

# TXLTAP MONTHLY NEWSLETTER



## What is the Condition of our Roadway System? by Don Ward, P.E.

This is a question that many leaders of a Public Works Department, City or County Engineer's Office, Road and Bridge Department, or even the City's or County's Management Office may frequently hear but might have difficulty answering. To begin with, one must truly understand that a roadway does have a "measurable condition". This is called a "Pavement Condition Index" or "PCI" for short. This PCI is typically measured from "0" (very poor) to "100" (new).

A roadway with a PCI between "0 – 50" PCI is in very poor condition and more than likely would need to be reconstructed from top to bottom, or at a minimum milled (several inches of surface pavement ground off) and overlaid with new pavement layers.

A roadway from "50 – 60" PCI is in fair condition and will likely require a surface treatment such as a micro surface, chip seal or slurry seal. Additionally, a crack sealant should be applied to the cracks in the roadway surface that will help prevent further deterioration of the roadway structure.

A roadway from "60 – 80" PCI is in good condition and will likely need a preservative treatment such as a maltene replacement emulsion application or a surface seal and of course a crack sealant application. Lastly, the roadways that range from "80 – 100" PCI should not require treatment for at least the next 2 years under normal conditions.

The tools to help provide the answers are also broad and varied but very important. The first step is performing a "Pavement Condition Survey." This can be performed in a variety of ways, but the information obtained is necessary for 1) the preparation of annual roadway maintenance budgets; 2) determining the extent of necessary roadway maintenance; and 3) potential preservation methods for the most valued asset owned by the entity: the overall roadway system.

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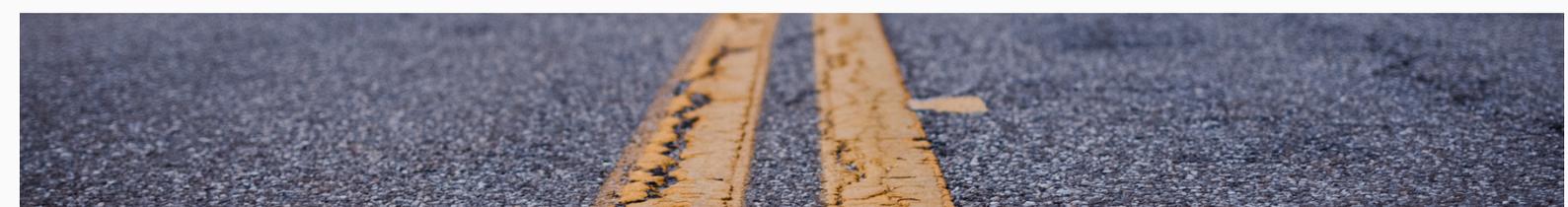
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The basic method for performing the pavement condition survey is called a “Windshield Survey”. This survey is completed by a qualified and experienced roadway maintenance individual who actually drives and views the entire roadway system while giving each roadway section a “PCI” rating. This information is finalized in a report detailing the roadway system’s condition and most importantly transferred to a map of the overall roadway system that clearly illustrates the different roadway conditions (typically highlighted in different colors for the different ranges of PCIs).

The highest and most detailed survey method is a “Digital Imaging Survey”. This is an extremely thorough survey that collects data according to selected distress parameters of the roadway and is accompanied by digital images of the roadway. This method can also collect roadside asset information such as signage or roadway structures. The collected information can then be downloaded into the entity’s “Pavement Management Program” where it can be utilized for analysis, report preparation and visual production or map generation. All these tools are extremely useful in assisting with planning on an annual basis.

There are many methods that fall between the “Windshield Survey” and the “Digital Imaging Survey” but the bottom line is that the pavement condition survey is critical to the preparation of an effective preservation and maintenance plan for the entity’s most valuable asset, “our roadway system”.



## Roadway Maintenance Terminology and Techniques by Don Ward, P.E.

### Crack Seal, Crack Fill or Crack Pour

The “Crack Seal” term goes by several names depending on the region, the contractor or even the product being used. “Crack Seal” is the method of filling cracks in the roadway surface with a “mastic” type material which is typically hot applied with a spray wand. The heating temperature can exceed 300 degrees Fahrenheit and is typically performed with a 3 to 5-person crew. The process begins by cleaning the cracks, if possible, then immediately following with the fill material and this material should be pushed into the cracks with a squidgy or some type of tool that can push the material into the crack. The surface is usually smoothed after application.

