



ENERGY-SECTOR BRIEF

Maintenance Division, Pavement Asset Management



14-3: Shoulder/Edge Repair Techniques

A variety of repair techniques and materials are used by TxDOT districts. This brief documents techniques and materials most used by districts to address energy sector roadway damage.

Techniques that are commonly used to extend the pavement life include patching, strip seals, and widening. Patching is usually temporary, and widening is usually required to extend roadway performance. Roadway surface widths of 28- to 32-feet are recommended as a minimum. Minimum and typical shoulder thicknesses are in the 8- to 12-inch range.

Background

TxDOT's Maintenance Division and the Texas A&M Transportation Institute have cooperated to define current practices relative to the repair and rehabilitation of these pavement shoulder/edge problems. Current practices for shoulder/edge repair were documented from visits to districts and during the participation in two regional workshops.

The report summarizing current district practices is forthcoming and may be found at the TxDOT Maintenance Division SharePoint site when completed. This summary brief presents information on pavement shoulder/edge repair. For roadways impacted by energy development. Repair techniques include the location specific use of patching materials (non-continuous), strip seals, and widening operations.

Spot or non-continuous patching should be considered only as a temporary fix. Typically, these techniques, regardless of the materials utilized, have a short life, and the pavement sections should be considered for widening and perhaps strengthening as soon as financial resources and crew time are available.

The Challenge

Over 15,000 oil and gas wells were permitted in Texas last year. The rapid development of these resources requires significant truck traffic per well developed. Estimates of loaded truck traffic for well development and production range from 1,200 to 4,000 loaded trucks per well. This truck traffic and other associated traffic have significantly impacted the Texas Department of Transportation's (TxDOT's) Farm-to-Market (FM) road network as well as some of its trunk State Highway and U.S. route-designated highways.

One of the major issues facing TxDOT maintenance forces is the repair of relatively narrow FM roads. The FM system is over 50,000 miles in length, and was designed and constructed to provide access to its markets for state farmers and ranchers. These roadways were designed for relatively light traffic volumes and light truck traffic volumes. Many of these roadways are 18 to 22 ft in width without paved shoulders.

Oil and gas well development and the production traffic associated with these wells are causing damage on these relatively narrow FM roads. Typical oil/gas development and production truck vehicles range in width from 10 to 10½ ft from outside edge to outside edge of side-view mirrors. When vehicles pass on these roadways, the outside truck and car tires are often near, on, or somewhat off the paved surface. Overloaded, special-haul vehicles can have widths in excess of 9 to 10 ft and carry loads that exceed 90,000 lb gross vehicle weight (GVW).

The unpaved shoulders offer little lateral support to the traveled surface pavement, and consequently edge drop-offs, edge raveling, and edge disintegration often result. Without repair, these roadway surfaces will disintegrate from the outside edge toward the center of the pavement. Repair and widening of these roadways are important not only from a pavement performance standpoint but also a safety standpoint. Narrow roadways increase the potential for severe accidents.

Patching

Patching typically has a short life. However, from a safety and scheduling point of view, it may be necessary to hold the road together until a more permanent repair can be made by maintenance or under contract. Localized patching materials used by the districts vary considerably from district to district. Some of the more common patching materials include the following:

1. Limestone rock asphalt Type A, C, or D depending on thickness and district.
2. Hot-mixed cold-laid asphalt.
3. Reclaimed asphalt pavement (RAP) mixed with emulsion or other binder.
4. Flexible base or salvaged flexible base.
5. Commercial patching material (5-gallon buckets).

Depth of patching is typically 8 to 12 inches. Districts prefer to seal these compacted materials with a chip seal or fog seal. Materials typically used for fog seals and chip seals are discussed on the following page.

Strip Seal

Two types of strip seals have been fairly commonly used on the shoulder areas — fog seal and chip seal (seal coat) as referenced in standard specifications. West Texas uses more strip seals than South Texas.



