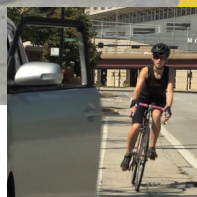


# LOCAL TECHNICAL ASSISTANCE PROGRAM



Fall 2014

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<http://ltap.colorado.edu/>

## New CDOT Transportation Erosion Control Supervisor (TECS) Training

JANUARY DEADLINE RAPIDLY APPROACHING

Erosion control and training at CDOT highway construction sites has been an established practice since 1994. CDOT was one of the first DOTs in the United States to have an established training and Erosion Control Supervisor (ECS) Certification Program to protect water quality. The original ECS training stressed regulatory compliance, documentation, erosion control-hydrology basics and stormwater best management practices. The CDOT ECS Training and Certification was used by most Front Range municipalities for their construction site stormwater trainings.

The goal of CDOT's new Transportation Erosion Control Supervisor (TECS) Certification Program is to improve the understanding and execution of stormwater protection and management practices at the construction site that are compliant with CDOT specifications and regulatory requirements. In the final analysis, the main purpose of the training is to improve erosion control practices in the field in order to protect and maintain our finite water resources.

The revamped training program is comprised of two training sessions, a classroom portion (Class 1) and a field training session (Class 2) that are approximately 8 hours each. The TECS classroom portion involves a comprehensive discussion and review of CDOT

*Previous ECS Certification expires January 2015 and the new TECS certification is required after January 1, 2015 to actively work on CDOT construction projects.*

# COLORADO LTAP

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The Local Technical Assistance Program (LTAP) is sponsored by the Federal Highway Administration, the Colorado Department of Transportation, and the University of Colorado at Boulder to provide information on the latest transportation issues facing Colorado's state and local governments.

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## Bicycle Safety Videos

### Are You Smarter than a 5 Year Old?

BIKE SAFETY VIDEOS FOR YOUR COMMUNITY



Are you smarter than **MY** 5-year old?? The star of this video is Renée's nephew, Lucas Cusson, who lives in Boston, MA. So proud!

Bicycling can be a fun and healthy way to enjoy our beautiful state. To stay safe, it is important for everyone to know their rights and responsibilities as a cyclist. Bicycle coalitions across the country have developed a series of *Bicycle Safety Videos*, some are available online at: <http://www.bu.edu/bikesafety/cycling-safety/training-videos/>.

There are eight *Bicycle Safety Videos* on this site that you can use to educate different levels of your community.

- Are You Smarter Than a 5 Year Old?
- Put Your Helmet On!
- Rights & Duties of Bicyclists
- Avoiding the "Door Zone" – How not to get doored
- Share the Road – Buses & Bicycles
- Share the Road – Trucks & Bicycles
- Urban Biking – Overcoming Your Fears
- Bicycle Safety & Sustainability Day (time lapsed)

Colorado's Safe Routes to School Program and Share the Road Campaign provide additional information and resources to help you learn more about safe bicycling in Colorado. Check out the following links at:

<http://www.coloradodot.info/programs/bikeped>.

- Information for Bicyclists
- Information for Pedestrians
- Health and Economic Benefits Of Bicycling
- Building a Bike/Ped Friendly Community
- Safe Routes to School
- Bike to Work Day
- Special Event Permits and Information
- Design and Policy Information
- On-Line Bicycling Map
- Colorado Bike/Ped Manual

**2 Assisting Local Road & Bridge Agencies for Over 25 Years**



# BEST PRACTICES FOR CRACK TREATMENTS IN ASPHALT PAVEMENTS

Crack sealing and crack filling are widely used treatments for maintenance of asphalt pavements; and successful crack sealing and crack filling applications are viewed as an art. When not properly applied, these pavement preservation treatments can result in early failures and costly corrective maintenance for highway agencies. Although much research has been performed in the United States and abroad on the materials, techniques, and designs for crack repair, the current state of practice regarding construction techniques and the resulting effectiveness of crack sealing and crack filling had not been investigated.

The objective of NCHRP Project 20-07/Task 339, *Best Practices for Crack Treatments for Asphalt Pavements*, was to identify current best practices for crack sealing and crack filling of asphalt pavements. The research was performed by Dale S. Decker, LLC, of Eagle, Colorado. His research included a critical review of the worldwide literature on crack sealing and filling, with emphasis on identifying current best practices. A survey of state, local, and provincial highway agencies was also conducted to fill gaps in the results of the literature review.

