

Pavement Surface Evaluation and Rating

PASER

Sealcoat Manual



For gravel roads with a sealcoat surface



**Transportation
Information Center**

University of Wisconsin–Madison

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This manual is designed to provide background information to local officials on gravel roads with a sealcoat surface. It describes conditions and causes of distress and provides a simple procedure to rate pavement condition. The rating procedure can be used as condition data for the Wisconsin DOT local road inventory and as part of a pavement management system like PASERWARE.

The PASER system described here and in other Wisconsin Transportation Information Center (T.I.C.) publications is based in part on a roadway management system originally developed by Phil Scherer, transportation planner, Northwest Regional Planning Commission.

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Sealcoat PASER Manual

Many gravel roads have been treated with a sealcoat surface. These roads look and perform differently from either gravel roads or asphalt pavement roads. This manual is intended to help local officials plan the maintenance and overall management of sealcoat roads. It discusses common problems and typical repairs and presents a simple system for evaluating and rating sealcoat roads. The ratings are included in the Wisconsin Department of Transportation's Local Road Inventory.

The *Sealcoat-PASER Manual* complements the *Asphalt-PASER*, *Gravel-PASER* and *Concrete-PASER Manual* also produced by the Wisconsin Transportation Information Center (T.I.C.).

Taking an organized approach to roadway management has many benefits. By documenting the actual conditions of roads you can establish realistic project budgets, make timely repairs, and plan cost-effective maintenance procedures. Developing an overall plan for the roadway system lets local agencies make more accurate annual budgets and anticipate future needs and expenses. In addition, local officials can respond more effectively to questions from the public when they have detailed and systematic information. A planned, objective approach is easier to explain and receives greater public support.

There are several key steps in developing a meaningful roadway management plan. First, you must inventory existing conditions. This is normally done by dividing the roadway into segments with similar characteristics. During the inventory, you collect information on construction history, roadway width, shoulder width, pavement type, and drainage conditions.

Next you need a method for assessing the condition of the existing roadway. The *Sealcoat-PASER Manual* uses visual observations and a simple rating system. Other information from material sampling, testing, and traffic counts can be useful for a more detailed system plan.

Setting priorities for roadway improvements is another necessary step. You can use roadway condition and the local importance of these roads to assign priorities. Budgets can then be developed based on cost estimates for the projected improvements.

Since the number and cost of improvements usually exceed one years' resources, a pavement management system will help you establish a multi-year plan. You can develop three-year to five-year plans for both maintenance and capital improvement. These are normally adjusted and updated each year.

The T.I.C., in cooperation with the Wisconsin Department of Transportation (WisDOT), has developed a computerized pavement management system called PASERWARE. It uses information on road condition and the rating systems described in the PASER manuals to produce suggested budgets. Local officials can use this information to evaluate whether their annual road budgets are adequate to maintain or improve current road conditions. PASERWARE also helps users evaluate the most cost effective strategies and priorities for annual projects.

Sealcoated gravel roads

Many miles of local gravel roads have been treated with an asphalt sealcoat which maintains the ride, weather-proofs the surface, and eliminates dust problems. The treatment often involves applying a double sealcoat—two chipseal layers. An alternative is to apply a heavy sealcoat, at a heavier asphalt application rate, followed by a second sealcoat the next year.

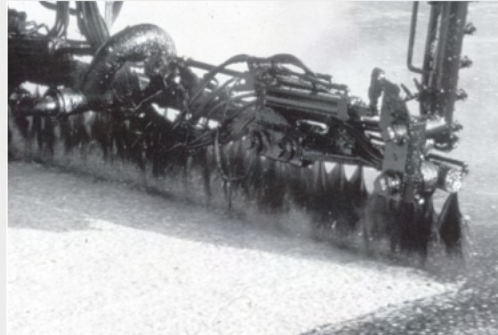
The service life of a sealcoat is generally expected to be five years. Sealcoat performance depends primarily on the underlying gravel which carries the traffic loads. An inadequate gravel layer or poor drainage will shorten the road's service life. A sealcoat surface also degrades more quickly under a high volume of heavy trucks, snowplowing, and at locations where traffic frequently makes turning maneuvers.

Surface maintenance generally involves patching failed areas, wedging raveled edges, and improving drainage. By making a timely application of a new sealcoat surface before the old one deteriorates completely, you can extend service life and maintain a good riding surface. A single sealcoat is often applied three years after the initial double sealcoat. After that a three to five year resealing cycle is common. When a road has received multiple treatments, the sealcoat layer may be several inches thick. These roads look and perform more like an asphalt pavement road, and crack sealing can be an effective maintenance technique on them.

