

STATE OF FLORIDA



**2006
RIGID PAVEMENT
CONDITION SURVEY
FACTS & FIGURES**

**FL/DOT/SMO/06-496
May 2006**

STATE MATERIALS OFFICE

The information in the following report is largely due to the team effort of the following individuals:

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This team's hard work in collecting and processing the data, and organizing this report is greatly appreciated.

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Executive Summary

Since 1985, the Pavement Condition Unit staff of the Pavement Materials Division have been collecting, processing and analyzing information on the condition and performance of the State Roadway System on an annual basis. The information provided by the Pavement Condition Survey (PCS) program has been critical to the Department's effort to support informed highway planning, policy and decision making at the State and local levels. This includes the apportionment and allocation of funding needs as well as the determination of appropriate cost-effective strategies to rehabilitate and preserve existing highway transportation infrastructure.

The PCS evaluates the pavement lane that is in the worst condition in each roadway direction. The beginning and ending of pavement sections to be rated are determined by construction limits and/or uniformity of conditions. All sections are rated based on the varying levels and extent of specific distresses, namely, 1) roughness, 2) surface deterioration, 3) spalling, 4) patching, 5) transverse cracking, 6) longitudinal cracking, 7) corner cracking, 8) shattered slabs, 9) faulting, 10) pumping, and 11) joint condition. The ratings for distresses 2 through 11 are combined to generate an overall Defect Rating.

Once the data collection process is complete, the Central Pavement Management Office is responsible for processing, analysis and making the data available for use by the Department, consultants and others. The Central Program Development Office is responsible for reporting the condition of the Florida State Highway System for Pavement Management purposes.

The present report provides essential information on the current condition of the rigid pavement sections of the Florida State Highway System as part of the PCS program. It also includes a summary of the historical condition rating data.

To obtain an electronic copy of this and other reports, and to learn more about our program, please visit the Pavement Materials Division at State Material Office's website:

Intranet: <http://materials.dot.state.fl.us/>

Internet: <http://www.dot.state.fl.us/statematerialsoffice/>

SECTION I

Introduction

The Pavement Materials Division of the SMO is responsible for the Department's Annual PCS. The Survey is conducted on the entire State-maintained Highway System on an annual basis.

The Survey, which covers flexible and rigid pavements, is conducted by a highly trained and experienced staff. It requires each of the four area staff specialists about 25 weeks of travel each year to complete the survey. This report pertains to rigid pavements only which represent 2.4% of the State maintained Highway System.

The annual PCS is used to accomplish the following main objectives:

- Determine the present condition of the State Roadway System
- Compare the present with past conditions
- Predict deterioration rates
- Predict rehabilitation funding needs
- Provide justification for annual rehabilitation budget
- Provide justification for project rehabilitation, and
- Provide justification for distribution of rehabilitation funds to Districts.

The PCS rating of rigid pavements is based on two main criteria, namely, 1) Defect Rating, and 2) Ride Rating. A pavement section is rated on a scale of 0 to 10, where a rating of 10 for any of the two criteria indicates a section in excellent condition. Currently, any section with a rating of 6.4 or less becomes eligible for rehabilitation.

The Defect Rating is obtained by evaluating ten individual distress types, namely, 1) surface deterioration, 2) spalling, 3) patching, 4) transverse cracking, 5) longitudinal cracking, 6) corner cracking, 7) shattered slab, 8) faulting, 9) pumping, and 10) joint condition. Raters collect this distress data by evaluating pavements from the roadway shoulder.

Each distress type for the lane being rated is assigned a score from 0 to 10, and a corresponding "deduct value" depending on the distress type and severity level (light, moderate, or severe). The Defect Rating is obtained by subtracting the sum of the deduct values from 100 and then dividing by 10. Thus, a pavement section with a Defect Rating of 10 indicates a pavement without any observable distress.

Ride quality is measured using an automated vehicle-mounted instrument called a Profiler that measures the longitudinal profile of the roadway. The ride quality is quantified in terms of Ride Number (RN). RN is a mathematical processing of longitudinal profile measurements to produce an estimate of ride quality or user perception in accordance with ASTM Standard E1489.

In order to ensure maximum accuracy and repeatability of the data collected, the testing equipment must be well maintained and routinely calibrated. In addition, edit procedures are currently implemented to test both the data accuracy and compliance with other parameters of the Pavement Management System. Comparisons of annual survey data to that of earlier years are also performed to review trends and identify potential errors. The efforts made to upgrade the survey equipment and to improve the data analysis software resulted in increased efficiency of data collection and improvement in accuracy of the Survey results. These improvements now allow in-depth analysis of any segment of the highway system and timely completion of the PCS while maintaining a high level of accuracy.

For more detailed information about the PCS, please refer to the latest edition of the Rigid and Flexible PCS Handbooks available online at:

<http://www.dot.state.fl.us/statematerialsoffice/pavement/pavementhome.htm>

The facts and figures contained in this report are for rigid pavements only which represent 2.4% of the entire state highway system lane miles.

Observations

The review and analysis of the statewide historical PCS distress ratings for rigid pavements have resulted in the following observations:

1. The average Defect Ratings have improved during the past fifteen years from 6.67 in 1992 to 8.04 in 2006.
2. The average Ride Ratings have remained constant for the twelve years prior to the 2004 PCS with a mean rating of 7.36 in 2003 and an overall average of 7.29. In 2004 the Ride Rating declined to a statewide average of 6.79. This decline was mainly due to using a 6 in. sampling interval since 2004. Prior to 2004, all surveys were conducted using a 12 in. sampling interval.
3. 95.3% of the pavement sections rated in 2006 for Defect rating was within one point compared to the 2005 ratings. *
4. 98.7% of the pavement sections rated in 2006 for Ride was within one point compared to the 2005 ratings. *

* Note (1): Sections that had undergone notable changes such as new construction or total rehabilitation were excluded from the analysis.

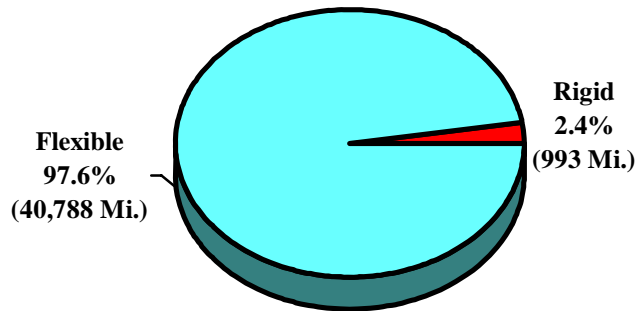
* Note (2): Ultrasonic sensors were replaced with Laser sensors beginning with the 1999 survey, along with the use of RN as the method of calculating Ride Ratings. This may explain the increase in serviceability observed thereafter.

General Notes

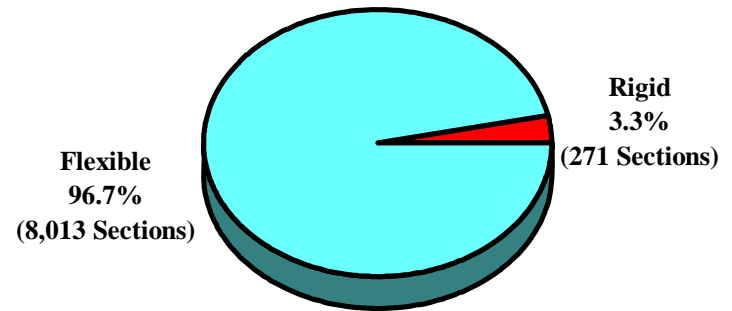
1. For multi-lane roadways: The worst lane in each direction is rated (normally the outermost traffic lane).
2. For two-lane roadways: The worst lane is rated (normally the same lane tested the previous year).
3. Rated sections are determined by construction limits and/or significant changes in visual condition of the pavement.
4. Ride Rating data is collected using four identical roadway profiler units.
5. Defect Rating is based on manual and visual distress measurements collected by the rater from the shoulder of the roadway.

2006 PCS Production Summary Statewide

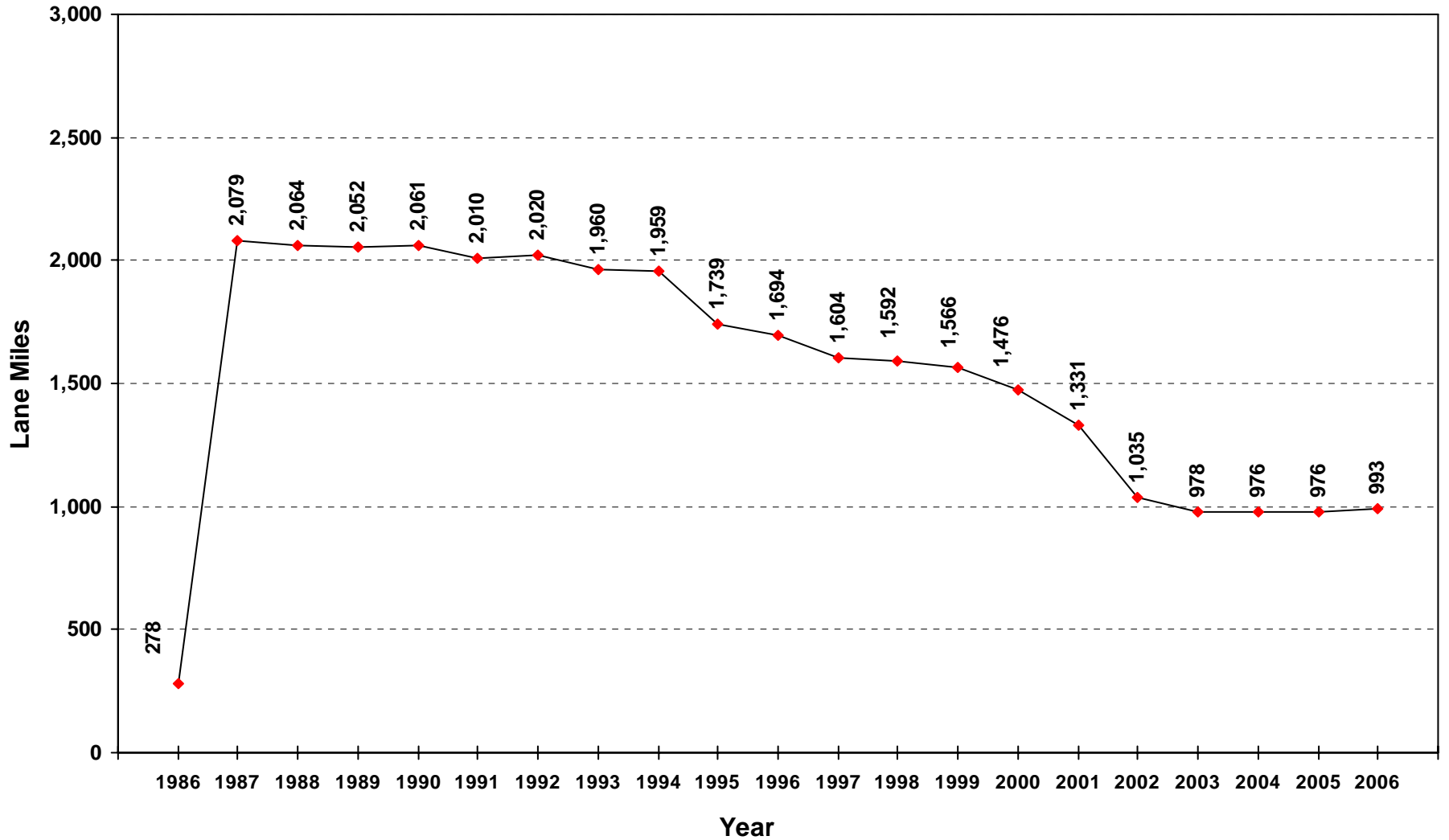
**Total Lane Miles: 41,781 Mi.
(Flexible and Rigid Combined)**



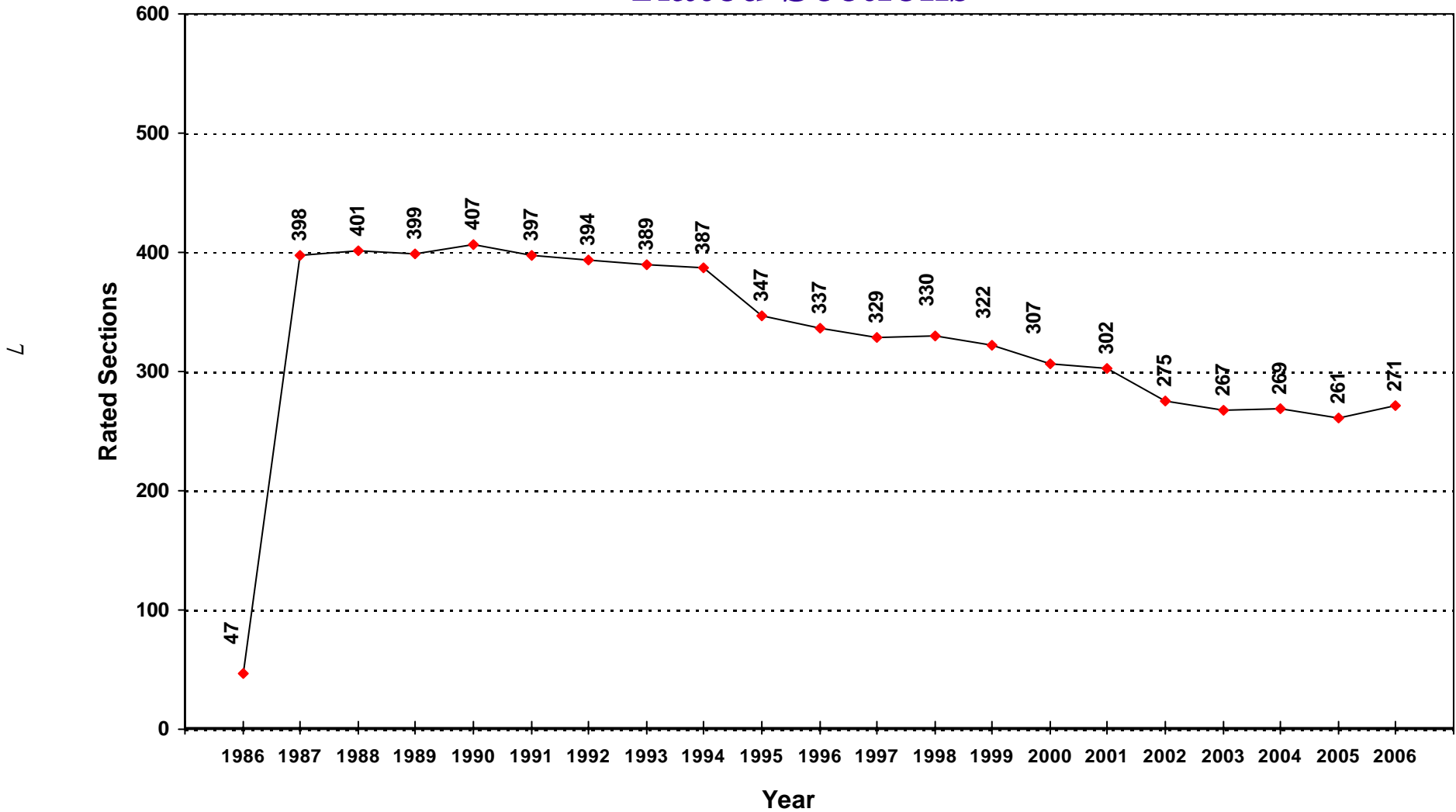
**Total Rated Sections: 8,284
(Flexible and Rigid Combined)**



Rigid Pavement Condition Survey Production History Lane Miles



Rigid Pavement Condition Survey Production History Rated Sections



SECTION II

DEFECT RATING

BY

SYSTEM AND DISTRICT



SECTION II

Defect Rating by System and District

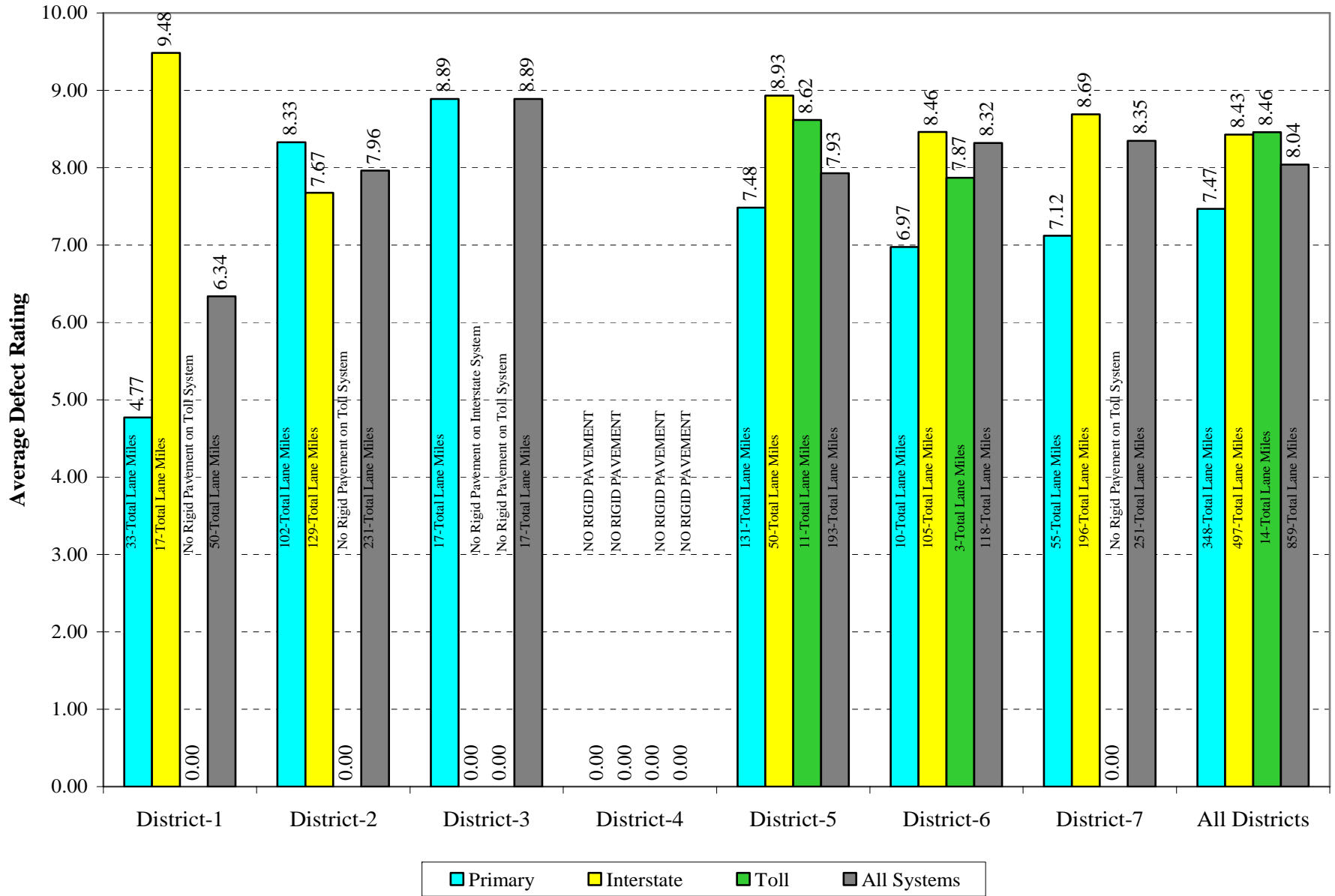
Defect Rating Criteria

- Ten different distresses are counted and/or estimated then classified by severity level.
- Each distress has a numeric deduct value based on the severity level assigned by the rater.
- Defect Rating is obtained by subtracting the individual deduct value associated with each form of distress from 100, and then dividing by 10. A Defect Rating of 10 indicates a pavement without observable distress.

