary tool to document and track how it provides access for their disabled residents. Having a report and a plan for compliance also diminish the possibility of adverse findings in accessibility-related lawsuits. Local governments with 50 or more employees are also required to have someone appointed as an ADA coordinator with certain responsibilities outlined by law, and a formal transition plan towards compliance.



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While not required, a best practice in ADA compliance is to engage an advisory board of local stakeholders and disability advocates for advice, review, and public input.

This article will provide a brief overview of requirements for ADA compliance for public entities, and guidance on working with advisory boards.

Required of ALL public entities: Self-evaluation to identify barriers and (reasonable) solutions to access

To ensure compliance with Title II, governments should have completed by 1993 a **self-evaluation**, a process required by ADA for all public entities regardless of number of employees. Self-evaluation results in a comprehensive report on local barriers for persons with disabilities. It pinpoints the facilities, programs and services that must be modified or relocated to be accessible to all residents.

The ADA does not require that all barriers identified in the self-evaluation report be removed; rather it requires that all programs be accessible if possible. Providing accessibility is required unless doing so would fundamentally alter a program, service, or activity or result in undue financial or administrative burdens.

An example of an undue financial or administrative burden would be to require that curb ramps be immediately installed on all sidewalks in a community. The FHWA

guidance is more realistic. It says that one way to ensure the proper integration of curb ramps throughout a city is to set a series of milestones (progress dates) for curb ramp compliance. The guidance suggests first focusing on government facilities, transit services, places of public accommodation, and business districts, followed by walkways serving residential areas. It also may be appropriate for a city government to establish an ongoing procedure for installing curb ramps upon request in both residential and nonresidential areas frequented by individuals with disabilities. 28 C.F.R. §§ 35.150(d) (2); 35.151(e). This guidance allows local governments a degree of flexibility to find the most cost-effective and case-specific strategy to address each accessibility barrier.

Required for MANY governments: Transition plan, ADA coordinator, and grievance procedure

A **transition plan** can be another product of self-evaluation, which moves from barriers to solutions. A transition plan is required by the ADA for public entities with 50 or more employees.

A transition plan identifies how and when the identified barriers will be made accessible and who is responsible for removing the identified barriers.

The ADA also requires that public entities with 50 or more employees designate at least one employee to coordinate ADA compliance. This **coordinator** is the lead on compliance efforts and the contact person for community members with accessibility grievances. (The ADA requires that a **formal grievance procedure** be established in these municipalities.)

The following are duties of an ADA coordinator:

- Administering and writing a self-evaluation report of barriers in city services and facilities;
- Establishing a complaint/grievance procedure to respond to the public;
- Developing a transition plan if structural changes are needed to achieve Title II compliance for accessibility;
- Revisiting the self-evaluation report every three years.

Examples of Transition Plans from Kansas

- **City of Winfield ADA Transition Plan.** http://www.winfieldks.org/documents/City%20of%20Winfield/ADA%20Information/Winfield_-_Transition_Plan_-_Draft2.pdf
- **Topeka ADA Transition Plan.** http://www.topeka.org/ada_plan_review.shtml



Good for ANY community: An advisory board

While not required by law, engaging an **advisory group of citizens and stakeholders** is considered a best practice for ADA compliance. Advisory boards commonly set priorities and monitor progress of the transition plan or self-evaluation report, educate the public, and participate in the grievance process.

The City of Hutchinson established their advisory group specifically as a grievance board soon after the ADA legislation was passed. But the board's role has expanded since then. According to Meryl Dye, Hutchinson ADA coordinator, now the primary role of the group is oversight. She said the Board "ensure[s] that the City is staying on top of new accessibility issues and new regulations, as things are changing all the time." Dye also applauds the Board's efforts in developing outreach and education programs to raise awareness of disability issues in the City. Dye said an advisory board can serve an important role in a community by advocating for continued community involvement and investment in creating better accessibility.

The City of Lawrence has not created an official ADA advisory board, but instead works closely with a local access task force organized by Independence Inc., a nonprofit

center supporting independent living for persons with disabilities. The City's ADA coordinator, Tammy Bennett, said the task force has been invaluable for advice on addressing case-specific accessibility issues.