A heavily cracked and potholed sealcoat surface requires more extensive rehabilitation than patching. Repair involves scarifying the surface, mixing in additional gravel if necessary, and reshaping with a grader. A new sealcoat treatment is then applied.

As with all types of road surface, good drainage is essential. The road's crown should be higher than the edges. Shoulders should continue the slope and direct water into ditches.

Chipsealing operation



◀ Spraying asphalt



▲ Spreading cover aggregate



◀ Compacting aggregate

Ditches need to be about a foot lower than the road base and pitched so water continues to move away and not pond along the road. The T.I.C.'s *Drainage Manual* describes in detail how to evaluate and rate drainage.

When a road requires frequent re-sealing because of heavy traffic,

it may be more economical to reconstruct the road and pave it with asphalt. Information on current and future traffic loads and the quality of the existing base will help determine whether to keep the road as sealcoated gravel or build an asphalt pavement.

Recognizing distress on sealcoated roads

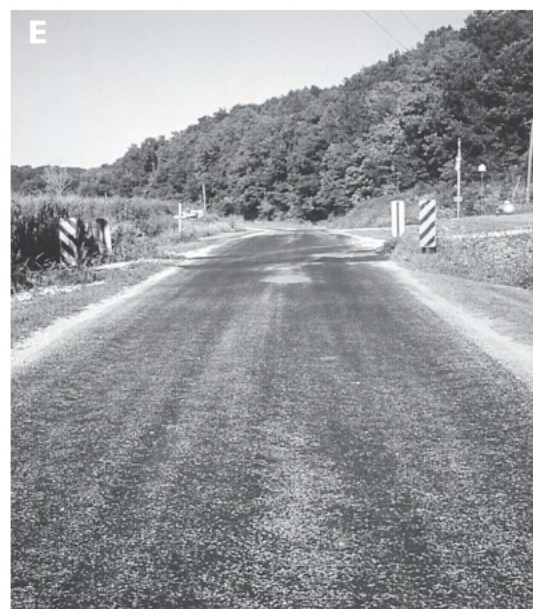
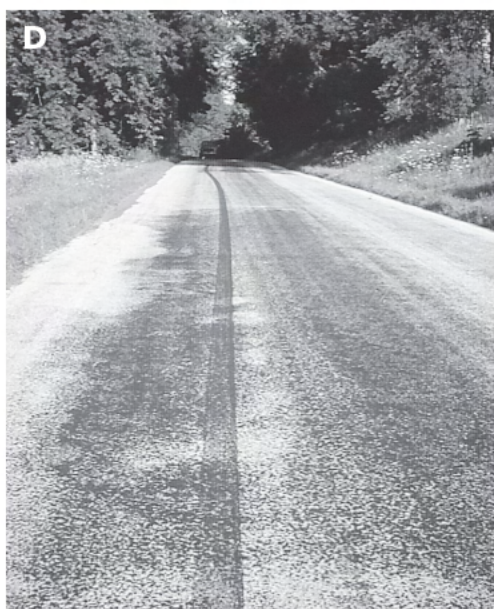
This section describes conditions and distress that are typical on sealcoated roads. You will need to recognize these symptoms and evaluate their severity in order to use the rating system described on page 10.

Distress types include: wear and flushing, loss of surface, edge cracking, alligator cracking, patching, potholes, and drainage.

Wear and flushing

Traffic wear and snowplowing may tend to remove cover aggregate from a sealcoat road. Slight wear is normal. Significant aggregate loss may be due to poor construction practice aggravated by high traffic volume. Extensive wear and lost aggregate create a flushed (asphalt rich) surface. If flushing is severe, tracking may occur. Wear and flushing shorten the sealcoat surface's service life.

The treatment for severe wear or flushing is a new sealcoat surface.



EXAMPLES

- A Slight wear.
- B Moderate wear and loss of aggregate.
- C Wear from turning traffic.
- D Moderate flushing.
- E Severe flushing and lost aggregate.

Loss of surface

The top layer of sealcoat may come loose and peel off. This failure of the bond between layers can be caused by applying sealcoat over dirt or debris.

The sealcoat surface is usually very thin, often less than one inch thick. It is susceptible to breaking and loss of surface material. The road edge is most vulnerable especially at driveways or in soft areas. Maintain by patching.