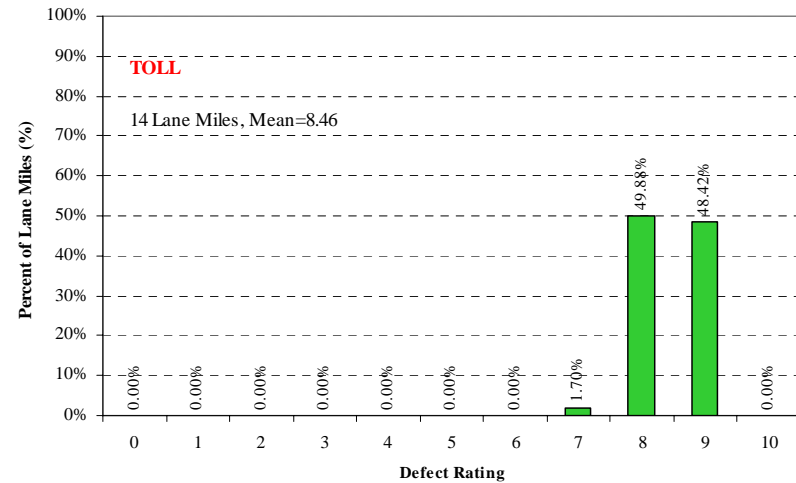
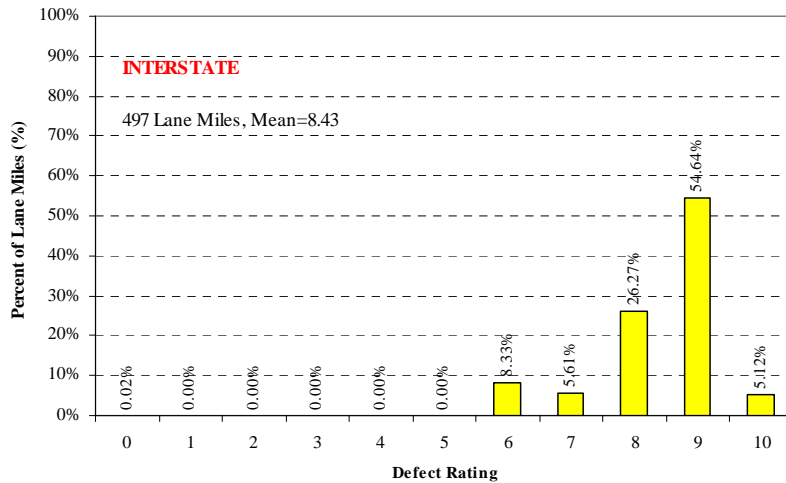
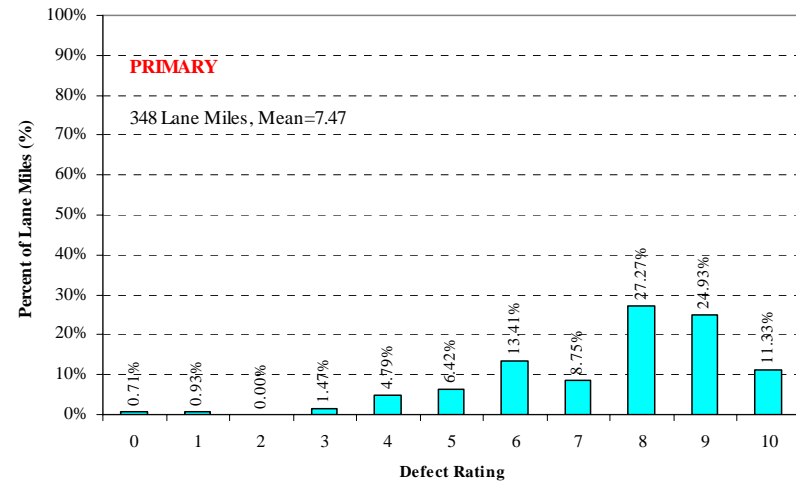
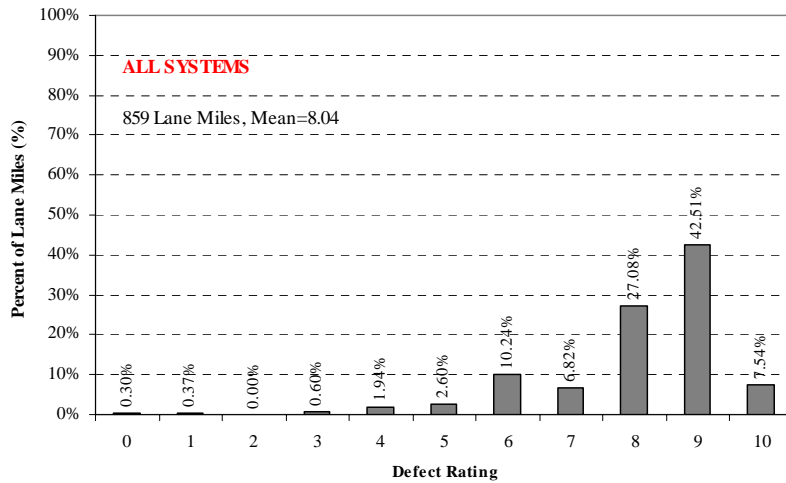
For more information on how Defect Rating is calculated see the 2003 Rigid PCS Handbook.

2006 Defect Rating by System and District

01



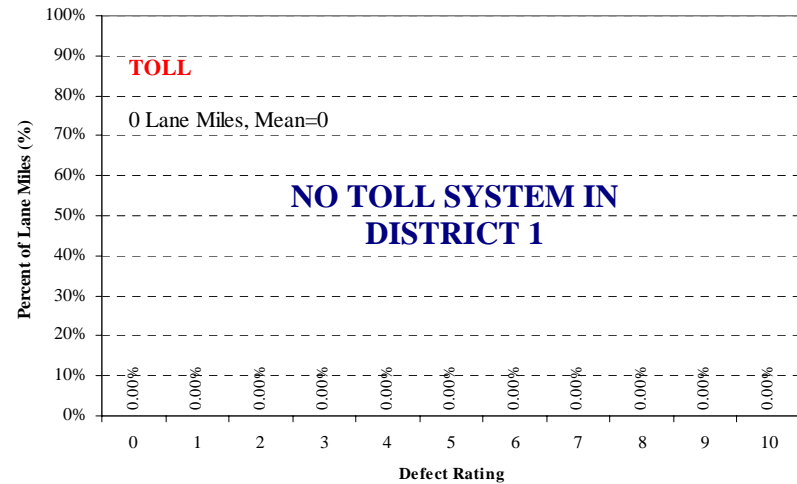
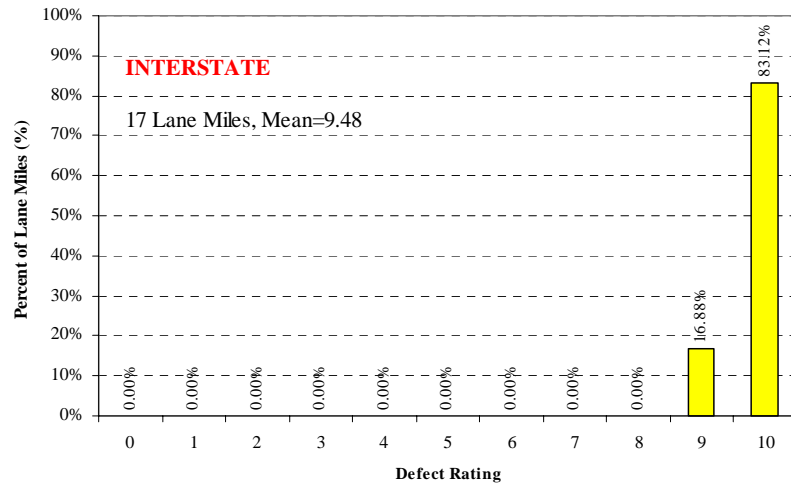
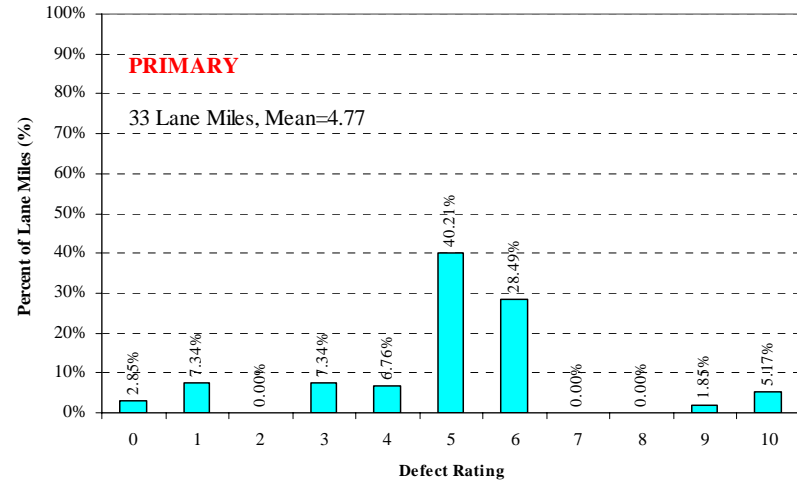
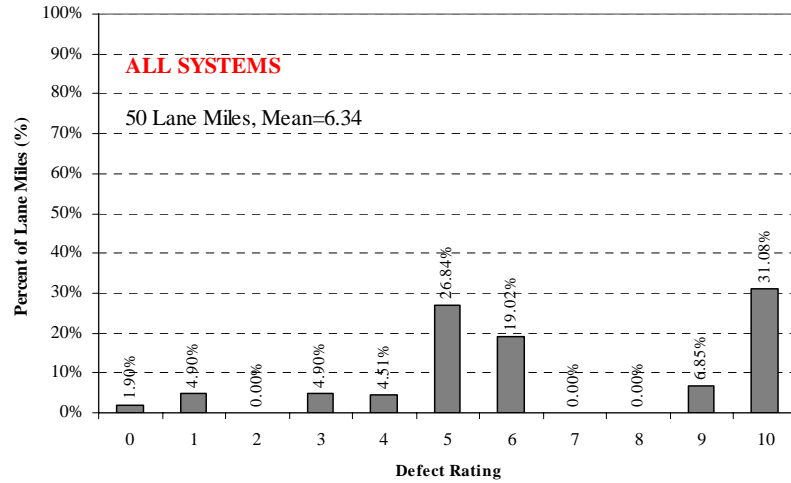
2006 Defect Distribution by System Statewide



Note: No Rigid Pavement on Turnpike System

2006 Defect Distribution by System

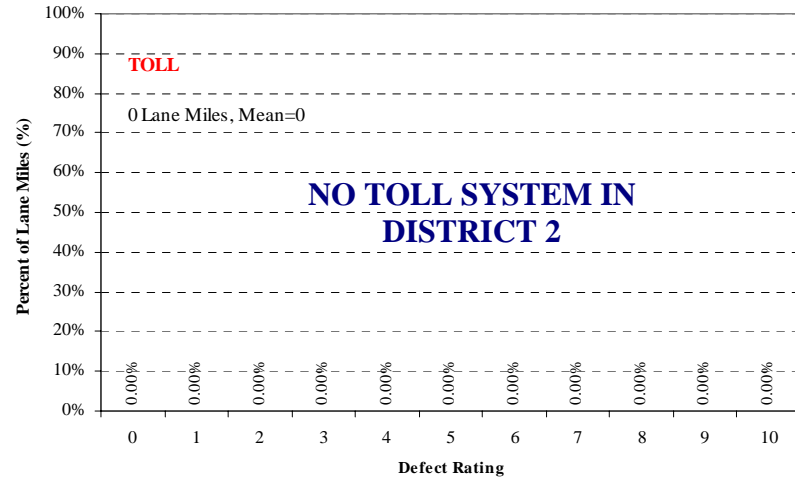
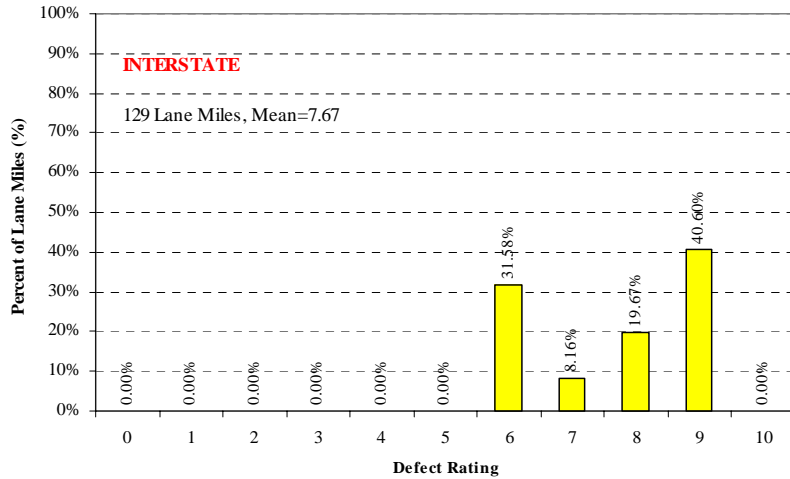
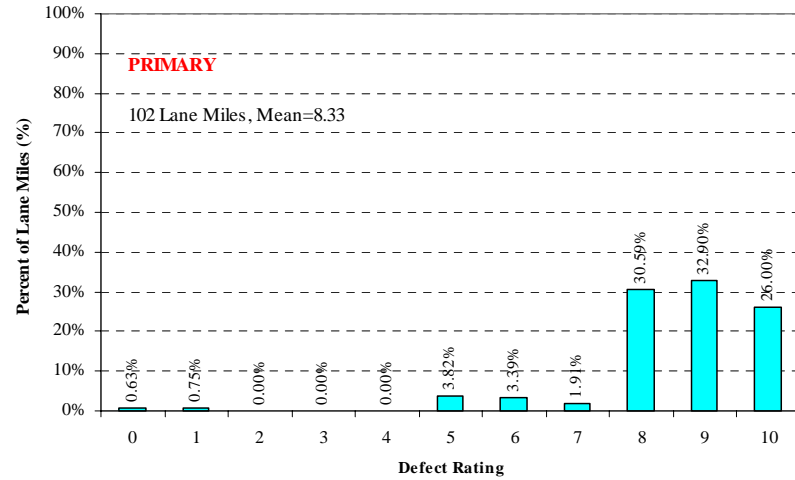
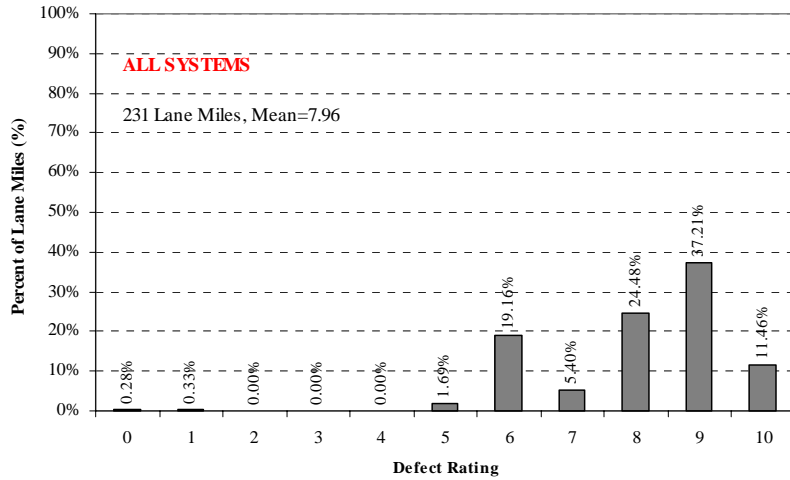
District 1



Note: No Rigid Pavement on Turnpike System

2006 Defect Distribution by System

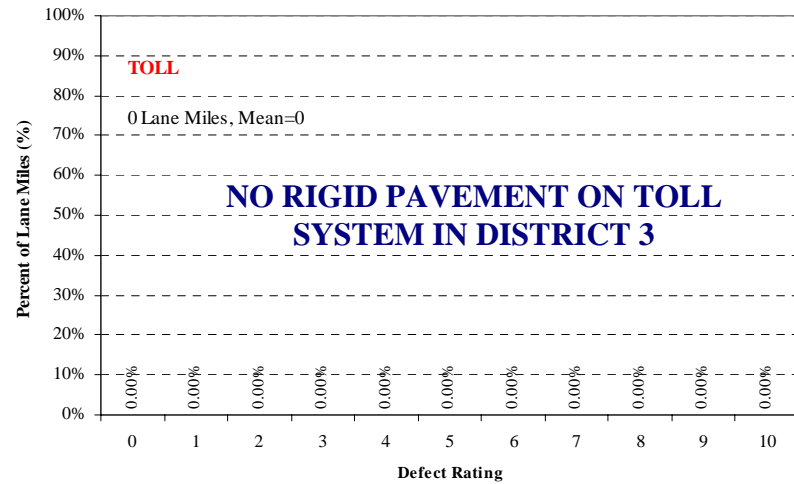
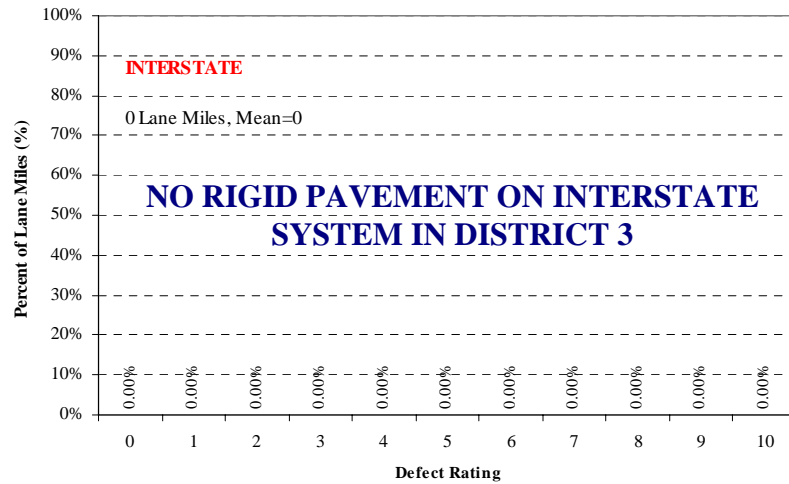
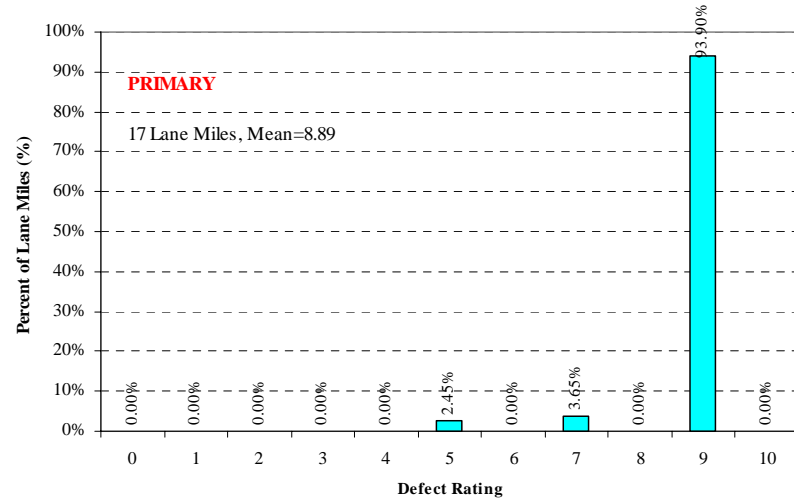
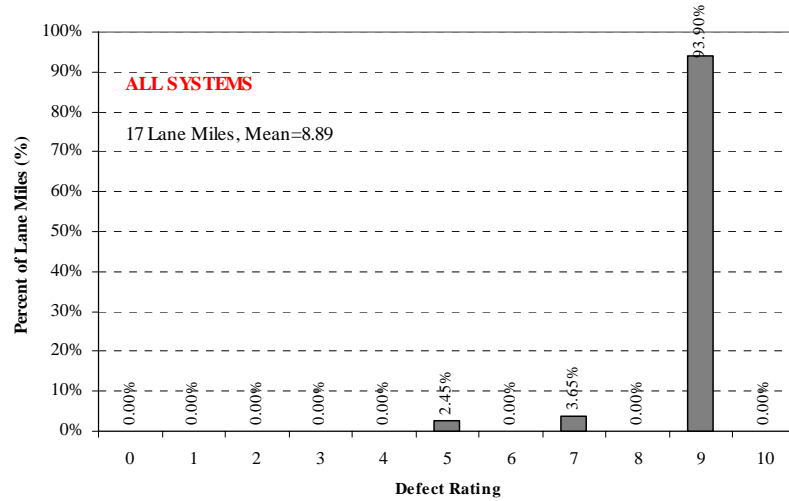
District 2