In Bennett's opinion, an advisory group will be most effective if it represents diverse disabilities and associated needs. It is important to include members (disabled or not) who are passionate about advocating for accessibility and who understand a variety of needs and situations. An advisory board can be either an official appointed board or just an informal group of passionate and informed citizens.

Conclusion

Make sure someone in your local government is familiar with the ADA requirements that fit your situation and that you have a plan in place for compliance. Forming an ADA advisory board is a best practice for staying current on local accessibility issues and regulations. Overall, a well-monitored self-evaluation, with ongoing, active citizen involvement serves as a demonstration of good faith to the community for compliance with the access requirements of the ADA, thereby reducing accessibility barriers and, hopefully, the number of grievances filed and negative results in lawsuits. ■



Sources:

- ADA guide for Small Towns. <http://www.ada.gov/smtown.htm#anchor23806>.
- ADA and City Governments: Common Problems. <http://www.ada.gov/comprob.htm>.
- ADA Coordinator ToolKit. <http://www.dbtacnorthwest.org/tools/tool-kits/ada-coordinators>.
- ADA Best Practices Tool Kit for State and Local Governments. <http://www.ada.gov/pcatoolkit/toolkitmain.htm>.
- Tammy Bennett, City of Lawrence ADA Coordinator. Phone interview, June 18, 2012.
- Meryl Dye, City of Hutchinson ADA Coordinator. Phone Interview, June 22, 2012.

Congratulations, Road Scholars!

By Kristin Kelly

Here's a list of the 2012 certificate awardees to date:

Level I (County) Graduates

• Butler County Public Works

*Bryan Brooker
Scott Carson
Kyle Dawson
Marvin Evans
Jim Latta
Rex Stephens
Joe Vittitow*

• Coffey County Highway Department

Jeff Beyer

• McPherson County Public Works

Kevin Erickson

• Montgomery County Public Works

Fred Long

• Riley County Public Works

*Mary Graham
Rhonda Lund
Steve Lund
Richard McIntyre
Steve Rightmire*

• Saline County Road and Bridge

*Darren Fishel
Brian Crandall*

Level I (City) Graduates

• City of El Dorado

*Jason Hughey
Brad Meyer*

Level III (City) Graduate

• City of Burlington

Doug Mast

Level III (County) Graduate

• Riley County Public Works

Bertra Manning

Awards were presented at the joint meeting of the Kansas County Highway Association and the Kansas Chapter of the American Public Works Association in Newton, Kansas, this past May. Thanks to the graduates for all their hard work and dedication to their professions. ■



Re-Purposing Railroad Cars as Culverts

By Aliza Chudnow & Lisa Harris



Railroad Yard, Inc.

A railroad tank car prepared for placement as a culvert.



Need a strong and low-cost solution for a low-volume culvert?

A re-purposed railroad tank car might be just the ticket. A railroad tank car culvert can range in size from a width of 7.5 to 10 feet. Such a structure can carry over 50 tons, can span from 20 to 80 feet and can carry a continuous flow of water.

This article will provide you with a snapshot for how to

install a railroad tank car culvert, along with the advantages and disadvantages of using this type of drainage system. Such culverts have been installed in many locations in rural areas of Kansas and surrounding states.

Pros and cons

Bob Strait, a retired county road official and now material and construction service specialist for Railroad Yard Inc., said that there are many advantages to using a railroad car culvert.

- **Longevity.** “They are going to last a long time because a railroad tank car is 1/2 inch steel all the way around,” Strait said. Although the life varies based on the environmental conditions such as runoff, Strait knows of one culvert that has been in service for 30 years and counting.
- **Strength.** “The tank cars are strong and solid because of all the steel, so when you put one in place you don’t have damage such as bending,” Strait said.
- **Good flow capacity.** Strait said the culverts can carry significant water flows. The flow opening of a rail car culvert can range from 50-75 square feet.
- **Conserves a resource.** Re-purposing a railroad tank car is a good way for the railroads to recycle.
- **Fast turnaround.** According to the Texas bridge manufacturer Lone Star Bridges, it takes a manufacturer one week to prep a railroad car for use in a bridge or culvert. At the site, installation typically takes just 1-2 days for a single-pipe structure, said Strait.

While the advantages to using railroad car culverts are clear, they can’t be used in every location. Field runoff will affect how long these products will last. “It’s really up to the outdoor conditions to dictate the life of these culverts,” Strait said. Strait also pointed out that since the culverts are made out of steel, they will rust, but the metal is thick enough that the possibility of rusting-through is remote.