The purpose of “Crack Sealing” is to close the surface of the roadway to intrusion of water which can quickly deteriorate the roadway requiring a higher level of repair and cost. “Crack Sealing” can be covered by numerous other maintenance techniques such as “Chip Seal”, “Micro Surface” or “Overlay” and will typically not hurt or damage the “Crack Seal”.



## Roadway Maintenance Terminology and Techniques Continued...

- Pros – Prevents water intrusion in the pavement surface. Slows the degradation of the pavement surface. Relatively inexpensive related to the overall benefit.
- Cons – Sometimes viewed as non-aesthetic visually.



### Penetrating Rejuvenation Emulsion

This maintenance process is the surface application of an emulsion of specific oils and resins designed to penetrate dry and weathered Hot Mix Asphalt Concrete (HMAC) pavements. The emulsion penetrates seeking the asphalt binder in the pavement structure in preference over the aggregate in the HMAC structure. During the penetration process the emulsion combines with the asphalt binder so as to restore its original “flexible pavement” properties. During the aging and oxidation process of the HMAC structure, the asphalt binder becomes dry and brittle causing cracks in the surface and into the HMAC structure as well. This deterioration causes loss of aggregate, structural/surface cracking and allows for intrusion of water into the HMAC structure with exponential deterioration of the HMAC structure over a short period of time.

This technique also seals the pavement surface from the intrusion of air and water slowing oxidation, preventing stripping/raveling of the surface aggregate and extending the life of the HMAC structure.

The emulsion is applied with an emulsion tanker truck with a spray nozzle bar. Typically applied at a rate of 0.70 to 0.10 gallons per square yard and is completed in a relatively short time of 1-2 hours.

- Pros – Extends pavement life 5-7 years per treatment. Low cost versus many other pavement treatments. Quick application timeframe. High return on the investment. Environmentally friendly. Minimal disruption to traffic flow. Restriping of pavement is not required.



Unsealed Treatment (left) – Sealed Treatment (right)



## Roadway Maintenance Terminology and Techniques Continued...

- Cons – Does not provide color enhancement to pavement surface.



### Sealcoat

A “Sealcoat” is a maintenance application that can be applied on numerous pavement surface types. The “Sealcoat” consists of a light spray application of a diluted slow-setting asphalt emulsion. The typical curing time is between 6-8 hours for the emulsion to break and cure. These treatments are surface application only and do not provide HMAC structural enhancements. These treatments are typically low in cost and are typically used to temporarily postpone the need for a surface treatment or a structural/non-structural overlay. These treatments are typically used on lower volume roadways and do not increase the roadway surface friction.

- Pros – Relatively inexpensive compared to Slurry Seal or Micro Surface. The treatment provides a short-term sealing of the pavement surface, typically 2-4 years. Construction timeframe of 6 to 8 hours, then is open to traffic.
- Cons – Does not provide any pavement structural benefit. The treatment must be repeated every 3 to 5 years to prevent the delamination of the seal material.



Untreated (left) – Sealed Treated (right)

### Slurry Seal

A “Slurry Seal” maintenance technique is a maintenance technique that includes water, asphalt emulsion, aggregate (small, crushed rock) and sometimes admixture combination which is spray applied or by an emulsion truck that applies the emulsion and aggregate or can apply this as a mixture. This technique helps fill small cracks in the pavement surface, it helps seal the pavement surface to prevent moisture intrusion and it provides an improved appearance to the roadway surface. A “Slurry Seal” can contain different size aggregate ranging from fine to coarse, where the fine aggregate can fill small cracks and provide a smoother surface and the larger aggregate “Slurry Seal” is used to treat larger surface defects and provide a higher level of vehicle skid resistance to reduce hydroplaning. It typically takes longer to cure than a “Fog Seal” due to the thicker layer and is between 6-10 hours that it is closed to traffic.