Note: No Turnpike System in District 2

2006 Defect Distribution by System

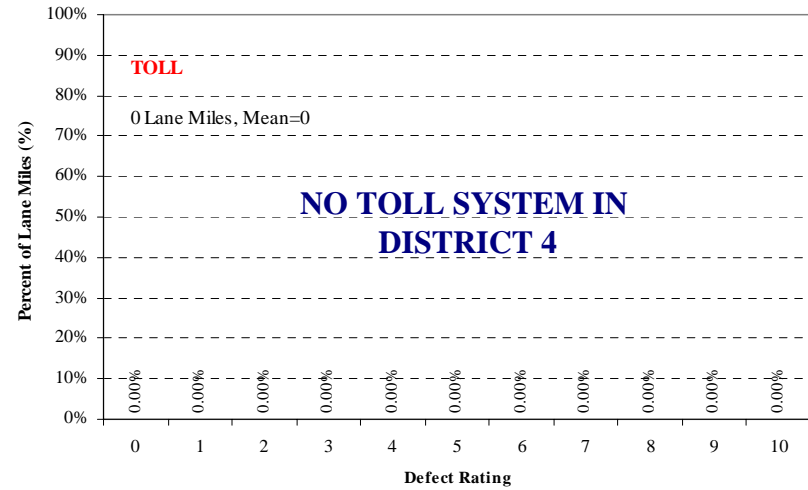
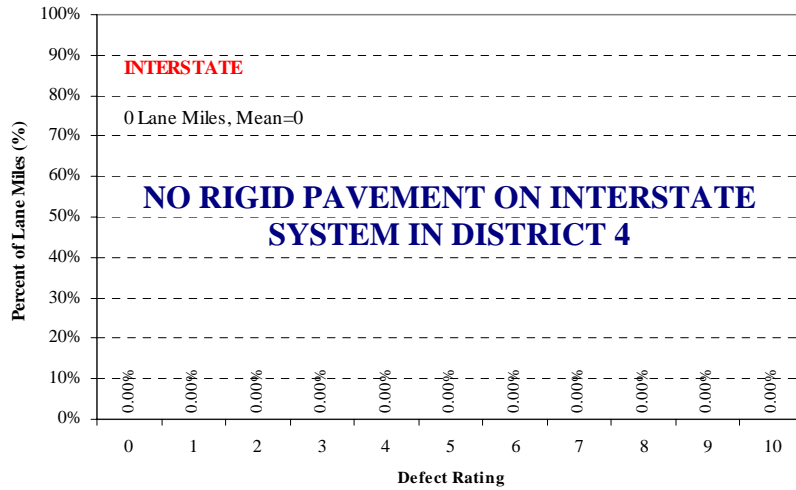
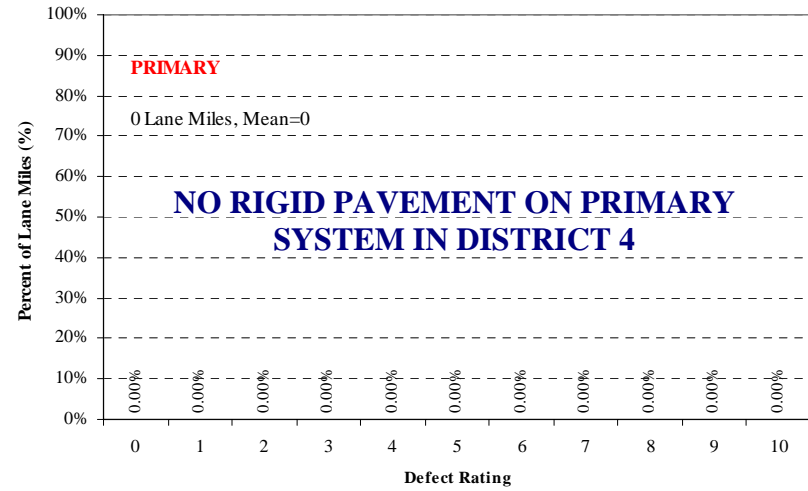
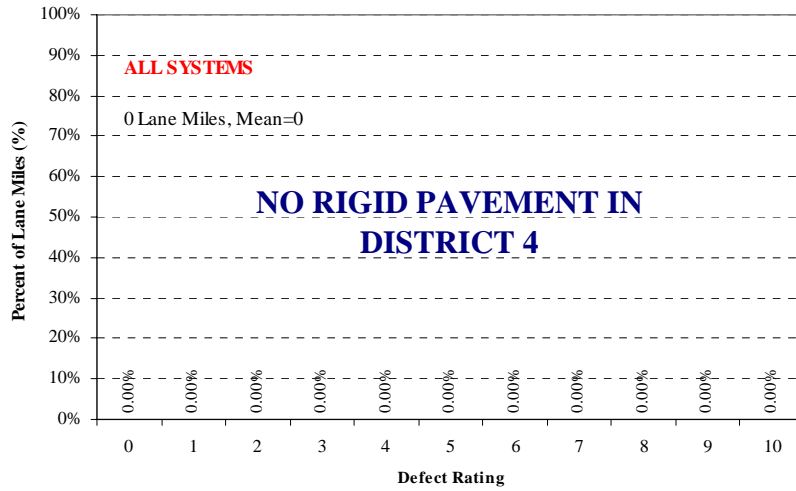
District 3



Note: No Turnpike System in District 3

2006 Defect Distribution by System

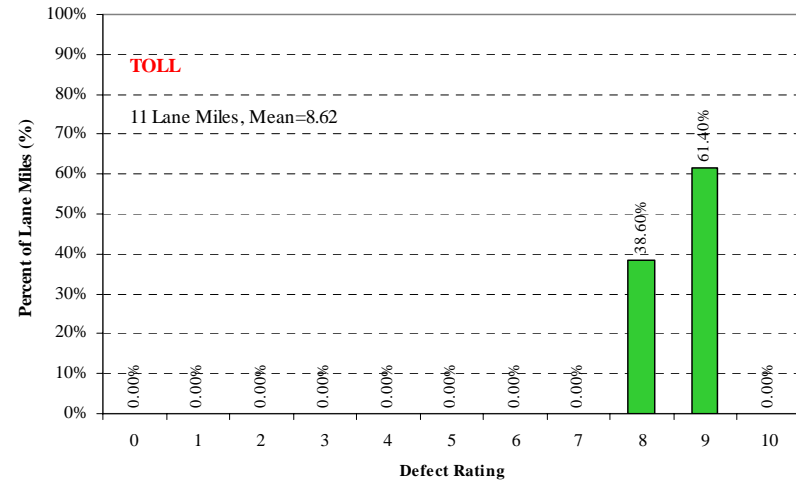
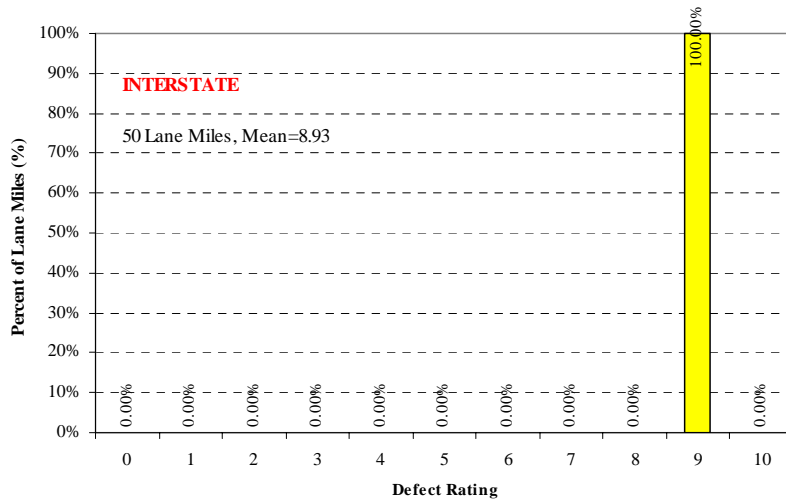
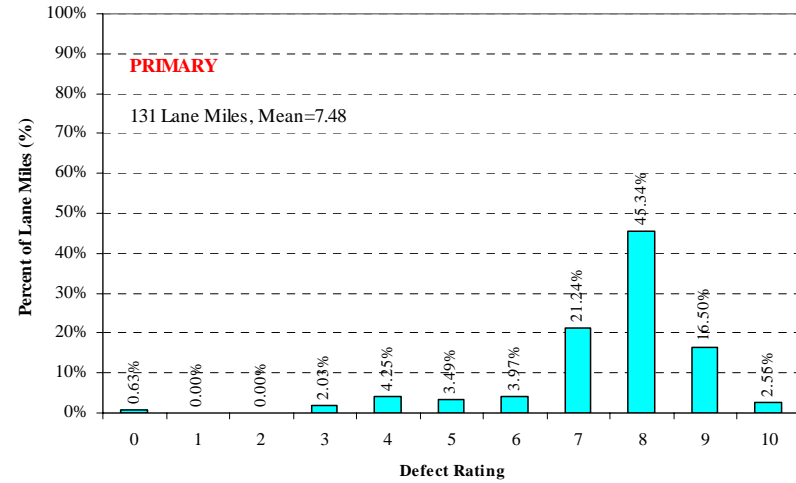
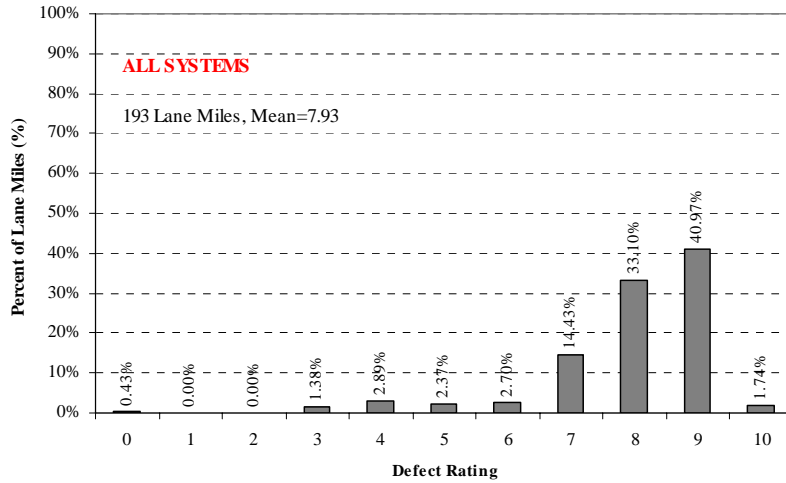
District 4



Note: No Rigid Pavement on Turnpike System

2006 Defect Distribution by System

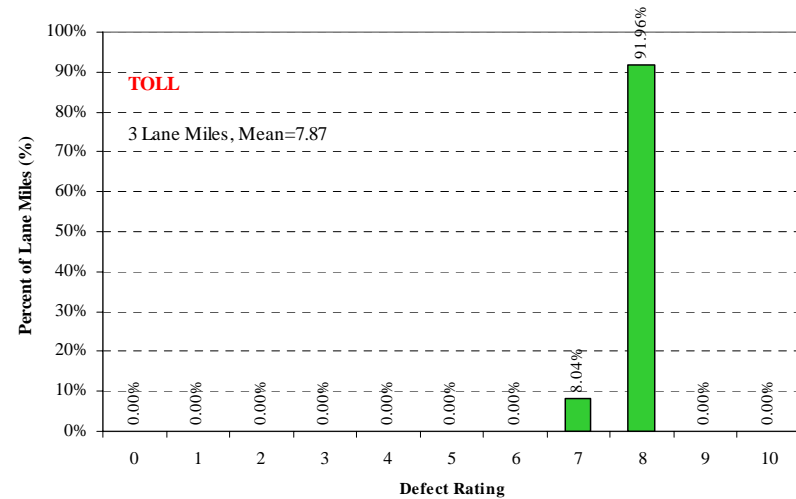
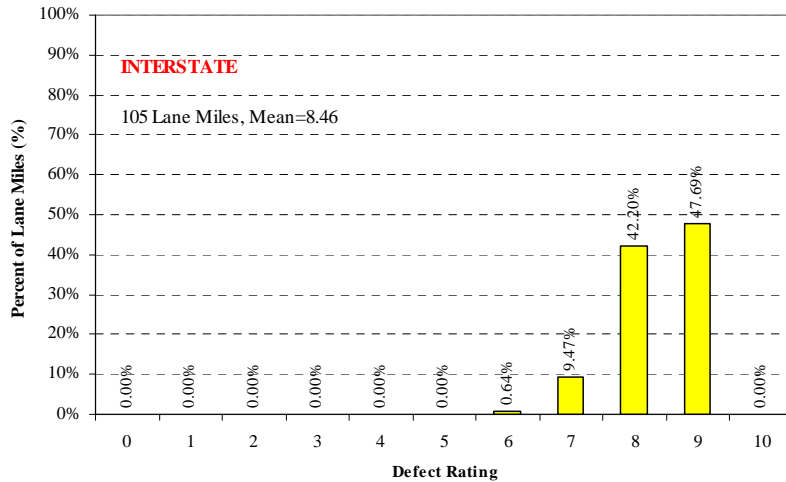
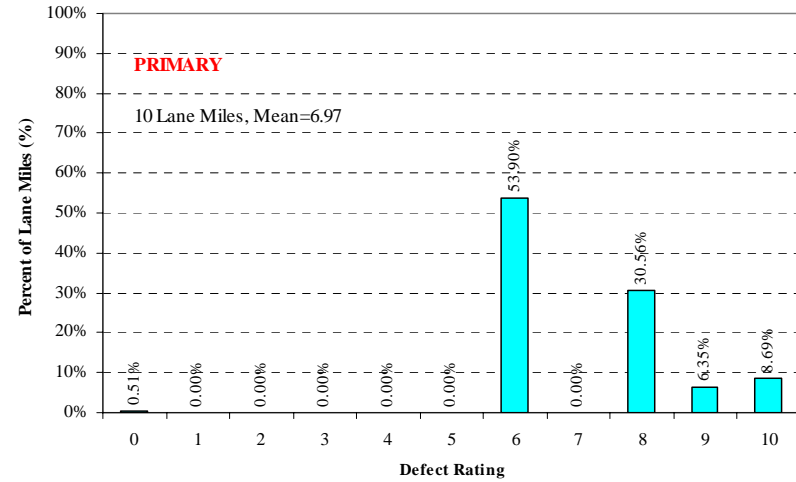
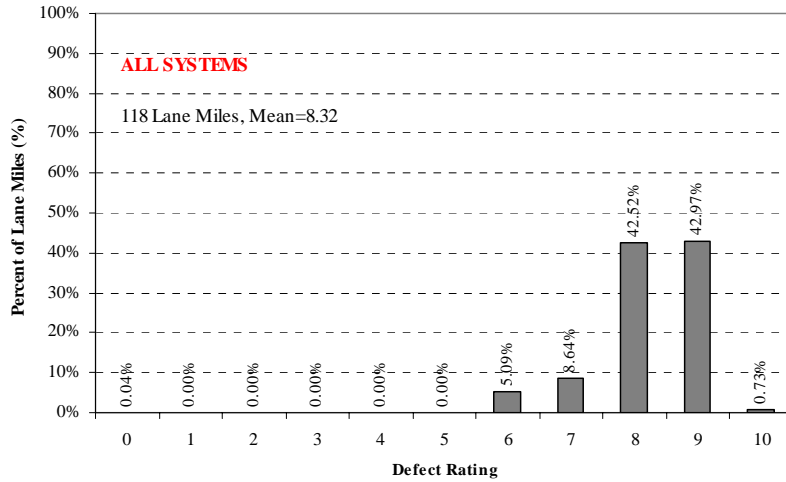
District 5



Note: No Rigid Pavement on Turnpike System

2006 Defect Distribution by System

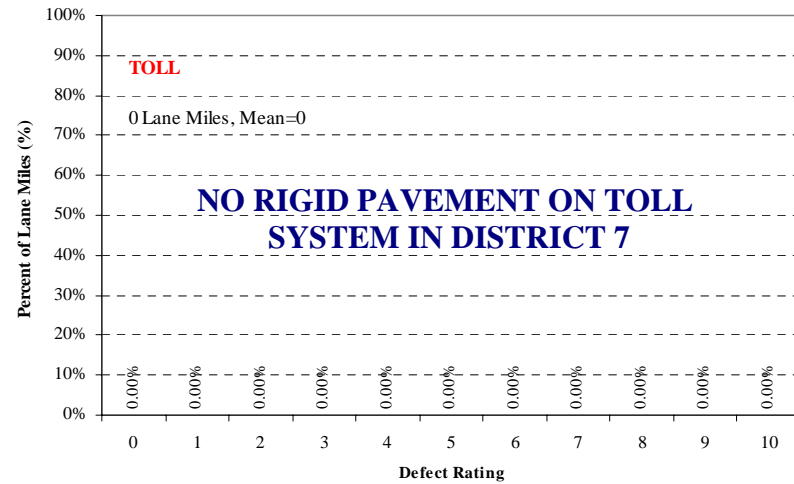
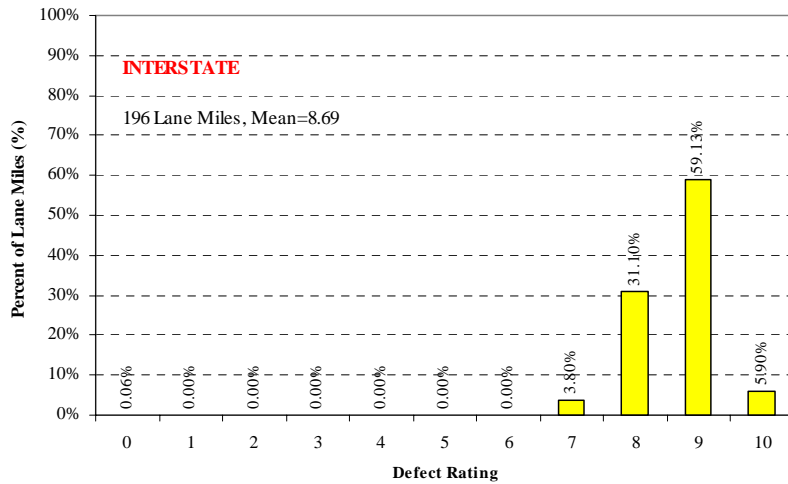
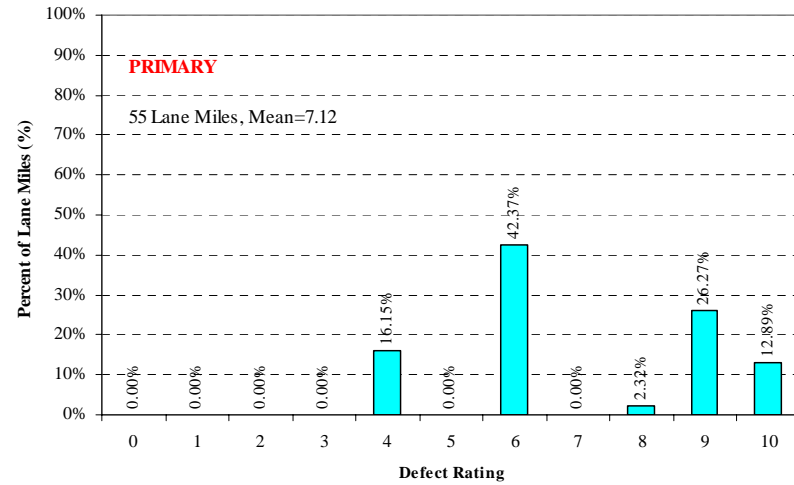
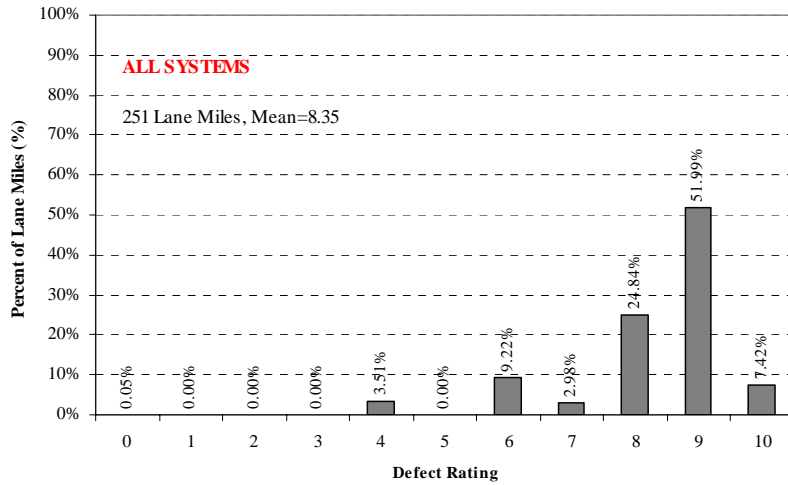
District 6