Typical users of these culverts

An article titled “Old Railroad Tank Cars Make Great Culverts,” (see Sources) states that the main customers who

purchase railroad tank cars for culverts are counties seeking to replace older culverts in constant need of repair. Strait said that the counties he has worked with really enjoy using railroad car culverts. “Some counties have railroad car culverts that were installed more than 30 years ago,” Strait said. “They have never had a problem with them and they are still looking good.”

One Kansas county that has been installing railroad tank car culverts for a long time—for almost 40 years—is Osage County. Glen Tyson, road and bridge supervisor, said the main reason the county installs these culverts is because they provide a strong structure with a quick installation time.

“We have 16 railroad-car culverts in Osage County, mostly on very low volume township roads” Tyson said. The first one was installed in 1973 and the last one was installed this summer.

Thirteen counties in Kansas have installed railroad tank car culverts that Strait knows about, include Ness and Phillips and Jackson counties as well as Osage. They are getting a lot of use in counties in Iowa, too, Strait said.

From tank car to culvert component

Tank cars must be cleaned, inspected and prepped before they are used in culverts, and there are companies that specialize in this. Each railroad car is carefully inspected for damage, and after it is determined that the railroad car is safe to use, the manufacturer patches the opening from the car’s access area and continues the process of turning the railroad car into a durable culvert component.

Some counties prefer using a “half-round,” which is a tank cut in half along its length. Tyson prefers using half-rounds that come manufactured with a floor and also a header wall



Railroad Yard, Inc.

This culvert in Phillips County uses a half tank car and the sides are faced with galvanized metal to protect against erosion in high flows.





welded onto it. “We really like those,” he said. “They go up especially fast and they can carry a lot of water.”

Design and construction

The basic steps for installing a railroad tank car culvert are simple. They include placing abutments on each bank of the stream, placing the railroad tanks car(s) on top of them, building approach ramps, adding guardrails if needed, and stabilizing the soil against erosion or scour. Specific steps will depend on the site conditions.

Agencies should consider both the environmental conditions and expected traffic volume at the culvert site when designing the structure. Strait said most counties want rail car culverts to be placed on low traffic-volume roads over streams with low water volume, but some will want them on a higher volume road or over a higher volume stream. In those cases, the culverts will need a larger span and should have head-walls to protect against erosion.

Some counties have over a dozen of these culverts, some installed more than 30 years ago. They rarely have problems with them and they are still looking good.

Strait said it is up to the local agencies to determine exactly how they want their drainage structure constructed with the tank car component. “I show them photos of the different structures and they decide what they want,” he said.

Tyson says tank car culverts install very quickly. “We usually can have the road open to one lane of traffic in one day, then finish the structure with 2-ft side toeholds and header walls the following day,” he said. The county places toe-holds under the culvert to keep water from channeling underneath the structure.

Most of the rail-car culverts in Osage county are faced with rip-rap to help prevent swirling water from damaging the structure. “We take a track-hoe and stair-step a wall with 24-inch blocks. It holds the dirt in place well,” he said.

Cost

Strait said that the cost of railroad tank car culverts varies based on the distance traveled from the rail car component manufacturer to the culvert site and it’s hard to put an exact number on how much they cost. But they are priced



Railroad Yard, Inc.

A double tank-car culvert in Ness County, faced with concrete.



competitively to other similar products, he said.

For more information, consult the sources for this article or contact a railroad car vendor in your area. ■



Flatbeds as Bridges

Tank cars are not the only railroad components used for drainage structures. Flat cars, which are longer than tank cars, are used for decks on low volume bridges.

A study in 1999 by the Iowa DOT looked at the feasibility of flat car bridges on low volume roads (see Sources). The study found that with some responsible engineering control RRFC bridges can be a viable and economical bridge replacement alternative. Care should be taken in choosing the kind of flatbed car to use, and the study recommends obtaining flatcars through businesses with experience in supplying flatbed bridges. The study contains other tips for successful installation. Check it out.