Extensive loss of surface may mean a new sealcoat or other repair is required. Before making the decision to reseal, evaluate current and future traffic, quality of the base gravel, and drainage. Improving ditches may ensure longer sealcoat life. It may be necessary to scarify the surface and add gravel before sealcoating again. Alternatively, it may be economical to convert to a paved surface.

EXAMPLES

- A** Loss of top surface seal.
- B** Torn surface, likely from vehicle traffic before sealcoat was fully cured.
- C** More extensive surface loss. Patching desirable.
- D** Extensive loss of surface. Scarify and reseal.



Edge cracking

The road edge is most susceptible to early cracking from traffic. It is exposed and not supported by adjacent sealed surface. The road edge often has poor drainage so water softens the soil and gravel, permitting greater deflection and causing the surface to crack.

Traffic commonly wears off the sealed edge along the insides of curves and where shoulder parking or mail delivery is frequent.

Patch the edges to strengthen the road; improve drainage where needed.

EXAMPLES

- A** Edge widening for mail delivery.
- B** Loss of surface at edge in intersection.
- C** Edge cracking due to heavy loads and lack of edge support.
- D** Severe edge cracking.
- E** Driveway entrance with good edge.
- F** Driveway entrance edge damage.



Alligator cracking

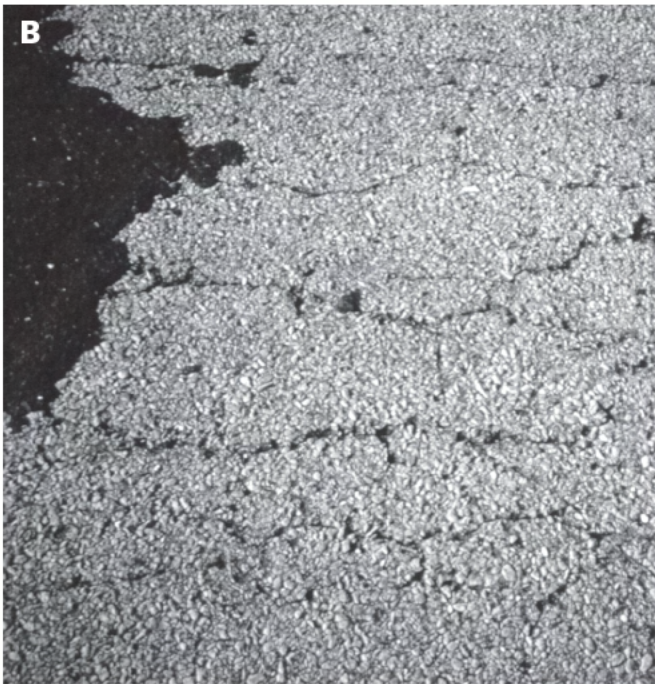
Alligator cracks form where the asphalt surfacing experiences excessive deflection (bending). Once cracks appear, thin seal-coat surfaces may quickly break apart. Thicker surfaces made from multiple sealcoats tend to crack into larger pieces and stay in place longer.

Alligator cracking often indicates that the base gravel is inadequate for the volume of truck traffic on the road. Poor drainage often contributes to early alligator cracking.

Consider base repair and drainage improvement before resealing. If alligator cracking is extensive from heavy traffic, you may need to upgrade the road and provide a paved surface.

EXAMPLES

- A** Early stage alligator cracking.
- B** Alligator cracking with patch repair.
- C** Severe alligator cracking creates potholes.



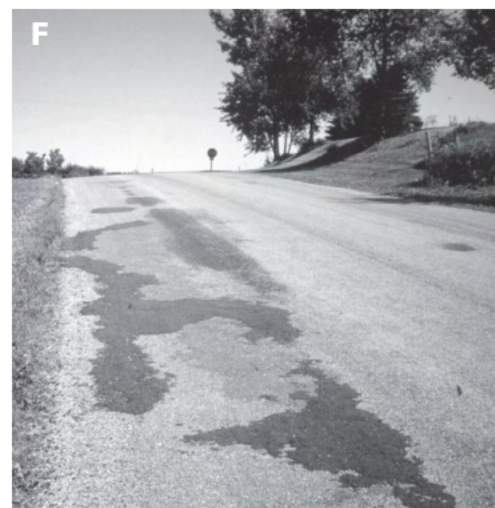
Patching

Patches indicate wear and surface failure caused by rutting, alligator cracking, or loss of surface. The seal-coat surface may have reached the end of its service life. Alternatively, the cause may be inadequate base gravel or heavy truck traffic which shortens the surface life.