Note: No Rigid Pavement on Turnpike System

2006 Defect Distribution by System

District 7



Note: No Rigid Pavement on Turnpike System

SECTION III

RIDE RATING

BY

SYSTEM AND DISTRICT



SECTION III

Ride Rating by System and District

Ride Rating Criteria

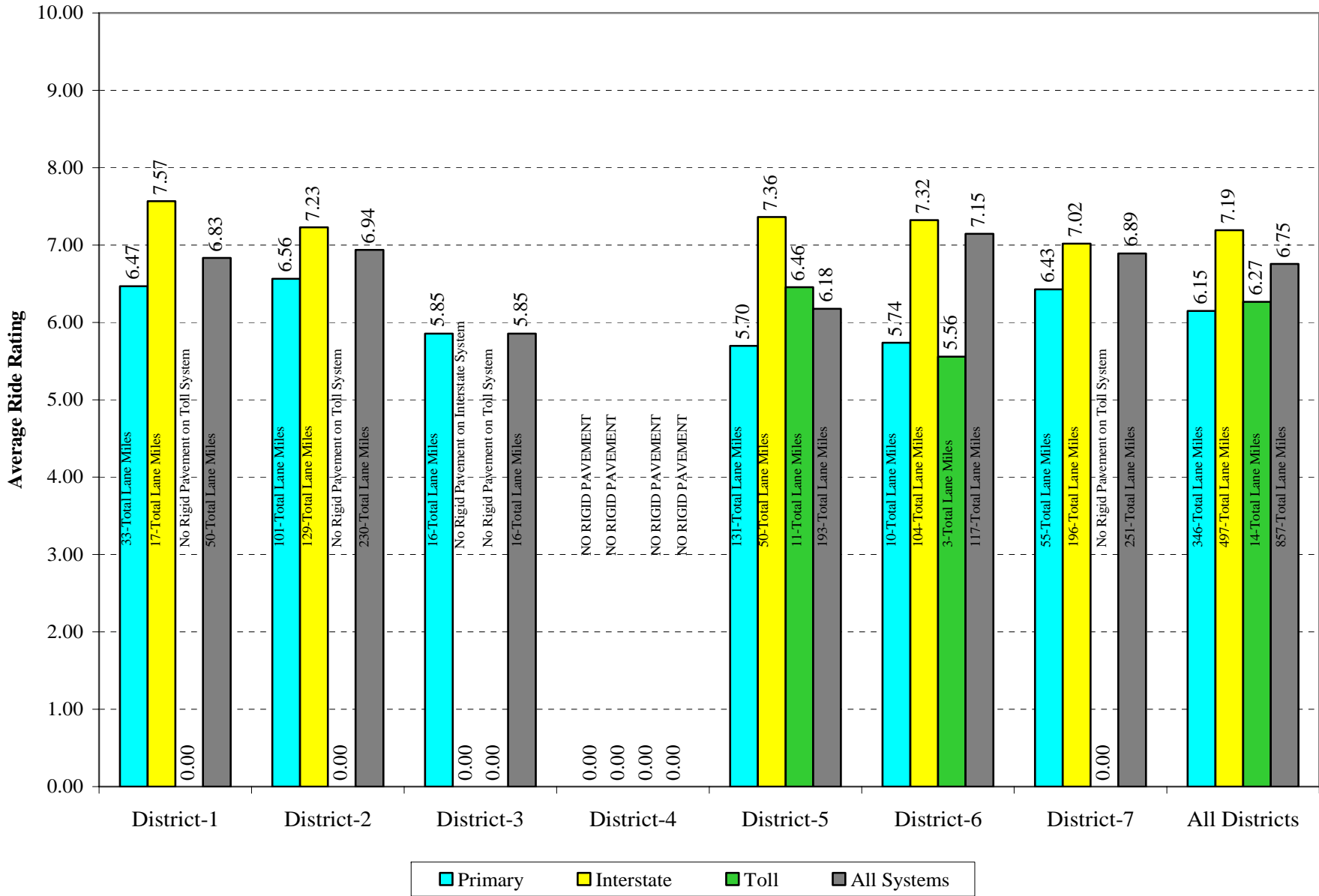
- Ride Ratings measure the ride quality of a pavement section. It is an indication of the degree of smoothness or roughness of the wearing surface.
- A Ride Rating is derived from RN (ASTM E-1489) as follows:

$$\text{Ride Rating} = \text{RN} \times 2$$

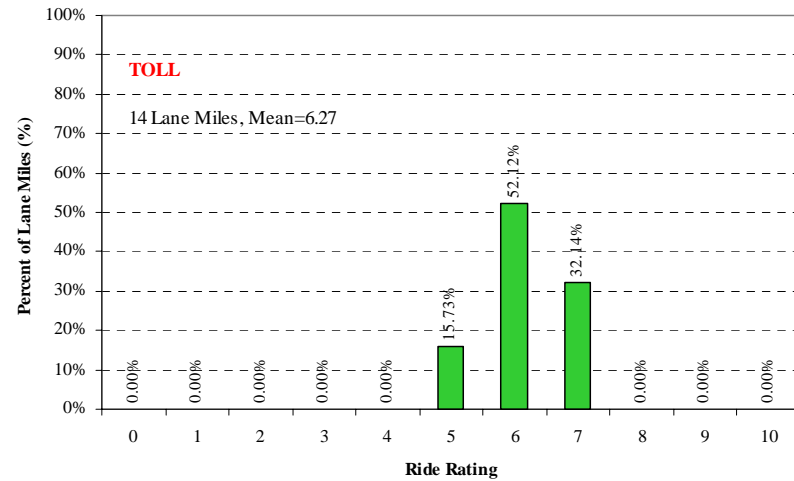
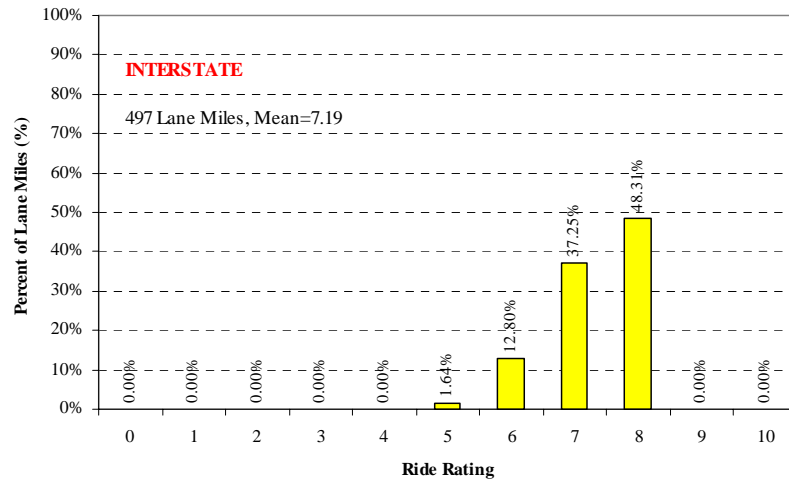
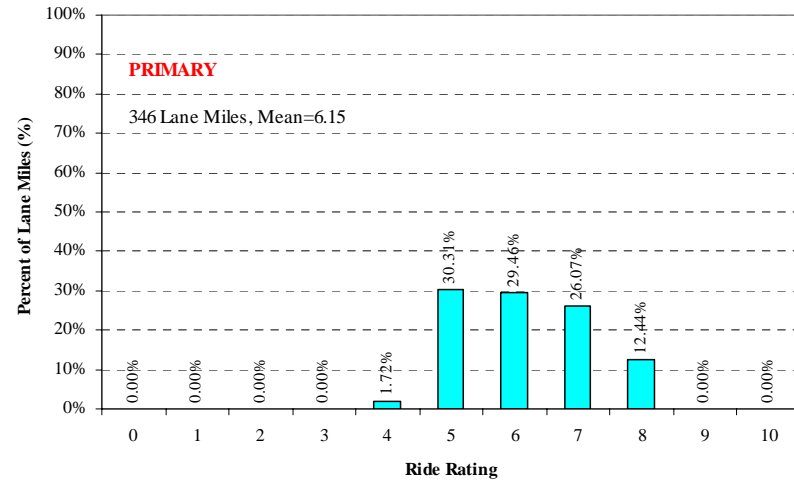
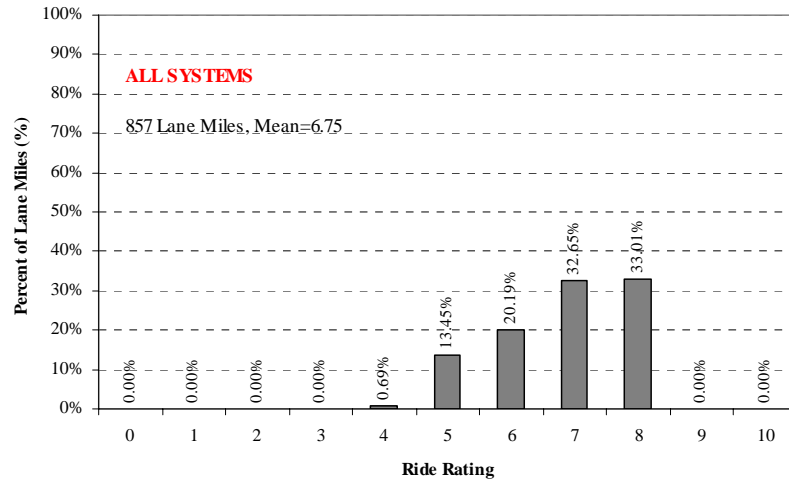
RN is a mathematical processing of longitudinal profile measurements to produce an estimate of a driver's subjective perception of the ride quality of a roadway. RN is based on an algorithm published in the National Cooperative Highway Research Project (NCHRP) 1-23 report and is defined in ASTM Standard E-1489.

- The ride quality of a roadway is greatly affected by, but not limited to the following factors:
 - ▶ Original pavement profile
 - ▶ Profiles from intersecting roads
 - ▶ Utility patches and manhole covers, and
 - ▶ Surface and structural deterioration
- Ride Rating is based on a 0 to 10 scale, where 10 represent a pavement with no roughness while ratings of 6 or less represent a pavement with an undesirable ride quality.

2006 Ride Rating by System and District

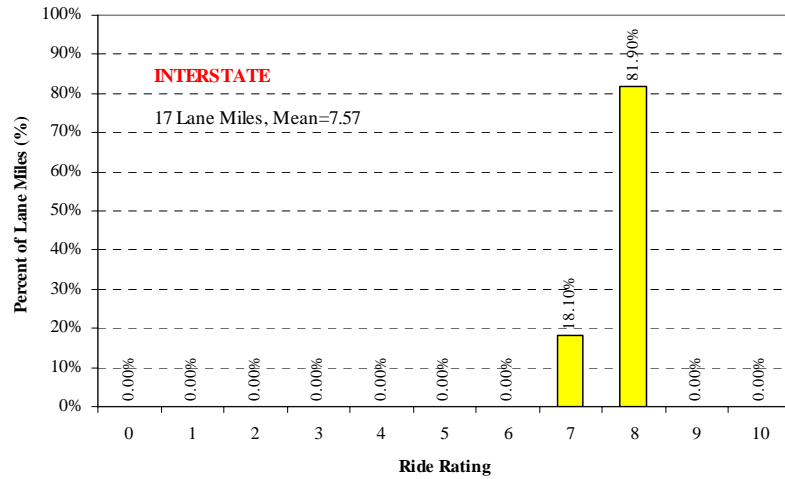
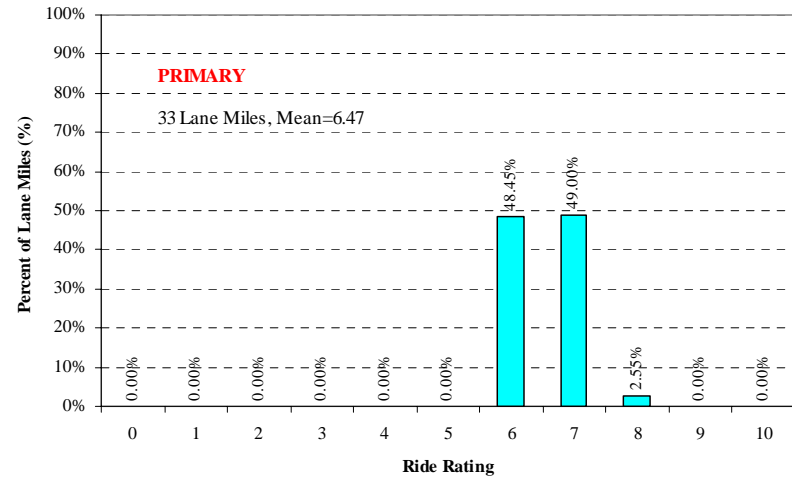
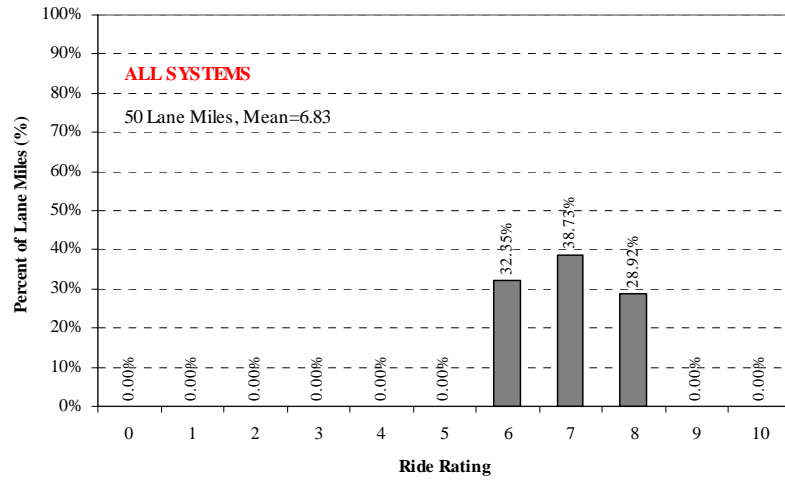


2006 Ride Rating Distribution by System Statewide



Note: No Rigid Pavement on Turnpike System

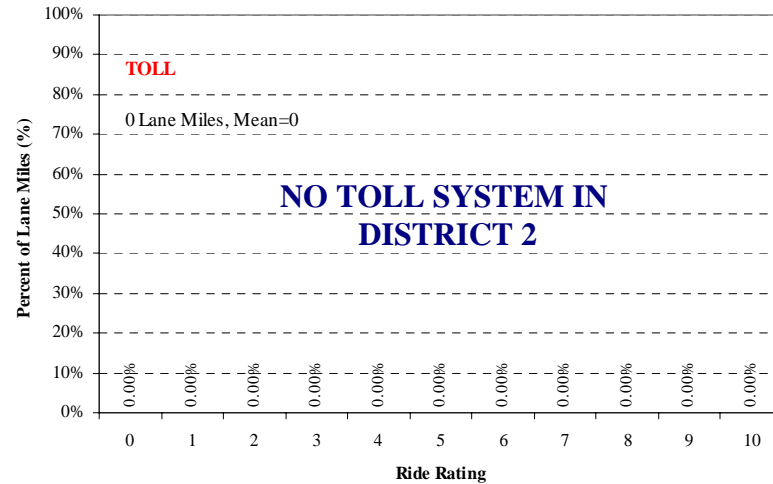
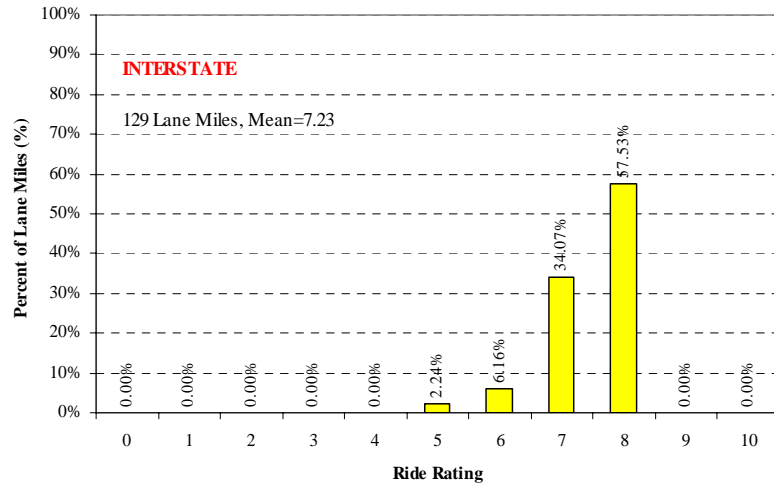
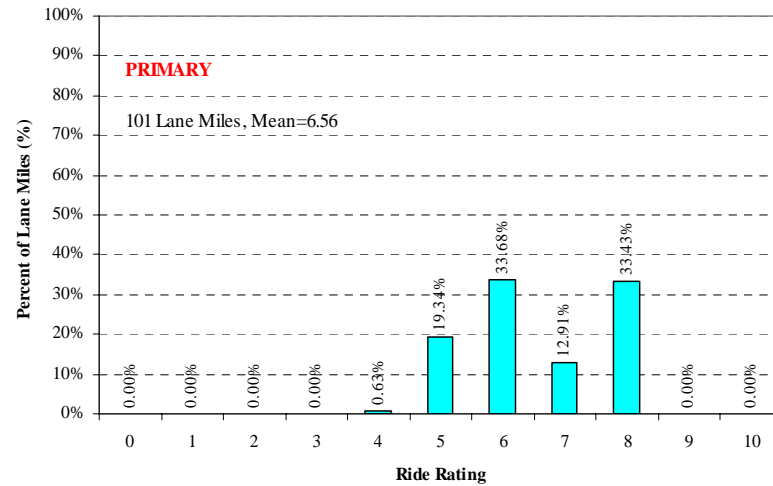
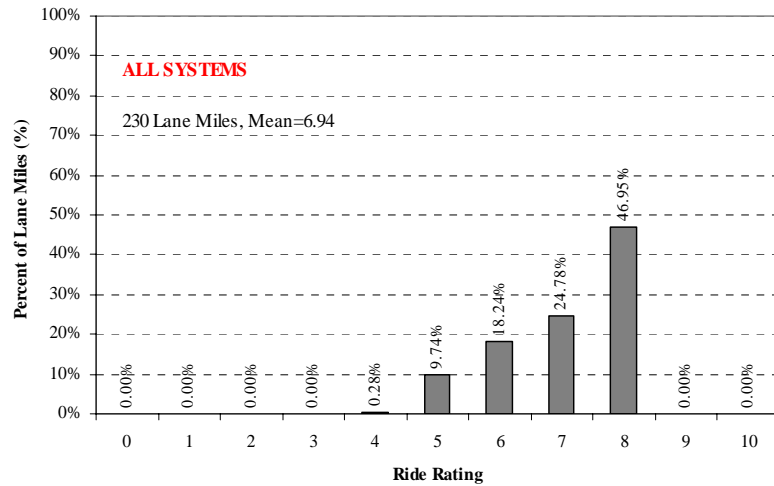
2006 Ride Rating Distribution by System District 1