Iowa DOT



Sources:

- Railroad Car, Steel, and Prestressed Concrete Bridges. Forest Management Practices Fact Sheet Crossing Options Series #6. University of Minnesota Extension. <http://www.extension.umn.edu/distribution/naturalresources/DD7006.html>.
- Railroad Car and other short span bridges an alternative for stream simulation. Porior Engineering, LLC. <http://porior.com/homepage/chapter%20nine-bridges.pdf>.
- T.J. Wipf, F.W. Klaiber, J. Witt, T.L. Threadgold Use of Railroad Flat Cars for Low-Volume Road Bridges. Iowa Department of Transportation. August 1999. http://www.iowadot.gov/operationsresearch/reports/reports_pdf/hr_and_tr/reports/tr421.pdf.
- Lone Star Bridges website. <http://lonestarbridge.com/>.
- “Old Railroad Tank Cars Make Great Culverts” Article. http://www.farmshow.com/view_articles.php?a_id=406.
- Interview with Bob Strait, Railroad Yard Inc., May 30, 2012.
- Interview with Glen Tyson, Osage County, June 20, 2012.



Name That Bridge

By Lisa Harris & Aliza Chudnow

How well do you know your bridge types? Find out by taking this quiz.

Match the photographs of Kansas bridges at right to the names below. Each name is followed by its National Bridge System acronym in parentheses. See results on page 14.

1. Reinforced Concrete Ridged Frame Box Culvert (RFB)
2. Reinforced Concrete Arch (RAR)
3. Steel Beam, Simple (SBMS)
4. Reinforced Concrete Slab, Continuous/Drop Panel (RCSD)
5. Timber Beam, Simple (TBMS)
6. Reinforced Concrete Deck T-Girder, Continuous and Parabolic Haunched (RDGH)
7. Steel Low Truss, Simple (SLTS)
8. Prestressed Concrete Beam, Continuous (PBMC)
9. Corrugated Metal Arch (CAR)
10. Reinforced Concrete Through Arch, Tied (RTAT)

Brian Engelke at KDOT's Bureau of Local Projects has developed a Powerpoint presentation that lists the top 12 most prevalent types of bridges in Kansas and show several different examples of each type. A PDF of that presentation is posted at the Kansas LTAP website at <http://www.ksltap.org> under "What's New" and "Resources to Download." Do you know which bridge types are the most common in Kansas? We'll quiz you on that next time. ■



Photos courtesy of KDOT Bureau of Local Projects



KDOT Korner

Assistance for Locally-Owned Bridges

By Sondra Clark

The Kansas Department of Transportation administers programs and resources available to local governments to help them design, construct and maintain their bridges:

1 Resources. KDOT's standard drawings, bridge design manuals, bridge design software and bridge-related forms can be downloaded with no fee. These resources are available through KDOT's Authentication & Resource Tracking (KART) service. Contact the KART Administrator at (785) 368-7176.



KDOT

The guidelines and application are located on the Bureau of Local Projects website at: <http://www.ksdot.org/burLocalProj/default.asp>. Contact Sondra Clark at (785) 296-0441 or sondrac@ksdot.org.

3 Federal Fund Exchange Program. The Kansas federal fund exchange program is a voluntary program that allows a local public agency (LPA) to trade all or a portion of its federal fund allocations in a specific federal fiscal year with the Kansas Department of Transportation (KDOT) in exchange for state transportation dollars, or with another LPA in exchange for their local funds.

2 Off-System Bridge Program. Federal law and regulations require that no less than 15 percent of a state's apportionment of Highway Bridge Program (HBP) dollars be used for replacement or rehabilitation of eligible bridges on roads that are not on the federal-aid system (i.e., local roads). To meet this requirement, KDOT offers a competitive Off-System Bridge Program. The amount of the federal funding is approximately \$8 million annually. The call for projects goes out in the spring of each year and the projects are selected by the fall.

The LPA is required to use the state funds for specific types of road or bridge improvement projects; however, this program allows a much wider variety of projects and ranges of scope than the federal-aid program would permit, including many aspects of bridge repair and safety improvements, and the funds can be used on any public road. The guidelines for this program are on the Bureau of Local Projects website at: <http://www.ksdot.org/burLocalProj/default.asp>. Contact Sondra Clark at (785) 296-0441 or sondrac@ksdot.org. ■

We've Moved! New Space for Kansas LTAP

By Lisa Harris

Kansas LTAP has new offices on the University of Kansas campus. LTAP is a program of the KU Transportation Center (KUTC), and now the KUTC is co-housed with its umbrella organization, the KU Transportation Institute, in the new "M2SEC" building at the School of Engineering.