Maintenance requires patch repairs with either cold mix or hot mix asphalt material. A relatively thin patch is often used to avoid bumps and a rough ride. Crack sealing is generally not effective unless the surface has been thickened by multiple sealcoat treatments.

EXAMPLES

- A** Cracks are patched but not sealed.
- B** Patching minor surface defects.
- C** Patching edge failures.
- D** Culvert settlement repair.
- E** Bridge approach repair.
- F** Extensive patching of failed areas.

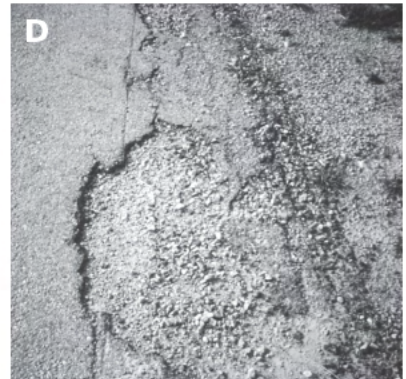


Potholes

Loss of surface will eventually lead to loss of base gravel and creation of a pothole. Early surface repairs with patches can keep large potholes from forming. Extensive potholes indicate poor road conditions. Major improvement in base gravel and drainage likely will be needed before resealing.

EXAMPLES

- A Pothole
- B Potholes located in wheel path
- C Potholes created by loss of surface on steep grade
- D Edge failure creates pothole



Drainage

A well-drained roadway is very important to ensure sealcoated gravel roads have a reasonable service life. Adequate crown, properly sloped shoulders, and a well-defined ditch (one foot deep or more) are recommended. See the T.I.C.'s *Drainage Manual* for more detailed information, photos, and a rating system.



EXAMPLES

- A Poor ditch slope traps water, causing surface deterioration.
- B A defined ditch and good road crown quickly move water away.
- C Poor drainage causes failed pavement. Needs ditching and edge wedging.

Rating the surface condition of sealcoated gravel roads

The extent and severity of each type of distress are used to rate the overall condition. Distress may gradually worsen with age or may deteriorate rapidly, depending on volume of heavy traffic and road quality. Inspecting roads every year or two helps track the rate of deterioration and lets local officials plan for maintenance and improvement.

This section presents a simplified rating system to help you manage sealcoated roads and to supply information for your local road inventory. It uses a scale of 1 to 5, with 5 being new condition and 1 a failed surface.

The photographic examples will help you become familiar with the general patterns of each rating. Before

selecting a rating, inspect the road segment, looking at the types, extent, and severity of visible distress. Determine the age of the sealcoat surface and then locate the age in the table. Consider distress and needed repairs to help select the final rating.

The rating can be no higher than the segment's age. For example, a 5-year-old sealcoat surface should not be rated higher than 3 even though there are few visible signs of distress. However, the rating may be lowered if distress is severe or extensive. That is, a 5-year-old surface could be rated 2 or 1.

The rating also reflects your judgment of needed repairs or improvements. Ratings of 5 and 4 require no maintenance. Rating 3 needs preven-

tive maintenance to extend life. The surface may require a few patches or minor drainage improvements. A new sealcoat is recommended.

Roads with a rating of 2 need more extensive repairs or significant drainage improvement. Repairs may include asphalt wedging or extensive patching. Ditch cleaning or culvert repairs may also be required to restore good drainage. A new sealcoat surface should be applied to a road surface with a rating of 2.

A road condition rating of 1 indicates failed conditions and the need for significant repair or rebuilding. New gravel base, re-grading, and/or significant drainage improvement, and a new double surface sealcoat are typical for roads rated 1.

<i>Surface age</i>	<i>Visible distress</i>	<i>General condition, drainage, and recommended improvement</i>	<i>Surface rating</i>
1 year old	No distress. Excellent surface and ride.	New surface condition. Excellent drainage. No maintenance required.	5 Excellent
2-4 years old	Slight surface wear from traffic. Slight loss of surface aggregate. Minor flushing or tracking.	Excellent or good drainage. Little or no maintenance required.	4 Good
3-5 years old	Moderate surface wear and/or flushing. Slight edge cracking. Occasional patch or loss of top layer of sealcoat.	Good or fair drainage. May need spot drainage improvement and/or minor patching. Preventive maintenance sealcoat recommended.	3 Fair
more than 5 years old	Severe wear or flushing. Moderate to severe edge cracking or patching. Potholes or significant loss of surface sealcoat. Alligator cracking.	Fair or poor drainage. Ditching or culvert improvements needed. Patching or surface wedging needed. New surface sealcoat required.	2 Poor
more than 5 years old	Extensive loss of surface sealcoat. Severe edge cracking and/or alligator cracking. Extensive patching in poor condition and/or rutting.	Extensive poor drainage. Needs base improvement and new double sealcoat.	1 Failed

✓ 5 – EXCELLENT

New surface condition.