Note: No Rigid Pavement on Turnpike System

2006 Ride Rating Distribution by System

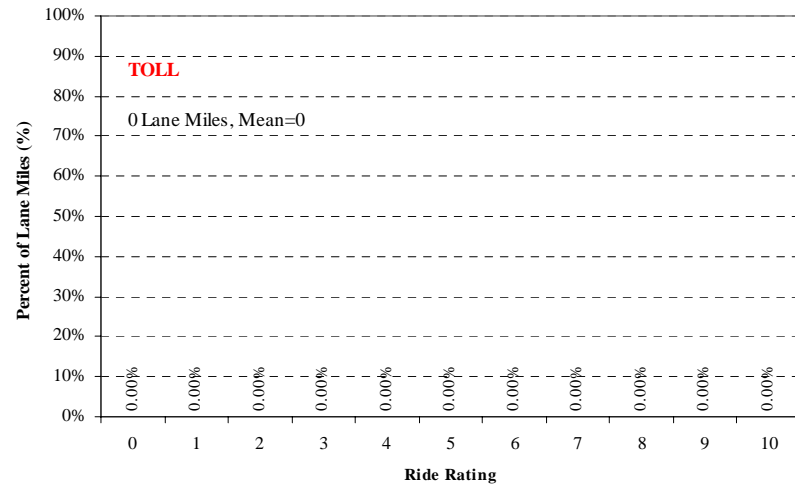
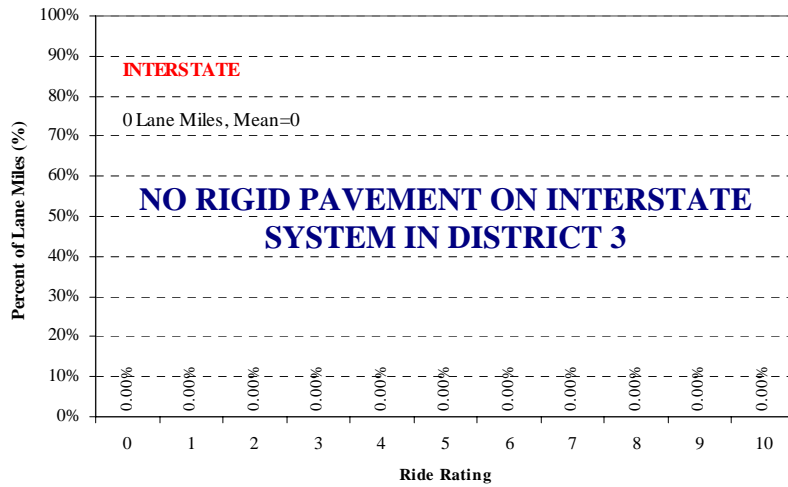
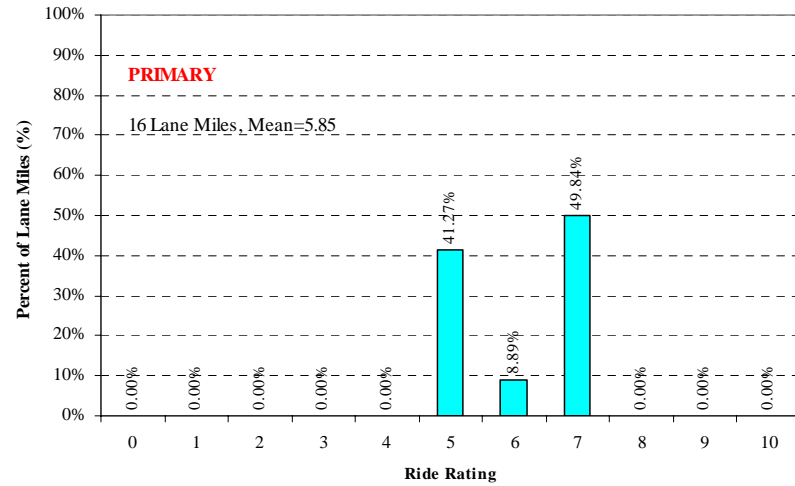
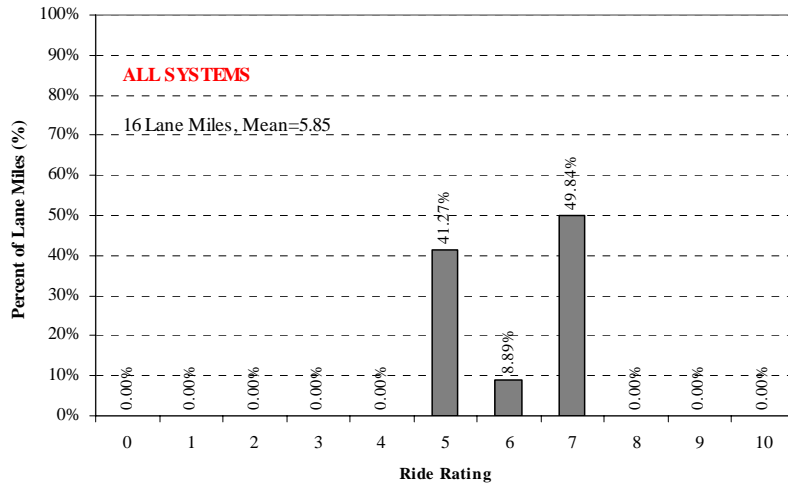
District 2



Note: No Rigid Pavement on Turnpike System

2006 Ride Rating Distribution by System

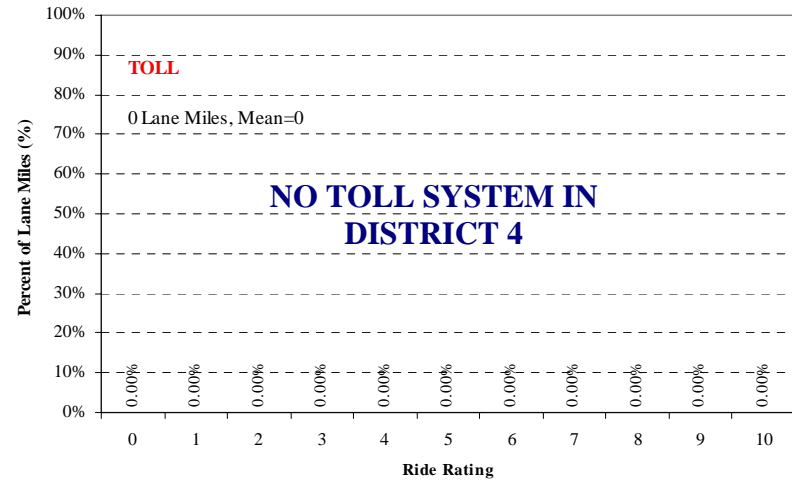
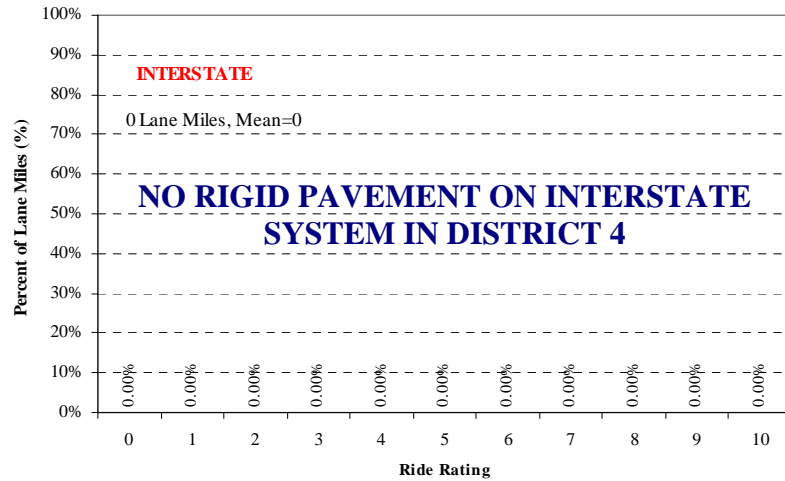
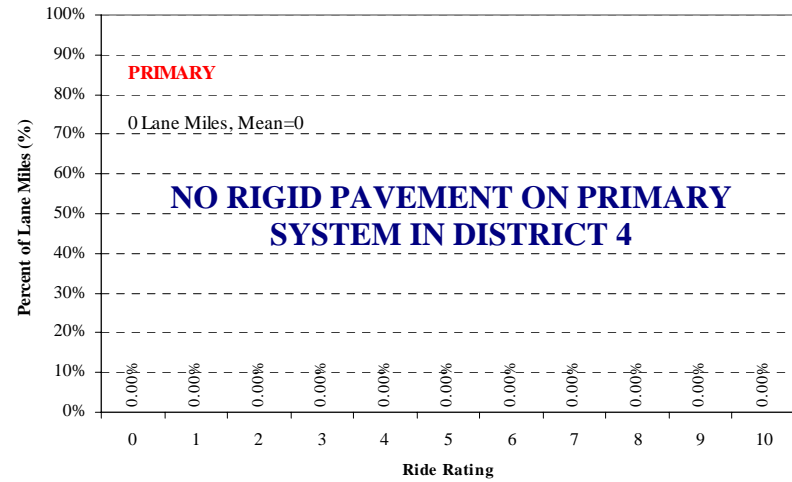
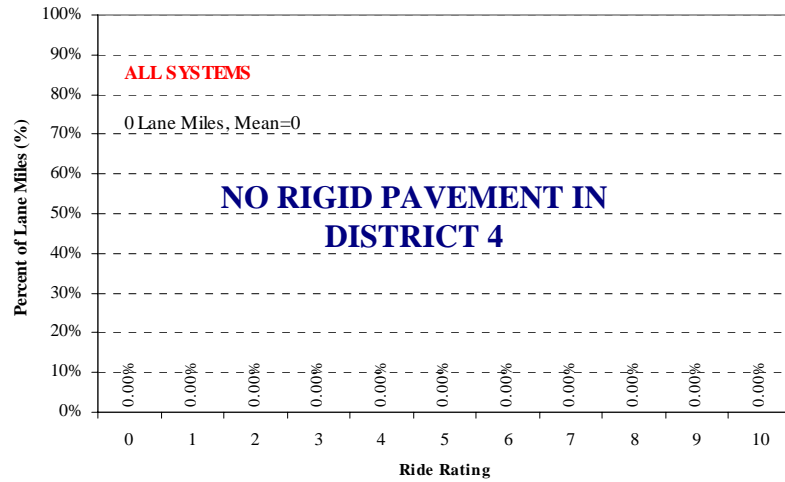
District 3



Note: No Rigid Pavement on Turnpike System

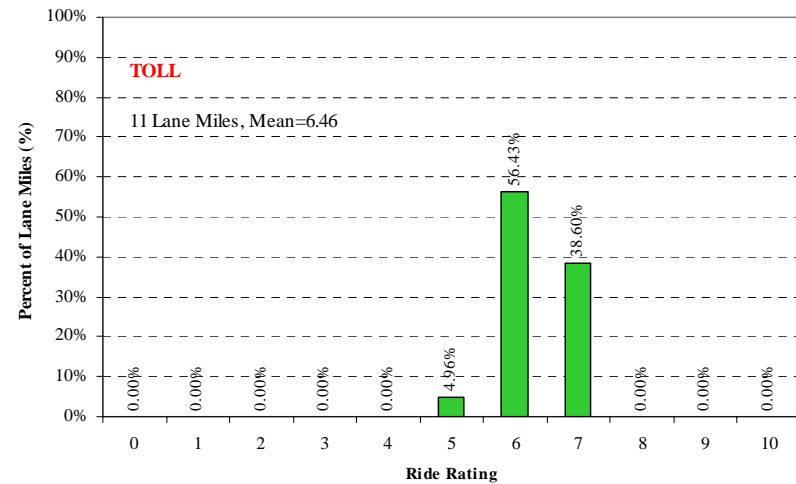
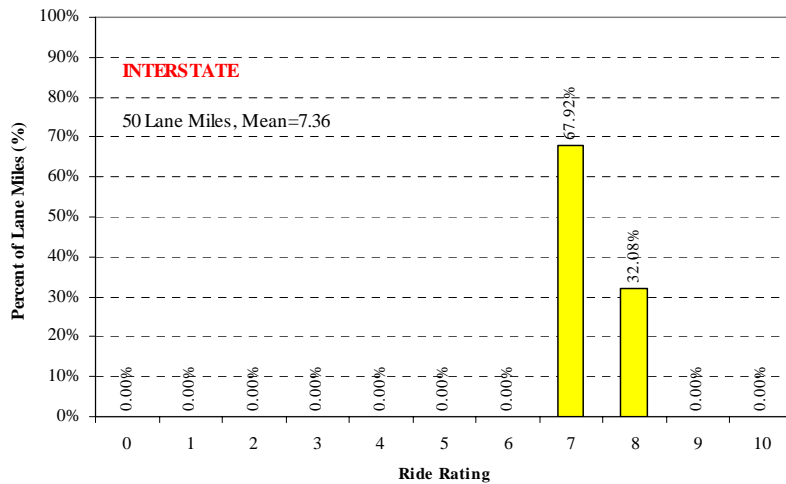
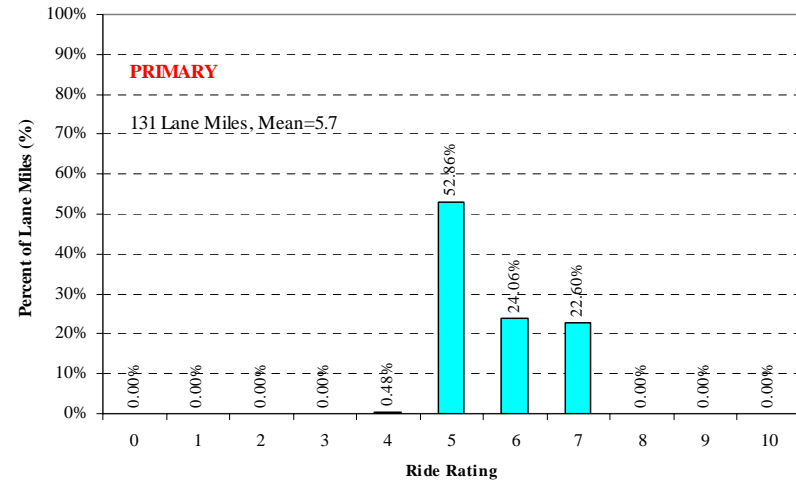
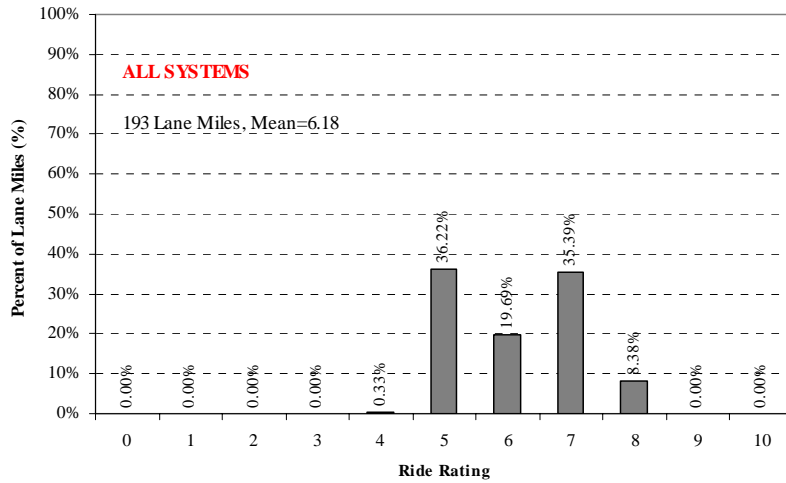
2006 Ride Rating Distribution by System

District 4



2006 Ride Rating Distribution by System

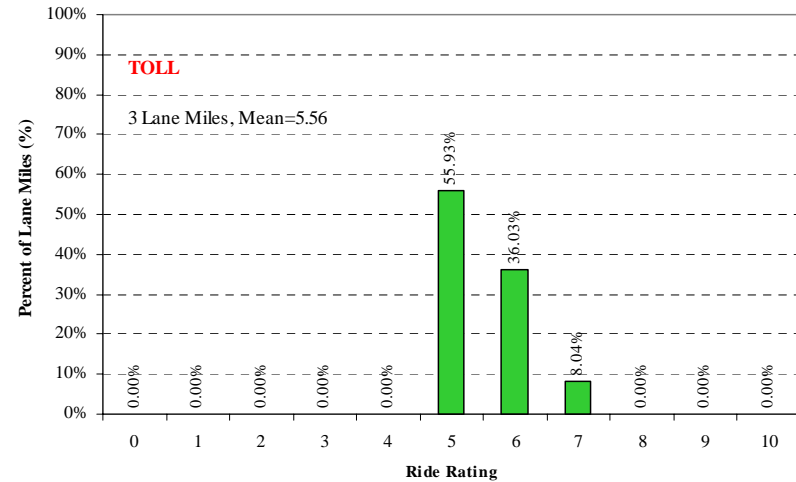
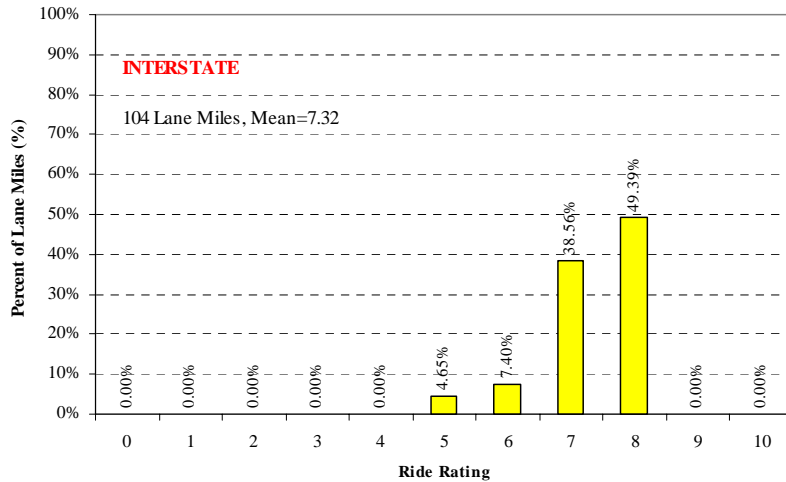
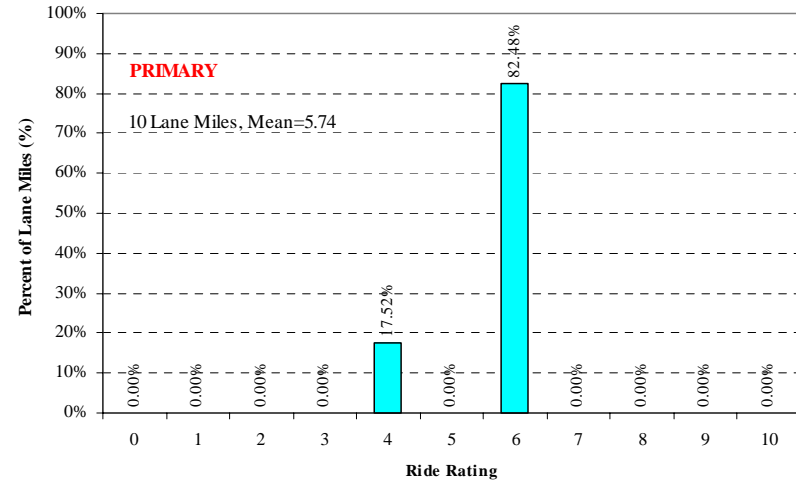
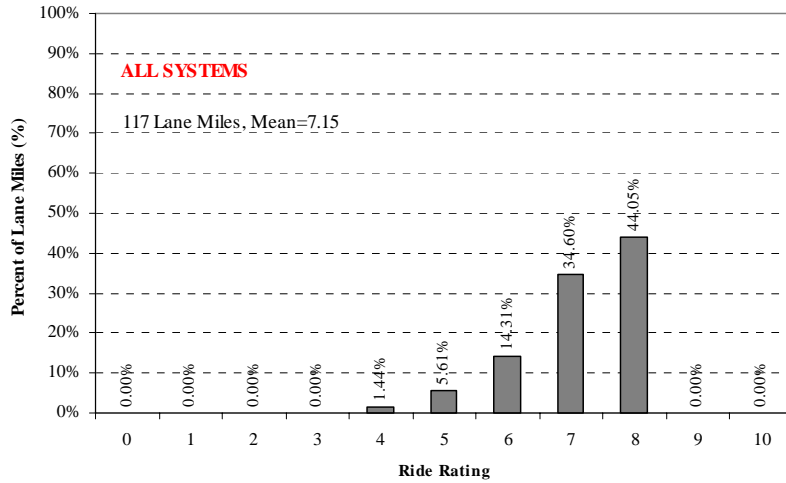
District 5