## Roadway Maintenance Terminology and Techniques Continued...

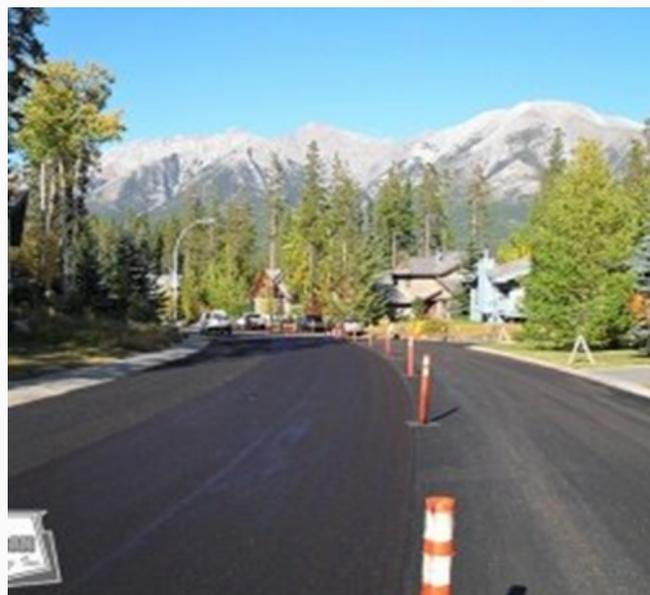
- Pros – This treatment provides a sealing of the pavement surface and the aggregate which is included in the emulsion helps seal cracks that exist in the pavement surface. Provides an improved pavement surface and appearance.
- Cons – Relatively more expensive than Fog Seals but with similar time before resealing is required, 3 to 5 years. Does not penetrate the pavement providing structural benefit. Takes a longer time for product to cure typically 6-10 hours prior to traffic be allowed on the treated surface.



### Micro Surface

The “Micro Surface” maintenance technique is very similar to a “Slurry Seal” in that it includes water, asphalt emulsion and aggregate (various sizes). The biggest difference between the two types of treatments is that “Micro Seals” contain various chemicals that allow the seal to cure faster than “Slurry Seals” thus allowing traffic back on the roadway in a much shorter timeframe. Typically, the “Micro Seal” is a thicker application than a “Slurry Seal” up to 1” in thickness. Polymers are often added to a “Micro Seal” that resists turning movements of vehicles and prevents the shedding of surface aggregates. This application also supports the surface structure on roadways with higher traffic volumes.

- Pros – This pavement treatment provides more of a preventative surface treatment than “Slurry Seals” in that the treatment is thicker, and it is used to repair and extend the pavement surface. It creates a smoother surface that resists cracking and raveling. There is less traffic disruption due to quicker cure time. Delays the need for structural pavement repair. Provides aesthetic roadway surface enhancement.
- Cons – More expensive to place than similar maintenance techniques. Does not provide pavement structural enhancements. The treatment should be repeated every 4-6 years to prevent delamination.





## Roadway Maintenance Terminology and Techniques Continued...

### Chipseal

A “Chipseal” (Chip Seal/Chip and Seal) is a roadway maintenance technique that combines one or more layers of asphalt with one or more layers of aggregate. The asphalt that is used can be a “Hot Applied” (300 degrees Fahrenheit or more) or lower temperature (150 degrees Fahrenheit) emulsion. Additionally, polymers or other additives are included in the emulsion to improve the performance. The aggregate used can be coarse (Grade 4) or fine (Grade 6-7) depending on the roadway surface conditions and the desired outcome of the finished surface. The process begins with the application of the asphalt with an emulsion truck, followed very quickly by the spreading of the aggregate and within a short time (depending on type of asphalt used and weather conditions) the emulsion/aggregate treatment is rolled to compress the aggregate into the emulsion with a rubber-tired roller. This entire process can be applied in multiple layers. Typically, with the larger aggregate in the first layer followed by the smaller aggregate in the second layer. This technique will assist in keeping the pavement in good condition by sealing the roadway, prevents the intrusion of water and seals minor cracks. The “Chip Seal” will extend the pavement life and provide an improved friction coefficient resulting in improved vehicular skid resistance.

- Pros – Typically more economical than overlays or in-place-recycling for major roadway rehabilitation. Provides an improved roadway friction coefficient to improve vehicular skid resistance. Seals the roadway surface and fills cracks to prevent intrusion of water into the pavement structure. Prevents the aging of the roadway surface due to oxidation and sun. Is a lower cost long term roadway maintenance solution.
- Cons – The treatment must be swept after the asphalt or emulsion sets to prevent any loose aggregate from becoming a safety issue. Additionally, the roadway must be periodically swept to prevent safety issues such as crack windshields, etc. This treatment will also exhibit a rougher surface than a HMA paved roadway and will exhibit a higher roadway noise level than typical HMA paved roadways. This treatment is a non-structural technique.