It has been found that *crack sealing* and *crack filling* are cost-effective pavement maintenance techniques. The objective of any successful crack treatment operation is to minimize the intrusion of water into underlying layers of the pavement structure. The penetration of water can weaken the base materials and lead to structural pavement failures with costly corrective actions.

The Federal Highway Administration (FHWA) provides the following guidelines to determine when to use crack treatments and the type of road maintenance that should be performed in relation to crack density.

Crack Density	Average Level of Edge Deterioration (% of crack length)		
	Low (0-25)	Moderate (26-50)	High (51-100)
Low	Do Nothing	Do Nothing or Crack Treatment	Crack Repair
Moderate	Crack Treatment	Crack Treatment	Crack Repair
High	Surface Treatment	Surface Treatment	Rehabilitation

After determining the appropriate type of maintenance for the cracked pavement based on the density and condition of the cracks, if a crack treatment is appropriate, determine whether cracks should be sealed or filled. FHWA categorizes crack sealing as *Preventative Maintenance* and crack filling as *Routine Maintenance*. It is imperative that both be done with appropriate equipment and in the best manner possible in order to attain good performance. The following are suggested best practice requirements to achieve a long-lasting crack treatment.

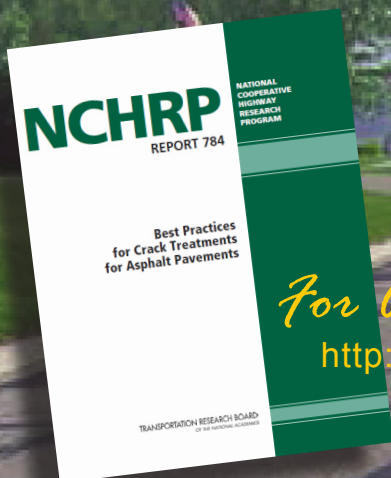
It is critical that the condition of the existing pavement be evaluated prior to any preservation treatment and to determine the potential crack movement, i.e., “working” versus “non-working” cracks. The Best Practices report found consensus on the following definitions:

**Crack Sealing:** The process when materials are placed into and/or above “working” cracks in order to prevent the intrusion of water and incompressibles into the cracks. Crack sealing is commonly used as a *transverse* crack treatment, and cracks with significant annual horizontal movement.

**Crack Filling:** The process when materials are placed into “non-working” cracks to substantially reduce water infiltration and reinforce adjacent cracks. Crack filling is commonly used as a *longitudinal* crack treatment, or cracks with little annual horizontal movement. “Non-working” cracks are not typically routed.

**Working Crack:** This refers to cracks that undergo significant amounts of movement; moving as a result of expansion and contraction. (In hot weather, the pavement expands and closes the crack; while in cold weather the pavement contracts, opening the crack.) FHWA has defined the amount of movement for “working” cracks to be 2.5 mm or more; however, the research found that the value most commonly used is 3 mm or approximately 1/8-in.

....continued on page 4



For Additional Best Practices  
<http://www.trb.org/Main/Blurbs/171266.aspx>

The research established that the most advantageous applications for crack sealing and/or crack filling are block, longitudinal, reflection, and transverse. It was found that unless the crack treatment is done in early-stage distress development, crack treatments for fatigue cracking do not substantially improve pavement performance. Fatigue cracking is indicative of a structural failure in the pavement system and can only be remedied by removing and replacing the failed materials.

[NOTE: FHWA’s *Distress Identification Manual for the Long-Term Pavement Performance Program* is a useful visual reference for identifying the types of distresses you have in your pavement. The manual includes color photographs and drawings to illustrate common distress types and provides a reference to assess their severity. The Distress Identification Manual is online at: [http://www.fhwa.dot.gov/pavement/pub\\_details.cfm?id=91](http://www.fhwa.dot.gov/pavement/pub_details.cfm?id=91).]

The survey queried participants regarding the type of crack that is appropriate for both crack sealing and crack filling. The following illustrates their preferred treatment by crack type and required climatic conditions for both crack sealing and crack filling. In general, crack sealing is typically performed in cold weather climates and crack filling is performed in warm weather climates.