Note: No Rigid Pavement on Turnpike System

2006 Ride Rating Distribution by System

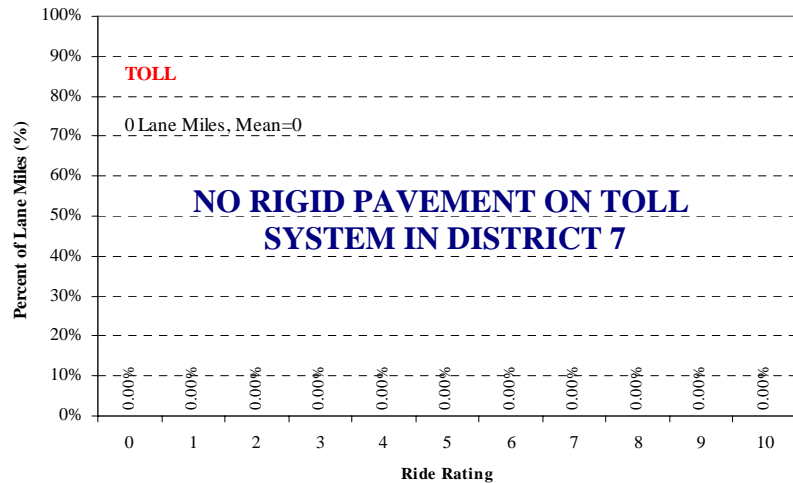
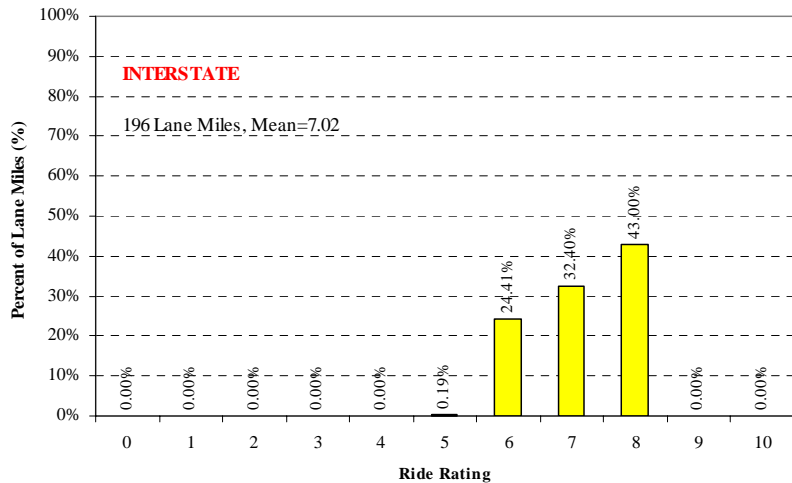
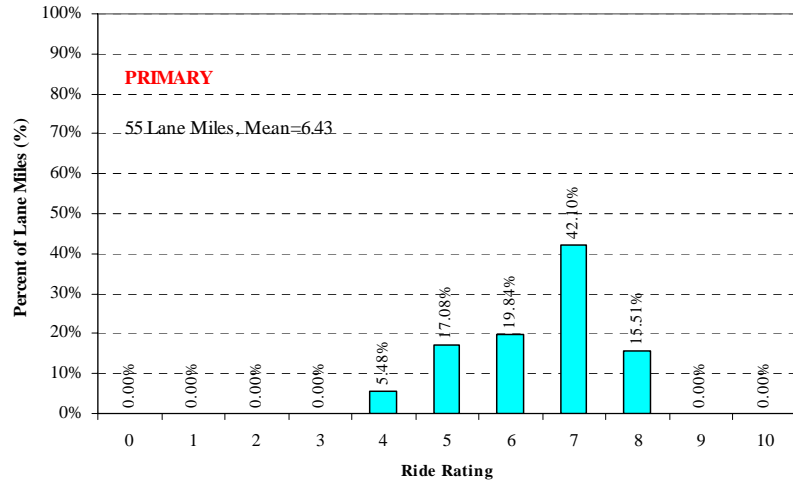
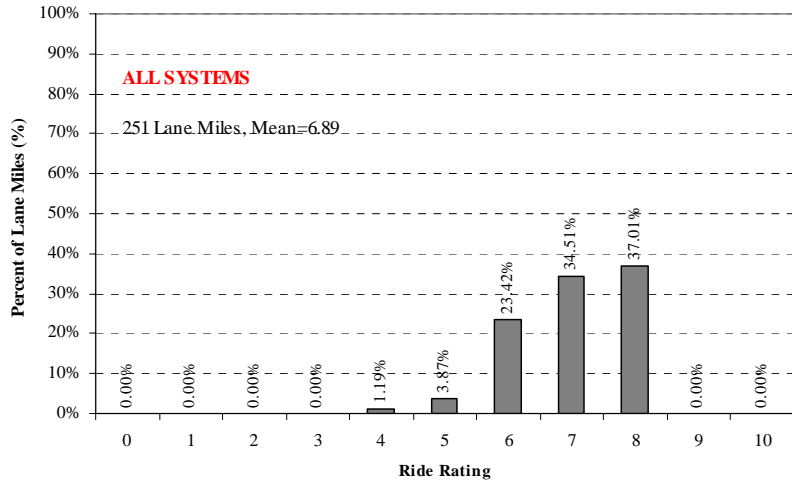
District 6



Note: No Rigid Pavement on Turnpike System

2006 Ride Rating Distribution by System

District 7



Note: No Rigid Pavement on Turnpike System

SECTION IV

HISTORICAL

DISTRESS RATINGS

BY

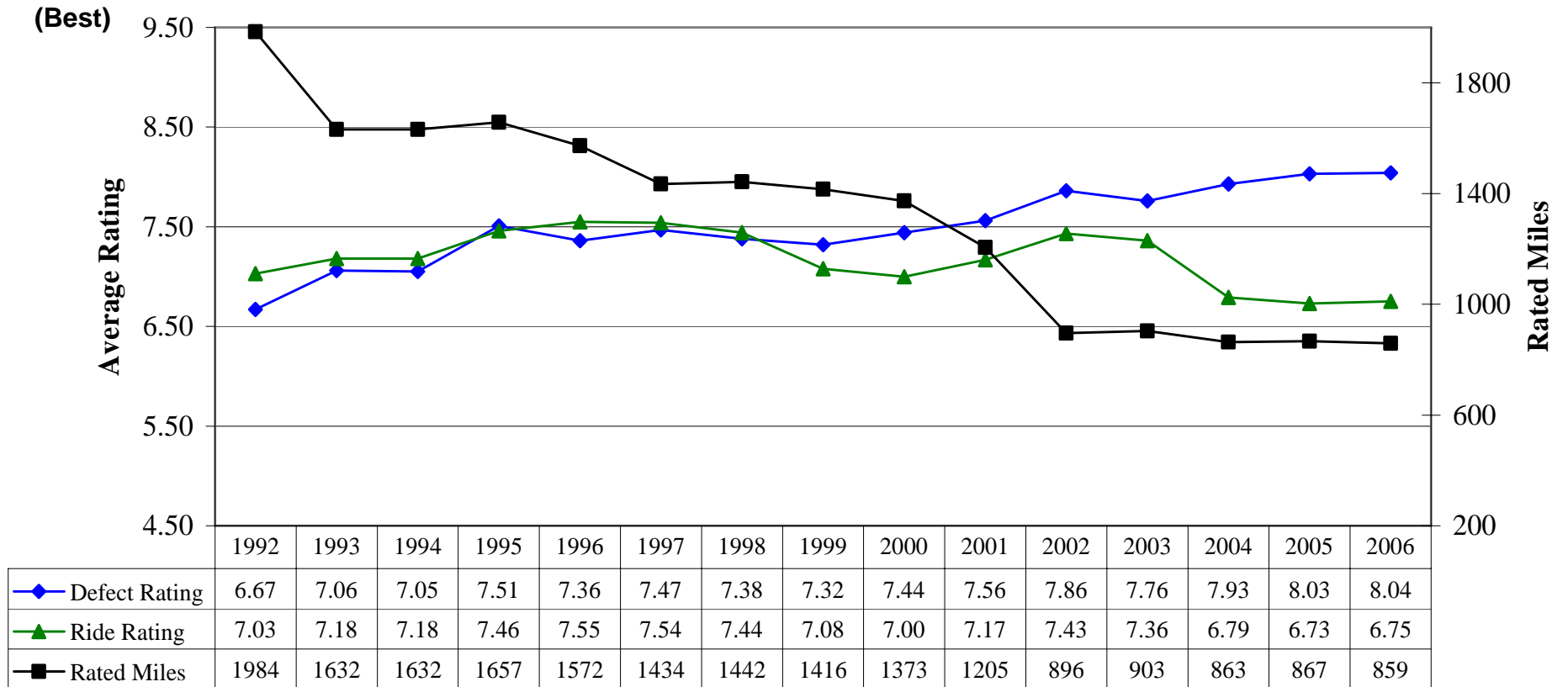
DISTRICT

(1992-2006)



Historical Distress Ratings Statewide (All Systems)

31

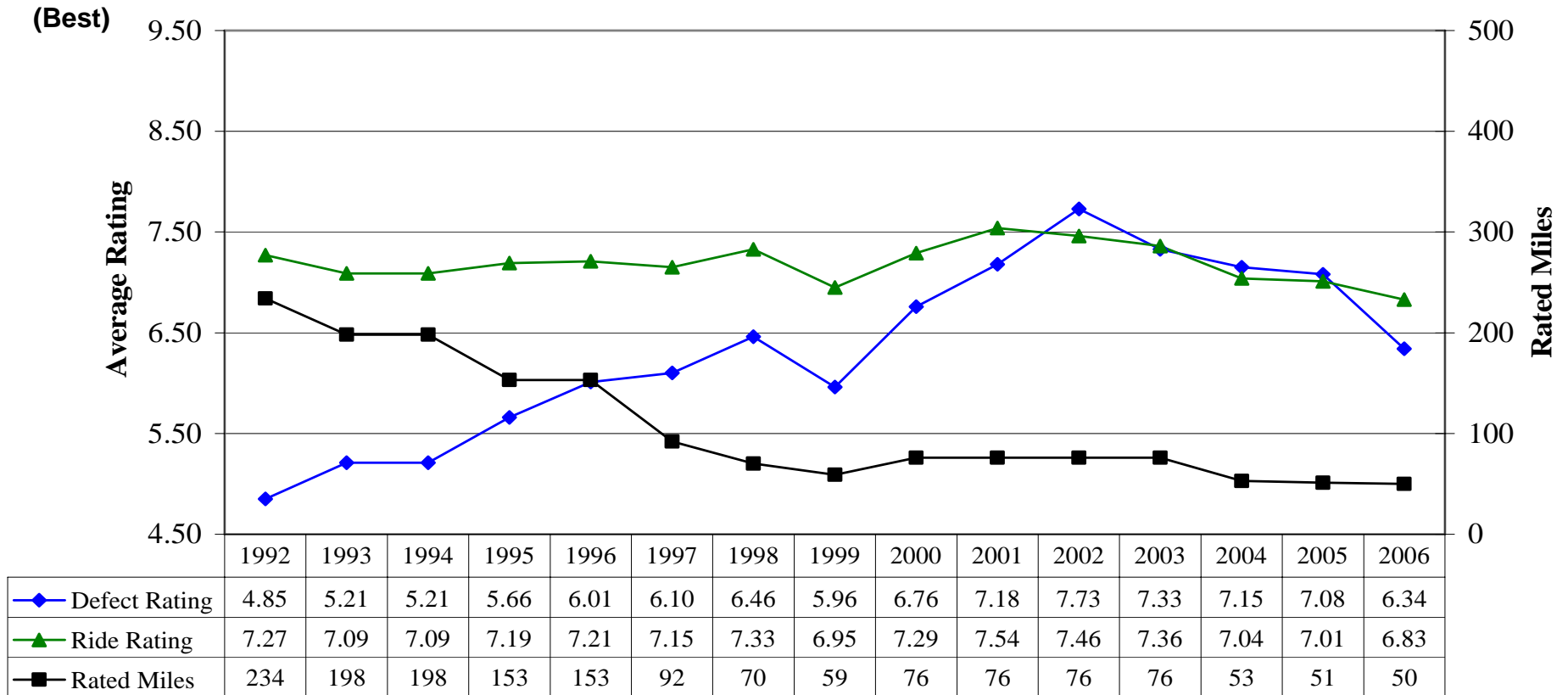


- (1) Please note that beginning with the 2004 PCS, the Ride Rating data was collected using a sampling rate of 6 inch intervals. (Refer to Item 2 under Observations, on page 4.)
- (2) Please note that Rated Miles equal number of miles evaluated for Defect Rating

Historical Distress Ratings

District 1 (All Systems)

32

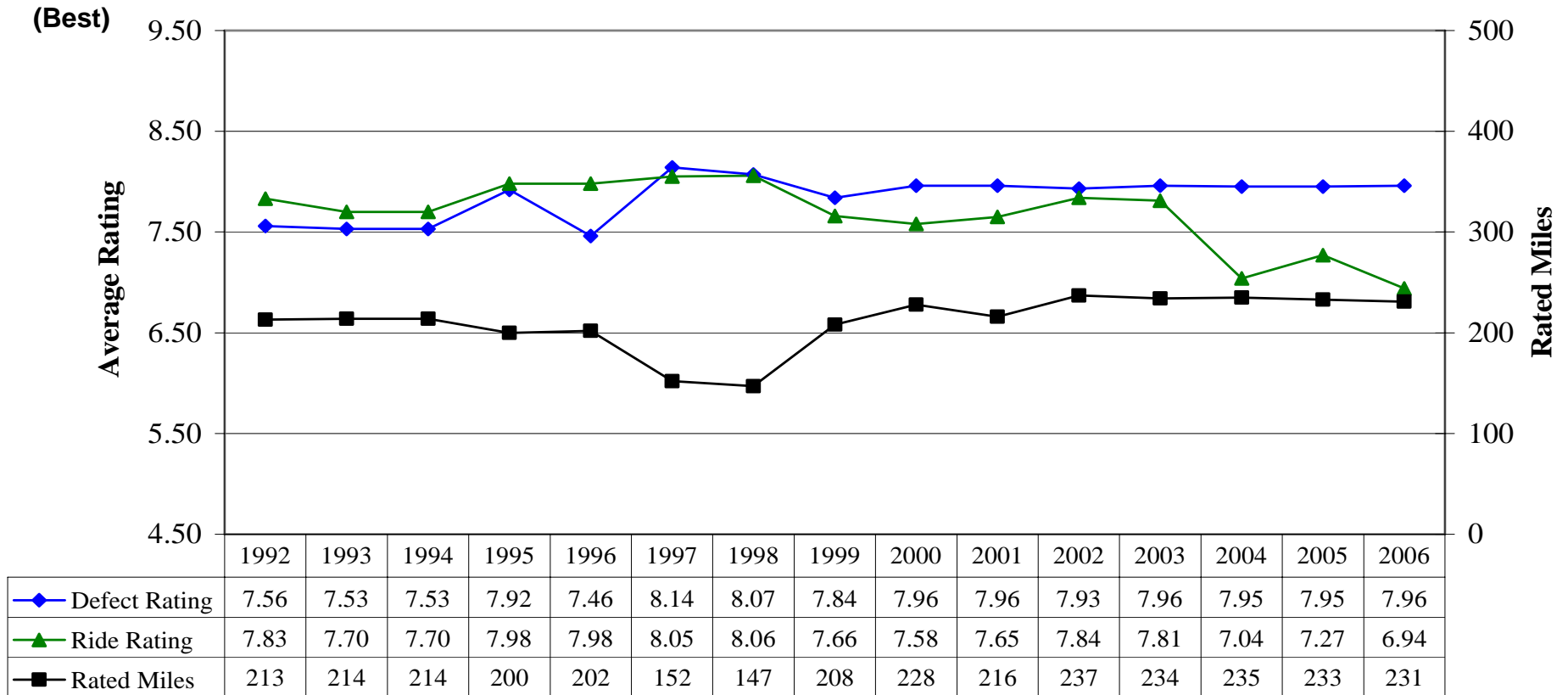


- (1) Please note that beginning with the 2004 PCS, the Ride Rating data was collected using a sampling rate of 6 inch intervals. (Refer to Item 2 under Observations, on page 4.)
- (2) Please note that Rated Miles equal number of miles evaluated for Defect Rating

Historical Distress Ratings

District 2 (All Systems)

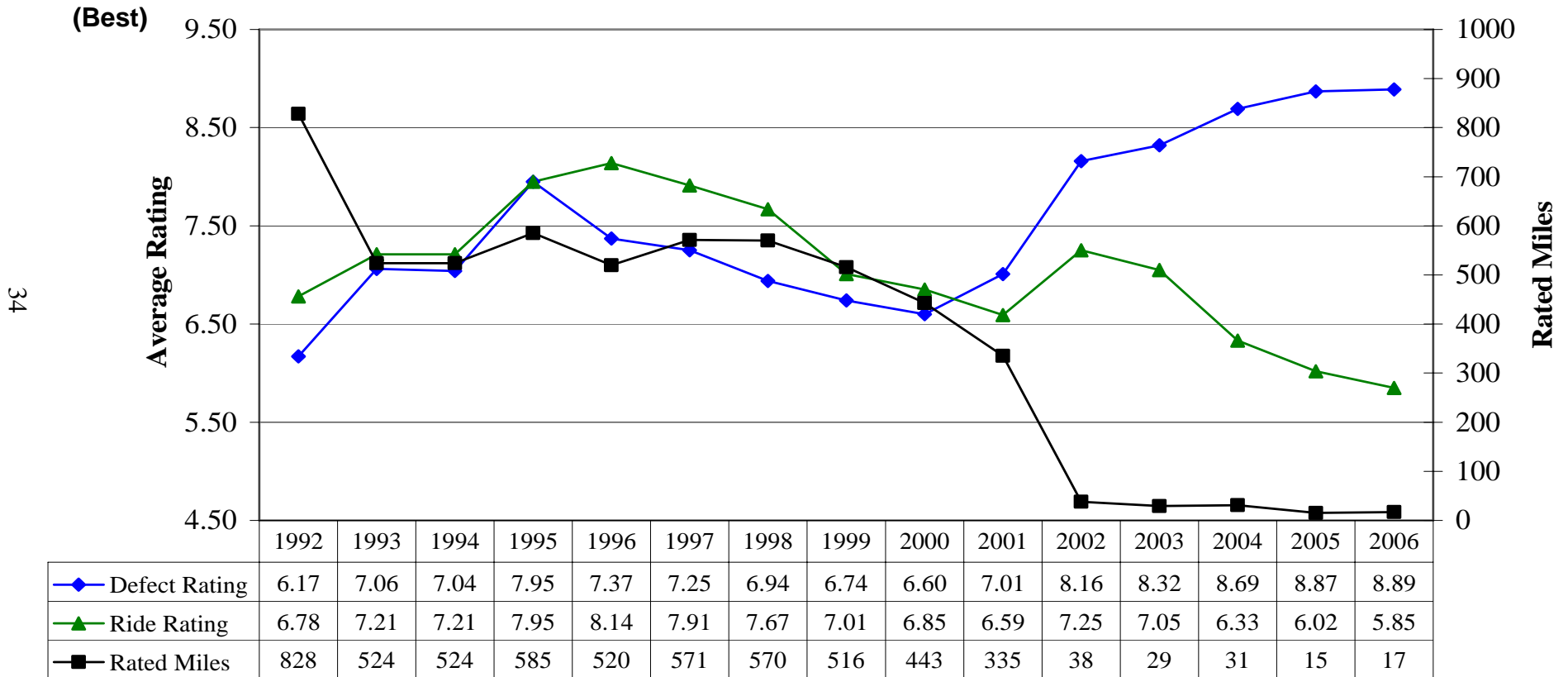
33



- (1) Please note that beginning with the 2004 PCS, the Ride Rating data was collected using a sampling rate of 6 inch intervals. (Refer to Item 2 under Observations, on page 4.)
- (2) Please note that Rated Miles equal number of miles evaluated for Defect Rating