### Overlay

An asphalt or HMA (Hot Mix Asphalt Concrete) Overlay is a new layer of HMA over an existing base layer of HMA or base material (compacted rock, HMA base or compacted subgrade). This new layer is typically 1.5 inches to 3 inches in depth.



## Roadway Maintenance Terminology and Techniques Continued...

This application depends on the type of use and demands of the roadway and is typically an engineered application. This process is typically a new structural layer that is required due to deterioration of the existing HMAC structure. A thin Overlay can be added to existing HMAC but in most case a “Milling” of the HMAC is required to remove the old deteriorated or damaged HMAC prior to the Overlay. The “Milling” process removes the old HMAC by grinding it to the required depth and removing the material. The millings can be recycled and reused. Any problems with the underlying base layer are then repaired and the new layer of HMAC is then constructed, compacted/rolled and the roadway restriped.

- Pros – This maintenance technique provides a new structure for damaged or deteriorated roadways. Provides a new safe surface for roadways. Extends the life of the roadway. Typically, can be performed in lieu of “Full Depth Reconstruction”. Usually is an engineered project with plans and specifications for construction.
- Cons – This maintenance option is typically more expensive than other methods due to construction requirements, engineered construction plans/documents and cost of materials. Typically, this process is very lengthy due to extensive preparation, selection of construction contractors, etc.



### In-Place-Recycling

Hot In-Place-Recycling (HIR) is on-site method for rehabilitating pavements. The process is used to correct surface distress (cracking, raveling, etc.), increase surface friction loss and surface distortion. This method is not intended for correctional pavement structure failures and is not typically used beyond a 2” repair depth.

The HIR process softens the existing pavement surface structure with heat, mills/scarifies the surface layer, mixes the milled surface material with soft asphalt or a recycling agent along with additional aggregate and then places/compacts the new recycled asphalt surface on the roadway.

- Pros - The process can be done relatively quickly without extensive construction documents. The roadway is quickly repaired and open to traffic. The process uses less energy and emits fewer greenhouse gas emissions. The HIR process is less expensive that many other paving methods.
- Cons – The HIR process does not correct structural, base or subgrade failures. It is used only to address roadway surface issues.



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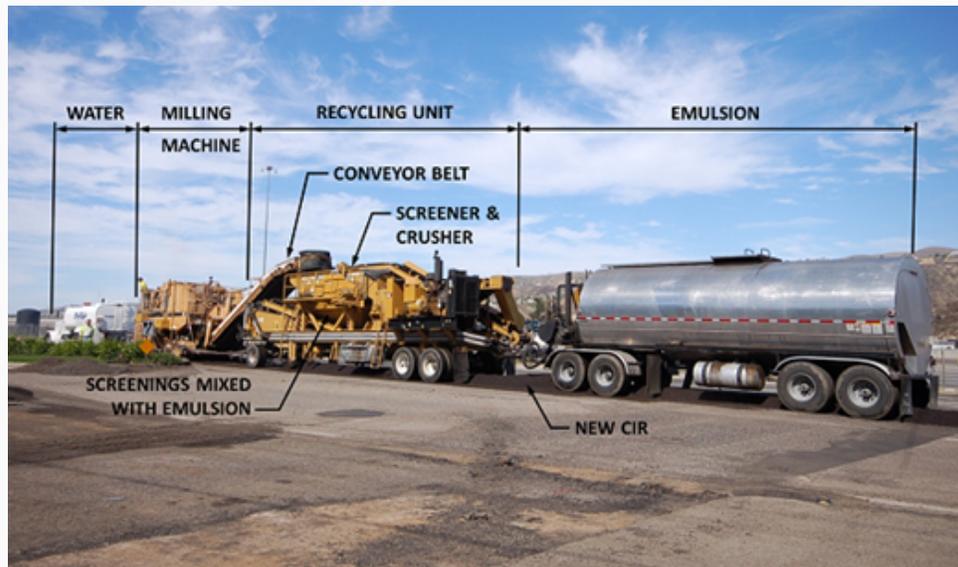


## Roadway Maintenance Terminology and Techniques Continued...



Cold In-Place-Recycling (CIR) is another on-site method for rehabilitating pavements. It is typically used for deeper pavement repairs needs than HIR and the depths are from 2" to 6". This process is also intended for roadways that do not have extensive underlying structural problems. This process can assist roadways that have issues with raveling, weathering, bleeding, corrugations, shoving, rutting and cracking. This process eliminates damaged layers with a recycled layer which provides a new base for a new HMAC overlay or surface course.