	Crack Sealing	Crack Filling
Minimum Air Temperature	89.4	60.6
Maximum Air Temperature	80.8	61.5
Minimum Pavement Temperature	88.1	64.4
Maximum Pavement Temperature	87.0	52.2
Recent Precipitation	89.2	64.6
Forecast Precipitation	87.8	65.9
Absence of Fog/Dew	87.5	77.1
Direct Sunlight	85.7	42.9

Type of Crack for Crack Sealing	Type of Crack for Crack Filling
Transverse Cracking	Joint Cracking
Reflective Cracking	Edge Cracking
Low Temperature Cracking	Transverse Cracking
Joint Cracking	Reflective Cracking
Edge Cracking	Fatigue Cracking
Fatigue Cracking	Low Temperature Cracking

The data show that both minimum and maximum crack width are the two most important criteria in determining crack sealing or filling.

	Percentage of Responses		Crack Dimensions, inches	
	Crack Sealing	Crack Filling	Crack Sealing	Crack Filling
Width, min	80.3 %	81.7 %	0.24	0.42
Width, max	71.1 %	71.7 %	1.01	1.66
Depth, min	51.3 %	58.3 %	0.72	1.00
Depth, max	51.3 %	60.0 %	3.00	4.14

The State-of-the-Practice in crack treatments indicates there are some conditions for which crack sealing or crack filling is not appropriate.

Situations where *crack sealing* is not appropriate:

- Cracks are too wide, too deep, or too numerous;
- “Non-working” cracks (can be used, but filler is cheaper and quicker);
- Pavement deterioration too severe (fatigue or alligator cracking);
- If major surface rehabilitation/repair is scheduled within the next two years (e.g., overlay, in-place recycling, chip seal); and
- If sealing would cover more than 25% of surface area (diminishes pavement skid safety).

Situations where *crack filling* is not appropriate:

- “Working” cracks (1/8” movement per year);
- Pavement deterioration too severe (fatigue cracking);
- If cold-in-place recycling is scheduled in the near future; and
- If reconstruction is scheduled within 2–3 years.

The report provides standards of practice in regard to *shape factor* – the depth-to-width ratio of the crack sealing material; successful crack seal configurations; routing vs. not routing; contracting services; and sealant material types. But even with the best materials, improper installation of the crack sealant compromises the performance of the application.

- » In order for the sealant to bond, the crack must be clean and dry. A vacuum and compressed air are commonly used to clean the crack. FHWA recommends the use of a hot air lance to remove dust and moisture from the crack to ensure a better bond between the pavement and the sealant.
- » The issue of whether or not to rout cracks prior to treatment is debatable. Routing of cracks is generally performed on transverse cracks that are “working”; and some caution that routing may be detrimental to pavements over 6 years old due to aging of the mixture. It was suggested to not rout cracks if microsurfacing is to be applied.
- » Since environmental conditions can have a significant impact on performance, the outdoor temperature should be between 40°F and 70°F at the time of sealant placement. Spring and fall are optimum times for crack treatment, and many prefer cooler temperatures so that the crack is wider.
- » Although there was no single crack treatment configuration that was overwhelmingly favored, reservoir configurations are common when crack sealing because the reservoir provides a mechanism for expansion and contraction and the sealant can uphold its adhesion to the crack edges. And it is recommended to overfill the crack just enough to cover both edges of the crack and to allow for shrinkage during cooling. This approach minimizes snowplow damage for routed cracks.
- » The key calibration component for crack sealing equipment is to ensure that the temperature control on the melter is working properly and is capable of safely heating the product to application temperature.

Additional details are provided on sealant installation including cold-poured applications, applying different blotter materials, safety precautions and quality control. The report includes a Troubleshooting guide published by the Montana DOT that provides good insight into crack treating issues that may be encountered along with possible causes and solutions. Inspection is a critical need for verifying the quality of the crack treatment operations performed.

The primary focus of crack treatments is to achieve a pavement maintenance application that will perform well under a variety of environmental and traffic conditions. Additional training resources on crack treatments are available through the LTAP centers, NHI’s Pavement Preservation Treatment Series, the National Center for Pavement Preservation, the International Slurry Surfacing Association and more.

# New CDOT Transportation Erosion Control Supervisor Training

*Continued from Page 1....*

Specifications related to water quality. The in-field training session is held at CDOT's Water Quality BMP Training Facility. This facility provides the necessary hands on field erosion control experience that complements the TECS classroom training.

**IMPORTANT TO NOTE** - The previous ECS Certification expires January 2015 and the new TECS certification is required after January 1, 2015 to actively work on CDOT construction projects. Everyone expected to work on CDOT projects needs to be re-certified under the new training program before January 1, regardless of how many years they had left on their old ECS certification.