Excellent drainage.

Surface 1 year old.

No maintenance required.

EXAMPLES

- A New seal; good drainage.
- B Good seal; excellent drainage.
- C One-year old seal; good drainage.



✓ 4 – GOOD

Surface 2–4 years old.

Excellent or good drainage.

Little or no maintenance required.

EXAMPLES

- A Slight surface wear; good drainage.

- B 3-year-old surface; aggregate loss and wear; good drainage.

- C 4-year-old surface; moderate surface wear; good culvert repair.

- D While surface is only 1 year old, the loss of aggregate makes it a 4. Good drainage.



✓ 3 – FAIR

Surface 3 to 5 years old.

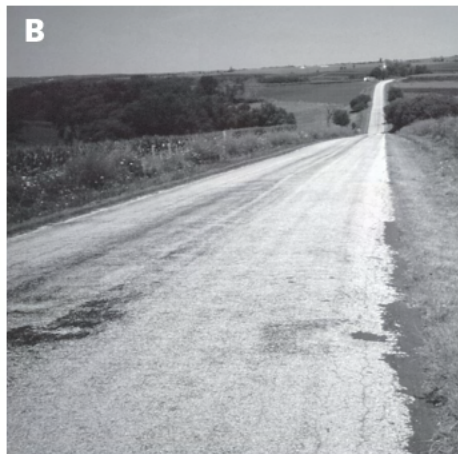
Good or fair drainage.

Needs spot drainage improvement and/or minor patching.

A preventive maintenance sealcoat recommended.

EXAMPLES

- A 4-year old surface; moderate surface wear; drainage improvement needed on right side.
- B 5-year-old surface; slight edge cracking and minor patching.
- C 3-year old surface; extensive loss of aggregate.
- D 5-year-old surface; edge cracking; spot drainage improvement needed.
- E 5-year-old surface; patching in good condition; spot drainage improvement needed.



✓ 2 – POOR

Surface more than 5 years old.

Fair drainage or poor drainage.

Ditching or culvert improvements needed.

Patching or surface wedging needed.

New surface sealcoat required.



EXAMPLES

- A Extensive ditch improvement required; patching needed.
- B No ditch present. Needs drainage improvement and edge wedging.
- C Poor drainage. Surface patching needed.
- D Surface wedging completed. Ready for new surface seal. Ditch improvement needed.
- E Fair drainage; patching and new surface seal required.



✓ 1 – FAILED

Surface more than 5 years old.

Extensive poor drainage.

Needs base improvement.

Needs new double sealcoat.

EXAMPLES

- A Alligator cracking; failed patching; poor drainage. Needs reconstruction and new seal.

- B Seal has failed. Poor surface requires new gravel, shaping and double surface seal.

- C Poor drainage; failed surface; lack of gravel base. Reconstruction and new seal required.

- D Ruts indicate need for additional gravel and reconstruction.

- E Poor drainage and failed surface. Reconstruct and seal.



Practical advice on rating roads

Inventory and field inspection

Most agencies routinely observe roadway conditions as a part of their normal work and travel. However, an actual inspection means looking at the entire roadway system and preparing a written summary of conditions. This inspection has many benefits over casual observations. It can be helpful to compare segments, and ratings decisions are likely to be more consistent because the entire roadway system is considered at the same time.

An inspection also encourages a review of specific conditions important in roadway maintenance, such as drainage and adequate strength.

A simple written inventory is useful in making decisions where other people are involved. You do not have to trust your memory, and you can usually answer questions in more detail. Having a written record and objective information also improves your credibility with the public.

Finally, a written inventory is very useful in documenting changing roadway conditions. Without records spanning several years, it is impossible to know if road conditions are improving, holding their own, or declining.

Annual budgets and long range planning are best done when based on actual needs as documented with a written inventory.

The Wisconsin DOT local road inventory is a valuable resource for managing your local roads. Adding PASER road condition ratings is an important improvement.