- Pros - The process can be done relatively quickly without extensive construction documents. The process uses less energy and emits fewer greenhouse gas emissions. The CIR process is less expensive than many other paving methods. It can be used to address numerous issues prior to overlays.
- Cons - The CIR process does not correct deeper issues such as base failures. It is used only to address roadway surface issues.



## TxLTAP Advisory Board Open Seats

The TxLTAP Advisory Board consists of engaged individuals who represent Texas' diversity in terms of geographical location, population size, and government organization. The board members have a variety of skills including insight into particular challenges and trends, current conditions, and technology research.

Our advisory board typically meets one time per year. If you are interested in joining our TxLTAP Advisory Board, please complete the form below and we will contact you to answer any questions you may have. You can send us your information: [Advisory Board](#)



# Build a Better **MOUSETRAP**

National Recognition Program  
for Transportation Innovation



**Driving  
Innovation  
Creating Inventions  
Implementing  
Improvements**



**Innovative Ideas must fall into  
one of four categories:**

- **Innovative Project**
- **Bold Steps**
- **Pioneer**
- **Smart Transformation**

**Submit your ideas to the TxLTAP Center,  
txltap@uta.edu - www.txltap.org ~ 817-272-2581**



## **2023 TEXAS SUBMISSION HONORABLE MENTION, CITY OF ARLINGTON**

### **Equitable Street Solutions for Vulnerable Road Users**

The City of Arlington is one of the largest U.S. cities without a public transit system. This project aims to revolutionize the roadways and intersections in Arlington by using cutting edge LiDAR sensors and disruptive control strategies to promote equitable safety and reduce traffic control delays while mitigating their negative impact on the environment. The smart traffic system collects behavioral data such as near misses, to help identify potential crashes under certain conditions (e.g., permissive left-turn vehicles vs opposing through vehicle).



# Focus on Training: Vehicle Backing Safety

Vehicle Backing Safety, LTP170, is an 8-hour course designed to provide best practice both in the classroom and hands-on to prevent the most common accidents that occur in most fleet operations. Estimates of backing accidents range from 70 to 80% of all truck fleet accidents and can be prevented. Vehicle Backing Safety walks through the following subjects:

- Identify Hazard/City Vehicle Backing
- Backing Vehicle and Trailer
- Procedures and Techniques
- Review Policies
- Spotter Positioning
- Field Exercises (located in a remote area)



# Instructor Spotlight

BOBBY CORNELIUS



Bobby worked 32 years with TxDOT, starting in the crew, working with the sign crew, operating equipment, serving as crew leader, assistant maintenance supervisor, and finishing out as maintenance supervisor. He has enjoyed teaching for UTA since 2013. Bobby teaches maintainer, telescopic hydraulic excavator (gradall), dozer, backhoe, loader, sweeper, broom, load & tie down, bucket truck & digger derrick, skid steer, roller, work zone traffic control, flagger, traffic control for first responders, and seal coat operations. Bobby has loved “playing in the dirt” since before he could hardly walk, so his TXDOT career and his second career with UTA is perfect for him. When not teaching heavy equipment or working on his farm with his own heavy equipment, Bobby serves as a deacon and Sunday School teacher at his church. He enjoys spending time with his family. Bobby has been married for 46 years, has two daughters and sons-in-law and nine precious grandchildren.

“Very knowledgeable (instructor).”  
“Well done and Professional!”  
“It was perfect!”

“I appreciated Bobby’s knowledge that he brought to the site.”  
‘Instructor is very knowledgeable!’  
“I’m very grateful for a knowledgeable instructor!”  
“Good class, kind instructor!”

# Upcoming Conferences and Events

Visit Our Exhibit and Meet Our Team:

- February 4-6, 2024: Texas APWA Public Workshop & Equipment Rodeo
- February 20-22, 2024: V.G. Young Institute Schools for County Commissioners Court





  
 Division for Enterprise Development  
**- TxLTAP -**

# INSTRUCTORS WANTED

Are you looking for your next  
adventure in the great state  
of Texas?

## TxLTAP IS LOOKING FOR EXPERTS IN:

- ✓ Work Zone
- ✓ Infrastructure
- ✓ Safety
- ✓ Heavy Equipment
- ✓ Management
- ✓ Flagging
- ✓ Environmental
- ✓ Electrical

Email Your Resume and  
 Letter of Interest to:  
**TxLTAP@uta.edu**



  
 Division for Enterprise Development  
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