Historical Distress Ratings

District 3 (All Systems)

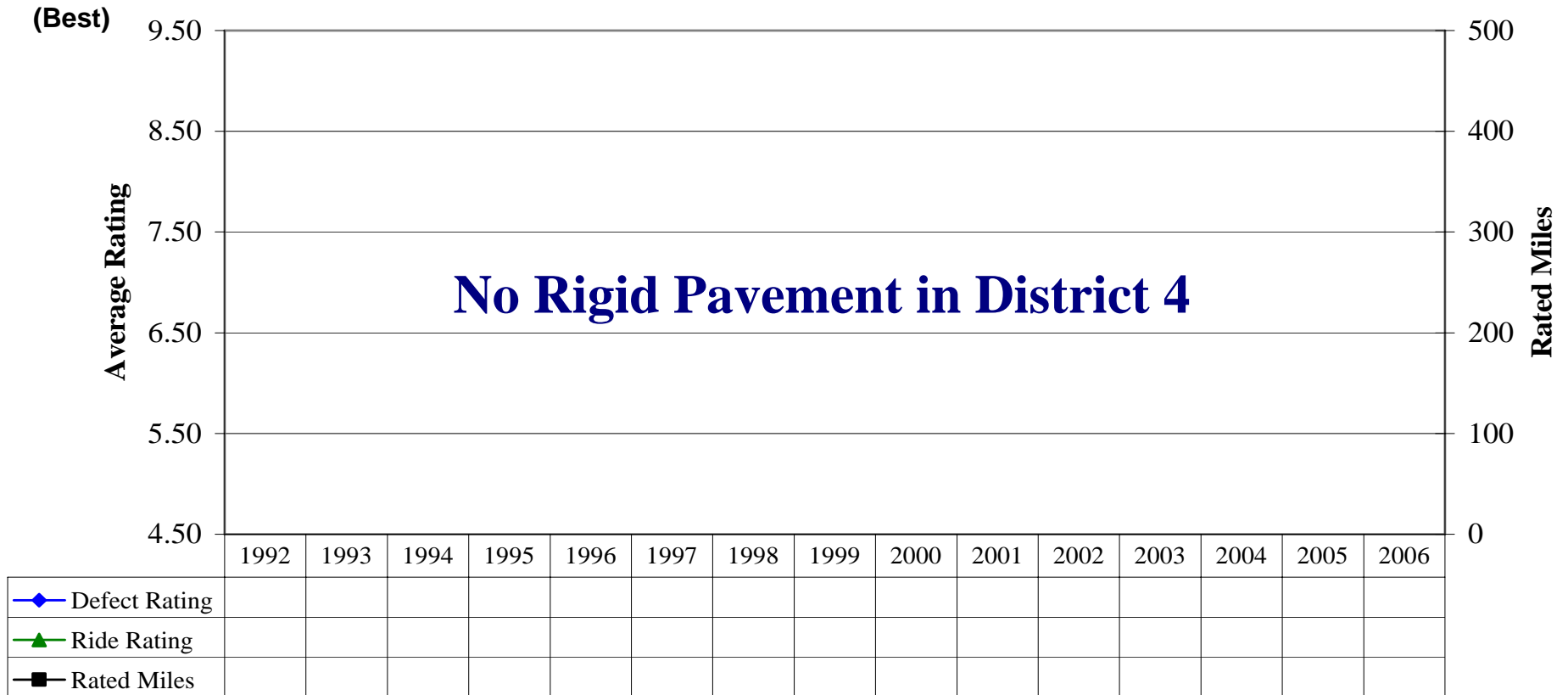


- (1) Please note that beginning with the 2004 PCS, the Ride Rating data was collected using a sampling rate of 6 inch intervals. (Refer to Item 2 under Observations, on page 4.)
- (2) Please note that Rated Miles equal number of miles evaluated for Defect Rating

Historical Distress Ratings

District 4 (All Systems)

35

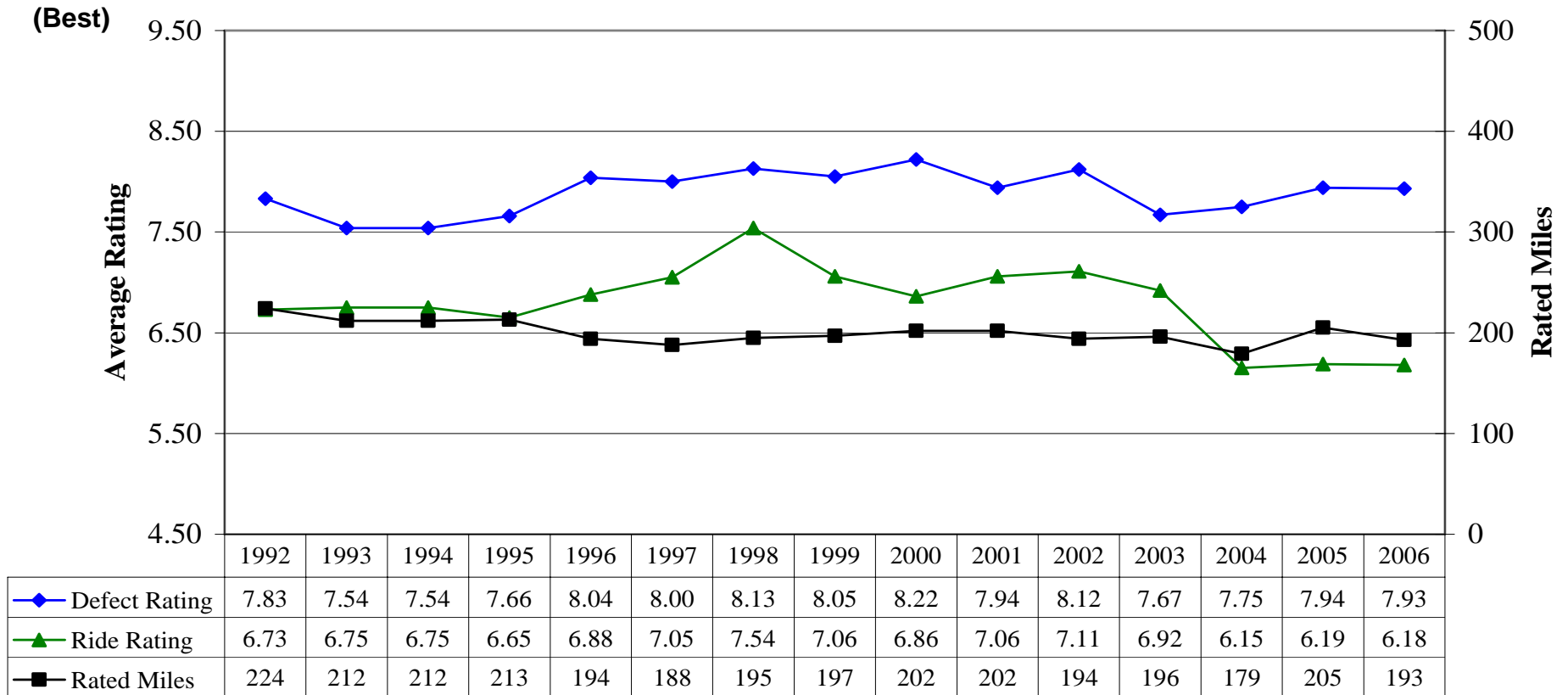


- (1) Please note that beginning with the 2004 PCS, the Ride Rating data was collected using a sampling rate of 6 inch intervals. (Refer to Item 2 under Observations, on page 4.)
- (2) Please note that Rated Miles equal number of miles evaluated for Defect Rating

Historical Distress Ratings

District 5 (All Systems)

36

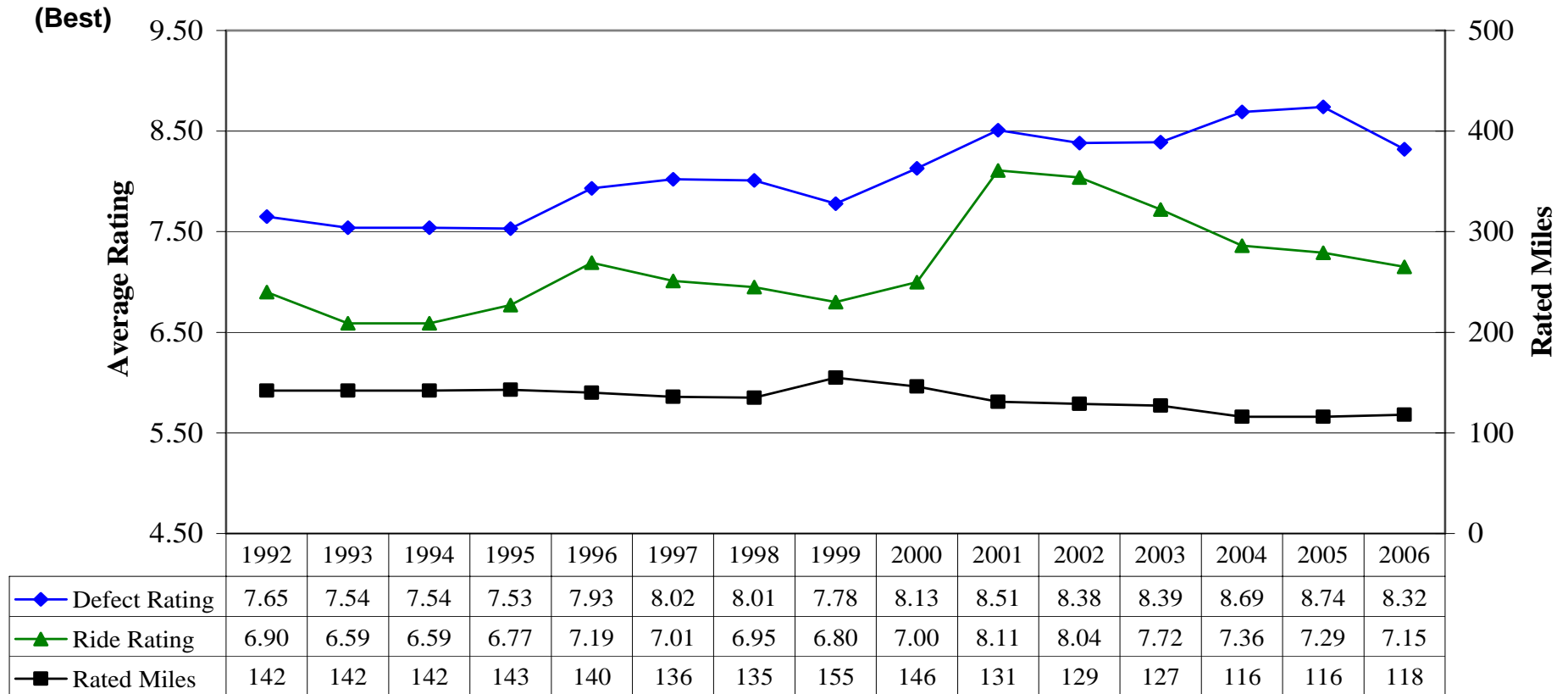


- (1) Please note that beginning with the 2004 PCS, the Ride Rating data was collected using a sampling rate of 6 inch intervals. (Refer to Item 2 under Observations, on page 4.)
- (2) Please note that Rated Miles equal number of miles evaluated for Defect Rating

Historical Distress Ratings

District 6 (All Systems)

37

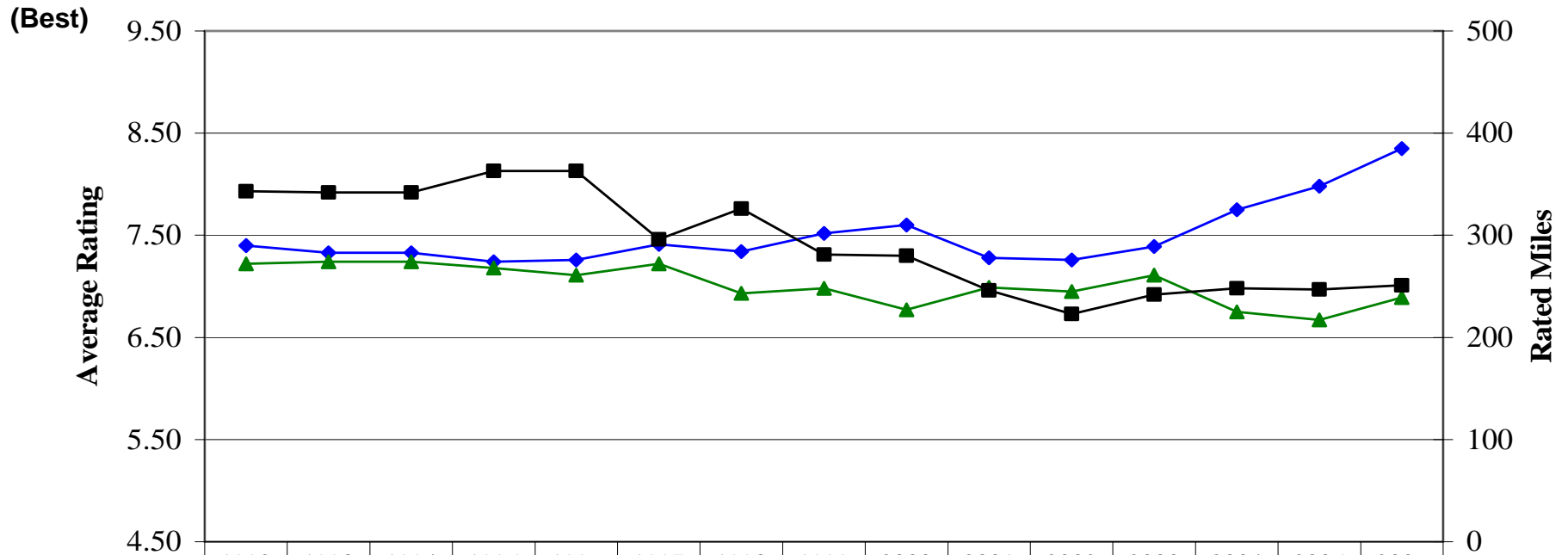


- (1) Please note that beginning with the 2004 PCS, the Ride Rating data was collected using a sampling rate of 6 inch intervals. (Refer to Item 2 under Observations, on page 4.)
- (2) Please note that Rated Miles equal number of miles evaluated for Defect Rating

Historical Distress Ratings

District 7 (All Systems)

38



	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
◆ Defect Rating	7.40	7.33	7.33	7.24	7.26	7.41	7.34	7.52	7.60	7.28	7.26	7.39	7.75	7.98	8.35
▲ Ride Rating	7.22	7.24	7.24	7.18	7.11	7.22	6.93	6.98	6.77	6.99	6.95	7.11	6.75	6.67	6.89
■ Rated Miles	343	342	342	363	363	296	326	281	280	246	223	242	248	247	251

- (1) Please note that beginning with the 2004 PCS, the Ride Rating data was collected using a sampling rate of 6 inch intervals. (Refer to Item 2 under Observations, on page 4.)
- (2) Please note that Rated Miles equal number of miles evaluated for Defect Rating

SECTION V

HISTORICAL

DISTRESS RATINGS

BY

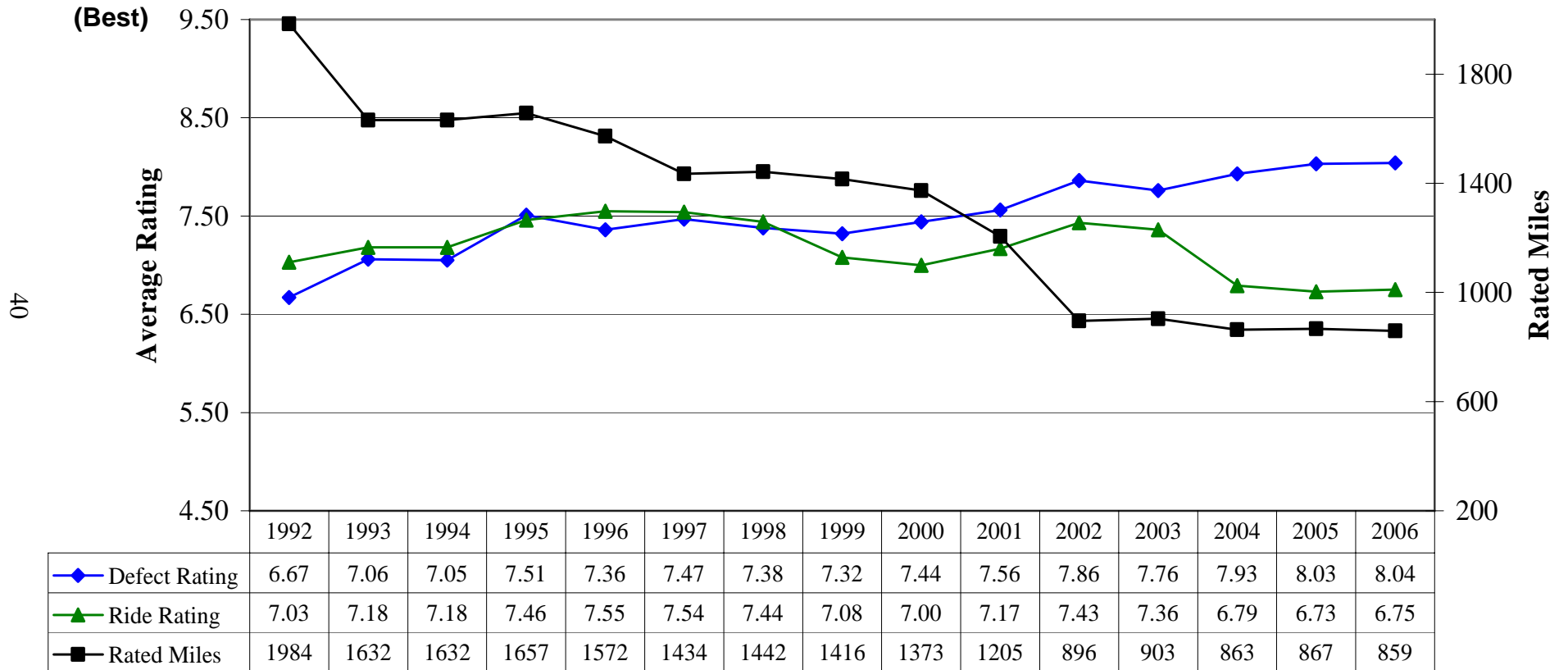
SYSTEM

(1992-2006)



Historical Distress Ratings

All Systems (All Districts)

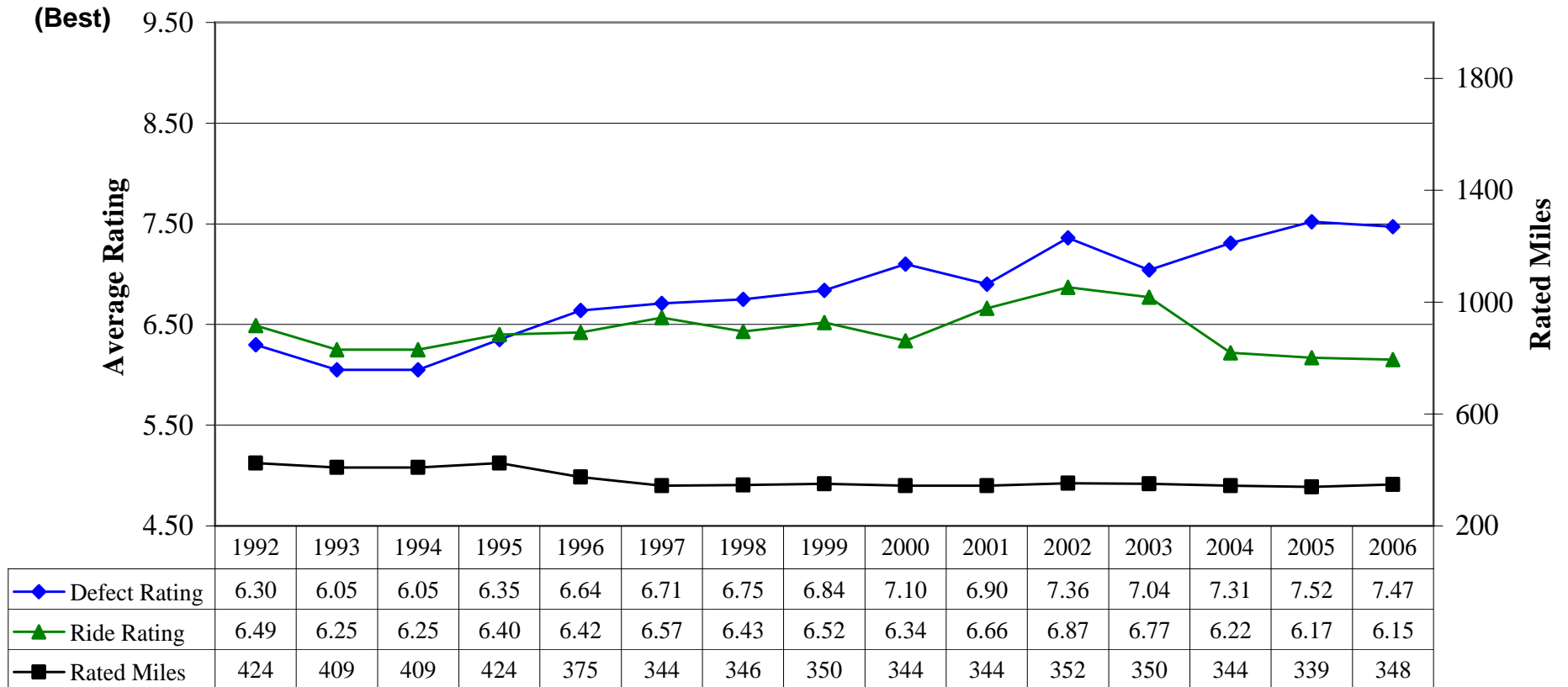


(1) Please note that beginning with the 2004 PCS, the Ride Rating data was collected using a sampling rate of 6 inch intervals. (Refer to Item 2 under Observations, on page 4.)