Averaging and comparing sections

Rating a roadway segment involves evaluating conditions over a considerable length (a mile or more in rural areas, or many blocks in urban areas). Obviously, no roadway segment has entirely consistent conditions. Also surfaces in one section will not have all of the types of distress listed for any particular rating. They may have only one or two types. Therefore, some averaging is necessary.

The objective is to rate the condition that represents the majority of the roadway. Small or isolated conditions should not influence the rating. It is useful to note these special conditions on the inventory form so this information can be used in planning specific improvement projects. For example, some spot repairs may be necessary.

Occasionally surface conditions vary significantly within a segment. For example, short sections of good condition may be followed by sections of poor surface conditions. In these cases, it is best to rate the segment according to the worst conditions and note the variation on the form.

The overall purpose of condition rating is to be able to compare each segment relative to all the other segments in your roadway system. On completion you should be able to look at any two pavement segments and find that the better surface has a higher rating.

Within a given rating, say 3, not all pavements will be exactly the same. However, they should all clearly be in better condition than those rated 2 or 1. When rating a difficult segment, it can be helpful to compare it to other segments that you have already rated. For example, if it is better than those you rated 2 and worse than a typical 4, then a rating of 3 is appropriate. Having all pavement segments rated in the proper relative order is most important and useful.

Separating road function from conditions

Sealcoated gravel roads often are found where traffic volumes are very low. This can be confusing. People rating roads are sometimes more willing to accept poor condition on a road if it is little used. In higher traffic situations, they expect the road should be in better condition.

Therefore, there may be a tendency to evaluate the condition more harshly in higher traffic volume situations and to be more lenient in evaluating little-used roads. This tendency should be

avoided. The evaluation must be an objective description of the actual roadway condition.

The road's function or importance is also a factor in making management decisions, but it must be considered separately from the condition rating process. Roads can be categorized by their use or their function. In choosing which projects to include in a budget or repair cycle and to set priorities, it is helpful to consider both the surface condition and the road's importance.

Planning maintenance and repair

We have found that relating a normal maintenance or rehabilitation procedure to the surface rating scheme helps local officials use the rating system. However, an individual surface rating should not automatically dictate the final maintenance or rehabilitation technique. You should consider future traffic projections, original construction, and pavement strength since these may dictate a more comprehensive rehabilitation than the rating suggests. On the other hand, it may be appropriate under special conditions to do nothing and let the pavement fully deteriorate, then rebuild when funds are available.

Summary

Using local road funds most efficiently requires good planning and accurate identification of appropriate rehabilitation projects. Assessing roadway conditions is an essential first step in this process. The PASER pavement surface evaluation and rating procedure has proven effective in improving decision making and using highway funds more efficiently. It can be used directly by local officials and staff. It may be combined with additional testing and data collection in a more comprehensive pavement management system. For additional training and information, contact the Transportation Information Center.

Transportation Information Center Publications

Asphalt PASER Manual

Pavement Surface Evaluation and Rating, 1987, 39 pp.

Gravel PASER Manual

Pavement Surface Evaluation and Rating, 1989, 32 pp.

Concrete PASER Manual

Pavement Surface Evaluation and Rating, 1989, 48 pp.

Sealcoat PASER Manual

Pavement Surface Evaluation and Rating, 2000, 16 pp.

Drainage Manual

Local Road Assessment and Improvement, 2000, 16 pp.

SAFER Manual

Safety Evaluation for Roadways, 1996, 40 pp.

Wisconsin Transportation Bulletins

- #1 Understanding and Using Asphalt
- #2 How Vehicle Loads Affect Pavement Performance
- #3 LCC—Life Cycle Cost Analysis
- #4 Road Drainage
- #5 Gravel Roads
- #6 Using Salt and Sand for Winter Road Maintenance
- #7 Signing for Local Roads
- #8 Using Weight Limits to Protect Local Roads
- #9 Pavement Markings
- #10 Seal Coating and Other Asphalt Surfaces
- #11 Compaction Improves Pavement Performance
- #12 Roadway Safety and Guardrail
- #13 Dust Control on Unpaved Roadways
- #14 Mailbox Safety
- #15 Culverts-Proper Use and Installation
- #16 Geotextiles in Road Construction/Maintenance and Erosion Control
- #17 Managing Utility Cuts
- #18 Roadway Management and Tort Liability in Wisconsin
- #19 The Basics of a Good Road
- #20 Using Recovered Materials in Highway Construction
- #21 Setting Speed Limits
- #22 Pre-wetting and Anti-icing
- #23 Meeting Minimum Sign Retroreflectivity Standards