To achieve the new TECS Certification, one must attend and pass examinations for both Classes 1 and 2.

Students must take Class 1 before taking Class 2 on-site; but the classes do not have to be taken consecutively. Please be aware - due to impending weather, the BMP site for the in-field Class 2 portion will be closing for the winter season around mid-November, 2014.

If you seek TECS Certification before the January 2015 deadline, you are urged to register now at <http://www.coloradodot.info/programs/environmental/water-quality/transportation-erosion-control-supervisor-certification>. The new TECS involves a three-year certification; and CDOT is exploring a future online certification extension option.

*Submitted by Art Hirsch, TerraLogic Sustainable Solutions and CDOT Stormwater consultant.*



## CO LTAP STORMWATER MANAGEMENT TRAINING

Colorado LTAP is offering a one-day informational course on **Stormwater Management: How YOUR Job Impacts Stormwater Quality & Compliance**. This course is being offered through the Roads Scholar II training program and is worth 7 credit hours in the Environment Focus Area. Although this class is *not* a part of the CDOT TECS Certification program, it will include collaborative instruction from CDOT, CDPHE, Local Agencies, and Consultants. This course will introduce key concepts of stormwater runoff and how they translate to maintenance and construction issues typically encountered in the field. Learn how you can help prevent and mitigate water quality impacts. Topics to be covered include:

- **WHY?** Clean Water Act; Stormwater Program Requirements; Construction; Municipal Separate Storm Sewer System (MS4); Industrial Considerations
- **WHAT?** Colorado and Local Impacts of Stormwater Regulations
- **WHO?** Lessons Learned - CDOT and Local Municipality/County Government Perspectives
- **HOW?** Stormwater Toolbox; Construction; Roadway Maintenance; Facilities; Standard Operating Procedures to Prevent Erosion and Pollution; and Breakout Group Discussions

**November 12, 2014**

Grand Junction  
Clarion Inn

**November 21, 2014**

Castle Rock  
Douglas County Fairgrounds

For more information or registration, visit online: <http://ltap.colorado.edu>.



# CDOT WATER QUALITY BMP TRAINING FACILITY OPEN HOUSE

CDOT's redesigned 2-day Transportation Erosion Control Supervisor Certification is required by CDOT construction specifications in order to actively work on CDOT projects. Day 1 of training is held in the classroom and covers the "three main pillars" of administration — phasing, documentation, and communication. Day 2 of field training takes place at CDOT's state-of-the-art Water Quality BMP Training Facility and covers the basics of erosion, soil types, watershed management, and hydrology. One of only a few in the country, the venue is used to increase the effectiveness of water-quality education throughout the state.

The training facility is designed to educate construction contractors, municipalities, and individuals on the proper use, installation and maintenance of erosion and sediment control BMP's. It provides hands on training with simulated real world applications to improve Stormwater Permit compliance and promote green government and sustainability. The revamped training program focuses on improving both the execution of stormwater controls at the construction site as well as the understanding of hydrological and watershed concepts.

On October 8, 2014, CDOT's Hydrological Resources and Ecological Design Section provided an Open House of their cutting-edge facility. Field erosion control demonstrations were provided including visual models illustrating laminar and turbulent flow and an augmented sandbox that shows how a watershed's shape affects runoff.

The renovated facility features new demonstrations of sediment and hydrology dynamics, and is used to demonstrate effectiveness of various stabilization BMP's.

Students can witness good and bad BMP

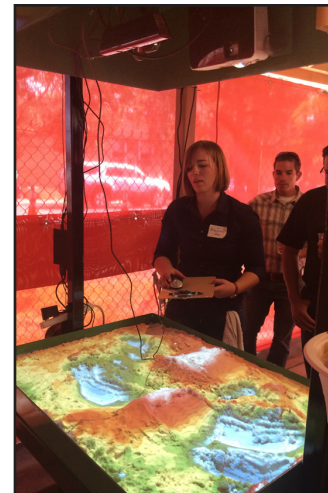


application and installation issues. Recirculated water is used to show hydrology in motion and to visualize the movement of water

and sediment down slopes and through channels. Irrigation components mimic natural precipitation events and resulting runoff to test proper and inadequate BMP installations; with ditches constructed at 2% and 5% slopes to simulate and compare erosion in ditches and BMP applications. The training facility promotes sustainability by using recycled materials. Constructed slopes used one ton compressed tire bales to create the earth berms. Water quality ponds display various outlet control BMP's, slope control and access options. The ponds capture stormwater from rain events and water used during training.