Fog Seal

Strip fog seals are typically applied 18 to 24 inches in width and span from the near edge of the paved surface to the unsurfaced shoulder. Fog seals are used to bind loose material and reduce the rate of raveling near the edge of the pavement. Typical fog seal materials used include the following:

1. CSS-1h emulsion.
2. CMS-1h emulsion.
3. SS-1h emulsion.
4. MS-2 emulsion.
5. HFRS-2 emulsion.

Typically these emulsions are diluted with water at the following ratios: 70 percent emulsion/30 percent water, 60 percent emulsion/40 percent water, or 50 percent emulsion/50 percent water. Typical spray rates are at 0.15 to 0.20 gallons per square yard, with a residual asphalt binder content of approximately 0.05 to 0.08 gallons per square yard. Heavier residual asphalt binder contents are sometimes used.

Contacts

Mark McDaniel

Transportation Engineer
Texas Department of Transportation
(512) 416-3113
mark.mcdaniel@txdot.gov

John Bilyeu

Transportation Engineer
Texas Department of Transportation
(512) 416-3291
john.bilyeu@txdot.gov

Chip Seal (Seal Coat)

Strip chip seals are commonly used on shoulders in the western portion of the state. These types of chip seals are applied from 18 to 24 inches in width and span from the near edge of the paved surface to the unsurfaced shoulder. The strip seals are used with or without patching and/or widening operations. Some districts indicated a 12-inch treatment on the existing paved surface and 12 inches on the unpaved shoulder area to control raveling near the shoulder edge.

Typical chip seal binders utilized by the district maintenance forces include the following:

1. MS-2.
2. CRS-2.
3. CRS-2P.
4. HFRS-2.
5. HFRS-2P.
6. RC-250.

High float emulsions are typically used in South Texas, and West Texas typically uses catatonic rapid set emulsions with and without polymer.

Typical chips or aggregate grades, and shot quantities utilized by the district maintenance forces include the following:

1. Grade 3 — 0.45 to 0.50 gallons per square yard.
2. Grade 4 — 0.40 to 0.48 gallons per square yard.
3. Grade 5 — 0.35 to 0.40 gallons per square yard.

Some districts report the use of Grade 2 chip (aggregate).

Jon Epps

Research Engineer
Texas A&M Transportation Institute
(979) 458-5709
j-epps@tamu.edu

David Newcomb

Senior Research Scientist
Texas A&M Transportation Institute
(979) 458-2301
d-newcomb@ttimail.tamu.edu

Widening

Some maintenance operations utilize pavement widening operations without pavement structural section strengthening. These types of operations utilize maintenance forces (personnel) to remove the existing materials adjacent to the paved surface area, replace the removed materials (see below), and typically place a chip seal. The chip seal typically provides a few inches to 12 inches of overlap on the existing pavement surface, covers the newly widened width, and extends slightly beyond the newly widened width.

The typical widening operation includes removal of materials adjacent to the paved surface to a depth of 8 to 12 inches below the top of the existing pavement and to a width of 2 to 4 ft by one of the following techniques:

1. Maintainer or blade.
2. Maintainer or blade with a cutting attachment.
3. Milling machine with a milling head of 2 to 4 ft in width.
4. Bobcat-type milling machine with a milling head of 2 to 4 ft in width.

Materials used in the prepared trench include the following:

1. New flexible base.
2. Salvaged flexible base.
3. RAP.
4. Mixture of RAP and new or salvaged flexible base.
5. Emulsion-treated RAP, salvaged base, or new flexible base.
6. Portland cement mixed with salvaged base or new flexible base.
7. Hot-mix cold-laid asphalt.
8. Limestone rock asphalt.
9. Type A or B hot-mix asphalt or black base.
10. Type C hot-mix asphalt.

After the materials have been placed in the trench, proper moisture added and compacted, a prime coat is placed, and a single or double surface treatment (chip seal) is placed. Typical materials used for the surface treatment are discussed in the strip chip seal section. If a double surface treatment is placed, a Grade 3 chip (aggregate) is often used on the first course, and a Grade 4 chip (aggregate) is used on the second course.

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