(2) Please note that Rated Miles equal number of miles evaluated for Defect Rating

Historical Distress Ratings Primary System (All Districts)

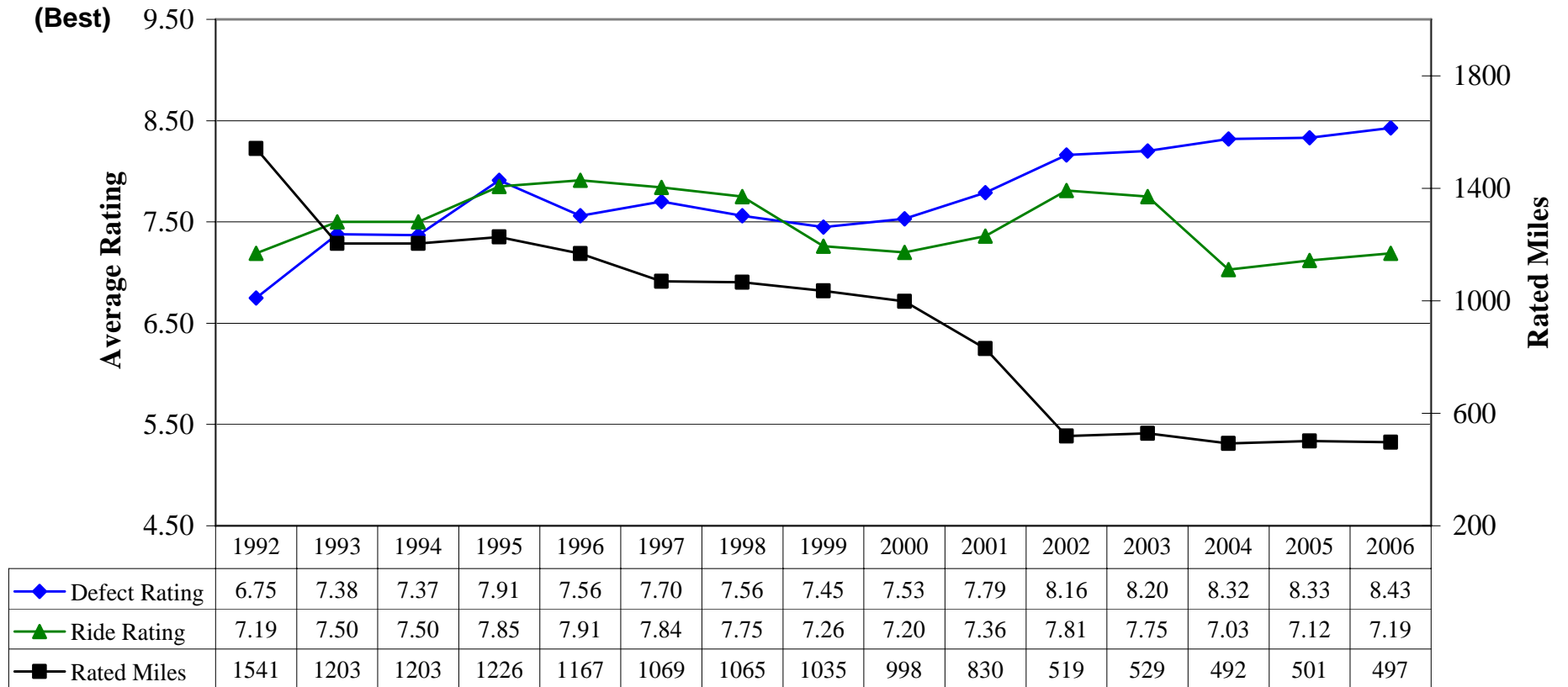
41



- (1) Please note that beginning with the 2004 PCS, the Ride Rating data was collected using a sampling rate of 6 inch intervals. (Refer to Item 2 under Observations, on page 4.)
- (2) Please note that Rated Miles equal number of miles evaluated for Defect Rating

Historical Distress Ratings Interstate System (All Districts)

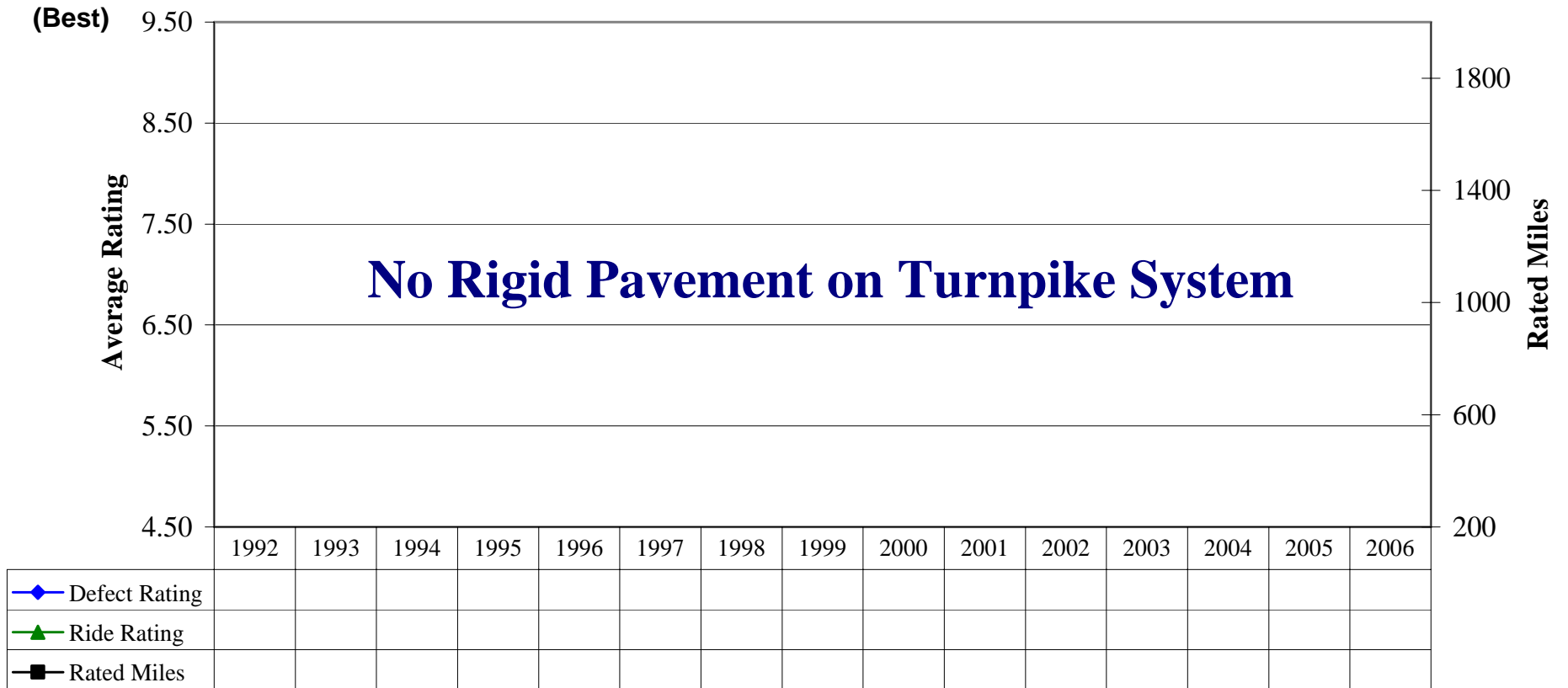
42



- (1) Please note that beginning with the 2004 PCS, the Ride Rating data was collected using a sampling rate of 6 inch intervals. (Refer to Item 2 under Observations, on page 4.)
- (2) Please note that Rated Miles equal number of miles evaluated for Defect Rating

Historical Distress Ratings Turnpike System (All Districts)

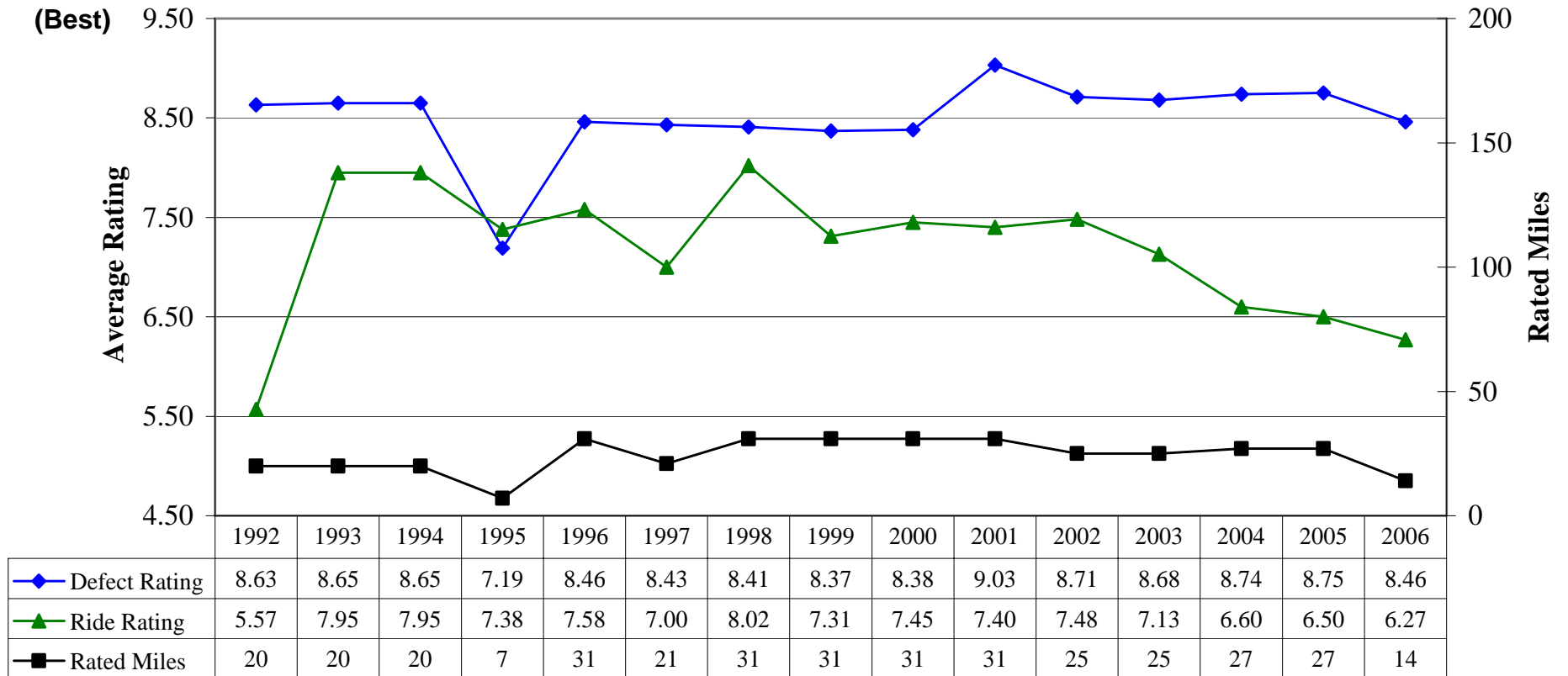
43



- (1) Please note that beginning with the 2004 PCS, the Ride Rating data was collected using a sampling rate of 6 inch intervals. (Refer to Item 2 under Observations, on page 4.)
- (2) Please note that Rated Miles equal number of miles evaluated for Defect Rating

Historical Distress Ratings Toll System (All Districts)

44

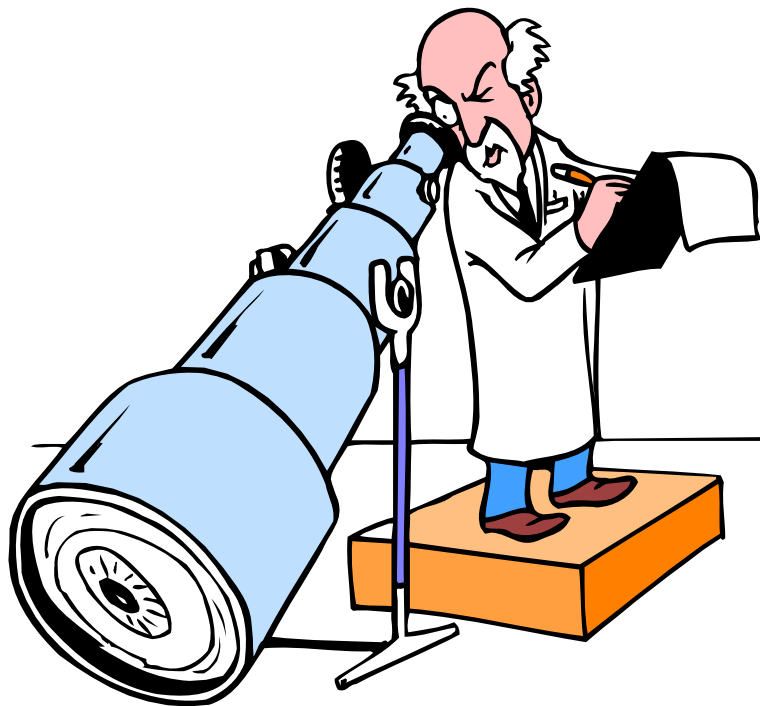


- (1) Please note that beginning with the 2004 PCS, the Ride Rating data was collected using a sampling rate of 6 inch intervals. (Refer to Item 2 under Observations, on page 4.)
- (2) Please note that Rated Miles equal number of miles evaluated for Defect Rating

SECTION VI

DEFECT AND RIDE RATINGS COMPARISON

2005 VS. 2006



SECTION VI

Defect and Ride Rating Comparison

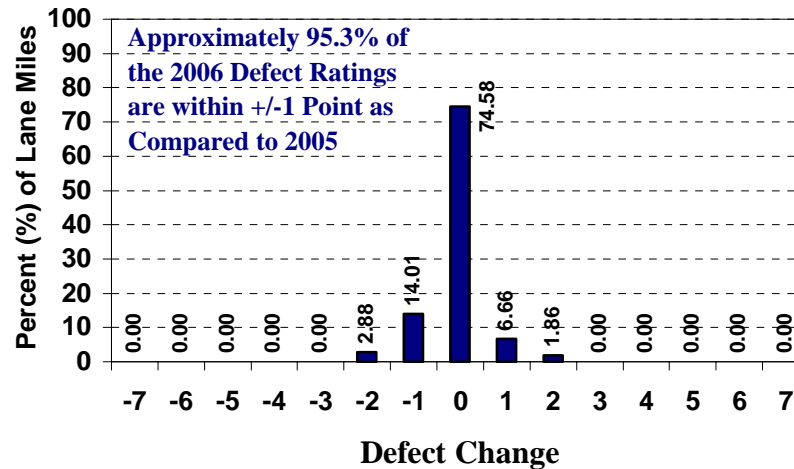
Rating Comparison Criteria

Only Type 4 Rigid Pavement is included in the comparison. The following pavement types have been omitted from this comparative analysis since they exhibit notable changes to the pavement surface as indicated below:

- Type 0 - Pavement sections not State-maintained, duplicated under another county section number, or added under the flexible pavement condition survey.
- Type 1 - Flexible Pavements
- Type 2 - Pavement improvements without new construction, such as intersection improvement, bridge approach, crack sealing or grinding.
- Type 5 - New Construction
- Type 6 - Sections not rated for Ride Quality, usually due to length constraint. (No Ride)
- Type 7 - Rehabilitated Pavement
- Type 8 - Under Construction
- Type 9 - Structures or exceptions that are State-maintained

Defect and Ride Rating Comparison

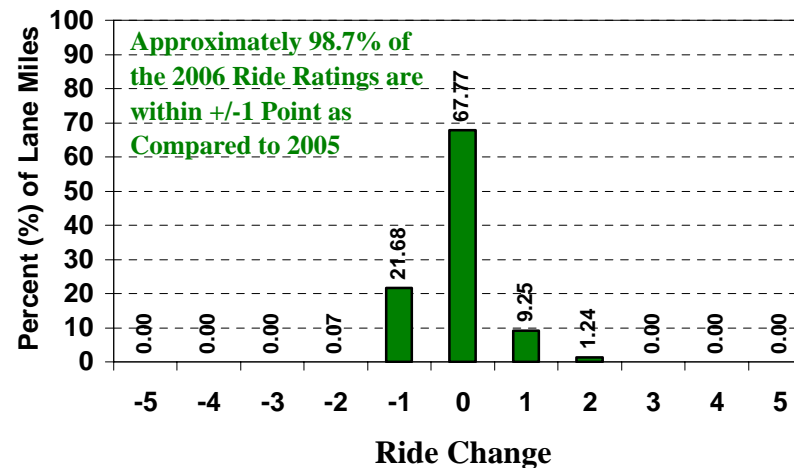
Defect Rating Change (2006 compared to 2005)



NEGATIVE VALUES ARE INDICATIVE OF THE DETERIORATION IN THE PAVEMENT AND/OR THE VARIABILITY IN THE DATA COLLECTION PROCESS

POSITIVE VALUES ARE INDICATIVE OF THE VARIABILITY IN THE DATA COLLECTION PROCESS

Ride Rating Change (2006 compared to 2005)



2006 Rigid Pavement Condition Survey

Facts and Figures

Customer Service Form

In an effort to continuously improve customer service, the Pavement Material Systems Division asks for your input by filling out and returning this survey form.

(Optional)

Your name: _____ Title: _____
 Company/Office/Organization: _____
 Address: _____ City/State/Zip: _____
 Phone: (____)_____ — SunCom: _____ e-mail: _____

*Please rate each of the following on the scale provided. **One** corresponds to **Very Poor**, and **Five** corresponds to **Excellent**.*

Usefulness of Content.....	1	2	3	4	5
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Organization of Information	1	2	3	4	5
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Clarity of Graphical Illustrations	1	2	3	4	5
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Format of Tables	1	2	3	4	5
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Overall Value of this Report.....	1	2	3	4	5
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please provide an answer to the following questions. Attach an additional sheet(s) if needed.

What was the most useful/informative part of this report? _____

What was the least useful/informative part of this report? _____

What changes do you recommend to improve this report? _____

Detach and mail to:
State Materials Office
Attn: Abdenour Nazef
5007 NE 39th Ave.
Gainesville, FL 32609

Or send via email to: abdenour.nazef@dot.state.fl.us