The BMP field training academy hosts vendor demonstration days, school tours and training for participants throughout Colorado. From stormwater inspection and BMP installation to new BMP applications and demonstrations, the outdoor lab is a

beneficial stormwater quality improvement tool and an asset for Colorado.



# IDEAS THAT WORK

## Arapahoe County Milling Scoop

### 2014 You Show Us Contest Winner



#### PROBLEM STATEMENT

Arapahoe County Road and Bridge purchased a milling attachment to use with a skid steer for the milling of cracks, bumps and soil mixing. They had incredible success with the implementation but found that the crew was spending extended time on the cleaning of the milled area. Shovels were fine for removal of about the first inch or two of millings but then near impossible once touching the milled surface. Push brooms were also not an acceptable tool for the job.

#### SOLUTION

The Road and Bridge patching crew came up with a very innovative and creative solution. They took a standard 6-ft wide skid steer bucket that was 18-in tall and turned it into a custom milled surface trench cleaner. The bucket has a 22.5-in center scoop that sits 2.5-in below the standard front cutting edge. It extends out from the cutting edge a total of 8.5-in, has a 2-ft flat section and then a 10-in taper to the back of the bucket. This bucket is 100% custom designed to work the trench behind their mill attachment to clean out millings and dirt from the hole.

#### LABOR, MATERIALS, EQUIPMENT

The patch crew decided to partner with the Fleet department to complete the project. They were able to utilize a spare bucket they had in the yard with some scrap steel.

#### TOTAL COST

They completed the project with about one day worth of welding and labor for a total just under \$400.

#### SAVINGS AND BENEFITS

This new bucket design has saved on average, about ten minutes per crack (2' x 24') cleaned out and repaired. With an average of about five cracks a day, that results in close to a full hour of available labor time every time the bucket is used.

**CONTACT:** Keith Runyan, Arapahoe County Road and Bridge, [krunyan@arapahoegov.com](mailto:krunyan@arapahoegov.com)



## LOCAL TECHNICAL ASSISTANCE PROGRAM

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## HELP ON LAWS ADDRESSING INSTALLATION OF CURB RAMPS and OTHER ROADWAY MODIFICATIONS

Are you aware that Federal law requires the installation of curb ramps or other modifications when a project alters a roadway? To learn more, check out the new informational module and short video entitled “*Americans with Disabilities Act (ADA) Requirements for Resurfacing Projects.*” This new video discusses the types of resurfacing modifications under which the law applies and will be of interest to any Agency that manages routes in the public right-of-way. Visit the video library <http://www.fhwa.dot.gov/federal-aidessentials/indexofvideos.cfm>. This video website also provides links to the following resources:

- USDOJ/DOT Joint Technical Assistance on when Curb Ramps are Required with Resurfacing
- Guidelines for Pedestrian Facilities in the Public ROW
- Federal Regulations Containing ADA Standards
- Glossary of Terms for Resurfacing
- FHWA’s Accessibility Resource Library
- U.S. Access Board’s ADA standards
- Questions and Answers for ADA/Section 504

Colorado LTAP is offering a 2-day class, “*Designing Pedestrian Facilities for Accessibility*”, focusing on proper design and maintenance of pedestrian access routes in new construction or when existing facilities are altered. Participants are engaged with an **hands-on outdoor exercise utilizing wheelchairs**. This class will cover best practices for those involved in the design and maintenance of pedestrian facilities, especially for those responsible for ensuring the proper adherence to all applicable laws and guidelines. It is being offered through the Roads Scholar II training program and is worth 14 credit hours in the Safety Focus Area. For more information, visit online: <http://ltap.colorado.edu>.

**November 5-6, 2014**  
Rifle  
Hampton Inn

**November 18-19, 2014**  
Lakewood  
FHWA Division Office

## MAINTENANCE ACTIVITIES

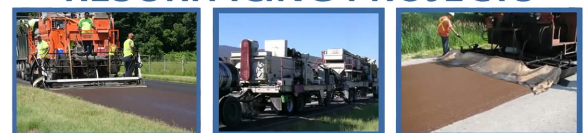


PAVEMENT  
PATCHING

CRACK  
FILLING

CHIP SEAL

## RESURFACING PROJECTS



MICRO-SURFACING

IN-PLACE ASPHALT  
RECYCLING

CAPE SEALS