KU Engineering School

we were located for 30 years. We're now a little closer to 15th Street—one of the main entrances to campus.

The photograph at left shows the east face of the M2SEC building. 15th Street is visible on the left of the photo. Our offices are the row of windows on the ground floor.

M2SEC is short for Measurement, Materials, and Sustainable Environment Center, an interdisciplinary building that houses research labs built with funds from the National Institutes for Sciences with Recovery Act grants. The building uses experimental architecture designed to enhance the educational experience for students and allow the University to pursue cutting edge research.

The M2SEC Building is adjacent to Learned Hall where

Our new address is:
Kansas LTAP, 1536 W. 15th Street
M2SEC Building Room G520
Lawrence, KS 66045

Our phone numbers are the same. Stop by and see us! ■



MORE

By Lisa Harris

See download / ordering information on next page.

Every Day Counts Multimedia Presentations for GRS-IBS

Contains presentations by two county officials who have successfully installed GRS-IBS bridges: Brian Keierleber, P.E., Buchanan County (IA) and Toby Bogart, P.E., St. Lawrence County (NY). Hear about the technology from your peers and see their projects.

Bridge Railings Safety Fact Sheet

This two-page fact sheet describes safety considerations for bridge railings and brief recommendations for addressing them, using AASHTO guidance. The fact sheet addresses bridges both on and off the National Highway System, including low-volume bridges. The fact sheet contains links to detailed information on the topic.

The Fix We're In: The State of Iowa's Bridges

Makes the case for funding to maintain bridges. Iowa ranks third in the nation in number of deficient bridges. A well-done advocacy piece with good county statistics, maps and photographs. Published by Transportation for America. 19 pages. ■

ANSWERS TO BRIDGE QUIZ ON PAGE 12:
A=9; B=7; C=5; D=4; E=2; F=1; G=3; H=6; I=8; J=10



Sedgewick County, KS

CALENDAR

Visit our website for even more training calendar listings and to register for workshops. Go to <http://www.ksltap.org> and click on "View the LTAP Calendar."

■ TRAINING:

Traffic Signal Design ▲L3-e
September 12 in Salina

Supervisor's Role in Enhancing Cooperative Work Relations ▲L2
September 13 in Manhattan
September 18 in Iola

Traffic Impact Studies ▲L3-e
September 19 in Olathe

Local/State Project Coordination ▲L3-r
October 2 in Hays
October 3 in Salina
October 4 in Topeka
October 5 in Bonner Springs

Snow and Ice Control ▲L1
October 9 in Dodge City
October 10 in Wichita
October 11 in Salina
October 12 in Lawrence

Concrete Road Maintenance ▲L1
October 16 in Wichita
October 17 in Merriam

Road Safety Assessment ▲L3-e
November 1 in Topeka

Bridge Maintenance
November 28 in Great Bend
November 29 in Leavenworth

Public Works I and II ▲L2
December 4-5 in Salina
December 11-12 in Lawrence

Engineering Function in Public Works ▲L3-r
December date and location TBA

Highway Safety Manual (HSM)
January 9-10 in Lawrence

HSM "Lite"
Coming in Spring 2013

■ UPCOMING MEETINGS:

2012 MINK Local Roads Meeting
September 26-27 in St. Joseph, MO
Annual meeting of county roads officials in Missouri, Iowa, Nebraska and Kansas. Call Lisa Harris at (785-864-2590) for more information or visit www.moltap.org to register.

Kansas County Highway Association Fall Meeting
November 14 in Topeka
Call Penny Evans at (316) 660-1777

APWA Kansas Chapter Fall Meeting
October 9 in Topeka
Call Dan Stack at (785) 309-5725

For information on calendar items or to suggest a topic for an LTAP workshop, contact: Kristin Kelly, LTAP Training Coordinator, 785/864-2594, kbkelly@ku.edu.

▲L1 = KS Road Scholar Program Level 1 — Technical skills required course.

▲L2 = KS Road Scholar Program Level 2 — Supervisory skills courses are provided by the Kansas Association of Counties. Go to <http://www.kansascounties.org> and click on "Education Program."

▲L3-r = KS Road Scholar Program Level 3 — Master Road Scholar required course.

▲L3-e = KS Road Scholar Program Level 3 — Master Road Scholar elective course.

COMING THIS OCTOBER: LOCAL/STATE PROJECT COORDINATION

This training will provide information on federal and state funding available to Local Public Authorities and requirements for participating in those funding programs. Topics will include: federal funding and expected changes with MAP-21, preliminary and construction engineering agreements, traffic safety, bridge topics, project development, right of way acquisition and civil rights. This is a Level III Road Scholar required course (will not be offered again until 2014). See dates and locations above.



FREE ROAD & BRIDGE RESOURCES

Check off your selections, fill in the bottom portion, and return this form to:
Kansas LTAP Materials Request, 1530 W. 15th St., Room 2160, Lawrence, Kansas 66045 or fax to 785/864-3199



TRAINING GUIDES & REPORTS

You are free to keep these unless otherwise noted.
Or you can download at the links provided.

Every Day Counts Multimedia Presentations for GRS-IBS

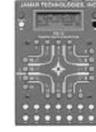
See description on page 14. Posted by the Federal Highway Administration. Access these presentations at:
http://www.fhwa.dot.gov/everydaycounts/technology/grs_ibs/multimedia.cfm

Bridge Railings Safety Fact Sheet

Two-page brief. See description on page 14. Download at
http://safety.fhwa.dot.gov/roadway_dept/policy_guide/road_hardware/ctrmeasures/bridge_railings/bridge_railings.pdf
or request hard copy.

The Fix We're In: The State of Iowa's Bridges

19 pages. See description on page 14.
Download at: <http://t4america.org/docs/bridgereport/states/bridgereport-ia.pdf>



EQUIPMENT LOANS

We offer the following items for loan to local highway agencies.
Contact mgivechi@ku.edu for counter boards and weaver@ku.edu for the Safety Edge shoe. There could be a waiting list for these items.

Safety Edge Paving Shoe. This Advant-Edge shoe attaches to a paver with a universal bracket, provided with the shoe.

Turning Movement Counter Board DB-400, Jamar Technologies, Inc. A basic model for recording turning movements at intersections. The board is lightweight and comes with its own case.

Turning Movement Counter Board TDC-8, Jamar Technologies, Inc. Can be used to do turning movement counts, classification counts, gap studies, stop-delay studies, speed studies, and travel time studies. The board is lightweight and comes with its own case.

Our library of free reports and training videos is searchable online. Visit <http://www.ksltap.org>. Click on the "Lending Library" to search the catalog and place your order.



REQUEST FORM

- send materials indicated address correction add to LTAP Newsletter mail list send Road Scholar Program brochure
 add to KS LTAP email discussion list

Name _____ Phone number _____

Position _____ E-mail address _____

Agency _____

Street Address _____

City _____ State _____ Zip+4 _____

*For requests outside the United States: After receiving your request, we will notify you of the postage cost and will send materials after receiving payment for postage.

The University of Kansas
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KU Transportation Center
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SAVE A TREE!

If you would rather link to our newsletter electronically instead of receiving a hard copy, send your email address to LHarris@ku.edu and we'll send a notice to you when each issue is published.

Is your mailing information correct?

Please fax changes to (785) 864-3199 or email Lisa Harris at LHarris@ku.edu.

 **KANSAS LTAP**

Let us help you find the answers to your transportation-related questions.

Kansas LTAP, 1536 W. 15th St., M2SEC Bldg. Room G520, Lawrence, KS, 66045. Call 785/864-5658. Fax 785/864-3199. <http://www.ksltap.org>

The Kansas Local Technical Assistance Program (LTAP) is an educational, technology transfer and service program of the Kansas University Transportation Center (KUTC), under the umbrella of the KU Transportation Research Institute. Its purpose is to provide information to local government highway departments and their personnel and contractors by translating into understandable terms the latest technologies in the areas of roads, highways and bridges.

The *Kansas LTAP Newsletter* is published quarterly and is free to counties, cities, townships, tribal governments, road districts and others with transportation responsibilities. Editorial decisions are made by Kansas LTAP. Engineering practices and procedures set forth in this newsletter shall be implemented by or under the supervision of a licensed professional engineer in accordance with Kansas state statutes dealing with the technical professions.

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